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PREFACE

The Allahabad Farmer (A Journal of Agricultural Science and Technology) an official Journal of Allahabad Agricultural Institute-Deemed University was for the first time published in the year 1925. Thus it is the foremost and pioneering Journal of Agricultural Science and Technology in India. Perhaps we can mention that it is one of the oldest journal of Agricultural research in whole of Asia.

This is an important publication with all aspects of agricultural rural life, educational research and appropriate technology research, applied to sustainable Agricultural production. This journal is dedicated to farm life development with a vision of **"Feed the hungry"** as commanded to the founders of the Institute by our **Lord Jesus Christ**. Feed the hungry does not only mean to acquire and supply the food to the hungry people but it means to disseminate the latest technology of Agriculture to the farmers in order to enable them to produce more food. The objectives of the journal are to further the work and interest of Agricultural research and scientists and to facilitate cooperation among them through research, to foster scientific honour in order to improve the effectiveness of Agricultural sciences, human resource development and welfare through technology, to enhance public understanding through Agriculture news and to appreciate the importance of innovation and creativeness through agreed highlights. The Allahabd Farmer is a forum for preservation and reviewing of burning issues pertaining to the advancement of sustainable Agriculture on planet earth.

With all good wishes.

Sincerely

Prof. (Dr.) Rajendra B. Lal
Editor-in-Chief
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Effect of different levels of Iron and Citric acid on feed consumption and feed efficiency incaged chicks

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ABSTRACT

An experiment was conducted to determine the effect of different levels of ironviz 60, 80, 100 and 120 mg, citric acid, 0.2, 0.4, 0.6 and 0.8%; and their combination on feed consumption and feed efficiency of chicks. There were 24 treatments and control, which contained neither iron nor citric acid. Performance of chicks evaluated on the basis of feed consumption and feed efficiency indicated that there was no significant influence of treatments on feed consumption and feed efficiency of chicks. Is concluded that diets fortified with iron and/or citric acid promoted the performance of chicks and a healthy growth cycle as no mortality was recorded. Supplementation of chicks.dietswas beneficial and enhanced production.

INTRODUCTION

chicks.production plays an important role in food security in the face of the rapid increasing world population and daily protein requirement for non-vegetarians depends on chicks. meat. However, a major concern is the need to improve the quality of meat and As such, the use of several dietary alternatives has been recommended to enhance performance of broiler chicks, two of which are iron and citric acid. It is well known that trace minerals in basal diets affects growth performance, immune responses, and meat quality. Iron can correct or prevent anemia, in addition to being directly involved in hemoglobin functions **McNaughton and Day (1979)**. Iron deficiency (anemia) is a common nutritional deficiency and Fe fortification of diets is necessary to alleviate this problem. Citric acid (CA) is another supplement, which is known to enhance nutrient utilization, growth and feed efficiency in chicks.. It is very effective in improving Phosphorus (P) and other nutrients utilization in chicks., as well as, improves phytase enzyme activity **Boling-Frankenbach, *et al.* (2001)**. Increasing the utilization of dietary P improves the performance and retention of mineral substances. The addition of CA to chicks. diet had positive effects on

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growth, feed intake and feed efficiency **Chowdhury *et al* 2009, Arjona-Roman *et al* (2011)**. Therefore, an experiment was conducted to determine the effect of different levels iron and citric acid or their combination on feed intake and feed conversion ratio of broilers chicks.

Table 1: Treatments used in the experiment

Treatment	Level of supplements or the combinations
T_0	CONTROL (basal feed with no supplement)
T_1	60 mg iron
T_2	80 mg iron
T_3	100 mg iron
T_4	120 mg iron
T_5	0.2% citric acid
T_6	0.4% citric acid
T_7	0.6% citric acid
T_8	0.8% citric acid
T_9	60 mg iron + 0.2% citric acid
T_{10}	60 mg iron + 0.4% citric acid
T_{11}	60 mg iron + 0.6% citric acid
T_{12}	60 mg iron + 0.8% citric acid
T_{13}	80 mg iron + 0.2% citric acid
T_{14}	80 mg iron + 0.4% citric acid
T_{15}	80 mg iron + 0.6% citric acid
T_{16}	80 mg iron + 0.8% citric acid
T_{17}	100 mg iron + 0.2% citric acid
T_{18}	100 mg iron + 0.4% citric acid
T_{19}	100 mg iron + 0.6% citric acid
T_{20}	100 mg iron + 0.8% citric acid
T_{21}	120 mg iron + 0.2% citric acid
T_{22}	120 mg iron + 0.4% citric acid
T_{23}	120 mg iron + 0.6% citric acid
T_{24}	120 mg iron + 0.8% citric acid

Seventy-five (75) day old chicks (DOC) of the same hatch were reared in battery type cages. Each day old chick was weighed and distributed randomly among 25 treatments with 3 chicks in each to move as replicates. The production cycle was up to 35 days (5 weeks) after hatching. Chicks were fed self-prepared standard chicks.starter ration from day 1 to day 21 (3 weeks followed by standard chicks. finisher ration from day 22 to day 35 (4th and 5th weeks). Two types of ration (starter and finisher) were supplemented with different levels of Iron and Citric Acid either alone or in various combinations *(Table 1)*. The ration was fed ad lib to the chicks.. Body weight was recorded weekly to determine growth rate and gain in weight of the chicks. All chicks.were offered drinking water

RESULTS AND DISCUSSION

The results revealed that the average weight of feed consumed by five-week old chicks for each treatment from T0 to T24 were 540.03, 526.00, 590.00, 601.33, 600.03, 590.00, 600.03, 574.03, 551.60, 612.63, 624.63, 552.50, 650.13, 610.33, 503.03, 506.03, 511.33, 609.47, 530.03, 535.63, 646.03, 656.37, 623.33, 650.00 and 551.00, respectively. The lowest mean weight of feed consumed was recorded from T14 as 503.03 g but the lowest individual weight of feed consumed was recorded from T24 as 325.00 g, a notable difference of 178.03 g. The highest mean weight of feed consumed was recorded from T21 as 656.37 g but the highest individual weight of feed consumed was recorded from T24 as 812.6 g, a notable difference of 156.23 g. There were no significant differences ($p \leq 0.05$) among the treatments, despite a difference of 153.34 g between the highest and lowest means. This suggests that no treatment was superior to the other and that T0, which was the unfortified diet, had an equal preference to the feeding intake by the five-week old chicks.

In terms of feed efficiency of the different treatments, the feed conversion ratio during the five-week period had a mean ranged from 1.85 g to 2.23 g. The mean FCR for each treatment from T0 to T24 were 2.11, 2.07, 1.92, 2.09, 2.09, 2.03, 1.94, 2.19, 2.03, 1.85, 2.03, 1.99, 2.23, 2.10, 2.15, 1.87, 2.17, 2.09, 2.09, 2.13, 2.04, 2.04, 1.86, 2.00 and 2.10, respectively. The lowest mean FCR was 1.85 g for T9 and the lowest individual FCR was 1.56 g in the same treatment, followed by 1.59 g in T15, while the highest mean FCR was 2.23 g for T12 but the highest individual FCR was 2.80 g in T7, followed by 2.70 g in T12. There were no significant differences ($p \leq 0.05$) among the treatments. The difference between the highest and lowest means is just 0.38 g. As it is, no treatment is superior to another.

Table-2 : Mean values of feed intake and feed conversion ratio of five-week old chicks

Treatments	Feed intake for five weeks (kg)	feed conversion ratio
T_0	1.91	1.85
T_1	1.95	1.71
T_2	1.95	1.77
T_3	2.03	1.80
T_4	2.01	1.84
T_5	2.00	1.74
T_6	1.94	1.61
T_7	1.93	1.71
T_8	1.91	1.66
T_9	1.93	1.59
T_{10}	2.14	1.78
T_{11}	1.81	1.61
T_{12}	2.16	1.85
T_{13}	2.02	1.84
T_{14}	1.98	1.91
T_{15}	1.72	1.61
T_{16}	1.79	1.66
T_{17}	2.03	1.87
T_{18}	1.85	1.82
T_{19}	1.73	1.73
T_{20}	2.07	1.75
T_{21}	2.07	1.92
T_{22}	2.05	1.84
T_{23}	2.18	1.85
T_{24}	1.78	1.89
Results	NS	NS

NS=not significantly

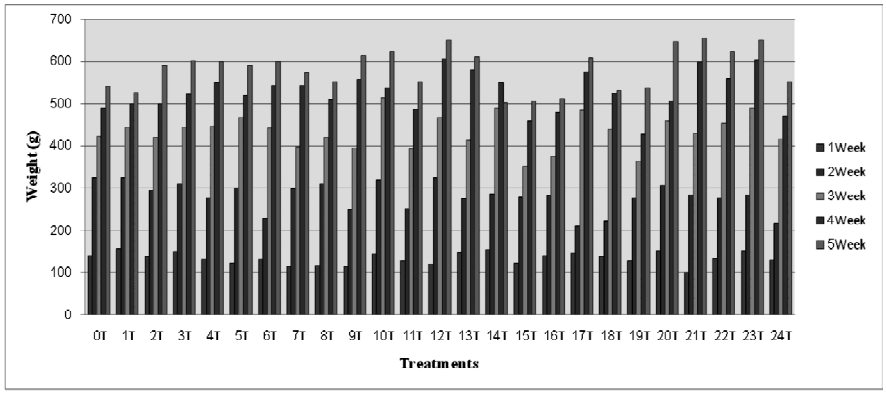

Figure 1 Average feed intake per week of chicks in different treatments

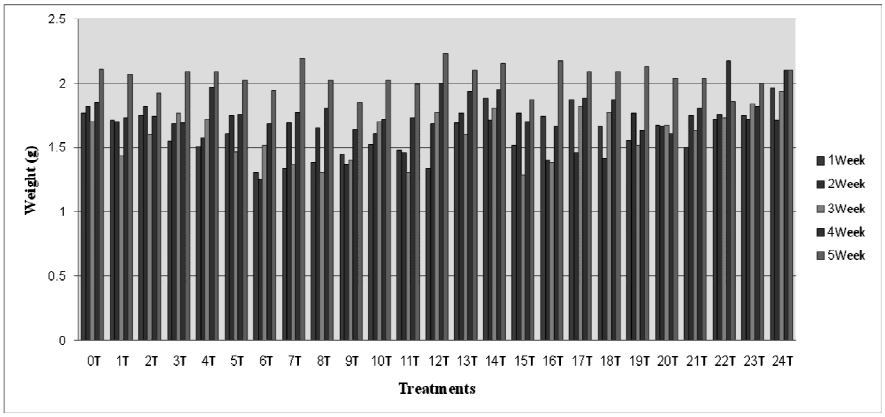

Figure 2 Average feed conversion ratio per week of chicks in different treatments

As reported by **Ramadan *et al* (2010)**, iron supplementation either at the level of 100 or 200 mg/kg improved feed conversion ratio and when combined with copper and/or zinc, improved the economical efficiency. Similarly, feed intake and feed conversion ratio were significantly higher for chicks. fed on diet supplemented with citric acid and phytase **Deepa *et al* (2001)**. **Ghazalah *et al* (2011)** found that feed conversion ratio was also significantly improved with citric acid supplementation. It was suggested that 2% citric acid could be used to safely improve performance and health of chicks.

In conclusion, diets fortified with iron and/or citric acid promoted the performance of chicks and a healthy growth cycle as no mortality was recorded. Supplementation of chicks.dietswas beneficial and should be considered to ascertain sustained production.

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Effect of different levels of manganese and ascorbic acid on body weight and Gain in weight in caged Broilers

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ABSTRACT

The present study was carried out at Sunderesan School of Animal Husbandry and Dairying of SHIATS, Allahabad, Uttar Pradesh, India on 75 Day-Old Broiler Chicks (DOBC) which were randomly divided into twenty five groups. Data on body weight and gain in weight of broiler chicks from day old to five weeks of age, was recorded and statisticaly analyzed. The result showesa significant effect of inclusion of manganese and ascorbic acid in the diet the body weight and gain in weight of the caged broilers.

INTRODUCTION

Broiler chicks have been selected for increased meat yield ,better feed conversion and high growth rates for many decades. Fifty years ago it took over 12 weeks to raise a 1815 g broiler. Through advances in genetic selection and nutrition, a 2268 g broiler can now be raised in 6 to 7 weeks. Genetics and nutritional improvements in broiler production have been extremely important to the efficiency of poultry meat production; however, thefull genetic potential of broilers cannot be reached unless the proper environment is maintained in the broiler house. The fast growing, modern broiler lines are more dependent on proper environmental conditions than birds from lines raised earlies.

Deficiency of manganese in the diet of young growing broiler chicks is one of the causes of perosis and of thin-shelled eggs. Most poultry feed are poor sources of manganese. Perosis caused by manganese deficiency is exacerbated by excess calcium and phosphorus in the diet. Birds reared on wire or slatted floors are more susceptible to perosis than those reared on litter. All commercial poultry diets are now supplemented with a source of available manganese (manganese sulfate). Because manganese deficiency is now rare, other possible causes should be considered when perosis is encountered hatchability ofbroiler chicks are more susceptible to changing

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environmental conditions **Nolan *et al.* (1999)**. In particular, the stress depressed feed intake, weight gain and increased mortality rates among broilers **Ayo *et al.*, (1996)**. A possible approach to counteracting the negative effects of cold stress among chicks could be the supplementation of birds with Vitamin C in broiler ration. Vitamin C plays a major role in the biosynthesis of corticosterone **Bains, (1996)**, a primary glucocorticoid hormone involved in gluconeogenesis to enhance energy supply during stress **Andarson, (1986)**.

MATERIALS AND METHODS

Day old 75 broiler chicks of same hatch were procured and housed in battery type cages consisting of three chicks in each to provide recommended floor space of 0.75ft2 in cage per broiler in Small Animal Laboratory of the Sundaresan School of Animal Husbandry and Dairying, SHIATS. Chicks were provided with self-prepared ration as per following treatments combinations:

T0 = control

T1 = T0 + 100mg/Kg ascorbic acid.

T2 = T0 + 200mg/Kg ascorbic acid.

T3 = T0 + 300mg/Kg ascorbic acid.

T4 = T0 + 400mg/Kg ascorbic acid.

T5 = T0 + 30mg/Kg manganese.

T6 = T0 + 60mg/Kg manganese.

T7 = T0 + 90mg/Kg manganese.

T8 = T0 + 120mg/Kg manganese.

T9 = T0 + 100mg/Kg ascorbic acid +30mg/Kg manganese.

T10 =T0 + 100mg/Kg ascorbic acid+60mg/Kg manganese.

T11 = T0 + 100mg/Kg ascorbic acid+90mg/Kg manganese.

T12 = T0 + 100mg/Kg ascorbic acid+120mg/Kg manganese.

T13 = T0 + 200mg/Kg ascorbic acid+30mg/Kg manganese.

T14 = T0 + 200mg/Kg ascorbic acid+60mg/Kg manganese.

T15 = T0 + 200mg/Kg ascorbic acid+90mg/Kg manganese.

T16 = T0 + 200mg/Kg ascorbic acid+120mg/Kg manganese.

T17 = T0 + 300mg/Kg ascorbic acid+30mg/Kg manganese.

T18 = T0 + 300mg/Kg ascorbic acid+60mg/Kg manganese.

T19 = T0 + 300mg/Kg ascorbic acid+90mg/Kg manganese.

T20 = T0 + 300mg/Kg ascorbic acid+120mg/Kg manganese.

T21 = T0 + 400mg/Kg ascorbic acid+30mg/Kg manganese.

T22 = T0 + 400mg/Kg ascorbic acid+60mg/Kg manganese.

T23 = T0 + 400mg/Kg ascorbic acid+90mg/Kg manganese.

T24 = T0 + 400mg/Kg ascorbic acid+120mg/Kg manganese.

The standard broiler starter ration contained CP:22 and ME : 2900 and broiler finisher ration contained CP:19 and ME:3000 were fed ad lib to the birds as per **Bureau of Indian Standards, (1992).**

STATISTICAL ANALYSIS

Data on various parameters weekly body weight and gain in weightwere collected, tabulated and analyzed statistically using analysis of variance techniques as per **Snedecar and Cochran (1994).**

RESULTS AND DISCUSSION

Average body weight of broiler:

In general the body weight of day old broiler chicks ranged from 40 to 46g. The mean bodyweight of DOC in different treatment viz. T0 to T24 was 42.6, 44.6, 42, 44.3, 43.6, 42, 42, 42, 42, 43.6, 44.3, 45.3, 42.3, 43.3, 45.3, 43, 43.6, 44.3, 40.6, 44.3, 43, 43.6, 42.6, 45 and 43g, respectively. The differences in mean body weight of the chicks were not significant. The results pertaining to the body weight of DOC contained in *Table 1* indicated that broiler in T11, 14 had the highest body weight 45.3(g) but it did not significantly differ from other treatments. And Irrespective of treatments in general the body weight of the broilers at fifth weeks of age ranged from 925 g to 1315g. The mean body weight at fifth weeks of age in different treatments viz.T0 to T24 were 953.3, 1233.6, 1211, 1206.3, 1289, 1046.6, 1082.3, 1139, 1141.3, 1163.6,

1172.3, 1191, 1174, 1224, 1186, 1211, 1248.3, 1207, 1202.6, 1158.3, 1171.3, 1223, 1159.3, 1282 and 1202.3g, respectively. The differences in mean body weight of the broilers of fifth weeks of age between treatments were significant *Table-1*. Highest mean body weight of broilers at fifth weeks of age was recorded in T4 (1289g) followed by T23, T16 and T1. And lowest mean was observed in T0 (953.3g). The differences in these values of body weights were found significant indicated there by significant effect of treatments on body weight of broilers. The body weight of broilers at fifth weeks of age in T4, T23, T16 and T1 were found non-significant being at bar. The control (T0) is the lowest treatments in body weight of broilers at fifth weeks of age registered significantly compared to all treatments. The results tally with the findings of **Ozkan. *et al.* (2003)** and **Balog *et al.*, (2003)**.

Averagegain in weight (g) of broiler

In general average gain in weight of the broilers at 5 weeks of age ranged from 910.4 g to 1245.4 (g). The mean gain in weight at 5 weeks in different treatments viz. T0 to T24 was 910.7, 1189, 1169, 1162, 1245.4, 1004, 1039, 1097, 1099, 1120, 1128, 1145.7, 1131.7, 1180.7, 1140.7, 1168, 1204.7, 1162.7, 1162, 1114, 1128.3, 1179.4, 1116.7, 1237 and 1159.3 g respectively. The differences in mean gain in weight of the broilers of 5 weeks of age between treatments were significant Table1. The highest mean gain in weight of broilers at weeksof was recorded in T4 (1245.4g) and T23, T16. And the lowest T0 (910.7g). However differences in these values of gain in weight were significant indicated there by significant effect of treatments on gain in weight of broilers. Gain in weight of broilers at 5weeks of age in T4, T23, and T16 were not significantly different 5% level. And the T0 (control) and T5, T6, T7, T8, were not significantly different is the lowest treatments gain in weight of broilers at fifth weeks of age. The control T0 andT5, T6, T7, T8, registered significantly the lowest gain in weight compared to all the treatments. The results tally with the finding of **Sobayo (2005)** and **Beck, (1991)** and **Smith *et al,* (1995)**.

Table1 .Mean values different parameters:

Treatments	PARAMETER		
	body weight of DOC age(g)	**body weight at fifth week of age(g)**	**Gain in weight at 5 weeks (g)**
T0	42.6	953.30	910.7
T1	44.6	1233.60	1189
T2	42	1211.00	1169
T3	44.3	1206.30	1162
T4	43.6	1289.00	1245.4
T5	42	1046.60	1004.6
T6	42.6	1082.30	1039.7
T7	42	1139.00	1097
T8	42	1141.30	1099.3
T9	43.6	1163.60	1120
T10	44.3	1172.30	1128
T11	45.3	1191.00	1145.7
T12	42.3	1174.00	1131.7
T13	43.3	1224.00	1180.7
T14	45.3	1186.00	1140.7
T15	43	1211.00	1168
T16	43.6	1248.30	1204.7
T17	44.3	1207.00	1162.7
T18	40.6	1202.60	1162
T19	44.3	1158.30	1114
T20	43	1171.30	1128.3
T21	43.6	1223.00	1179.4
T22	42.6	1159.30	1116.7
T23	45	1282.00	1237
T24	43	1202.30	1159.3
RESULT	**NS	*S	S

*Significant S - Significant

**Non-significant NS - Not Significant

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Bacterial quality of raw milk as influenced by lactation number of crossbred cows

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ABSTRACT

The present study was undertaken to determine the effect of lactation number on total viable count of bacteria as standard plate count (SPC), proteolytic bacterial count (PBC), lipolytic bacterial count (LBC), lactic acid bacterial count (LABC) and coliforms in raw milk as influenced by different lactations of crossbred cows under full hand in diagonal method of milking at SHIATS Dairy Farm, Allahabad. The analysis of variance showed significant effect of lactation on SPC, PBC, LBC and LABC whereas no significant difference on coliforms. The quality of raw milk as determined by bacterial parameters was found better in milk of cows in sixth lactation followed by milk obtained in third, fifth, fourth and second lactation of cows.

Key words: *Crossbred, raw milk, lactation number, bacterial parameter.*

INTRODUCTION

India is basically a rural oriented and land based country with 76.27 per cent of rural population and livestock sector is an integral part of Indian agriculture. Being an agricultural country with 1/5th of world's population of cattle (222 million) and of the worlds buffaloes (98 million) - the cows and bullocks are the back bone of Indian agriculture and play a major role in the rural economy **Prasad, (2013)**. Country has an obligation to the cows as cows provide milk and milk products which are the only source of animal protein in vegetarian diets. In India, hitherto, there was a synergy balance maintained between agriculture and animal husbandry, one complementing the other. Livestock is an important sub-sector of Indian agricultural economy which plays a multi-faceted role in providing livelihood support to the rural population. Contribution of livestock has increased from 14 per cent (1980-81) to 24-30 per cent in 2010-11 **Rawat, (2013)**.

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Among all output, milk is the main output which plays an important role in enhancing the food security. Milk synthesized in the udder is sterile but when drawn out from udder of healthy cows contains bacteria that have entered into the teat opening. These are pushed out during milking process. Therefore, fore milk from udder in general carry greater number of bacteria than stripping. Further, contamination in milk may take place from the nearest source outside the udder such as milker, method of milking, cow's skin, flanks and utensils. Type and number of micro-organisms in milk vary with the extent and nature of contamination due to conditions at production of milk. Whether the quality and density of these bacteria is influenced by lactation number of cows is yet to be determined. With this in view the present experiment on quality of raw milk was undertaken.

MATERIALS AND METHODS

The present experiment on fresh raw milk obtained from the udder of healthy crossbred cows (HF crosses) at the Dairy farm of Sam Higginbottom Institute of Agriculture, Technology and Sciences, Allahabad was carried out from September 2011 to March 2012.

In all 18 cows chosen for the experiment were housed in tail to tail barn and were divided into six groups of 3 cows in each based on lactation number viz. L_1 (cows in first lactation), L_2 (cows in second lactation), L_3 (cows in third lactation), L_4 (cows in fourth lactation), L_5 (cows in fifth lactation) and L_6 (cows in sixth lactation). Cows were prepared for milking at 1 p.m. Sanitary precautions like clipping of long hairs on the udder and flank, grooming, washing of udder and teats with clean water before milking, wiping mammary quarters with towel soaked in 2% Dettol solution, tying tail with hind legs etc. were taken care prior to collection of milk samples. Cows were milked by full hand in diagonal method of milking. Two streams of fore-milk from each quarter of udder were discarded as per recommendation of **Singh and Prasad (1987)**. Then representative samples of 200 ml milk were collected aseptically from milking pail into sterilized conical flask and plugs were replaced immediately. In all 20 replications were made in each lactation. Bacterial quality was ascertained by determining Standard plate count (SPC), lactic acid bacterial count (LABC), lipolytic bacterial count (LBC), proteolytic bacterial count (PBC) and coliforms as per **Chalmers (1953)**.

RESULTS AND DISCUSSION

Mean values of SPC (10^4) of cows of different lactations are 224.59, 290.70, 244.16, 298.17, 273.95 and 235.58 in raw milk of cows of L_1, L_2, L_3, L_4, L_5 and L_6 number, respectively *(Table 1)*. It may be noted that SPC (10^4) per ml in raw milk of cows L_1, L_2, L_3, L_4, L_5 and L_6 ranged from 135.73 to 356.75, 200.00 to 364.80, 153.00 to 334.00, 212.20 to 354.50, 215.00 to 357.50 and 162.50 to 294.50, respectively and the differences in SPC per ml in raw milk due to lactation number of cows were significant. The average values of SPC/ ml of raw milk are in agreement with **Dey and Prasad (1989)**. However, **Singh *et al.* (2012)** observed no significant effect of lactation on SPC in raw milk.

Mean values of LABC (10^3) per ml in raw milk of cows of L_1, L_2, L_3, L_4, L_5 and L_6 number was 23.37, 27.95, 34.56, 37.90, 29.56 and 39.77, respectively *(Table 1)*. LABC (10^3) per ml in raw milk of cows of L_1, L_2, L_3, L_4, L_5 and L_6 ranged from 16.50 to 30.50, 19.00 to 37.00, 23.00 to 46.50, 23.70 to 56.00, 16.50 to 40.00 and 26.50 to 65.00, respectively and the differences in Lactic acid bacterial count per ml in raw milk of cows due to their lactation number were significant. Findings of this study are in agreement with the results obtained by **Singh and Prasad (1987)**.

Mean values of LBC (10^2) per ml in raw milk of cows of L_1, L_2, L_3, L_4, L_5 and L_6 was 25.11, 18.32, 16.05, 15.24, 8.23 and 12.67, respectively *(Table 1)*. LBC (10^2) per ml in raw milk of cows of L_1, L_2, L_3, L_4, L_5 and L_6 number ranged from 10.40 to 38.90, 9.00 to 25.00, nil to 41.00, 3.50 to 37.50, nil to 23.00 and nil to 32.00, respectively and the differences in LBC per ml in raw milk due to lactation number of cows were significant. A different trend in LBC was noted which showed that its density decreased with the increase in lactations as milk production tended to decrease up to V^{th} lactation though it again increased in the last VI^{th} lactation. Findings of this study are in agreement with the results obtained by **Neeraj and Prasad (1990)**. However, results of **Singh *et al.* (2012)** did not tally with the present study.

Mean values of PBC (10^2) per ml in raw milk of cows in L_1, L_2, L_3, L_4, L_5 and L_6 lactation was 22.19, 25.23, 18.56, 23.34, 23.10 and 16.52, respectively *(Table 1)*. PBC (10^2) per ml in raw milk of cows in L_1, L_2, L_3, L_4, L_5 and L_6 lactation ranged from 12.90 to 37.00, 11.00 to 46.00, nil to 35.00, 12.70 to 32.50, 12.50 to 38.50 and 7.00 to 25.60, respectively and the differences in PBC per ml in raw milk due to lactation number of cows were significant. The averages values of PBC/ ml of raw milk are in agreement with **Anna and Prasad (1989)**.

Mean values of coliforms per ml in raw milk of cows of L_1, L_2, L_3, L_4, L_5 and L_6 lactation was 1.03, 0.70, 0.00, 0.55, 0.70 and 0.60, respectively *(Table 1)*. Coliforms per ml in raw milk of cows of L_1, L_2, L_3, L_4, L_5 and L_6 numbers ranged from nil to 13.00, nil to 7.00, nil to nil, nil to 5.00, nil to 7.00 and nil to 8.00, respectively and the differences in coliforms per ml in raw milk due to lactation number of cows were not significant. Results are in agreement with **Singh *et al.* (2012)** and **Pandey and Prasad (1991)** who did not find any significant differences in coliforms due to lactation number.

Table 1: Mean values of different parameters arranged in ascending or descending order of their significance for bacterial quality of milk.

Parameters	Mean Values						*C.D.*
	L^1	L^2	L^3	L^4	L^5	L^6	
SPC (10^4)	224.59	290.70	244.16	298.17	273.95	235.58	*25.19*
LABC (10^3)	23.37	27.95	34.56	37.90	29.56	39.77	*4.66*
LBC (10^2)	25.11	18.32	16.05	15.24	8.23	12.67	*4.85*
PBC (10^2)	22.19	25.23	18.56	23.34	23.10	16.52	*4.61*
Coliforms	1.03	0.70	0.00	0.55	0.70	0.60	*NS*

Rating of milk quality based on stage of lactation: L6 > L3 > L5 > L4 > L2 > L1

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Utilization of fodder beet (*Beta vulgaris*) on growth of Black Bengal Goats under semi intensive condition

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ABSTRACT

The growth performance of Black Bengal goats reared under semi-intensive condition was studied. For this purpose, eighteen weaned male growing kids of about 4 months of age were randomly assigned to three treatment groups (T_1, T_2 and T_3) in equal number. Group T_1 served as control having conventional feed ingredients while fodder beet was incorporated at 50 percent and 100 percent (w/w) in groups T_2 and T_3, respectively, replacing maize. Feeding trial continued for 90 days period followed by a metabolic trial adopting standard procedures. Body weight of all the kids was recorded at fortnightly intervals. Digestibility of nutrients, average plane of nutrition, balance of nitrogen, calcium and phosphorus, feed conversion efficiency and economics of feeding were recorded.

The total consumption of feed was found non-significant among three groups. The digestibility co-efficient of various organic nutrients such as DM, CP, EE, CF and NFE did not differ significantly among the three groups. This also indicated that fodder beet had no adverse effect on the digestibility of various organic nutrients on the different diets.

The balances of nitrogen, calcium and phosphorus were found to be highly positive in respect of all three groups. The balances of N, Ca and P did not differ significantly among the three groups.

Key Words : *Bengal goat, growth rate, fodder beet, semi- intensive condition*

INTRODUCTION

In India goats are the main meat producing animals, whose meat is one of the choicest meat and has huge majestic demand. Beside meat, goats provide other products like skin, fiber and manure. Goats are important part of rural economy

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particularly in the arid, semi-arid and mountainous regions of the country. They provide nutritional security to the million of marginal and small farmers. However the productivity of goats under the prevailing traditional system is very low **Singh and Kumar, (2007)**. It is because they are maintained under the extensive system on natural vegetation on degraded common grazing land and the tree looping. Even these degraded grazing resources are shrinking continuously, therefore rearing of goats under intensive and semi- intensive system using improved technologies for commercial production has become imperative, not only for realizing for their full potential but also to meet the increasing demand of goat meat in the domestic as well as international markets.

Responding the market signals the goat production system in India has been slowly moving from extensive to semi- intensive system for commercial production. The black Bengal breeds of goat known for producing excellent quality of meat and superior skin to other breeds and widely distributed in West Bengal, Jharkhand , Bihar and adjoining areas. Now a days many educated wealthy people are coming up for goat production. Thus goat rearing is gradually taking up a shape of an enterprises.

The main constraints in semi-intensive profitable goat farming is the cost of feed. Increasing shortage of food grains, particularly in developing countries of the world have initiated a growing realization for the need of restricting the use of grains for feeding of animals. Therefore new form of animal feed based on tuber crops being developed, which contains the following:

Moisture	83.20 per cent	Crude protein	13.32 per cent
Crude Fiber	11.81 per cent	Ether Extract	1.50 per cent
Nitrogen Free Extract	62.21 per cent	Ash	11.36 per cent
Calcium	1.06 per cent	Phosphorous	0.43 per cent

Keeping in view,the importance of formulating of low cost, balanced feed for goats, the present study was conducted to find out the performance of fodder beet on black Bengal goats in semi- intensive condition.

Table- 1 : Composition of Ration under different treatments (T)

Ingredients %	T_1	T_2	T_3
Crushed Maize	50	25	00
Wheat bran	37	37	37
Groundnut cake	10	10	10
Fodder Beet Tuber	00	25	50
Mineral Mixture	02	02	02
Common Salt	01	01	01
	100	**100**	**100**

MATERIALS AND METHODS

The study was carried on eighteen growing male black Bengal kids of four month age and randomly divided into three groups namely T_1, T_2 and T_3, each comprising of six animals in such a way that average body weight of the animals of each group should be similar. Distribution of kids in different groups have been shown in *Table-2.*

Table-2 : Distribution of kids in different groups

Kid No.	**Body Weight (kg)**	**Kid No.**	**Body Weight (kg)**	**Kid No.**	**Body Weight (kg)**
1	9.40	7	7.10	13	5.40
2	12.00	8	11.30	14	11.10
3	11.00	9	10.60	15	10.80
4	4.00	10	5.20	16	8.90
5	5.00	11	6.40	17	4.60
6	7.30	12	8.30	18	8.70
Average Body weight	8.11±1.206		8.15±0.895		8.25±1.01

All the kids were dewormed with anthelmentic drugs (fenbendazole @ 7.5mg/ kg body weight) and for removal of ectoparasites dipped into Amitraj medicated water. A standard concentrate ratio was prepared as per **ICAR (1998)** feeding standards. Ground maize of control ration was replaced with fodder beet tuber 50 per cent and 100 per cent in T_2 and T_3 groups respectively. The composition of ration has been presented in *table-1*.

To assess the effect of fodder beet tuber in kids were fed weigh quantity of different feeds in different group at 8a.m in the morning and 4 pm in the evening. The left over feed residues were collected and weighed to estimate the actual consumption. The kids groups were fed daily Oat + Berseem (1:1) ad lib. Body weight of the all kids was taken in the morning, before feeding and watering at fortnight intervals with the help of spring balance. Body weight was recorded for six consecutive fortnights and growth rate of individual animal was calculated on fortnightly and daily basis.

After the end of 90 days feeding a metabolic trial was conducted using all experimental kids from each groups. Representative sample of concentrate mixture and green fodder (offered and leftover) were taken and their dry matter content was estimated daily. The data were subjected to statistical analysis as per to **Snedecor and Cochran (2004)**.

RESULT AND DISCUSSION

The data obtained from experiment on effect of feeding of fodder beet tuber to the growing kids on their body weight gain have been presented here in *table-3*. However before starting of the feeding trial, sample of fodder beet tuber analyzed in the laboratory for various proximate principles. The values of dry matter, crude protein, crude fibre, ether extract, total ash and nitrogen free extract were found to be 16.80, 13.32, 11.81, 1.50, 11.36 and 62.21 per cent respectively. Calcium and phosphorous content of fodder beet tuber was estimated to be 1.06 and 0.43 per cent respectively.

The average body weight of kids in different groups at fortnightly interval for six fortnight, has been presented in *table-3*. The average initial body weight of the black Bengal male kids of about four months of age were8.11±1.20, 8.15±0.89 and 8.25± 1.01 kg in groups T_1, T_2 and T_3, respectively. The difference between the initial body weight among different groups was non significant (P> 0.05). The average body weight attained after 90 days feeding trial period were 12.23 ±1.30, 12.63±1.21 and

Table-3 : Average body weight (kg) of kids in different groups at fortnightly intervals.

Fortnights	Experimental groups			'F' Value
	T_1	T_2	T_3	
Initial	8.11±1.206	8.15±0895	8.25± 1.01	0.00NS
1st	8.45± 1.20	8.55±0.95	8.40± 1.02	0.00NS
2nd	9.12± 1.28	9.28± 0.93	9.10± 1.10	0.00NS
3rd	9.70± 1.39	9.98± 1.00	9.70± 1.12	0.00NS
4th	10.78± 1.50	10.66± 1.22	10.69± 1.31	0.01NS
5th	11.65± 1.65	11.94± 1.12	11.42± 1.05	0.00NS
6th	12.23± 1.30	12.63± 1.21	12.19± 1.36	0.00NS

Table - 4 : Overall growth performance of the kids of different groups

S.No	Particulars	Experimental groups			'F' Value
		T_1	T_2	T_3	
1	Initial body weight(kg)	8.11±1.20	8.15±0.89	8.25±1.01	0.00NS
2	Final body weight a (kg) after 90 days	12.23±1.30	12.63±1.21	12.19±1.36	0.00NS
3	Total gain in body weight (kg) during 90 days	4.12± 0.62	4.48± 0.58	3.94± 0.52	0.01NS
4	Average daily gain in body weight (g)	44.04±5.20	46.20± 4.82	42.18± 5.82	0.03NS

12.19±1.36 kg in groups T_1, T_2 and T_3, respectively. The overall growth performances of kids in different groups have been presented in *table-4*.

The average daily gain in live weight were found to be 44.04±5.20, 46.20±4.82 and 42.18±5.12 g in three groups T_1, T_2 and T_3, respectively, which did not differ significantly. The highest daily gain in body weight was noted in group T_2 followed by group T_1 and T_3.

The finding of the present study are comparable with the findings of **Shalaby, *et.al.* (1989)** who started, fodder beet as a new forage in **Egypt and Muller *et.al* (1994)** who reported that utilization of fodder beet as an energy source in lactating cows showed no adverse effect on their production.

CONCLUSION

On the basis of finding, it was concluded that 50% crushed maize can be replaced by fodder beet tuber to cut down the cost of concentrate feed without any harmful effect.

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Aggressive behaviour in Crossbred lactating cows

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ABSTRACT

The present study was carried out in 18 cross-bred lactating cows in a competitive eating situation over a feed resource using video camera (Kodak, 10.2 mega pixels) for 1 hour after returning from milking in day time for each group (C, T_1 and T_2) for three consecutive days fortnightly. The aggressiveness was measured in terms of Aggressive index (AI) and Displacement index (DI) and two non-parametric tests were used to see the significance of AI and DI in three groups of animals (C, T_1 and T_2) using SYSTAT12 Software package. The present finding indicated that the feeding system consisting of post and rail with partitions for individual cows (T_2) was found better than the existing manger system (C) of feeding due to lower level of aggressiveness.

Key words: *Aggressiveness, Aggressive index, Displacement index, SYSTAT12 Software package, Aggression.*

INTRODUCTION

The provision of feed to lactating dairy cows is associated with increased activity and aggressive behaviour between animals. So the provision of comfortable housing and proper feeding to dairy cows is very important which not only improves their production, longevity but also their health status **Albright, (1981)**. Competition among cows during feeding is stressful for the cows and thus leads to less feed intake results in poor animal performance. Increasing the amount of space at manger can increase feeding time and reduce aggression thus the socially subordinate and younger animals get the most benefit from this reduced competition **Huzzey *et al.*, (2006)**. When a competitive situation existed at the manger, dominant cows spent more time on eating than subordinate cows, resulting in greater DMI by dominant than by submissive cows **Manson and Appleby, (1990)**. The present study was planned to know the effect of different feeding system on aggressive behaviour of crossbred cows.

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MATERIALS AND METHODS

The present study was carried out on 18 lactating cross bred cows between 1st to 3rd parity maintained at NDRI, Karnal. The experimental animals were allotted to 3 treatments on the basis of similarity in body weight, milk yield and parity comprising 6 animals in each group. Similar feed ingredients and feeding schedule were provided for each group. In control group animals were kept on elevated manger as existing at cattle yard, NDRI. In T_1 group animals were kept through a post and rail without partition in place of the existing manger while in T_2 group animals were kept on post and rail with partitions for individual cows in place of existing manger.

Aggressive behaviour in cows in this study was recorded in a competitive eating situation over a feed resource using video camera (Kodak, 10.2 mega pixels) for 1 hour after returning from milking in day time for each group for three consecutive days fortnightly.

MEASUREMENT OF AGGRESSIVENESS

The aggressiveness was measured in terms of Aggressive index (AI) **Barroso *et al.*, (2000)** and Displacement index (DI) **Galindo and Broom, (2000)**. AI is the ratio of number of times animal showed aggression to total number of aggressive interactions. The AI values ranged from 0 to 1 corresponding to whether an individual is always a recipient or always an aggressor. Displacement at the feed fence is defined as the complete with drawal of the recipient's head from beneath the feed fence following an aggressive interaction from another aggressor cow As per **Galindo and Broom, (2000)**. The DI is an estimate of a cow's ability to displace other cows relative to itself being displaced. DI was calculated as the ratio of number of active displacements divided by number of active displacements summed with number of animals being displaced. The DI ranges from 0 to 1 which corresponds to always being displaced or always successfully displacing others, respectively. Two non- parametric tests were used to see the significance of AI and DI in three groups of animals (C, T_1 and T_2) using SYSTAT12 Software package. The Kruskal-Wallis test was used to test the effect of 3 situations on aggressive behaviour. Maan-Whitney test (or Wilcoxon Signed Ranks test) was used to test in which situation differs from each other.

RESULTS AND DISCUSSION

The overall means of aggressive index (AI) in C, T_1 and T_2 group of cows were 0.34 ± 0.06, 0.29 ± 0.02 and 0.14 ± 0.01 and the mean values of displacement index

Table.1 Grouping of animals

Animal No.	Parity	Milk yield (kg)	Daily milk yield (kg)	Body weight (kg)
Control (C)				
7028	1	15.6	15.21	334
6958	1	12.36	15.97	322
6977	1	18.61	10.55	398
7001	1	13.93	11.73	417
7003	1	10.55	9.4	330
7034	1	19.35	11.6	335
Mean ± SE	**1 ± 0**	**15.07 ± 1.42**	**12.41 ± 1.07**	**356 ± 16.58**
Treatment 1 (T_1)				
6785	3	13.16	9.27	350
7006	1	17.22	10.6	342
7033	1	20.76	12.25	403
7040	1	12.95	15.59	350
7052	1	17.22	14	360
7075	1	12.03	12.31	337
Mean ± SE	**1.33 ± 0.33**	**15.56 ± 1.39**	**12.34 ± 0.93**	**357.00 ± 9.74**
Treatment 2 (T_2)				
KF COWS	PARITY	MY	DMY	WEIGHT
6957	2	18.9	7.78	340
6984	1	12.9	11.25	375
7000	1	11.5	13.8	356
7008	1	11.75	11.59	400
7027	1	15.39	14.6	361
7088	1	21.04	14.84	390
Mean ± SE	**1.17 ± 0.17**	**15.25 ± 1.62**	**12.31 ± 1.09**	**370.33 ± 9.13**

(DI) were 0.40 ± 0.04, 0.36 ± 0.03 and 0.26 ± 0.03, respectively. The Kruskal-Wallis test was used to test the effect of 3 situations (C, T_1 and T_2) on aggressive behaviour. From Kruskal-Wallis test results, the AI value obtained was 9.029 with P value of 0.011 ($P \leq 0.05$) assuming Chi square distribution with 2 df and DI value was obtained 7.47 with P value of 0.024 ($P \leq 0.05$) assuming Chi square distribution with 2 df. The statistical analysis indicated the significant difference among 3 groups of animals with respect to AI and DI. In order to test the significance of difference of means among 3 groups Wilcoxon Signed Ranks Test was used and the analysis revealed that in C and T_1, aggression index (AI) was significantly ($P \leq 0.05$) higher than T_2. The DI also was observed to be significantly ($P \leq 0.05$) higher in C and T_1 than T_2. The reduced AI and DI in T_2 group of cows may be attributed to the space allocation for feeding to the individual cows on the fenceline due to partitions which may have discouraged them to engage in aggressive interactions during feeding.

Table no : 2 Mean ± SE of AI and DI (%) in 3 groups of animals

Treatment	Aggressive index(AI)	Displacement index(DI)
C	0.31a ± .06	0.40 a ± .04
T_1	0.40 a ±.12	0.36 a ± .03
T_2	0.18 b ±.03	0.26 b ± .03

● Means bearing different superscripts differ significantly

√ Kruskal-Wallis Test Statistic: 9.029 (AI) P-value is 0.011 ($P \leq 0.05$) assuming Chi-square distribution with 2 df

√ Kruskal-Wallis Test Statistic: 7.47 (DI) P-value is 0.024 ($P \leq 0.05$) assuming Chi-square distribution with 2 df

The present findings are on the similar lines as reported by **Huzzey *et al.*, (2006)** who reported that cows ranked lower in the social hierarchy at the feed bunk were displaced more often when feeding at a post-and-rail barrier and the headlocks provided protection against competitive interactions at the feed bunk. **DeVries and Keyserlingk (2006)** also observed that providing increased feed bunk space will improve access to feed and reduce competition at the feed bunk, particularly for subordinate cows. **DeVries *et al.*, (2005)** reported that headlocks reduced the frequency of competitive interactions at the feed bunk by 21% compared to the post and rail and this resulted in all cows having more equal access to fresh feed.

CONCLUSION

It is therefore concluded that the feeding system consisting of post and rail with partitions for individual cows (T_2) was found to be better as compared to existing manger system (C) of feeding due to lower level of aggression.

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Effects of Drying conditions on quality of Coconut Flake

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ABSTRACT

The objective of this study was to determine the effects of drying conditions on quality of coconut flake which was produced from ingredients, i.e., coconut milk and corn starch. The desirable quality of the dried sample which contains 5% of moisture content or lower was white and dried flake. The initial fat content of coconut milk before mixing with corn starch was varied between 10 to 15% after heating. The raw mixture was then dried using a drum dryer and the effects of the drying temperature and the speed of drum was studied. The drying temperature varied between 110, 120, and 130^{0}C while the drum speed was varied between 1.0, 1.5, and 2.0 rpm. The appearance, moisture content, surface oil content, colour, and fat content of coconut flake obtained by using different drying conditions were compared. The results showed that fat content and drying conditions have an impact on product appearances. Chunky-like appearance was found at drying temperature of 110^{0}C while combination of flaky and chunky-like appearance was found at 120^{0}C and 130^{0}C. Moisture and surface oil content varied directly with the initial fat content and inversely with drying Temperature. The speed of drum rotation directly related to only the moisture content. All flaky products with moisture content of 5% or lower were not significantly different in colour. Final dried products contained low fat content, which varies between 19% - 24% and varied directly with the initial fat content of coconut milk used. From the study, it can be concluded that the optimum condition for coconut flake production was found at 15% initial fat content and drying temperature at 130^{0}C with the drum speed of 1.0 rpm. These conditions gave white and dried coconut flake which contains 2.3% moisture content.

Keywords: *Coconut Flake / Coconut Milk / Drying Temperature / Fat Content / Single Drum Dryer / Speed of Drum Rotation / Surface Oil Content*

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INTRODUCTION

The coconut palm, coccus nucifera is a member of a family is coccus. (palm family). It is only accepted species in the aenus cocas. The term coconut can refer to the entire coconut palm, the seed or the unit, which is not a botanical nut. The word coconut is derived from 16th century Portuguese word coccus meaning "grinning face" from the three small holes on the coconut shell that resemble human facial features. **Ravi, (2009).**

Traditional areas of coconut cultivation in India are the states of Kerala, Tamil Nadu, Karnataka, Goa, Andhra Pradesh, Konaseema, Orissa, West Bengal, Pondicherry, Maharashtra and the islands of Lakshadweep and Andaman and Nicobar. Four southern states combined account for almost 92% of the total production in the country: Kerala (45.22%), Tamil Nadu (26.56%), Karnataka (10.85%), and Andhra Pradesh (8.93%). Other states, such as Goa, Maharashtra, Orissa, West Bengal, and those in the northeast (Tripura and Assam) account for the remaining 8.44%. Kerala, which has the largest number of coconut trees, is famous for its coconut-based products - coconut water, copra, coconut oil, coconut cake (also called coconut meal, copra cake, or copra meal), coconut toddy, coconut shell-based products, coconut wood-based products, coconut leaves, and coir pith.

Coconut flake is another new product created for value-addition purpose to coconut. This product is designed to be used in industries such as cookies, biscuit, doughnut, etc. The desirable appearance of this product should be white and dry flake which has less than 5% moisture content. To obtain the expected appearance of coconut flake production is that corn starch and coconut milk are mixed together. Then, the mixture is heated and stirred until temperature reach 700C and maintain for 10 min. Further this mixing is dehydrated in a drum dryer.

This product has been developed to increase the shelf life of coconut milk and to make it available, even in the areas where coconut production is not there.

MATERIALS AND METHOD

The present work was done in the Department of Food Process Engineering, Vaugh School of Agriculture Engineering and Technology, Sam Higginbottom Institute of Agriculture, Technology and Sciences (Deemed to be University), Allahabad–211007 (U.P.).

Procurement of raw material

The raw material i.e. Coconut milk **Seow, (1997)** and corn starch was purchased from the local market of Allahabad.

Processing equipments used

Single drum dryer, Colorimeter, Hot air oven, Electronic weighing balance

The experimental procedure of this study is mentioned below:

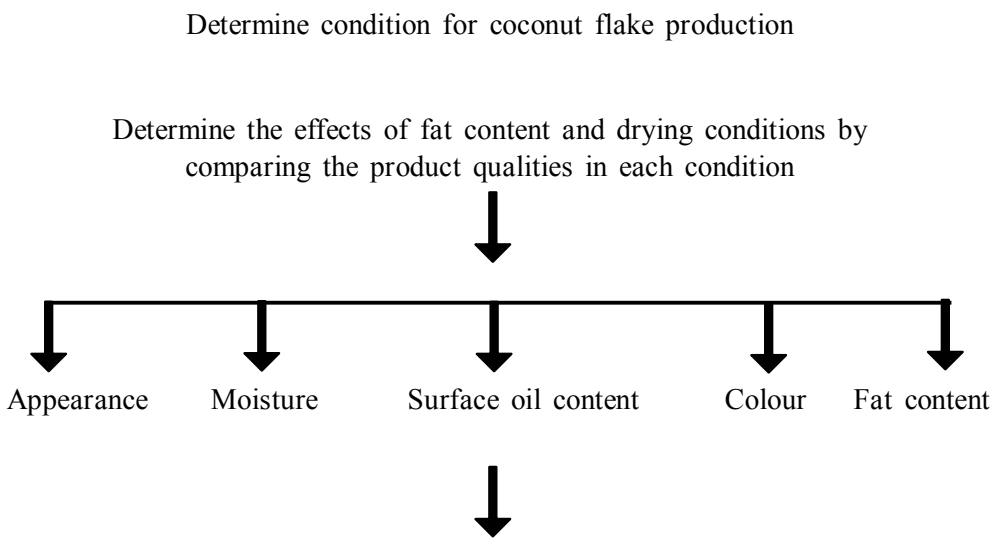

Fig 1.1 Experimental procedure

Flowchart for coconut flake production

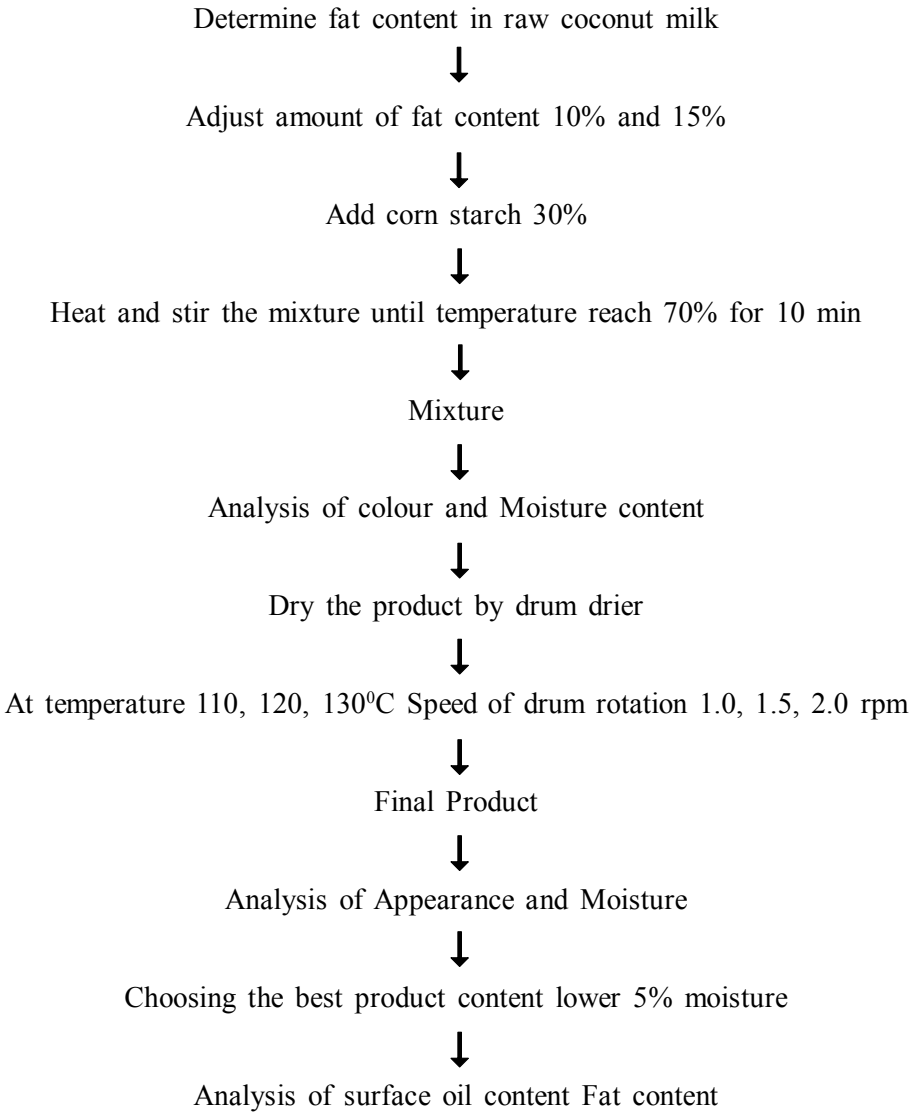

Fig 1.2 Flowchart for coconut flake production

Coconut milk without added water was prepared for fat content determination. The fat content of coconut milk was determined by the Rose-Gottlieb method. Distilled water was added to dilute the samples at 10% and 15% fat content. The diluted coconut milk was mixed with 30% corn starch. After heating, the moisture content and colour of slurry were measured. Drying conditions was determined at different drying temperature and speed of drum rotation or drying time.

Drying temperatures were set at 110, 120 and 130^{0}C while drum rotation speed varied at 1.0, 1.5 and 2.0 rpm. After that, the qualities of product in each condition were compared for moisture content, and appearance. The products having lower 5% of moisture content and flaky-like were chosen for determining of surface oil content colour and fat content.

Physico-chemical analysis

Moisture content **A.O.A.C., (1999)**,

Fat content **A.O.A.C., (1999),**

Surface oil content **Swern, (1979)**

Appearance **Priestley, (1992)**

RESULTS AND DISCUSSION

Effects of Drying Conditions on Moisture Content

Table1.1Experimental data of moisture content

% Initial fat	Speed (rpm)	T_1 (%)	T_2 (%)	T_3 (%)
10	1.0	1.57	2.44	1.96
15	1.0	2.30	3.00	2.56
10	1.5	3.34	3.37	3.57
15	1.5	3.63	3.73	3.66
10	2.0	3.96	3.73	3.84
15	2.0	4.24	4.14	4.16

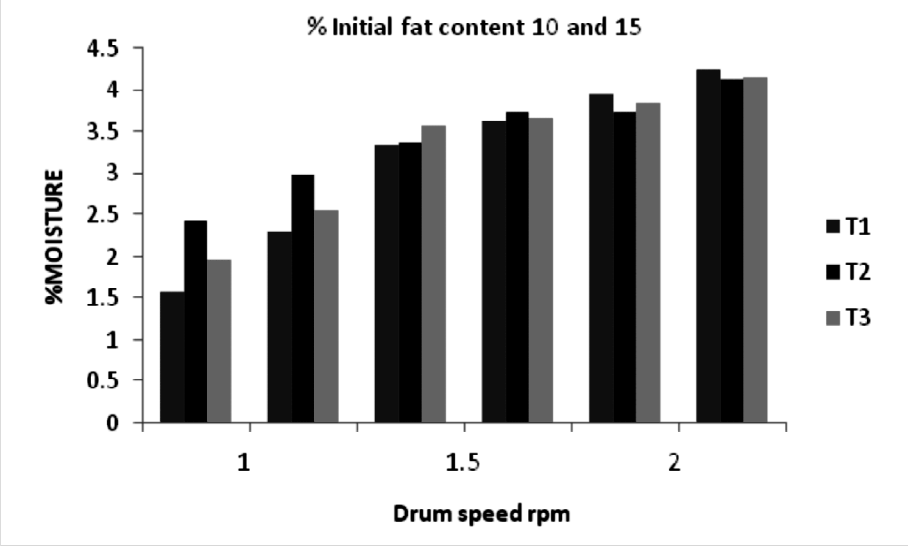

Fig 1.3 Moisture (%) of products from the sample T_1, T_2, T_3 treated at 130°C with variation of rotation speed of drum and fat content (wet basis)

In the *Fig 1.3*, summary is given for the moisture contents from the previous three results. The moisture contents of slurries which were around 50% and 45% for 10% and 15% fat content, respectively, were higher than those of the dried samples due to the evaporation of water in slurry during drying. The sample at 110^0C gave the highest moisture content. This could be explained by the product at this temperature by its chunk appearance. The result showed that moisture content significantly varied and inversely up as propotional to drum temperature ($p \leq 0.05$). As the temperature increased the moisture decreased.

Henig, (1971) found that increasing drying temperature (steam pressure) reduced final moisture content of dried tomato paste. The moisture of the sample is inversely proportional to, and varies with the local drum temperature. Therefore it can be noticed that the appearance of the sample will be changed with the final moisture content. The criteria for selection for the optimum condition are the desirable qualities, i.e., 5% moisture content or lower flaky-like appearance of the finished sample. Base on the result of moisture content and appearance, the condition of 120^0C at 1.0 rpm, 130^0C at 1, 0, 1.5, and 2.0 rpm were chosen for comparing sample quality in terms of surface oil content, colour, and fat content.

Effects of Drying Conditions on Surface Oil Content

Table1.2 Experimental data of surface oil content

Speed (rpm)	%Initial fat content	Oil Content T_1	Oil Content T_2	Oil Content T_3
1.0	10	0.0171	0.0269	0.0224
1.0	15	0.0525	0.0964	0.0777
1.0	10	0.0085	0.0127	0.0112
1.0	15	0.0407	0.0352	0.0383
1.5	10	0.0071	0.0118	0.0100
1.5	15	0.0383	0.0240	0.0324
2.0	10	0.0016	0.0147	0.0092

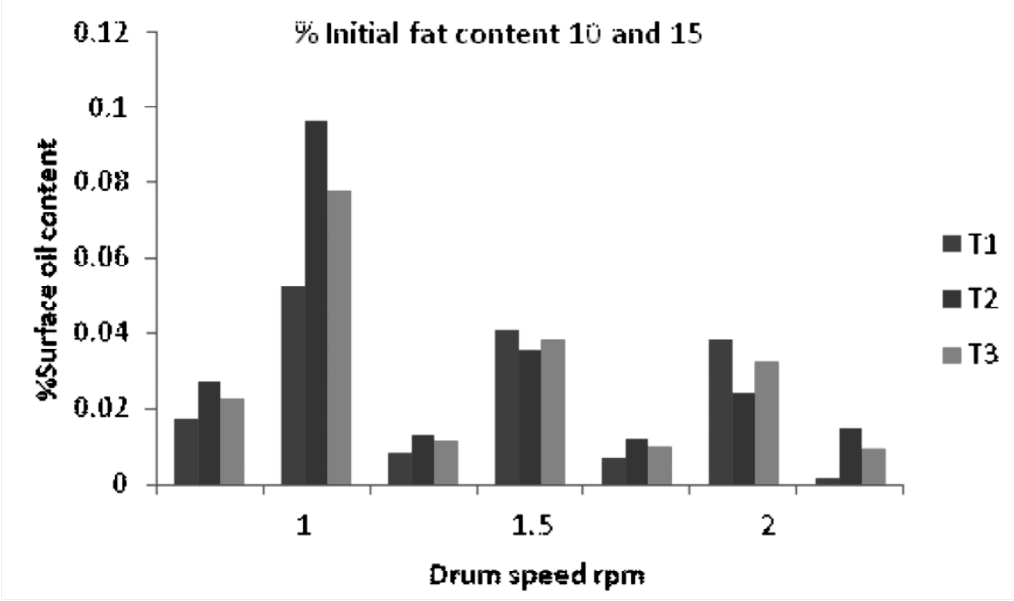

Fig. 1.4 (%) of Surface oil content of desirable product

The surface oil content in flaky-like sample which contains 5% moisture content or lower is shown in *Fig.1.4* the result is given at same speed of drum rotation and drying temperature. The surface oil content of sample varied directly with the percentage of initial fat content. At the different drying temperature, the surface oil content in the sample varied inversely with the drying temperature. This result may be explained by vaporization of oil during slurry drying. Laurie acid which is the major fatty acid in coconut milk could be evaporated at 130^{0}C **Swern, (1979)**. So, the oil content in the sample dried at 130^{0}C was lower than that, of 120^{0}C. Therefore, the effect of speed of drum rotation on surface oil content, it was found that there was no significant effect on each other.

Effects of Drying Conditions on Colour

Table 1.3 : Colour intensity of desirable sample (flaky-like and 5% moisture content or lower

Sample			**Colour**				
Temp (^{o}C)	**Speed (rpm)**	**%Fat**	**L***	**b***	**ΔL***	**Δb***	**ΔE***
120	1.0	10	79.12^{ab}±1.48	9.90^b±0.84	-0.02^a	-0.71^a	4.68^a
120	1.0	15	77.38^{ab}±2.85	10.49^b±1.02	-0.05^a	-0.55^a	4.41^a
130	1.0	10	81.7^b±0.25	10.39^b±0.31	-0.05^a	-0.81^a	6.20^a
130	1.0	15	79.96^{ab}±1.10	10.95^b±0.19	-0.04^a	-0.63^a	5.11^a
130	1.5	10	79.03^{ab}±2.01	9.99^b±0.77	-0.02^a	-0.67^a	4.59^a
130	1.5	15	75.52^a±3.32	11.06^b±0.66	0.02^a	-0.65^a	5.39^a
130	2.0	10	76.97^{ab}±3.39	10.47^b±0.26	0.01^a	-0.83^a	5.83^a
Fat 10%			77.6^{ab}±0.71	5.8^a±0.77			
Fat 15%			77.24^{ab}±0.17	6.80^a±0.86			

Colour intensity of desirable sample showed in *Table 1.3* in the Mean ±S.D. (*n*=3). Means in the same column having a same letter are not significantly different ($\alpha < 0.05$). CIELAB system was chosen for comparing colour intensity of dried product. L* and b* represent lightness and yellowness of dried product, respectively, while, ΔL* and Δb* represent the changing of lightness and yellowness

of product after drying. From *Table 1.3*, the b*-value or yellowness was slightly increased with initial fat content in slurry while L* was slightly decreased. In addition at different drying temperature, higher temperature resulted in higher b*-value. Therefore, at higher drying temperature and higher initial fat content, the finished product contained a little bit higher colour intensity. This result may be caused from non enzymatic browning reaction as the function of composition of food and heating temperature. From the fact that, coconut milk is composed of sugar and amino acid which are the substance of no enzymatic browning reaction; so, higher initial fat content or higher amount of coconut milk will give browner product. Besides, higher temperature will give browner product **McCarthy, (1991)**.

For the changing of colour intensity from slurry to dried product, it was expressed in ΔL*, Δb* and ΔE*-value. The result showed that Δb* (yellowness) of dried product was increased as drying temperature decreased. It was found in literature that the yellowness was increased during drying for all examined material and all conditions **Mujumdar, (2000)**. Yellowness (Δb*) of dried banana was increased when drying temperature was decreased ΔE* is total colour difference, this value is increased with the colour intensity of product. The result shows that at higher drying temperature gave a little bit higher total colour different or higher colour intensity. However, it was found that there were no statistically significant different in all parameter ($p \leq 0.05$). These results may be explained by the range of drying conditions and initial fat content was too close and may be caused by un uniform temperature distribution on drum surface.

Effects of Initial Drying Conditions on Final Fat Content of Product

The final fat content of desirable dried sample is showed in *table 1.4* about 19% to 24%. The result shows that fat content of the dried sample was significantly increased with initial fat content in slurry ($p \leq 0.05$). At the same amount of initial fat content in heating temperature, the fat content in dried sample varied directly with the speed of drum rotation. Because of higher speed of drum rotation or lower retention time, the amount of evaporated oil from slurry is lower, This caused a higher fat content in dried sample. And at the same speed of drum rotation and initial fat content, the final fat content of the product slightly varied inversely with the drying temperature.

Therefore, fat content of the sample T_3, T_2 dried at 130^0C was lower than that of 120^0C. However, drying temperature and speed of drum rotation were not significantly affecting the final fat content ($p>0.05$).

Table1.4 Experimental data of fat content

Temp (°C)	Speed (rpm)	% Initial fat content	T_1	T_2	T_3
120	1.0	10	19.5	19.63	20.05
120	1.0	15	24.92	23.6	23.75
130	1.0	10	18.6	18.56	20.59
130	1.0	15	24.22	22.13	22.45
130	1.5	10	19.85	19.75	21.02
130	1.5	15	25.02	22.72	23.99
130	2.0	10	20.12	19.99	22

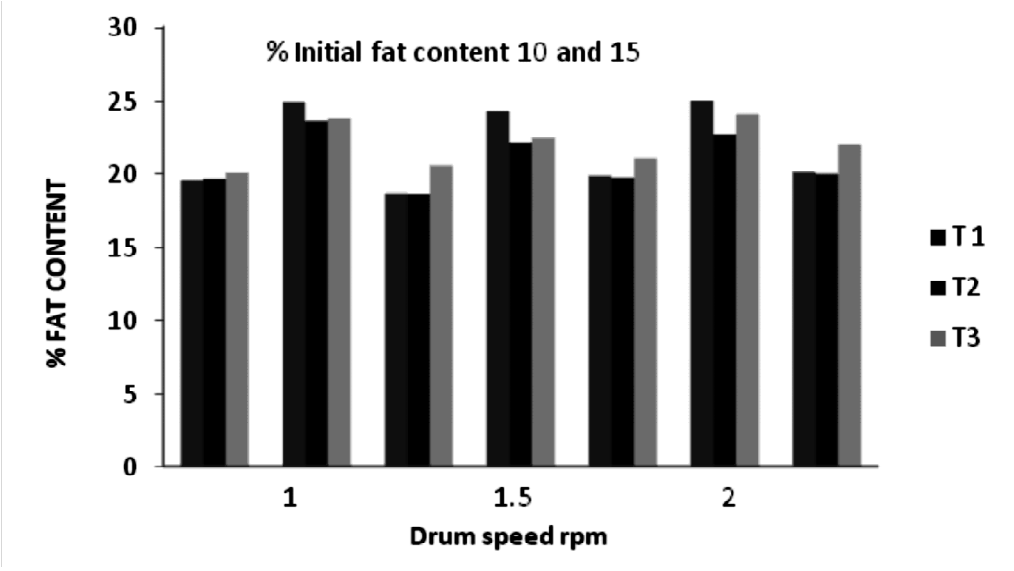

Fig. 1.5 fat (%) content of desirable product

Optimum Conditions for Coconut Flake Production

In the coconut flake production, the initial fat content and drying conditions had effect on sample quality, i.e., appearance, moisture content, surface oil content, and fat content. To obtain the desirable quality of coconut flake, the suitable condition was chosen from the experimental results. 15% initial fat content was selected due to obtaining thicker flake while 10% of fat gave film of dry paste. Drying temperature at 120^0C and 130^0C gave the combination of flaky and chunky-like appearance. On the other hand, the sample T_1, T_2, T_3 heated at 110^0C gave only chunky-like. Therefore, the condition at 120^0C and 130^0C were considered. However, the flakey and chunky appearance not only depends on drying temperature but also speed of drum rotation. The condition at 120^0C, 1.0 rpm and 130^0C, 1.0, 1.5 rpm give only the flaky-like and 5% moisture content or lower. It was also noted that, the sample T_3 from 130^0C, 1.0 rpm had the lowest moisture content (2.30%) which should be the best condition for coconut flake production.

Sensory analysis of Coconut flake sample T_1, T_2 sample T_3, and control was carried out on the basis of Colour, Flavour, Texture, taste and Overall acceptability with the help of sensory evaluator.

Sensory evaluation of Coconut flake

Sensory evaluation of Coconut flake prelist that the score of control flake was low, (i.e. 31.5) as compared to experimental flake. Sown in the *table 1.5* Among the Coconut flake the sample T_3 recorded the highest score having 5% moisture, 130^0C temp and 1 rpm speed. The overall acceptability of Coconut flake and the texture of Coconut flake was significantly affected by increased level of moisture.

Table1.5 Experimental Sensory Analysis

Sample	Colour	Flavour	Texture	Taste	Overall acceptability	Total score
T_1	7	7.5	6	7	7	34.5
T_2	7	7	8	7	8	37
T_3	8	8.5	8	8.5	8	41

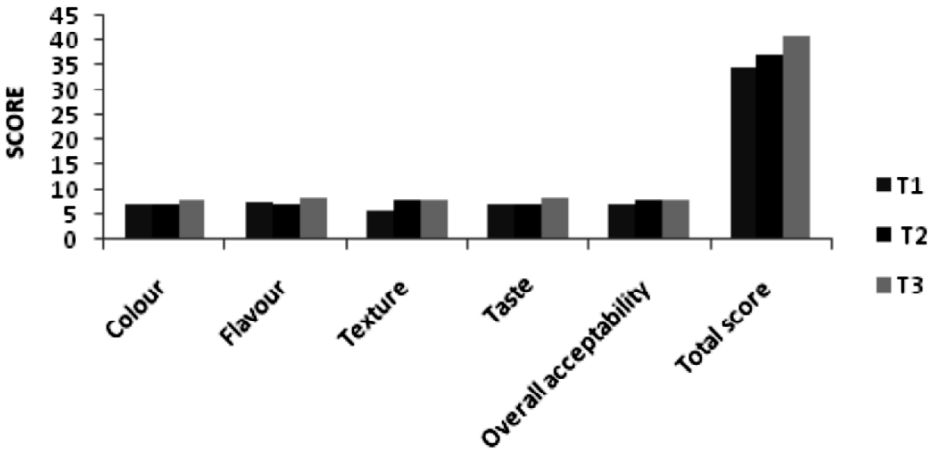

Fig. 1.6 Sensory evaluation of Coconut flake

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Studies on preparation of Whey Protein Enriched Dietetic Kulfi

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ABSTRACT

In the new millennium we are witnessing the upward trend in nutritional and health awareness which has increased the consumer demand for functional foods. The present investigation was made with an attempt to develop a whey protein enriched dietetic kulfi by addition of different level of whey protein concentrate powder @0.5%, 1%, 1.5%, and evaluate the effect on nutritional quality. The kulfi samples of different treatments were analyzed for chemical quality (Fat, Total Solids, Acidity, Protein, Moisture and Ash), Microbial quality (SPC, yeast and mould, coliform) and organoleptic quality (colour and appearance, Body and texture, flavour and taste, melting resistance). The product acceptability as per judge's opinion(using 9 point hedonic scale) was rated as $T_0 > T_1 > T_2 > T_3$.

Key Words: *whey protein, dietetic kulfi, WPC*

INTRODUCTION

Whey protein is one of the major proteins found in cow milk comprising about 20% of total milk protein. It has the highest biological value and protein efficiency as compared to other protein, which makes it suitable for wide range of neutraceutical and functional food system. The best known effect of whey protein are its ability to increase lean muscle mass and to boost the immune system (info@dairycouncelofa.org). WPC also gives a boost for soft body, smooth texture, and pleasant taste in Kulfi. Therefore, the present investigation was planned to incorporate whey protein concentrate (WPC - 70) in milk for preparation of Kulfi as per the technique given by **Salooja *et.al.*, (1982)**. Kulfi is a frozen dairy product made by suitable blending and processing of Skim milk powder and other milk products, together with sugar and flavour, with or without stabilizers or colour and with the incorporation of air during the freezing process. A typical compositional range for the

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components used in kulfi mix is milk fat 10-16%, milk solids not fat 9-12%, Sucrose 9-12%, Corn syrup solids 4-6%, Stabilizers/Emulsifiers 0-0.5%, total solids 36-45% and water 55-64% **Giri, (2007)**.

MATERIALS AND METHODS

Ingredients used for manufacturing dietetic kulfi were milk, sugar, stabilizer, emulsifiers, nuts and whey protein concentrate (WPC -70). First of all, 1 kg of wholemilk with 6% fat and 9% MNSF was placed in a steel pan with a wooden plunger and heated by placing pan in a container containing water (double jacketed vat arrangement) over direct fire. The milk was condensed to (2 : 1) ratio. Calculated amount of liquid ingredients like condensed milk and dry ingredients like sugar, stabilizer and emulsifier was added as per the requirement in treatments T_1 (0.5% WPC), T_2 (1.0% WPC) and T_3 (1.5% WPC). Then mix was held at 68°C for 30 minutes to fulfill the PFA requirement of Pasteurization and cooled to 42°C. Then the mix is further chilled at 5°C and other ingredients such as cashew nuts were added. The mix then subsequently frozen in a batch freezer and transferred into Kulfi moulds and hardened at -20°C overnight. The Kulfi samples were analyzed forphysiochemical, microbial and organoleptic qualities as per procedure laid down by Indian Standard **(IS:1960)** and Indian Standard **(IS:1964)**.

RESULT AND DISCUSSION

The data collected on different aspects as per plan were tabulated and statistically analyzed as per **Chandel (1991)**.

Physiochemical Properties

Table -1 showed average data obtained on different parameters. The highest mean value for % fat content indietetic kulfi was found in T_3 = 10.82, followed by T_2 (10.72), T_1 (10.42) and T_0 (10.20). The differences among the treatments were significant due to WPC content. The highest mean value for total solids content in Kulfi was foundin T_3(38.53), T_2(37.84), T_1(37.82) and T_0(37.58). The treatments differ significantly. The highest mean value for acidity was found in T_0 = 0.16 followed by T_1(0.16), T_2(0.14) and T_3(0.14). The highest mean value for protein inKulfi was found in T_3 = 5.79, followed by T_2(5.49), T_1(4.96), and T_0(3.56). There were no significant differences found amongthe treatments. The highest mean value for moisture content was found in T_0 = 62.44, T_1(62.17), T_2(62.15) and T_3(61.46). The differences among the treatments weresignificant. The highest mean value for ash content in dietetic kulfi was found

in T_3 = 2.4, T_2 (2.25), T_0 (2.21) and T_1 (2.2). The differences among the treatments were significant.

Table-1: Average of different physiochemical parameters.

Parameters (%)	Treatments			
	T_0	T_1	T_2	T_3
Fat	10.20	10.42	10.72	10.82
Total Solids	37.56	37.82	37.84	38.53
Acidity	0.16	0.16	0.14	0.14
Protein	3.56	4.96	5.49	5.79
Moisture	62.44	62.17	62.15	61.46
Ash	2.21	2.20	2.25	2.46

Table-2: Microbial parameters

Parameters	Treatments			
	T_0	T_1	T_2	T_3
SPC (cfu^{-3}/g)	75.0	62.2	52.4	47.4
Yeast and mould (cfu^{-2}/g)	17.8	19.0	17.0	14.8
Coliform (cfu^{-1}/g)	Nil	Nil	Nil	Nil

The highest mean value for SPC in dietetic kulfi was found in T_0=75.0, followed by T_1 (62.2), T_2 (52.4) and T_3 (47.4). The treatments were non significant. The highest mean value for Yeast and mould count in Kulfi was found in T_1 = 19.0, followed by T_0 (17.8), T_2 (17.0) and T_3 (14.8). The treatment values were non significant. There were no coliform found in all the treatments, hencethe dietetic kulfi was hygienicin nature.

Table-3: Organoleptic Parameters (score)

Parameters	Treatments			
	T_0	T_1	T_2	T_3
Colour and Appearance	8.20	7.96	7.80	7.76
Body and Texture	7.84	7.64	7.56	7.60
Flavour and Taste	7.96	7.80	7.84	7.72

The highest mean value in dietetic kulfi for colour and appearance was found in T_0=8.2, followed by T_1 (7.96), T_2 (7.8) and T_3 (7.76). There were significant differences found among the treatments which may be attributed to the addition of WPC. The highest mean value for body and texture was found in T_0 = 7.84, followed by T_3 (7.60), T_1 (7.64) and T_2 (7.56). There were no significant differences found among the treatments. The highest mean value for flavour and taste in dietetic kulfi was found in T_0 = 7.96, followed by T_2 (7.84), T_1 (7.80) and T_3 (7.72). The treatments did not differsignificantly.The highest mean value for melting resistance was found in T_0 = 7.68, followed by T_1 (7.32), T_2 (7.16) and T_3 (7.04). The treatments differ significantly.

Table-4: Melting resistance

Parameters / Replication	Treatments			
	T_0	T_1	T_2	T_3
R_1	7.0	7.0	7.2	6.6
R_2	8.0	7.4	7.8	7.4
R_3	7.8	7.2	6.8	7.6
R_4	7.8	7.6	7.4	7.7
R_5	7.8	7.4	6.6	6.6
Mean	7.68	7.32	7.16	7.04

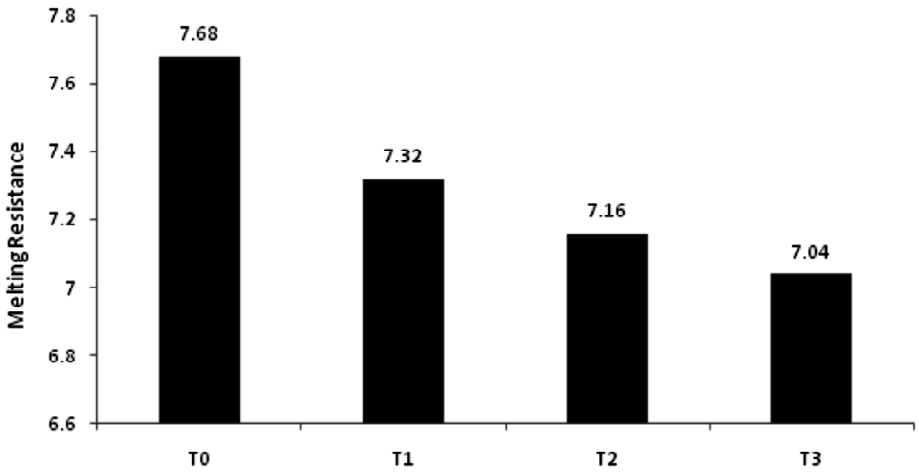

Figure 1: Average of melting resistance for WPC Kulfi

CONCLUSION

In view of the experimental results obtained during the present investigation, it may be concluded that the WPC enriched dietetic kulfi made from wholemilk + 15% Sugar + WPC (0.5%, 1.0% & 1.5%) has a wider scope in the market as per as health and nutritional quality is concerned.

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Isolation and Biochemical characterization of *Azotobacter spp.* from Rhizospheric soil of Urd Bean

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ABSTRACT

Plant Growth Promoting Rhizobacteria (PGPR) are beneficial group of bacteria that colonize plant root and enhance plant growth by a wide variety of mechanism. *Azotobacter spp.* were isolated from root nodule of Urd bean plant. Sixty days old plants of urd bean were randomly dugged out from different location. *Azotobacter spp* were isolated by using Jensen?s medium, designated as - A_1, A_2, and A_3 and characterized. Screening of *Azotobacter* in pot culture (soil) and in pot culture (Chemical fertilizer and Organic manure) with *Azotobacter* strain A_1, A_2, A_3 affects the biomass of urd bean. The biomass of pot-culture (soil) is ranged from 75.6 mg/plant (control) to 116.5mg/plant in A_3 and in pot culture (Chemical fertilizer and Organic Manure) A_3 is better and range from 0.0407mg/plant (root weight) to 0.1222 mg/plant (shoot weight). *Azotobacter* affects nodulation of urd bean, nodule number was higher in organic block and nodule weight was higher in chemical block after 15 days. *Azotobacter* affected the nodulation of urd bean between 15 to 30 days.

Key words : *PGPR, Azotobacter spp., Urd bean.*

INTRODUCTION

Bacteria are able to colonize plant root system and promote plant growth are referred to Plant Growth Promoting Rhizobacteria (PGPR) **Kloepper and Schroth, (1978)**. Plant growth promoting Rhizobacteria (PGPR) is a group of micro-organisms which colonizes root or rhizospheric soil of crop and plays a major role in biocontrol of plant pathogen and acts bio-fertilizer. A number of different nitrogen fixing and Phosphate solublizing bacteria may be considered to be PGPR including *Azotobacter, Rhizobium, Pseudomonas, Bacillus etc.* PGPR have been applied to various crops to enhance growth, seed emergence and crop yield, and some have been commercialized

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Dey *et al.,* (2004), Herman *et al.,* (2008), Minorsky, (2008). A PGPR, *Pseudomonas fluorescens* B16 isolated from the roots of graminaceous plants has been shown to colonize the roots of various plants, and to increase the height, flower number, fruit number and total fruit weight of tomato plants **Minorsky, (2008)**. PGPR are indigenous to soil and the plant rhizosphere and play a major role in biocontrol of plant pathogens. The rhizobacteria can stimulate plant growth directly by producing growth hormone and improving nutrient uptake or indirectly by changing microbial balance in rhizosphere in favor of beneficial micro-organisms. Under salt stress, PGPR have shown positive effects in plants on such parameters as germination rate, tolerance to drought, weight of shoots and roots, yield, and plant growth **Kloepper *et al.,* (1978), Kokalis-Burelle *et al.,* (2006)**. Plant exudates in the rhizosphere, such as amino acid and sugar, provide a rich source of energy and nutrient for bacteria, resulting bacterial population greater in this area then outside the rhizosphere, such as amino acid and sugars and provide a rich source of energy and nutrient for bacteria, resulting in bacterial population greater in this area then outside the rhizosphere. There is simple evidence that the mode of action of many PGPR is by increasing the availability of nutrients for the plant in rhizosphere. **Glick, (1995), Vessey, (2003)**

MATERIALS AND METHODS

Sample collection and Isolation of *Azotobacter spp.* -

Sixty days old plants of Urd bean were randomly dugged out from different field locations and rhizosphereric soil adhering to the plant root were gently removed. *Azotobacter spp.* were isolated by serial dilution method using Jensen's medium. Colonies were streaked and maintained on Selective media as slant for future use.

Biochemical Characterization-

Following biochemical tests were conducted - Litmus milk test, Nitrate reduction test, Gelatenase Test, Catalase test, Starch utilization test, Citrate utilization test.

Plant bioassay -

Urd bean seed were surface sterilized and treated with *Azotobacter spp.* These were sown in pot (chemical fertilizer and organic manure) as well as in field for 1 month. Number and weight of root Nodules, Dry weight of root, shoot and biomass were recorded.

Statistics-

The statistical analysis was performed by using 2 way analysis of variance (ANOVA)

RESULTS AND DISCUSSION

Three species of *Azotobacter spp.* were isolated and designated as A_1, A_2, and A_3. All three species of *Azotobacter spp.* were found to be positive for litmus milk test, Nitrate reduction test and citrate utilization test. Negative results were observed for catalase and starch utilization in A_1 while, it is positive for A_2 and A_3. Gelatinase test was positive for A_1 while negative for A_2 and A_3.

After 15 days nodule number was high in organic and nodule weight was high in chemical block. Higher biomass recorded in chemical block *(Table 1.1)*. After 30 days nodule number was high in organic block compared to chemical block. However, nodule weight was not affected. Plant biomass is higher in organic compound. A_3 recorded highest biomass in organic block. *(Table 1.2)* Screening revealed that A_3 showed better result in both soil as well as in field. *(Table 1.3* and *1.4)* Data is found to be significant ($p<0.05$).

S.No	Nodulation at 15th Day		Growth At 15th Day					
			Root weight		Shoot weight		BiomassWeight	
	Organic	Chemical	Organic	Chemical	Organic	chemical	Organic	Chemical
A_1	25.66 /2.86	15.66/ 2.73	45.4	23	253	168.4	298.5	191.4
A_2	26.33/ 3.8	9/ 3.9	37.7	28.3	217.9	174.4	250.6	202.7
A_3	20/ 3.56	16.33/ 8.8	38.7	27.5	221.5	158.2	260.2	105.7
CONTROL	22/ 1.5	23.33/ 7.1	47.5	28.4	208.2	227.9	227.7	257.3

(Table 1.1)

S.No	Nodulation at 30th Day		Growth At 30th Day					
			Root weight		Shoot weight		BiomassWeight	
	Organic	Chemical	Organic	Chemical	Organic	chemical	Organic	Chemical
A_1	47.6/ 20.03	37.4/ 21.2	493	346	3970	2380	4463	2726
A_2	37.33/ 16.2	20.6/ 14.3	626	310	4670	2740	5296	3050
A_3	71.66/ 32.6	32.6/ 24.1	600	276	5050	2640	5650	2916
Control	52.7/ 20	20.6/ 10.3	593	403	4920	3560	5513	3963

(Table 1.2)

	Root wt (mg/plant)	Shoot wt mg/plant)	Biomass mg/plant
A1	0.0309	0.1408	171.1
A2	0.0380	0.0701	108.1
A3	0.0407	0.1222	162.9
Control	0.0356	0.1041	139.7

(Table 1. 3)

	Root wt (mg/plant)	Shoot wt mg/plant)	Biomass mg/plant)
A_1	0.0146	0.0728	87.4
A_2	0.0165	0.0645	80.9
A_3	0.0173	0.0992	116.5
Control	0.0164	0.0592	75.6

(Table 1.4)

CONCLUSION

From the above study it was concluded that all Azotobacter isolates obtained from root nodules of urd bean showed plant growth promoting activities. Consequently, continued research is needed to develop new approaches to ameliorate the efficiency of PGPRs and to understand the ecological, genetic and biochemical relationships in their habitat.

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Heavy Metals Pollution of Roadside Soils in Mosul City/IRAQ by Emissions of Vehicular Traffic & Electricity- producing Generators

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ABSTRACT

The accumulation of heavy metals at the roadside soil due to emissions of vehicular traffic & electricity- producing generators had been studied by the analysis of topsoil samples. Concentrations of the elements lead (Pb), cadmium (Cd), copper (Cu), iron (Fe), silicon (Si) and manganese (Mn) were determined. Samples were collected from twenty stations located along crowded streets and near private electricity producing generators.

Soil samples were distributed to comprise ten roadsides and ten generator stations to represent both left and right sides of Mosul city.

Sampling was repeated three times through six months. Analysis showed that the studied stations appeared to be contaminated by heavy metals. Concentration of Pb, Cd, Cu, Fe, SI, and Mn from vehicles at roadsides ranged from {(216-293), (0-13), (110-139), (226-332), (8-19) and (108-220)} μg/g respectively. The same heavy metal concentration from generators were ranged from {(265-354), (1-15), (115-156), (280-572), (13-30) and (145-290)} μg/g respectively.

Heavy metals are a potential human health concern when concentrations are at high levels in soils. Metals may be harmful to humans through ingestion of edible plants containing metals through normal uptake, ingestion of plants splashed with contaminated soil or by accidental direct ingestion of soil usually by children. Breathing dust coming from soil may also pose health risks.

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Some simple statistical analysis were made concerning conventional parameters and t-tests. The latter revealed that there was no significant difference among the studied metals in both sides of the city.

Keywords: *roadside contamination, heavy metals pollution, traffic pollution, electricity-producing generators.*

INTRODUCTION

Mosul, the second major city in Iraq has witnessed after 2003, a rapid increase in numbers of imported automobiles of different types and sources. These automobiles are mostly operated by leaded fuel.

As roads are important infrastructures in the city, they play a major role in stimulating social and economic activities. These roads stayed unimproved and nothing was done to make them cope with such increase in the automobile numbers. This was reflected on creating traffic jam and crowding of cars that inevitably led to heavy environmental pollution.

Parallel to this, national electricity production have extremely strained. Again, no real steps for improving electricity were done. The latter led people to count on private generators to provide electricity for different public uses.

These two practices have - due to their emissions - led to increasingly high levels of some heavy metals and other pollutants in the dust, soil and plants near highways and crowded roads in both rural and urban areas.

The pollution of soils by heavy metals from automobile and electricity private electric generators sources are serious environmental issue. These metals are released during different operations of the road transport such as combustion, trys component wearing out, fuel burning such as diesel, fluid leakage and corrosion of batteries and metallic parts such as radiators.

Lead, cadmium, copper, and zinc are the major metal pollutants of the roadside environments **Dolen *et al.*, (2006).**

The majority of the heavy metals are toxic to the living organisms. Even those considered as essential can be toxic if present in excess. The heavy metals can impair important biochemical processes posing a threat to human health, plant growth and animal life **Michalke, (2003)**. Studies have shown that such pollutants can be harmful

to the roadside vegetation, wildlife, and the neighboring human settlements **Muskett and Jones, (1980); Khan and Frankland, (1983); Ndiokwere, (1984); Iqbal *et al.*, (1994); Ferretti *et al.*, (1995); Turer and Maynard, (2003).**

Heavy metals are a potential human health concern when concentrations are at high levels in soils. Metals may be harmful to humans through ingestion of edible plants containing metals through normal uptake, ingestion of plants splashed with contaminated soil or by accidental direct ingestion of soil usually by children. Breathing dust coming from soil may also pose a health risk.

A great part of metal pollutants is deposited on adjacent soil where they may be transformed and transported to other parts of the environment i.e. to vegetation. The latter can act as a sink for atmospheric pollutants. There is no doubt that the leafy vegetables grown or planted near major motorways can contain significant traces of lead and cadmium derived from motor vehicle emissions. The distribution of these metals in the roadside soil is strongly but inversely correlated with the distance away from roadside **Shashank, (2010)**.

The present study aims at investigating the extent of soil contamination by heavy metals on main roads inside the city of Mosul and nearby the generators locations. This study focuses on Lead, cadmium, copper, iron, silicon, and manganese as major metal pollutants of the roadside environments.

MATERIALS AND METHODS

Soil samples were collected from 20 stations distributed on both sides of Mosul city. 10 stations represented crowded streets of both sides of the city and the remaining 10 stations represented nearby generators locations close to and surrounding the selected streets.

Samples were taken at 1-2 m from sidewalk of streets and at a radius 5-100 m for generators locations. Soil samples were put into plastic sacks and transferred to laboratory. The sample were then evacuated into aluminum pots and dried for 24-48 hours at 60^0C. Later the samples were grounded in a ceramic mortar.

The standard methods **Apha, Wpcf and Awwa, (1998)** were adopted for heavy metals analyses. 2 grams of soil passing through 2 mm sieve were weighted and transferred to 500 ml flask of pure H_2SO_4 and digested at 120^0C in a water bath. The temperature was increased gradually up to 180^0C to get rid of rising fumes. Digestion was continued until the mix became colorless and silica appeared as white residue.

This process lasted 4-5 hours. The solution was later cooled and 50 ml of distilled water was added to verify dissolution process.

The filtrate was then filtered on 42 Whatmar paper and transferred into cylinder of 250 ml volume. The precipitate was leached by distilled water and its volume was completed.

As compared to transactions carried out by adding acids only without soil and treated the same way and put in very clean and accurate weighed ceramics vessel (pottery), firstly the sludge was dried carefully and its contents had been burnt as whole in an electric oven at a temperature 800-900 ^{0}C for two hours. Later soil was taken out of the oven, cooled, and weighed. The ceramics vessel with the output where the true weight is the weight of silica and passed solutions prepared by (Atomic Absorption system) with the preparation of solutions record for each of copper, lead, cadmium, iron and manganese as part of a million. *Fig. (1)* Illustrates the locations where samples for vehicles and generator emissions were collected. *Table (1)* lists the description of sampling points.

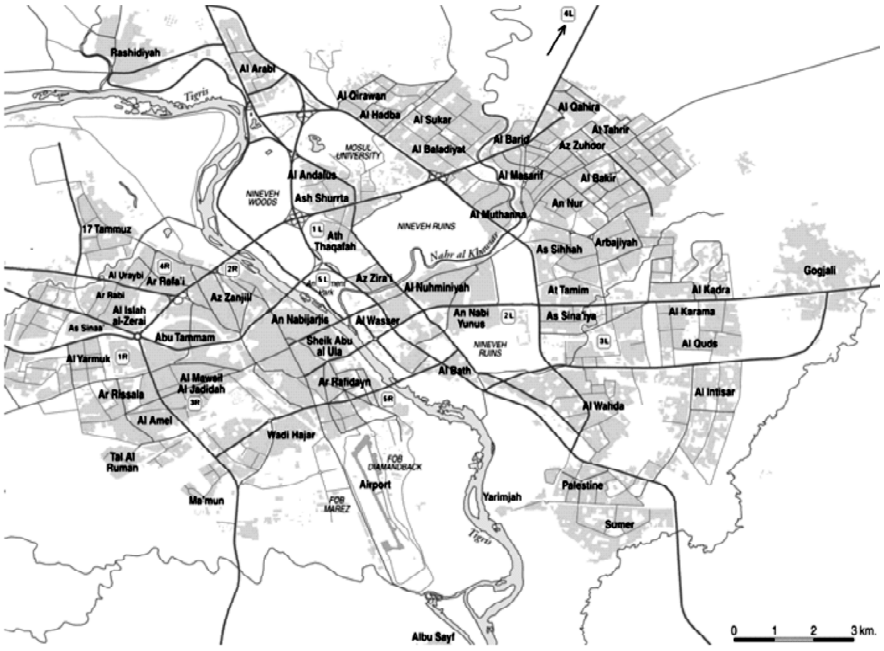

Fig. (1) : Approximate locations of sampling points.

Table (1): Sampling locations

Sample symbol	Area name	Description
1L*	Al Thaana street	These areas were to represent the crowded streets and quarters of the city. They contain health care institutions, educational, commercial and some of these areas are links between both banks of the city.
2L	NabiYounis square	
3L	Al-maaridh square	
4L	Al -shalalat area	
5L	Hurriya bridge intersection	
1R*	Yarmouk square	
2R	Hospital square	
3R	Baghdad square	
4R	Al-Najjar quarter	
5R	4th bridge intersection	

* The letter L denotes studied areas of the left side while the letter R denotes areas of the right side of the city.

RESULTS AND DISCUSSION

Fig. (2) depicts the mean and the concentration range of the six heavy metals in surface soil, taken from the ten stations, at different distances from the main road. *Fig.1* illustrates the increase of generator emissions compared to those of vehicles based on each side.

A close look at the values of *Fig.2* shows that high mean metal concentrations were found for all the metals except Cd. The variability in range of all the metal distributions as compared with their means respectively is an indication of a pollution of the sediment with that metal ion.

Based on both sides sampling analysis, the average Fe concentration was 350.35 µg/g. followed by Pb, Mn, Cu, Si and Cd at 273.7, 191.75, 127.3, 16.2 and 6.8 µg/g. respectively. The decreasing trend of average metal levels was as follows: Fe, >Pb>Mn>Cu >Si >Cd.

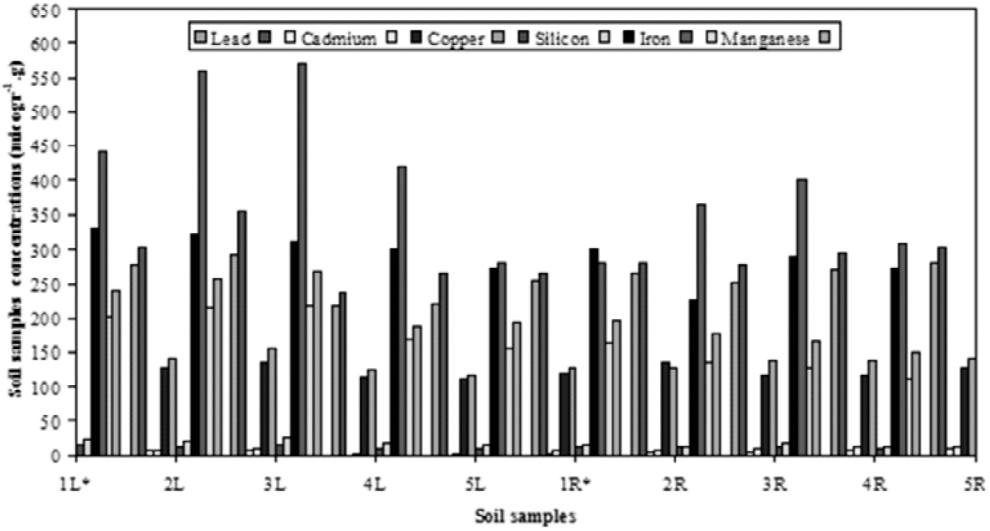

Fig.(2) : concentrations of some elements for studied soil samples (μg/g)

For a closer look on metal concentrations in each side, the reader is referred to *table (2)*:

Table (2): Average concentration of heavy metal ion emitted from vehicles

Mn	Fe	Si	Cu	Cd	Pb	Site
192	307.2	12.8	120	4.4	256.2	Left
149.6	274.4	12.8	123.4	6.2	264.8	Right

The same fact of decreasing metal concentrations holds true for generators emission see *table (3)*.

Table (3): Average concentration of heavy metal ions emitted from generators

Emitted from generators

Mn	Fe	Si	Cu	Cd	Pb	Site
229.6	455.4	21.8	131	6.2	289.6	Left
195.8	364.4	17.4	135	10.4	284.4	Right

Table (4) shows the increase in emission between vehicles and generators.

Table (4): The percent increase of emissions (generators/vehicles) in the studied areas

Mn	Fe	Si	Cu	Cd	Pb	Site
19%	48%	70%	9%	40%	13%	Left
30.8%	32.8%	36%	9.4%	67.8%	7.5%	Right

Lead (Pb)

Lead is one of the oldest metallic pollutants introduced by man into the environment. Lead, if ingested with food or water, can cause severe damage to the nervous system, the urinary system and the reproductive system. It may cause abortion in females and reduce the fertility of males. It may also cause anemia by obstructing the biosynthesis of hemoglobin.

In the present study, the lead content of the roadside soils in both sides ranged from 218 to 354 μg/g with the mean value of 273.7 μg/g. Samples were regarded "polluted" when contained lead exceeding concentration ranging from 200 to 400 μg/g.

Alloway, (1995) mentioned that the total lead content of normal British soils ranged from 2 to 300 μg/g while **McGrath (1986)** reported 75 micro per kg as the mean value for lead in urban top soils of England and Wales.

Cadmium (Cd)

Cadmium is a highly toxic metal not known to have any beneficial effects for plants and animals. High human exposures to cadmium are rare today, but long-term, low-level exposure may cause adverse chronic health effects. The main toxic effect in humans from chronic exposure to the metal is kidney damage and, ultimately, kidney failure. Many cadmium compounds are also believed to be carcinogenic **ATSDR, (2008)**. The normal intake of cadmium by humans amounts to about 1-3 $\mu g/g^{-1}$, which does not appear to cause health problems. Most cadmium enters the body via the gastrointestinal tract by eating food products grown on contaminated soil, although smokers may receive a considerable part of total soil Cd content in the surface soils on both sides ranged between 1.0 and 14 microg/kg, with a median value of 6.8 micogr/ kg. About 35% of the surface studied soils were found between the critical soil total

concentration range for Cd, which is 3-8 μg/g. The critical soil total concentration is defined as the range of values above which toxicity is considered possible.

Alloway (1995) mentioned that 0-1 μg/g of cadmium in soils indicates non-contamination, 1-3 micogr^{-1}.g indicates slight contamination and 3-10 micogr^{-1}.g indicates a contaminated soil.

Copper (Cu)

The copper content in the roadside soils in both sides ranged from 110 to 156 μg/g with the mean value of 126.85 μg/g *(Table 1)*. Copper is usually present in soils within the range of 0 to 250 μg/g **Alloway (1995)**. **Mc Grath and Loveland (1992)** reported the range of 1.2 to1507.7 μg/g. For copper in the soils of England and Wales with a median value of 18.1 μg/g. Its amount in urban and roadside soils, however, is reported to be 5-10 times higher than the normal concentrations **Baker and Senft (1995)**.

Copper is an essential micronutrient that is a constituent of many enzyme systems. Copper deficiency in soils may depress crop yields, especially in cereals. Animals and humans need copper to be able to use iron properly. The most commonly observed results of copper deficiency in cattle are diarrhea, broken bones, infertility, anemia, poor weight gains, and reduced immune response. Humans need between 1 micro and 3 micro each day. It takes several days for copper to leave the body. Copper contamination of soils may cause phytotoxicity. The bioavailability of copper decreases with increasing pH, so the toxicity to plants can be mitigated by liming soils contaminated with copper, to bring the pH up to seven. In addition, copper is highly toxic to soil microorganisms.

Selenium (Si)

Selenium is an essential element (micronutrient) for animals and humans and is used as a nutritional additive for livestock and poultry **IPCS, (1987); ATSDR, (2003)**. It has been extensively investigated with regard to both toxicity and deficiencies in humans and livestock **Kabata-Pendias and Mukherjee, (2007)**; **Environment Agency, (2009d)**. Selenium in studied soils in both sides ranged from 10 - 28 μg/g with a mean of 16.2 μg/g much and from too little exposure to selenium. Excess selenium can result in pathological changes to the hair and nails (sclerosis), skin lesions and neurological effects. Convulsions and paralysis may also develop. The milder features of this sclerosis are thought to occur at an oral dose in adults of about 910-μg day^{-1}. There is expert group consensus that the dose-response of the sclerosis is the critical feature in the definition of an oral HCV.

As for the silicon, this element defines a necessary and essential element at low concentrations. It is known as the second component more economical in nature and is combined with oxygen. It represents three-quarters of the earth's crust. Silicon element has a significant effect on the growth of rats. it coexists in the human blood 1-2 μg/g in the liver, muscle, lungs, brain, and some of the connective tissue of the frame in the limits of 200-100 μg/g **Schwarz, (1993)**. Obtained results indicate a range of 10-28 μg/g. Near generators, the silicon concentration was higher by 53% than at those caused by vehicles. These results were very close with some of the published locally and internationally about the pollution problem in this element of risk that the use of produced crude oil is refined by the motor **Lactase, (1998) and Okinawa *et.al.*, (2001)**. Diseases affecting the heart and bones develop in populations with grossly insufficient intakes of selenium. To maintain good health, the World Health Organization **(WHO, 2003)** recommends minimum selenium oral intakes of 33-34 μg day^{-1} for adult males and 25-26 μg day^{-1} for adult females (35-42 μg day^{-1} for lactating females). These intakes are equivalent to 0.47- 0.49 μg kg^{-1} bw day^{-1} for adult males, 0.42 - 0.43 μg kg^{-1} bw day^{-1} for adult females and 0.58 - 0.7 μg kg^{-1} bw day^{-1} for lactating females (assuming an adult male bodyweight of 70 kg and female body weight of 60 kg).

Iron (Fe)

For Fe the concentration in soil were 227 to 572 μg/g with a mean of 350.35 μg/g. The iron constitutes approximately 0.5 - 5% by weight of the earth's crust. In addition, there is a constant variable in all soils, extracted from the soil in a way (DTPA + TEA). In addition, this element introduces in the composition of respiratory enzymes and thus the iron a direct role in operations of breath and has a direct role in the processes of oxidation and reduction and the formation of chlorophyll of the plant. The results showed that the normal concentration of iron ranged between 50-250 μg/g and symptoms of toxicity with iron started when this figure was exceeded. The results of this study showed arrange of 227-572 μg/g this figure increased by 25% near the generator.

Manganese (Mn)

As for manganese, the plants differ in their sensitivity for this element. it has been observed more often poisoning of plants due to increased focus and increasing seriousness of the disease the existence of circumstances shorthand in the soil and is characterized in general spots brown color in the older parts of the plant and unequal

distribution. The concentration in soil samples of this study was between 111-290 μg/g and by 41% between the generator compared to the output of cars fuel, and shows symptoms of poisoning and clear. (The manganese content of the roadside soils ranged from 129 to 290 μg/g. with the mean value of 191.75 μg/g).

STATISTICAL TREATMENT

Tables (5 and 6) show estimation of some statistical parameters of the studied data. Correlations among heavy metals in both sides are shown in *table (7 and 8)*. It appears that such correlation in the left side in greater than those at right side. This may be attributed to the fact that left side is more open and more uniformly built compared to the other side. This facilitates more mixing and more chance for transferring. The right side is crowded, closely- built. This will lead to restrict mixing and precipitation on homes, trees...etc. of heavy metals.

On the other hand, the t-test results (concerned tables are not listed) showed some significant differences and effects among some heavy metals in both sides.

Table (5): Statistical parameters for vehicle heavy metal

Concentrations in the left bank

Variable		Mean	Variance	Minimum	Maximum	Skewness	Kurtosis
Pb	Left	2562	1144.7	218.0	291.0	-0.41	-2.96
Pb	Right	264.	159.70	252.00	282.00	0.33	-1.37
Cd	Left	4.40	13.30	0.00000	8.00	-0.48	-2.85
Cd	Right	1.20	13.70	2.00	11.00	0.38	-1.81
Cu	Left	120.2	131.50	110.00	136.00	0.76	-1.72
Cu	Right	123.1	64.30	116.00	135.00	0.79	-0.97
Si	Left	12.8	6.70	10.00	16.00	0.36	-2.41
Si	Right	12.80	6.70	10.00	17.00	1.23	2.40
Fe	Left	307.2	517.7	272.0	331.0	-0.96	0.89
Fe	Right	274.4	787.8	227.0	299.0	-1.66	3.00
Mg	Left	192.0	814.5	156.0	219.0	-0.47	-2.57
Mg	Right	149.6	1372.8	111.0	206.0	0.94	0.36

Table (6): Statistical parameters for generator heavy metal concentrations in the left bank

Variable		Mean	Variance	Minimum	Maximum	Skewness	Kurtosis
Pb	Left	289.6	1932.8	236.0	354.0	0.50	0.63
Pb	Right	284.4	206.30	266.00	303.00	0.12	-0.83
Cd	Left	6.20	15.20	2.00	10.00	-0.46	-3.12
Cd	Right	10.40	8.30	7.00	14.00	-0.04	-1.80
Cu	Left	131.0	292.00	116.00	156.00	0.89	-0.93
Cu	Right	135.0	43.00	128.00	142.00	-0.37	-2.90
Si	Left	21.80	24.20	16.00	28.00	0.07	-1.76
Si	Right	17.40	22.30	13.00	25.00	1.24	1.66
Fe	Left	455.4	13991.8	282.0	572.0	-0.64	-0.27
Fe	Right	364.4	5280.3	282.0	464.0	0.33	-1.02
Mg	Left	229.6	1344.3	188.0	269.0	-0.30	-2.80
Mg	Right	195.8	3053.2	150.0	290.0	1.75	3.27

Table (7): Correlations among Generator Vehicle heavy metals in left bank

Left vehicles

		Pb	**Cd**	**Cu**	**Si**	**Fe**	**Micro**
Pb	Pearson Correlation	1	.998**	.702	.783	0.723	.976*
	Sig. (2-tailed)		.000	.186	.118	0.167	.005
Cd	Pearson Correlation	.998*	1	.687	.779	.704	.966**
	Sig. (2-tailed)	.000		.200	.121	.185	.008
Cu	Pearson Correlation	.702	.687	1	.227	o.262	.747
	Sig. (2-tailed)	.186	.200		.713	.671	.147
Si	Pearson Correlation	o.783	.779	.227	1	.642	.680
	Sig. (2-tailed)	.118	.121	.713		..243	.206
Fe	Pearson Correlation	.723	.704	.262	.642	1	.793
	Sig. (2-tailed)	.167	.185	.671	.243		.109
Mg	Pearson Correlation	.976*	.966**	.747	.680	.793	1
	Sig. (2-tailed)	.005	.008	.147	.206	.109	
Right							
Pb	Pearson Correlation	1	.942*	.435	.465	-.245	.426
	Sig. (2-tailed)		.017	.464	.430	.691	.475
Cd	Pearson Correlation	.942*	1	.140	.423	-.071	.289
	Sig. (2-tailed)	.017		.823	.478	.910	.638
Cu	Pearson Correlation	.435	.140	1	.342	-.724	.400
	Sig. (2-tailed)	.464	.823		.573	.167	.504
Si	Pearson Correlation	.465	.423	.342	1	.239	.883*
	Sig. (2-tailed)	.430	.478	.573		.699	.047
Fe	Pearson Correlation	-.245	-.071	-.724	.239	1	.324
	Sig. (2-tailed)	.691	.910	.167	.699		.595
Mg	Pearson Correlation	.426	.289	.400	.883*	.324	1
	Sig. (2-tailed)	.475	.638	.504	.047	.595	

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Table (8): Correlations among generator heavy metals in left bank

Correlations

		Pb	Cd	Cu	Si	Fe	Micro
Pb	Pearson Correlation	1	.920*	.828	.436	.630	.489
	Sig. (2-tailed)		.027	.083	.463	.254	.403
Cd	Pearson Correlation	.920*	1	.979**	.555	.679	.459
	Sig. (2-tailed)	.027		.004	.332	.208	.437
Cu	Pearson Correlation	.828	.979**	1	.517	.604	.357
	Sig. (2-tailed)	.083	.004		.373	.281	.556
Si	Pearson Correlation	.436	.555	.517	1	.765	.923*
	Sig. (2-tailed)	.463	.332	.373		.132	.025
Fe	Pearson Correlation	.630	.679	.604	.765	1	.671
	Sig. (2-tailed)	.254	.208	.281	.132		.215
Mg	Pearson Correlation	.489	.459	.357	.923*	.671	1
	Sig. (2-tailed)	.403	.437	.556	.025	.215	
Right							
Pb	Pearson Correlation	1	.882*	.802	.860	.708	.921*
	Sig. (2-tailed)		.048	.103	.062	.180	.026
Cd	Pearson Correlation	.882*	1	.675	.915*	.859	.994**
	Sig. (2-tailed)	.048		.211	.029	.062	.001
Cu	Pearson Correlation	.802	.675	1	.628	.823	.731
	Sig. (2-tailed)	.103	.211		.257	.087	.161
Si	Pearson Correlation	.860	.915*	.628	1	.789	.902*
	Sig. (2-tailed)	.062	.029	.257		.112	.036
Fe	Pearson Correlation	.708	.859	.823	.789	1	.854
	Sig. (2-tailed)	.180	.062	.087	.112		.066
Mg	Pearson Correlation	.921*	.994**	.731	.902*	.854	1
	Sig. (2-tailed)	.026	.001	.161	.036	.066	

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

CONCLUSIONS

Pollution of roadsides soils with heavy metals emitted from vehicles and private electric generators in Mosul city / Iraq.

An attempt is made to analyze topsoil samples of roadsides soil polluted with heavy metals accumulated through the activities of vehicles and private electric generators. The heavy metals Pb, Cd, Cu, Fe, Si and Mn were evaluated. These metals are released during different operations of the road transport such as combustion, tires component wearing out, fuel burning such as diesel , fluid leakage and corrosion of batteries and metallic parts such as radiators.

Heavy metal contamination in the soils from the roadside verges in the study area was higher as compared to the background levels for lead, cadmium, copper, Iron and silicon. These concentrations, however, were below the critical maximum levels above which toxicity is possible. The highest concentrations were detected in the samples collected from the border zone of the verges and there was a trend of gradual decrease in the metal contents with the increasing distance from the paved roads.

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Climate Analyses for Assessment of Agricultural Potential

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ABSTRACT

An attempt was made to analyse the climatic data of Coimbatore for the coefficient of variation and Initial probability of rainfall and length of growing period so as to assess the agricultural potential. The rainfall averages for the weeks 16, 17, 19, 20, 22-27, 29-32, 37-42 and 44 were found dependable. The reasonable limits for taking risk in planning of rain water harvesting strategies were observed to be between 50 and 30 per cent. If structures are intended to harvest weekly rainfall they can be designed based on 50 per cent probable rainfall as the weekly maximum at 50 per cent probability equals the maximum mean weekly rainfall. Short and medium duration crops like sorghum, maize, sunflower, cowpea, groundnut, gingelly etc were found possible to be raised without exploiting much the scarce water resources for irrigation.

Key words: *Climate analysis, probability of rainfall, length of growing period, moisture availability index*

INTRODUCTION

An assessment of the rainwater harvesting potential of an area can be done based on the analyses of rainfall, soil, topography, water requirements etc. Climate and weather are the important integrated factors determining the status of agriculture. The influence of weather on crop performance is operative even before the crop seed is sown. The yield potential of a crop mainly depends on weather even though climate decides the choice of the crop.

Sharma *et al.*, (1979) analysed the probability and frequency of rainfall in Nainital Tarai region. Weekly rainfall at 80, 50, and 10 percent chances was proposed to be utilized for planning and deciding time of different agricultural operation,

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considering 50 per cent chance rainfall as the maximum limit for taking any risk for planning the cropping programme. The initial and conditional probabilities of dry and wet spells for the arid zone of Haryana was analysed and its application to the management of agricultural operations in Kharif crops was determined by **Khichar *et.al.*,(2000)**. **Das *et.al.*(2001)** conducted an agro-ecological study to determine the weekly distribution of rainfall so as to compute assured rainfall and moisture availability index at 10,25, 75 and 90 percent probability levels. **Kashyapi (2002)** analysed the influence of meteorological parameters on performance of rainfed cropping systems. He reported that rainfall, its distribution along with distribution of temperature, relative humidity (RH) and bright sunshine hours (SSH) suggest the possible growing season and crop performance in a given area. When the relative yield performance of crops and sequences as influenced by meteorological parameters were studied, performance of' jute-rice-lentil and mung bean-rice-lentil were the best with sustainable production and net return. **Agrawal and Singh (2012)** studied the characteristics of rainfall pattern for crop planning in Jabalpur, India. The daily rainfall data of past 31 years (1978-2008) was analyzed by them for establishing the long term average of weekly, monthly, seasonal and annual rainfall and its variability. The weekly probability of rainfall was estimated using Markov Chain probability model for receiving $\geq$ 10 and 30 mm rainfall per week. Standard week from 25 to 37 received rainfall more than 30 mm indicating the crop growing period from June 2nd week to September last week.

In the present study, an attempt was made to analyse the climatic data of Coimbatore for the coefficient of variation and initial probability of rainfall and length of growing period so as to assess the agricultural potential.

METHODOLOGY

Coimbatore, being in the rain shadow region of Western Ghats, has an arid climate during winter (January-February), summer (March-May) and South West monsoon (June-September) seasons. During North East monsoon (October-December) the climate is sub humid. Comprehensively the annual climate of Coimbatore falls under semi-arid **Veeraputhiran *et al.*, (2003)**. The mean annual rainfall is 706.7mm and the contribution by North East monsoon, South West monsoon, summer and winter showers are 50.7, 27.7, 19.2 and 2.5 per cent respectively. The mean maximum and minimum temperature ranges between 29.2^{0}C to 35.2^{0}C and 17.9^{0}C to 23.8^{0}C respectively.

Paddy, maize, banana, groundnut, vegetables, sugarcane, sun flower, millets, pulses, cotton, oil seeds, coconut, fodder grass and fruit trees like mango and guava were the major crops grown in the study area. The analysis of meteorological data forms is the essential basis for water budgeting and optimal water allocation.

Coefficient of variation (CV)

The main features of rainfall variability namely its quantity and distribution is understood better by the analysis of CV. The variability of rainfall was determined by finding CV which is a unit free measure and expressed in percentage.

$$CV = \frac{SD}{\overline{X}} \times 100$$

where,

CV = Coefficient of variation

SD = Standard deviation

$\overline{X}$ = Mean

As per WMO standards, rainfall data for at least a block of 30 years are required for this analysis and the blocking of 30 years must be done in such a way that the starting year should be the beginning of a decade and the terminal year should be the end of the decade. Hence 30 years data from 1971-2000 was used for the analysis. The rainfall data was collected from the Department of Agricultural Meteorology, TNAU, Coimbatore.

Initial probability (IP)

The presentation of rainfall data in the form of simple mean provides a general understanding but is not useful for specific operations. The expected rainfall at certain amount of probability (chances) is much more useful in dry land conditions.

Initial probability indicates the minimum quantity of rainfall to be expected for a particular time series data, which is to be arranged in descending order.

$$IP = (n \times p)/100$$

where,

IP = Initial probability, per cent

n = Sample size

p = Probability required in percentage

Rainfall data for thirty years was taken for analysis and hence n = 30. IP at 50 per cent probability was computed as follows.

$$IP = (30 \times 50)/100 = 15$$

The 15th value from the top of the data arranged in descending order was taken as the 50 per cent probable rainfall. Similarly, the position for each probability level was found out and the corresponding values were chosen for each week.

Length of growing period (LGP)

It is the duration of growing period wherein crop gets sufficient moisture for its growth continuously without any interruption. Moisture is the major limiting factor for agriculture in semi arid tropics. LGP aids in the selection of best agro-techniques for the area. LGP is computed by taking into account the rainfall and potential evapotranspiration.

According to **Sarkar and Biswas (1988)**, Moisture Availability Index is given by:

$$MAI = \frac{\text{Assured weekly rainfall, mm}}{\text{Weekly evapotrans piration, mm}}$$

As the annual rainfall is more than 400 mm, 50 per cent weekly probability rainfall was taken for computation.

Potential evapotranspiration

To estimate crop water requirements, the potential evapotranspiration from the crop under consideration is to be related to an estimated reference evapotranspiration by means of a crop coefficient.

$$PET = Kc \times ETo$$

where,

PET = Potential evapotranspiration

Kc = Crop coefficient

ETo = Reference evapotranspiration

The reference evapotranspiration was found from the following combination formula, which is based on the Penman-Monteith approach. **Verhoef and Feddes, (1991)**

RESULTS AND DISCUSSION

Rainfall variability

The mean weekly rainfall and the coefficient of variation are presented in *Table 1*. From the observation of the mean weekly rainfall, the weeks over which the South West monsoon and North East monsoon are distributed can be understood. The peak rainfall depth of 46 mm is got in the 43rd week (October 22-28) and it is observed that the major rainfall contributor is the North East monsoon. Mean weekly rainfall of more than 30 mm is recorded from 41st to 46th standard weeks (October 8-14 to November 12-18). The fourth week (January 22-28) has no rainfall at all. The total mean annual rainfall comes to 706.69 mm which places the study area in the semi-arid zone.

The computed coefficient of variation (CV) values lie between the threshold values of 100 and 150 per cent in 18 weeks. This indicates lesser rainfall variability during these weeks **Veeraputhiran *et al.*, (2003)**. Hence the rainfall averages for the weeks 16, 17, 19, 20, 22-27, 29-32, 37-42 and 44 are dependable. The rainfall variability values over the weeks will enable better planning on a sustainable basis. It can be generalized that greater the CV lesser is the dependability and for lower rainfalls greater will be the value of CV.

Weekly probability of rainfall

The weekly assured rainfall for a wide range of probability levels are presented in *Table 2*. Analysis of annual and monthly rainfall data is inadequate to evaluate the

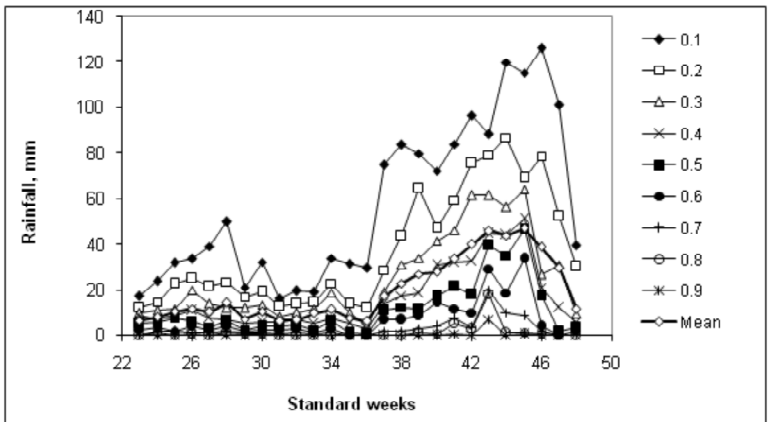

Fig. 1 : Minimum assured rainfall from 23rd to 48th week

Table 1 Mean weekly rainfall and coefficient of variation

Std. weeks	Month and date	Mean rainfall, mm	S D	CV, %	Std. weeks date	Month and mm	Mean rainfall,	S D	CV, %
1	January 01-07	4	13.72	344	27	02--08	10.4	13.43	129
2	08--14	0.5	1.56	328	28	09--15	14.3	23.74	166
3	15--21	4.1	14.49	353	29	16--22	7.2	8.18	114
4	22--28	0	0.13	539	30	23--29	10.2	14.21	139
5	Jan 29-Feb 4	0.3	1.36	539	31	Jul 30 - Aug 5	6.4	8.51	132
6	05--11	1	3.44	331	32	06--12	6.8	7.7	113
7	12--18	3.1	9.54	304	33	13--19	9.7	18.18	187
8	19--25	4.4	10.39	236	34	20--26	11.4	16.17	142
9	Feb 26-Mar 4	3.4	8.83	263	35	Aug27-Sep 2	7.7	12.62	163
10	05--11	9.6	24.46	255	36	03--09	6.3	11.09	177
11	02--18	3.6	7.17	201	37	10--16	17.3	22.92	132
12	19--25	1	3.59	378	38	17--23	22.9	28.6	125
13	Mar 26-Apr 1	2.7	7.12	261	39	24--30	26.9	33.32	124
14	02--08	7.5	13.24	176	40	Oct 01-07	27.7	32.68	118
15	09--15	12	27.94	234	41	08--14	33.6	37.76	112
16	16--22	17.5	23.78	136	42	15--21	39.9	51.34	129
17	23--29	11.7	17.46	150	43	22--28	46	39.76	86
18	Apr 30-May 6	19	32.96	173	44	Oct 29-Nov 4	43.8	46.2	105
19	07--13	15.3	22.09	144	45	05--11	47	46.5	99
20	14--20	14.6	16.12	110	46	12--18	38.9	63.12	162
21	21--27	11.7	17.84	152	47	19--25	29.5	59.49	202
22	May28-June-3	7.9	9.99	126	48	Nov26-Dec 2	11.6	8.13	156
23	04--10	6.6	7.57	114	49	03--09	16.7	37.11	222
24	11--17	7.9	8.68	110	50	10--16	14	29.73	212
25	18--24	10.3	12.85	125	51	17--23	3.1	5.37	174
26	Jun 25-Jul 1	11.7	13.37	115	52	24--31	6.6	18.65	282

Table 2. Assured rainfalls at different probability levels

Std. Week	Different probability levels, per cent						
	30	**33.33**	**40**	**50**	**60**	**70**	**Mean**
1	0.00	0.00	0.00	0.00	0.00	0.00	3.99
2	0.00	0.00	0.00	0.00	0.00	0.00	0.48
3	0.00	0.00	0.00	0.00	0.00	0.00	4.10
4	0.00	0.00	0.00	0.00	0.00	0.00	0.02
5	0.00	0.00	0.00	0.00	0.00	0.00	0.25
6	0.00	0.00	0.00	0.00	0.00	0.00	1.04
7	0.00	0.00	0.00	0.00	0.00	0.00	3.14
8	0.00	0.00	0.00	0.00	0.00	0.00	4.40
9	0.00	0.00	0.00	0.00	0.00	0.00	3.36
10	2.00	0.00	0.00	0.00	0.00	0.00	9.59
11	0.00	0.00	0.00	0.00	0.00	0.00	2.73
12	0.00	0.00	0.00	0.00	0.00	0.00	0.95
13	1.00	0.00	0.00	0.00	0.00	0.00	2.73
14	3.30	3.00	2.80	2.00	0.00	0.00	7.51
15	7.00	6.80	1.80	0.80	0.00	0.00	11.96
16	16.90	16.20	10.40	7.50	4.00	2.00	17.45
17	11.00	10.50	7.00	3.00	1.40	0.00	11.66
18	20.10	18.80	17.50	7.00	4.40	2.00	19.03
19	18.00	15.50	12.50	5.30	3.40	1.50	15.32
20	22.00	21.40	12.60	9.00	4.70	2.50	14.64
21	13.00	10.00	8.50	3.20	2.00	0.80	11.72
22	10.00	9.00	6.20	4.70	2.70	0.00	7.91
23	9.90	9.20	8.60	5.00	2.30	0.00	6.63
24	10.90	9.00	7.00	5.80	3.40	2.00	7.87
25	11.90	10.00	8.70	7.50	2.00	1.50	10.30

26	20.00	17.50	10.90	6.50	3.90	1.10	11.92
27	13.90	12.80	7.50	3.60	2.50	1.40	10.40
28	12.00	8.80	7.00	6.20	4.30	1.50	14.27
29	12.30	11.20	5.00	2.60	1.70	1.30	7.20
30	13.50	13.30	5.80	3.80	2.50	1.20	10.23
31	7.90	7.50	6.00	4.00	2.20	0.30	6.44
32	9.80	8.00	6.80	4.90	3.00	1.00	6.80
33	11.80	10.80	5.20	2.50	1.30	0.50	9.73
34	18.70	10.60	7.60	6.30	2.80	1.00	11.43
35	9.60	7.90	5.00	1.00	0.00	0.00	7.73
36	4.30	3.50	3.00	0.30	0.00	0.00	6.26
37	19.40	16.50	13.70	11.10	7.00	2.00	17.33
38	31.00	27.90	17.70	12.40	6.80	2.00	22.87
39	33.90	28.00	18.60	11.60	8.50	3.10	26.95
40	41.50	37.80	30.80	17.50	14.40	3.80	27.65
41	46.20	41.50	32.00	21.50	11.90	7.50	33.58
42	61.40	58.30	32.30	18.00	10.00	3.40	39.89
43	61.60	60.10	44.50	39.40	29.20	20.00	45.98
44	56.40	51.60	44.20	35.10	18.70	10.00	43.81
45	64.20	64.20	51.00	46.30	33.80	8.50	46.99
46	26.50	24.90	21.10	17.20	3.90	1.50	38.89
47	31.00	25.80	12.00	1.60	0.00	0.00	29.49
48	9.50	6.40	6.00	3.20	1.50	0.20	11.60
49	13.40	8.80	7.00	3.40	2.40	0.00	16.71
50	5.80	5.00	3.00	0.20	0.00	0.00	14.05
51	1.60	1.60	1.00	0.00	0.00	0.00	3.09
52	0.00	0.00	0.00	0.00	0.00	0.00	6.60
Total	794.20	709.70	508.30	341.00	202.60	83.60	706.69

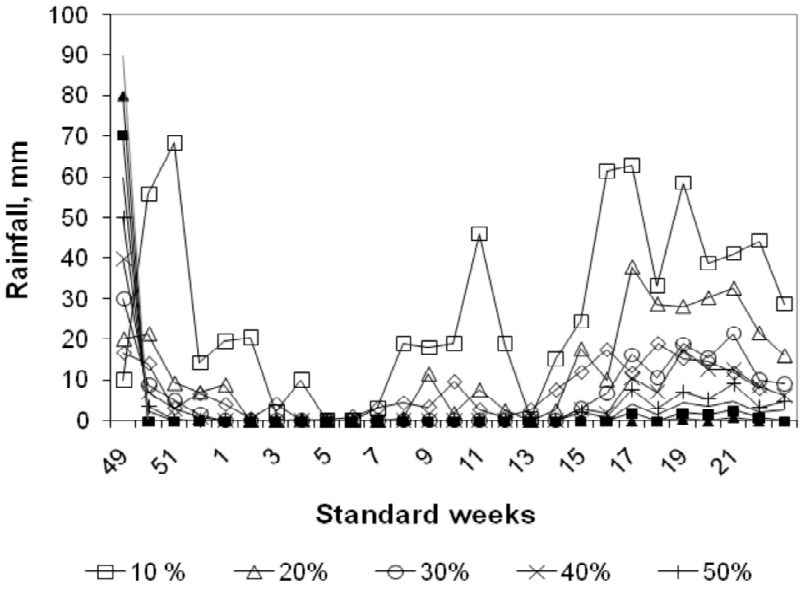

Fig. 2 : Minimum assured rainfall from 49th to 22nd week

moisture availability at various stages of crop growth and the water needs over a short period. Hence rainfall data was analysed on a weekly basis.

Initial probabilities at 30%, 33.33% and 40% to 70% are given in the table. The annual rainfall at 33.33 % is in par with the mean annual rainfall. Also it is found that the peak weekly rain at 50 % probability has the same value as the peak weekly mean rainfall, which is 46.3 mm. The distribution of rainfall at different probability levels over the weeks are depicted in *Fig 1* and *Fig 2*. Rainfall is zero in weeks 1 to 6 at all probability levels except 10 %. It is seen that the minimum quantity of rainfall to be expected in a particular week is higher at lower probability levels. But lower probabilities indicate lesser chance of rain to occur.

The rainfall at different probabilities gains importance depending on the management strategy to be adopted for the best utilization of the rainwater. The reasonable limits for taking risk in planning of rain water harvesting strategies are observed to be between 50 and 30 per cent. If structures are to harvest weekly rainfall they can be designed based on 50 per cent probable rainfall as the weekly maximum

Table 3. Moisture Availability Indices

Std. week	Assured rainfall at 50% probability	Mean ET_0, mm	MAI	Std. week	Assured rainfall at 50% probability	Mean ET_0, mm	MAI
1	0.00	25.21	0.00	27	3.60	35.89	0.10
2	0.00	26.14	0.00	28	6.20	38.33	0.16
3	0.00	24.96	0.00	29	2.60	35.16	0.07
4	0.00	24.07	0.00	30	3.80	30.28	0.13
5	0.00	20.48	0.00	31	4.00	29.79	0.13
6	0.00	22.11	0.00	32	4.90	35.01	0.14
7	0.00	30.12	0.00	33	2.50	41.95	0.06
8	0.00	32.48	0.00	34	6.30	32.80	0.19
9	0.00	32.73	0.00	35	1.00	25.45	0.04
10	0.00	32.35	0.00	36	0.30	38.48	0.01
11	0.00	31.41	0.00	37	11.10	32.40	0.34
12	0.00	31.99	0.00	38	12.40	32.38	0.38
13	0.00	26.06	0.00	39	11.60	28.73	0.40
14	2.00	29.71	0.07	40	17.50	30.13	0.58
15	0.80	32.68	0.03	41	21.50	25.21	0.85
16	7.50	33.35	0.23	42	18.00	24.31	0.74
17	3.00	34.79	0.09	43	39.40	22.56	1.75
18	7.00	33.07	0.21	44	35.10	19.46	1.80
19	5.30	36.03	0.15	45	46.30	16.03	2.89
20	9.00	30.51	0.29	46	17.20	20.08	0.86
21	3.20	34.75	0.09	47	1.60	21.88	0.07
22	4.70	30.29	0.16	48	3.20	20.02	0.16
23	5.00	31.69	0.16	49	3.40	23.26	0.15
24	5.80	40.90	0.14	50	0.20	23.24	0.01
25	7.50	40.52	0.19	51	0.00	28.72	0.00
26	6.50	41.36	0.16	52	0.00	27.27	0.00

at 50 per cent probability equals the maximum mean weekly rainfall. In systems where total rainfall is of significance, as in the design of farm ponds, 33 % rainfall sum can be adopted.

Length of growing period

The Moisture Availability Index (MAI) is an indicator which aids in the selection of suitable agro-techniques based on the rainfall and reference evapotranspiration. Rainfall at 50 per cent probability and reference evapotranspiration calculated by Penman-Monteith method were used for the calculations. The weekly MAI worked out based on the method of **Sarkar and Biswas (1988)** is presented in *Table 3*.

From weeks 37 to 46 (September 10-16 to November 12-18) the MAI value was greater than 0.3. Also, MAI was greater than 0.7 from 42nd to 46th weeks (October 8-14 to November 12-18). According to Sarkar and Biswas such regions with MAI greater than or equal to 0.3 for duration of 10 weeks do not have much scope for intensive crop production. However short or medium duration crops can be raised. MAI values for the area indicated that a rain fed crop of 70 days duration is recommendable. The stored soil moisture at the end of the season may support the crop for a maximum of 10 more days.

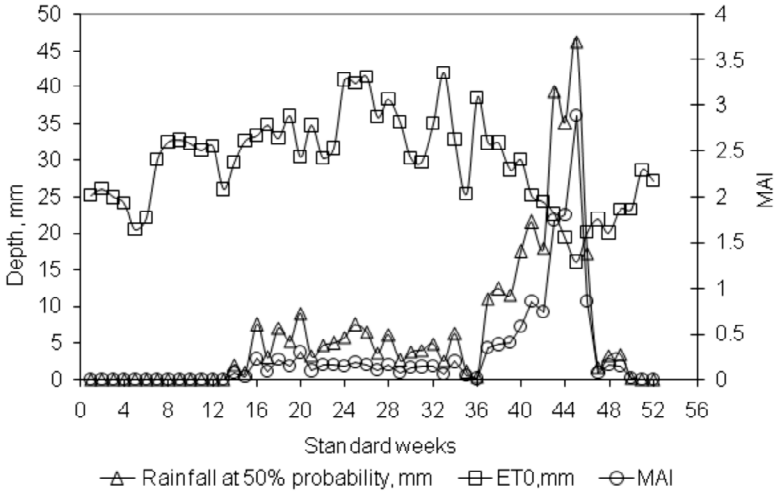

Fig. 3 : Rainfall at 50% to probability and Moisture Availability Index

The crop potential of the study area can thus be said to be moderate. Short and medium duration crops like sorghum, maize, sunflower, cowpea, groundnut, gingelly etc can be raised without much exploiting the scarce water resources for irrigation. Means to provide water in the required quantity and quality for the remaining 290 days is to be explored. The distribution of MAI values over the weeks is shown in *Fig. 3*. The MAI curve shows the same trend as the rainfall curve and this shows the influence of rainfall on the length of growing period.

CONCLUSIONS

The computed coefficients of variation (CV) values of rainfall were between the threshold values of 100 and 150 per cent in 18 weeks, indicating lesser rainfall variability during these weeks. Hence the rainfall averages for the weeks 16, 17, 19, 20, 22-27, 29-32, 37-42 and 44 were found dependable. The reasonable limits for taking risk in planning of rain water harvesting strategies were observed to be between 50 and 30 per cent. If structures are intended to harvest weekly rainfall they can be designed based on 50 per cent probable rainfall as the weekly maximum at 50 per cent probability equals the maximum mean weekly rainfall. In systems where total rainfall is of significance, as in the design of farm ponds, 33% rainfall sum can be adopted. The Moisture Availability Index was an indicator which aided in the selection of suitable agro-techniques based on the rainfall and reference evapo-transpiration. The crop potential of the study area was found to be moderate. Short and medium duration crops like sorghum, maize, sunflower, cowpea, groundnut, gingelly etc were found possible to be raised without exploiting the scarce water resources much for irrigation.

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Effect on nutritional quality of filled milk beverage prepared with banana pulp

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ABSTRACT

The present study was carried out with the objective to develop a suitable technology of manufacturing sweet filled milk beverage with fruit pulp as well as to find out the nutritional quality of filled milk beverage.

Beverages were prepared by incorporating vegetable oil (Saffola) with skim milk in different proportion i.e. 3 percent, 3.5 percent & 4 percent to increase the poly unsaturated fatty acids of the product. Filled milk beverage containing high amount of Poly unsaturated fatty acids and low saturated fat can be given to the patients suffering from disease of liver, heart and kidney and also from high cholesterol level and obesity. Fruit filled milk beverages are easily digestible, highly refreshing, thirst quenching, appetizing and nutritionally superior to many synthetic and aerated drink. Blended drinks are a good alternative to the development of new products which combines new taste and improvement in the quality of nutrition.

Each Treatment was replicated six times. Product was analyzed for fat, total solids, protein, moisture carbohydrate and ash. The data obtained were statistically analyzed using analysis of variance and critical difference technique. Significant difference in total solids, moisture, fat and protein was observed. Highest value of fat and protein was obtained in treatment T_2F_3 (Filled Milk beverage prepared from 3.5 percent vegetable oil (Saffola) containing 15 percent banana pulp).

Key words: *beverage, fruit pulp/juice, skim milk, filled milk.*

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INTRODUCTION

Fruit pulp and juices are rich source of many vitamins. Milk based products like milk beverages are proven to be an extraordinary nutritional material with essential and non-essential amino acids.

Beverages based on fruits and milk products are currently receiving considerable attention as their market potential is growing. Besides being delicious, these beverages are highly nutritious. They may be particularly useful in places where there is inadequate nutrition, which could lead to nutritional deficiency diseases. Filled milk beverage is a by product obtained during the manufacture of skim milk. It is cheaper source of full cream milk, and economic disposal is an essential requirement in profitable dairying. Milk after removal of a fat is generally used for processing in to skim- milk powder. It contains all the components of milk except fat and, as it is highly nutritious, it could be considered for development into beverages. Banana is ideal food. It reduces hunger and thirst. It helps in all stomach related afflictions like diarrhoea, gastritis, colitis and gastric ulcer. Banana is probably the most widely grown fruit worldwide. It is sweet and creamy to taste and is a favourite with children, young and old alike. A maximum of 3 bananas should be taken in a day.

Fruits are a good source of vitamins and minerals. As production fruits are seasonal there is a glut in the market during a particular season. Thus the pulp from fruits such as mango, banana, apple, pear, guava and litchi can be stored by proper treatment for use in the lean season. Therefore, to make the best use of Indian fruit and dairy products, the present study was conducted to develop delicious and nutritious beverages from the combination of fruit and milk products.

MATERIALS AND METHODS

The experiment was carried out in the Research laboratory of Warner School of Food and Dairy Technology, SHIATS, (Deemed-to-be University, formerly AAI-DU), Allahabad during this investigation have been outlined in the following sections. The sequence of operations designed to conduct the experiment, the experimental procedures and analytical methods followed.

Nine different ratios of fruit pulp and vegetable oil (saffola) were used in the present experimental work. Filled milk was prepared in the laboratory from skim milk. Vegetable oil, Sugar and fruits namely banana was also procured from the local market of Allahabad.

Preparation of Filled Milk

Skim milk was taken for preparation of Filled Milk beverage. Blending of milk and pre-calculated amount of vegetable oil was done at 70^0C by using domestic mixer.

Preparation of Filled Milk Beverage

There was 9 experimental treatment (T_1B_1, T_1B_2, T_1B_3, T_2B_1, T_2B_2, T_2B_3, T_3B_1, T_3B_2, T_3B_3) having different proportion of vegetable oil and banana pulp.

Preparation of Filled Milk Beverage

Treatment	Composition (%)			
	Vegetable oil	Banana pulp	Sugar	Solid not fat
T_1B_1	3	5	8	8.5
T_1B_2	3	10	8	8.5
T_1B_3	3	15	8	8.5
T_2B_1	3.5	5	8	8.5
T_2B_2	3.5	10	8	8.5
T_2B_3	3.5	15	8	8.5
T_3B_1	4	5	8	8.5
T_3B_2	4	10	8	8.5
T_3B_3	4	15	8	8.5

Skimmed milk

↓

Addition of pre-calculated amount of vegetable oil standardized with 3%, 3.5% and 4% with 8.5 SNF

↓

Preheating (70^0C)

↓

Mixing and blending in domestic mixer

↓

Addition of sugar (8%)

↓

Addition of fruit pulp

↓

Mixing

↓

Pasteurization (at 75^0C for 5 minutes)

↓

Cooling (at room temp.)

↓

Stored till further use

Flow chart for preparation of filled milk beverage

Physico chemical analysis-

Moisture- the moisture of filled milk beverage was determined as per procedure given in manual in dairy chemistry, **Ranganna, (2004).**

Fat - fat percentage of filled milk beverage was determined by Gerber method as per the procedure laid down in I.S., 1224; part; (1977).

Protein - protein percentage of filled milk beverage was determined by the **AOAC, (2000)** Association of Analytical Chemist.

Total solids- was determined by subtracting 100 - moisture

Carbohydrate- The carbohydrate content was calculated by subtracting sum of moisture, protein fat and Ash form 100.

Ash- Ash percentage was determined by the **AOAC, (2000)** Association of Analytical chemist.

Statistical analysis- the data obtained for various parameters were analyzed statistically using analysis of variance

RESULTS

The data collected on different aspect as per the methodology have been tabulated and analyzed statistically. The findings are also illustrated diagrammatically. The results obtained from the analysis are presented and discussed in this chapter in the following sequence.

A. Chemical composition

1. Total solids percent in Filled Milk Beverage.
2. Moisture percent Filled Milk Beverage.
3. Fat percent in Filled Milk Beverage.
4. Protein percent in Filled Milk Beverage.
5. Carbohydrate in Filled Milk Beverage.
6. Ash in filled Milk Beverage.

Average data obtained on different parameters in Filled Milk beverage sample

Nutrient composition						
	Total solid (%)	**Moisture (%)**	**Fat (%)**	**Protein (%)**	**Carbohydrate (%)**	**Ash (%)**
T_1B_1	18.24	81.76	2.60	3.15	12.16	0.68
T_1B_2	18.23	81.77	2.58	2.93	12.81	0.65
T_1B_3	18.33	81.67	2.52	2.77	13.37	0.66
T_2B_1	18.60	81.40	3.22	3.19	12.17	0.67
T_2B_2	18.67	81.33	3.05	2.91	12.81	0.69
T_2B_3	18.73	81.27	2.90	9.83	13.38	0.64
T_3B_1	19.09	80.91	3.62	3.17	12.17	0.61
T_3B_2	19.17	80.83	3.53	2.93	12.82	0.62
T_3B_3	19.22	80.78	3.43	2.81	13.41	0.63

The experimental trials were replicated six times and in each replication the product were tested for total solids, moisture, protein, Fat, carbohydrate and ash percentage. A panel of five judges evaluated the Filled Milk Beverage by using score card (9 point hedonic scale) for organoleptic properties.

The data's obtained were statistically analyzed using analysis of variance and critical difference techniques and the results obtained show that the higher average

total solids content of 20.30 Percent was obtained for T_3B_3. Followed by the T_3B_2 (19.76), T_2B_3 (19.47), T_2B_2 (19.44), T_3B_1 (19.41), T_1B_3 (19.28), T_1B_2 (19.02) & T_2B_1 (19.01). The lowest average total solids content of 18.55 percent for T_1B_1. Total solids content of filled milk beverage differed significant difference the mean value of (T_1B_1, T_3B_3) (T_1B_2, T_3B_3) (T_1B_3, T_3B_3) (T_2B_1, T_3B_3) (T_2B_2, T_3B_3) (T_2B_3, T_3B_3) (T_3B_1, T_3B_3) (T_1B_1, T_3B_2) (T_1B_2, T_3B_2) (T_1B_3, T_3B_2) (T_1B_1, T_3B_1) (T_1B_1, T_2B_3) (T_1B_1, T_2B_2) (T_1B_1, T_2B_1).

The higher average moisture content of 81.45 Percent was obtained for T_1B_1. Followed by the T_1B_2 (80.98), T_2B_1 (80.94), T_3B_1 (80.59), T_1B_3 (80.58), T_2B_2 (80.56), T_2B_3 (80.45) and T_3B_2 (80.24). Moisture content of Filled Milk beverage differed significantly in most of the treatment combinations. The maximum average fat percentage of 3.54 percent was recorded in T_3B_1. This is because the treatment consists of 4 percent fat and 15 percent pulp for preparation of the product. Whereas T_1B_3 had lowest average fat content of 2.47 percent .This is because the treatments consist of 3.5 percent fat and 15 percent pulp for preparation of the product.

The higher average Protein content of 3.38 Percent was obtained for T_1B_1. Followed by the T_2B_1 (3.08), T_3B_1 (3.08), T_3B_2 (3.06), T_2B_2 (3.05), T_1B_2 (3.05), T_1B_3 (2.96) and T_2B_3 (2.92) whereas the lowest average Fat content of 2.92 percent for T_2B_3.

The higher average Carbohydrate content of 13.40 Percent was obtained for T_3B_3. Followed by the T_1B_3 (13.39), T_2B_3 (13.38), T_3B_2 (12.83), T_2B_2 (12.81), T_1B_2 (12.81), T_1B_1 (12.18) and T_2B_1 (12.17). Whereas the lowest average Fat content of 12.16 percent for T_3B_1. Significant difference, it was observed that there was significant difference the mean value of (T_1B_1, T_3B_3) (T_1B_2, T_3B_3) (T_1B_3, T_3B_3) (T_2B_1, T_3B_3) (T_2B_2, T_3B_3) (T_2B_3, T_3B_3) (T_1B_1, T_3B_2) (T_1B_2, T_3B_2) (T_3B_1, T_3B_2) (T_2B_1, T_3B_2) (T_2B_2, T_3B_2) (T_2B_3, T_3B_2) (T_1B_1,T_3B_1) (T_1B_2,T_3B_1) (T_1B_3, T_3B_1) (T_2B_1, T_3B_1) (T_2B_2, T_3B_1) (T_2B_3, T_3B_1) (T_1B_1, T_2B_2) (T_1B_2, T_2B_2) (T_1B_3, T_2B_2) (T_1B_1, T_2B_1) (T_1B_2, T_2B_1) (T_1B_3, T_2B_1). The non- significant difference was observed between the mean value of (T_3B_1, T_3B_3) (T_3B_2, T_3B_3) (T_3B_1, T_3B_2) (T_2B_1, T_2B_3) (T_2B_2, T_2B_3) (T_2B_1, T_2B_2) (T_1B_1, T_1B_3) (T_1B_2, T_1B_3) (T_1B_1, T_1B_2).

The higher average Ash content of 0.69 Percent was obtained for T_2B_2. Followed by the T_1B_1 (0.68), T_2B_1 (0.67), T_1B_3 (0.66), T_1B_2 (0.65), T_2B_3 (0.64), T_3B_3 (0.63) and T_3B_2 (0.62).Whereas the lowest average Ash content of 0.61 percent for T_3B_1.

CONCLUSION

From the findings of the study undertaken, it is concluded that milk fat can successfully be substituted by vegetable oil/fat. Domestic mixer can be effectively used in the process of blending vegetable oil with milk for the purpose of making Filled Milk beverage.

These findings will be helpful from therapeutic point of view to the people, suffering from cardiovascular diseases. Their diet should contain moderate or restricted amounts of saturated but high poly unsaturated fatty acids. These are people may have manifestation of cardiovascular disease, liver and other related diseases. Therefore, Filled milk beverage prepared from 3.5 percent vegetable oil (Saffola) containing 15 percent Banana pulp may be recommended for these patients as well as normal human beings in order to help them to maintain their saturated fat intake.

RECOMMENDATION

Further investigations can be taken under the following topics:

1. Studies on the shelf life of the product and nutritive value of the product can be further undertaken.

2. A Study on improving the flavour of Filled Milk beverage by adding other Fruit pulp in different proportions.

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Isolation, Identification and Characterization of health beneficial Lactic Acid Bacteria from milk

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ABSTRACT

Milk is an important part of daily diet as an essential food for human beings and also serves as good medium for microbial growth. The lactic acid bacteria was isolated from milk samples and identified. They are tested for the tolerance of Nacl from the concentration of 1-10% at which isolates grow well from 1-7% concentration. Antimicrobial activity of *Lactobacillus spp.* of different volume of 15µl/well, 20µl/well and 25µl/well was tested against E.coli, S.aureus, and S.typhi in which it was found that 25µl/well volume of *Lactobacilli* is more effective in inhibiting the three organisms where as highly antagonistic against the *S.typhi.* So the use of Lactobacillus as probiotic products in packed foods which provide alternate therapy to the medicinal world apart from the use of traditional antibiotics and pharmaceutical compounds for the treatment of many infections.

Key words: *Lactobacillus spp., probiotic, antimicrobial activity, antagonistic.*

INTRODUCTION

Milk is an essential part of daily diet for the growing children and expectant mother. Milk is a major constituent of the diet, as it is a nutritious food for human beings also serve as a good medium for the growth of many microorganisms especially *Lactobacillus, Streptococcus, Staphylococcus* and *Micrococcus spp.* **Surujana *et al.*, (2011)**. Lactic acid bacteria (LAB) have played along an important role in food and dairy industry. LAB are Gram positive, non spore forming bacteria, grow under anaerobic condition, cooci or rods which produce lactic acid as the major end product during the fermentation of carbohydrates.

LAB are mainly divided into two groups based on products formed from the fermentation of glucose homo-fermentative LAB and hetero-fermentative organism.

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LAB can act as cell factories for production of food additives and aroma compounds and they have a potential use for the establizing the so called functional food **Abdullah and Osman, (2010).**

LAB have been found to control intestinal disorders, partially due to serum antibodies IgG and secretary IgA and IgM enhancing immune response as naturally LAB have been cited to be part of human and animal microbiota **Beasley, (2004)**. They are also considered as a probiotic bacteria.

MATERIALS AND METHODS

Sample collection

The 100 milk samples were collected from the different area of Allahabad in sterilized vials and kept at 4°C until used.

Isolation of LAB

Isolation of LAB was done by serial 10 fold dilution technique on MRS Agar and colonies were examined microscopically for Gram reaction and colony morphology (shape, size, colour, texture) using 24 hrs old cultures. Motility and biochemical tests were performed. Appropriate positive and negative control was used to make distinctive positive and false positive reaction.

Identification of isolates

Identification was based on growth on selective agar and broth, colony morphology, Grams reaction biochemical test results and criteria for disregarding negative cultures. Results were analyzed using Bergey's manual.

Nacl tolerance test

For the determination of Nacl tolerance of isolated *Lactobacilli*, 10 test tube containing MRS broth were adjusted with different concentration (1-10%) of Nacl. After sterilization each test tube was inoculated with 1% fresh over night culture of *Lactobaccilus* and inoculated at 37°C for 24 hrs. After 24 hrs of incubation their growth was determined by observing culture medium turbidity **Diba *et al.*, (2013)**.

Antimicrobial activity of lactobacillus isolates

Agar well diffusion method was used to detect antimicrobial activities of the cell free supernatant produced from lactobacillus spp. or isolates. Nutrient agar medium were poured in each plates, and the pathogenic strains isolated from the milk samples

as *S.aureus, E.coli*, and *Salmonella spp.* were spread on the surface of the nutrient agar medium. Four wells of 4mm diameter were cut into the agar plates and 15µl, 20µl, and 25µl of cell free supernatant collected from 72 hrs old culture were poured into the 3 wells and MRS broth was poured in one well which is mainly considered as negative control. These plates were now incubated at 37°C for 24 to 48 hrs **Diba *et al.,* (2013)**.

RESULT AND DISCUSSION

Identification

Bacteria isolated from the milk samples were identified as *Lactobacillus spp.* by observing their morphological, physiological as well as biochemical characteristics. They are small circular white creamy colour convex and non transparent colonies. Microscopically they were Gm^{+Ve}, rod shaped, non motile, catalase negative and lacked endospores, which is similar with the finding of the earlier studies by **Vamanau *et al.,* (2005)** and **Emanuel *et al.,* (2005)**.

Tolerance of Nacl

The identified *Lactobacilli* were able to tolerate the 1-10% of Nacl as it was studied that Nacl is an inhibitory substances which antagonized the growth of some bacteria. In the present study it was seen than the *Lactobacillus spp.* were able to grow at the concentration from 1-7% where as isolates B_1 do not grow at 9% and 10% concentration of Nacl *(Table 1)*, which is in favour with the earlier observation of **Elezete and Carlos (2005)** and **Diba *et al.,* (2013)**.

Table 1. Tolerance of Nacl showed by Lactobacilli

Concentration of Nacl		**1%**	**2%**	**3%**	**4%**	**5%**	**6%**	**7%**	**8%**	**9%**	**10%**
Isolate	A_1	+++	+++	++++	+++	+++	+++	++	--	--	--
	B_1	+++	+++	++++	+++	+++	+++	++	+	--	--

Legend: (+++ maximal growth), (++ good growth), (+ mimal growth) and (-- no growth).

Antimicrobial activity

Lactobacillus isolates showed antimicrobial activity against *S.aureus, E.coli, S. typhi* which were isolated from the milk samples identified by the biochemical testing.

The capacity of substances to inhibit microbial growth is known as antimicrobial activity. The isolates showed the prominent antimicrobial activity against E.coli, S.aureus, and S.typhi with the zone of inhibition ranged from 9 to 20 mm in the present study *(Table 2)*, which is in favour and support the previous study of **Diba *et al.*, (2013)**.

Table 2. Antimicrobial activity of Lactobacillus species against pathogenic bacterial strains

Bacterial strains	**Diameter of zone of inhibition in mm**		
	15µl/well	**20µl/well**	**25µl/well**
S. aureus	9	16	17
E.coli	Nil	13	17
S.typhi	13	17	20

As the lactic acid bacteria inhibit the growth of these pathogenic organisms successfully it may be preferred for including these organisms in probiotic commercial and packed foods which would confer these effective protection against the many infections.

CONCLUSION

Lactic acid bacteria were mainly isolated from the milk samples in pure culture and various properties were determined. All organisms showed the antimicrobial activity against the *E.coli, S.aureus, and S.typhi* which is the main property which helps us to conclude the *Lactobacillus* spp. is helpful in combacting many of the infections of human spp. when are feed in the form of probiotic strains in packed and commercial food which provide alternate therapy to the medical world apart from many side effects caused by the traditionally used antibiotics and pharmaceutical compounds.

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Antibiotic Susceptibility pattern of Staphylococcus aureus isolated from street foods

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ABSTRACT

Staphylococcus aureus is a common pathogen associated with serious community and hospital acquired diseases and mainly food borne illness. The aim of the present study is to investigate the antibiotic susceptibility pattern mainly isolated from different street foods. Out of 50 food sample 53% were present in samosa which is highest percent of all the samples and antibiotic susceptibility pattern were observe for *Staphylococcus aureus* concluding to have resistance to Methicillin while all were sensitive to Vancomycin, Gentamycin, Tobramycin, and Erythromycin. So further studies should be carried out to investigate the antibiotic resistance within the bacterial community, which is mainly developed because of frequent exposure of antibiotic due to self medication habit of general people.

Key words: *Staphylococcus aureus, antibiotic susceptibility, self medication, sensitive.*

INTRODUCTION

Staphylococcus aureus (S. aureus) is a versatile pathogen in humans and animals which is responsible for a diverse spectrum of diseases ranging from minor skin infections to the threatening diseases, such as pneumonia and meningitis **Sasidharan *et al.,* (2011)**. *S. aureus* has been isolated from several foods such as meat, meat products, milk, dairy products, fermented food items, fish products, etc. **Fueyo *et al.,* (2001)**. *S. aureus* is a gram positive bacterium producing enterotoxins, which are responsible for food borne intoxication. Whereas the staphylococcal enterotoxins are a family of serologically defined low molecular weight proteins. SEB is a highly heat resistant enteric toxin **Bao *et al.,* (2011)**. The large number of carriers

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more than 30%-50% of the population, the contamination of food or one of its ingredients during handling, storage at a unsuitable temperature and the capacity of microorganisms to develop in a wide range pH, free water concentration and Nacl concentration and therefore a wide range of food products are main epidemiological features that creates the ideal conditions for the outbreak of *S.aureus* food poisoning **Giannatale *et al.*, (2011).** *Staphylococcus aureus* is recognized worldwide as a common infection in humans and animals. *Staphylococcus aureus* produces a spectrum of enterotoxins and other determinants of virulence that contribute to its pathogenecity **Moon *et al.*, (2007)**. *Staphylococcus aureus* food poisoning is considered to be one of the leading causes of all food borne diseases. Staphylococcal food poisoning is a mild intoxication occurring after the ingestion of food containing from 20ng to <1µg of staphylococcal enterotoxin **Normanno *et al.*, (2007)**.

MATERIAL AND METHODS

Sampling

A total of 50 food sample (Samosa, Kacouri, Chat and Pakouri) collected from different places of Allahabad city. The samples were refrigerated at 4°C till used for microbial analysis.

Isolation

The isolation was performed by the using of pour plate technique on Tryptic Soy Agar (TSA). Colonies suspected of being Staphylococci were sub-cultured on Nutrient Agar (N.A.) plates.

Identification

Identification was performed by Gram staining, Coagulase test, IMViC test, Mannitol fermentation test etc. Isolates of *S. aureus* were kept in refrigerator for study.

Antibiotic Susceptibility Test

The isolates were tested for susceptibility to a panel of eight antimicrobics using the disc agar diffusion method on Muller Hinton Agar media following the guidelines of NCCLS. The antibiotic discs were used Oxacillin, Rifampicin, Gentamycin, Ofloxanin, Tobramycin, Erythromycin, Trimetroprim-sulfamethozolin and Fusidic acid.

RESULTS AND DISCUSSION

Out of 60 food samples (Samosa, Kachouri, Chat and Pakouri) 27 samples were positive of Staphylococcus aureus which predicts 45% of food samples were contaminated by *Staphylococcus aureus*, similarly **Sina *et al.*, (2011)** and **Normanno *et al.*, (2007)** reported 56.25% and 12.8% of food samples were contaminated by *Staphylococcus aureus* in street foods and in milk and dairy samples *(Table 1)*. This is only because all street food installation, they are pills of garbage and secondly majority of food seller served the customers with their hands without using sanitary disposable gloves.

Table.1.: Prevalence of sample contaminated by Staphylococcus aureus per type of street Food

Food samples	Total sample	No. of *S. aureus* present in sample
Samosa	15	8 (53%)
Kachouri	15	7 (46.67%)
Chat	15	7 (46.67%)
Pakouri	15	5 (33.33%)

Antibiotic Susceptibility Test

In the present study we tested resistance profile of the bacteria under different antibiotics. The results revealed that 15.18% of *S. aureus* were resistant to Methicilin. All isolated bacterial colonies were resistant to Methicilin. However they were all sensitive to Vancomycin, Gentamycin, Tobramycin and Erythromycin *(Fig. 1)*. So this shows that the bacteria were sensitive to most of the antibiotic tested in the present study. Whereas **Normanno *et al.*, (2007)**, in their study reported that 68.8% strains tested showed antimicrobial resistant properties. In addition epidermiological screening of MRSA mediated diseases in the cities of Baltimore and Atlanta between 2001 to 2002 showed that 17% of community based colonies were resistant to antibiotics **Fridkin *et al.*, (2005)**.

So our study reveals that 71.85% bacteria were resistant to erythromycin 20.37% of colonies resistant to Gentamycin 8.88% to Rifampicin 9.99% to Trimetropric.

The occurrence of antibiotic resistance in the present study might be explained by self medication habit of general people. This common practice enhances frequent

exposure to antibiotics leading to a development of antibiotic resistance within the bacterial community.

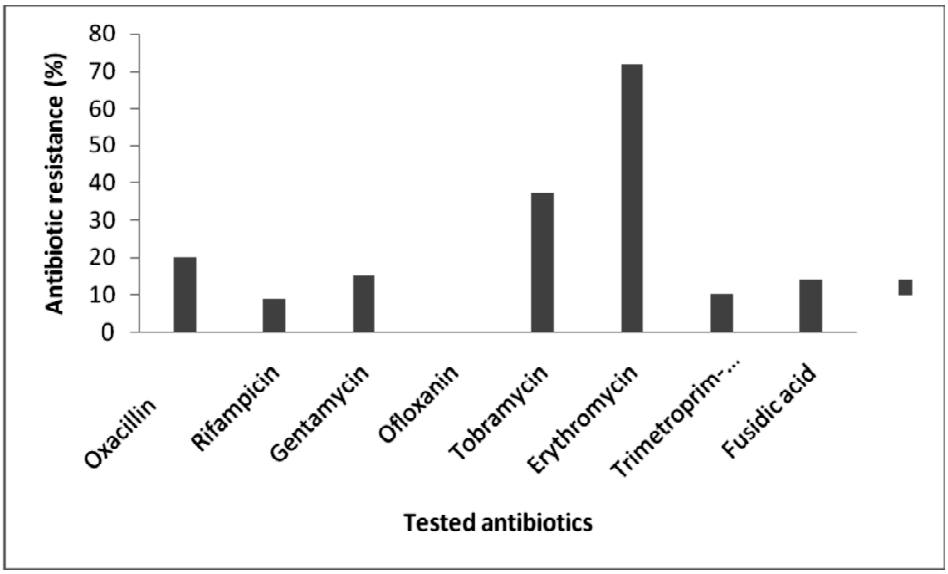

Fig.1. Resistance of S. aureus colonies to different antibiotics

CONCLUSION

This study highlights the toxicity and antibiotic resistance profiles of S. aureus isolated from street foods in public places in Allahabad (India). This study reveals a wide range of *S. aureus* food contamination producing food borne diseases. It is evident that street food might constitute a major problem for public health in Allahabad. So it is important to educate the community and particularly the street food sellers about the hygiene maintenance and about food quality and security.

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Comparison of digital photogrammetric software in the production of digital orthophoto and digital map

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ABSTRACT

Photogrammetry is a discipline where several output such as Orthophoto, digital map contour lines, three dimensional coordinates and others can be produced from aerial photograph. The orthophoto is a photographic representation on which effect of terrain height and camera attitude are removed. The orthophoto constitutes a platform on which accurate measurement can be done which is similar to a map. A map or topographic map is commonly produced using photogrammetric technique. With the advances in computer hard, software and digital technique, photogrammetry has embraces this advances. Today the photogrammetry discipline is known as digital phothogrammetry. In digital photogrammetry, product such as digital a orthophoto and digital map can be produced within short period. These outputs are becoming very popular and very useful to Geographical Information System (GIS) community. The aim of this study is to assess the accuracy of digital orthophoto and digital map produced using tow digital photogrammetric softwares known as ERDAS and PCI. A good understanding of photogrammetry and its component is essential. A well structured criteria was used to assess the accuracy of the digital Orthophoto and digital map produced from the analysis. From this study, based on the findings it was found that PCI software produces superior results or accuracy compared to Erdas software. Even though Erdas software produces less accurate results, it has other function that is superior than the PCI software. In this study, it can be concluded that user should select appropriate software to produce accurate results in producing photogrammetric output.

INTRODUCTION

In photogrammetry, basically mapping can be done using minimum of two aerial photographs to form a stereo model. Photogrammetry is a technique in which stereo

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pairs of photographs are used to produce a two dimensional representation of a three dimensional object as a projection of that object on a single plane. It is used extensively for making maps from aerial stereopair photographs. The developed techniques for avoiding errors due to camera distortion, parallax and other optical aberrations, have now become standard practice. Photogrammetry has been and still is one of the basic means of gathering data from the real world to use in vast applications both qualitatively and quantitatively. To keep up with times it has had to advance through time and trends and at the pinnacle of that advancement is digital photogrammetry. Things that were done analogue methods are now done by a click of the mouse, tasks that took enormous amounts of technical manpower and time, are now accomplished within the shortest record times possible. It is therefore safe to say that digital photogrammetry has come to stay, and as long as computer and software advance it has to keep up as well **Ahmad, (2005)**.

But we will and therefore continue to look for the best possible application or software that can best address our immediate need. To do so we need to critically look at what is available on market and choose the best based on a well stipulated criteria; which application to use for which particular task, this is very vital because photogrammetry is a measurement science and as photogrammetry users we need a software that provides maximum accuracy, with at most efficiency in ample time. It has therefore become very necessary for us to compare and contrast between the software available to us at any given time so that we can not only choose wisely which software to apply for which task, but also encourage the advancement and research by manufacturers into better software applications that will in the end benefit our profession.

Digital photogrammetric software on market today is also quite costly and it would therefore be a disaster for a company or users not to consider which software would best suit their needs in terms of accuracy, time efficiency, data presentation, space management, manipulation capabilities to mention but a few, and end up acquiring a software that will do the job as required but not up to the best presently acquirable standards **Rajendra Parmanik, (2008)**.

In digital photogrammetry, it is common to produce digital orthophoto or digital map using an appropriate software. Assessment of the accuracy of the stereomodel could also be performed. However, in digital photogrammetry it is a challenge to produce digital orthophoto or digital map if a project consists of more than two aerial

photographs. In this study, four aerial photographs (i.e three stereomodel) has been processed and digital orthophoto and digital map has been produced. Later the accuracy of the output has been assessed and reported. The production of the digital orthophoto and digital map are based on the three stereomodel and after the process of aerial triangulation.

The aim of this project is to compare two digital photogrammetric software in the production of digital orthophoto and digital map. The softwares used in this study include ERDAS and PCI. The assessment of the digital orthophoto and digital map from the two different software is done based on a given criteria such as the minimum root mean square error (RMSE).

Objective of Study

This study will be carried out to fulfil the following objectives:

(i) To study and understand the process of producing digital orthophoto by using two digital photogrammetric software and subsequently produce the digital orthophoto.

(ii) To produce digital map of the study area using two digital photogrammetric softwares.

(iii) To perform a comparison of the digital orthophoto and digital map between the two digital photogrammetric softwares.

Study Area

The study area is Universiti Technologi Malaysia (UTM) main campus in Skudai, Johor Bahru. Four aerial photographs of UTM, Skudai campus were used for this project. The photographs were acquired by Department of Surveying and Mapping Malaysia (DSMM) in November 2005 at the scale of 1:10,000. After the photography, the colour film was developed and scanned at 1000dpi. This study will be carried out on the basis of the aerial photographs will be processed using different digital photogrammetric software that include ERDAS and PCI software.

Scope of Study

In this study, two digital photogrammetric software known as ERDAS and PCI were used to produce digital orthophoto and digital map from the four aerial photographs which cover UTM Skudai campus. The aerial photographs were scanned a 1000dpi. In this study, ground control points (GCP) and check points (CP) has been established by conducting GPS survey and utilizing rapid static technique. Then the

data were processed using Trimble TGO software. The four aerial photographs form a strip of photograph and aerial triangulation has been performed before the production of digital orthophoto and digital map.

The digital orthophoto and digital map are were produced using aerial digital photogrammetric software i.e. ERDAS, and PCI. The accuracy of the digital orthophoto and digital map were determined based on root mean square error (RMSE). Then comparative analyses were made based on both planimetric accuracy and the stereomodel accuracy.

LITERATURE REVIEW

With the development of higher-resolution scanners, high quality digital imagery is increasingly available. Additionally, with the progress in high performance computer hardware and software, e.g. higher resolution screens and faster image-handling capabilities, automation of photogrammetric processes becomes presently possible. Image processing and computer vision techniques have successfully been employed for facilitating automated procedures in digital aerial images such as interior orientation, **Schickler *et aI.* (1998)** relative orientation, point transfer in photogrammetric block triangulation and the generation of Digital Terrain Models.

In common terms the true orthophoto is "true" it tries to restore any obscured objects, and is visible in the source images, but it would be an incomprehensive task to create a full model including vegetation, people, cars, traffic lights etc. In general when talking photos about true orthophotos, they are based on surface models that only include terrain, buildings bridges. A similar definition is given by **Amhar (1998)** where the generation of true orthophoto using 3D Building Model in conjunction with a conventional DTM. The orthorectification process is a process that tries to eliminate the perspectiveness of the image. The result is an orthographic projection where the rays are parallel as opposed to the perspective projection where all the rays pass a common center. As a result of the rectification, the orthophoto is an image where the perspective aspect of the image has been removed. It has a consistent scale and can be used as a planimetric map **Mikhail, *et al.*, (2001)**.

In order to create the orthophoto, knowledge of the terrain is needed. A terrain model can be created in several ways, but the most common is using photogrammetry. Furthermore the position and orientation of the camera during the exposure is needed. These parameters can be derived using either a bundle adjustment or by fitting the image over some known ground control points **Ahmad, (2000).**

MATERIALS AND METHODOLOGY

The four aerial photographs were scanned at 1000 dpi.In this study, ground control points (GCP) and check points (CP) will be established by conducting GPS survey and utilizing rapid static technique.Then the data will be processed using Trimble TGO software. The four aerial photographs form a strip of photograph and aerial triangulation will be performed before the production of digital orthophoto and digital map. The best photograph selected through two software as explained in *(figure 1)*.

The accuracy of the digital orthophoto and digital map will be determined based on root mean square error (RMSE). Then comparative analysis will be made based on both planimetric accuracy and the stereomodel accuracy.

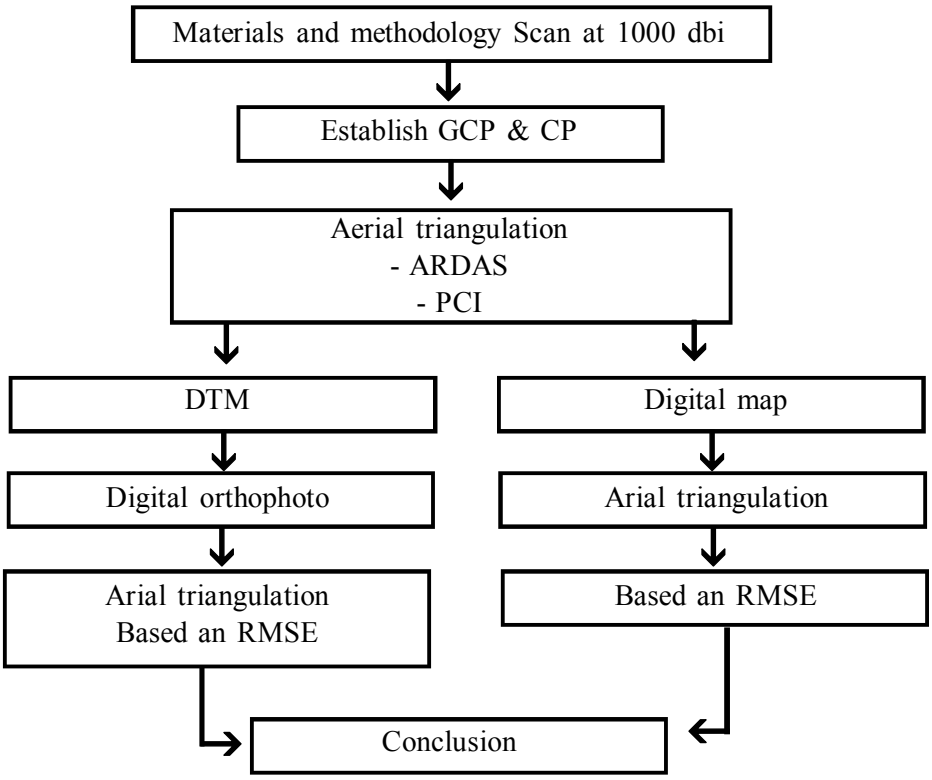

Fig 1: Diagrammatic representation of research methodology

Data Collection

This is the next step in the methodology and it basically deals with the means by which information and data required for the commencement and facilitation of the project is acquired. The data is gathered from DMMS and other such sources. The researcher uses two basic means as a source of information and or data to facilitate the project from start to finish. These are the following;

- Establishing Ground Control Points
- Scanning of Aerial photographs

Establishing Ground Control Point

The term ground control refers to a set of fixed points on the ground for which precise horizontal and vertical coordinates can be determined. These coordinates enable the photogrammetrist to position and correlate map features from aerial photography accurately and to tie the mapping to an established horizontal and vertical coordinate system, or datum. Surveyors can either target and mark ground points prior to the photography or select appropriate photoidentifiable points on the ground after the photographs are taken. The coordinates of these points are derived from existing map data, published control established by government agencies, or new surveys. Horizontal control surveys are necessary to establish the scale of a map and its grid coordinate system; vertical control surveys define the elevation reference and serve as a basis for creating contour maps. The requirements for ground control are dependent on such factors as the flight line plan, the scale of the photography, and the proposed accuracy of the maps.

Historical field methods for establishing control involved the use of theodolites, optical instruments with highpower telescopes, and steel tapes. In the last 20 years, surveyors have used total stations, tripod-mounted theodolites equipped with electronic measuring devices (light beams) and digital data collectors. Today the majority of photogrammetric ground control is performed with satellite-based GPS, which has improved the speed and accuracy of surveys dramatically.

RESULTS AND DISCUSSION

The results of the different software ERDAS and PCI are presented here one by one at a time and later a general comparison and analysis carried out.

ERDAS

ERDAS is the first photogrammetric software considered in this study and is a very powerful tool in today's digital photogrammetry. It is very capable among digital photogrammetric software and very widely used to generate orthophoto form aerial photograph. The orthophoto was generated using the four aerial photographs and the following result is obtained *(Figure 2)*.

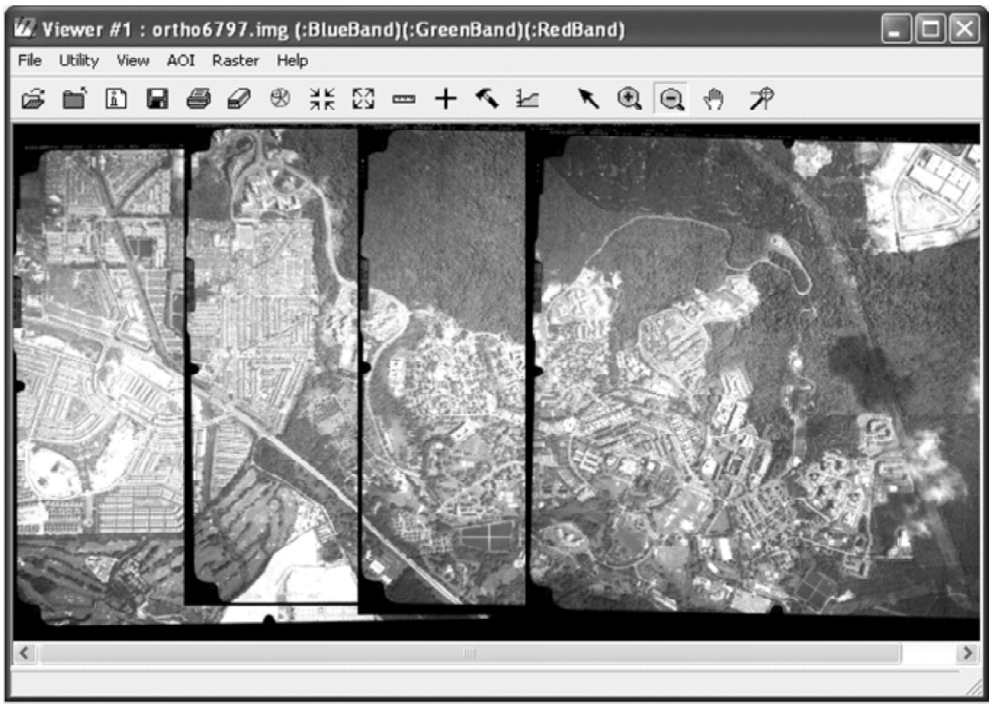

Fig 2: Orthophoto generated from ERDAS software

PCI Geomatica

PCI Geomatica is the two photogrammetric software considered in this study and is a very powerful tool in today's digital photogrammetry. It is also among the best digital photogrammetric software that is very widely used to generate orthophoto form aerial photographs. PCI is used to generate the orthophoto form the provided aerial photographs and the following result is obtained *(Figure 3)*.

Fig 3: Orthophoto generated using PCI software

Accuracy Assessment

For a qualitative analysis for ERDAS and PCI software it is based on the GCP in the stereo model and the GPS control points' coordinates. Once again analysis is done through the use of RMSE criteria *(table 1 and table 2)*.

Table 3 shows the summary of the accuracy assessment. For both software. From *table 3* it is cleary seen that PCI software produce better result compared to ERDAS. For qualitative analysis, distances measured in each software are compared with the same distance measured directly on the ground using tape. *Table 4* shows the result of the comparison.Once again it is clearly seen that PCI produce better result compared to ERDAS.

Table 1: The Accuracy Assessment for ERDAS and PCI Geomatica Software's based on CP

HJHF	ERDAS			PCI			GPS			DIFF(ERDAS)			DIFF(PCI		
Points	X(m)	Y(m)	Z(m)	X(m)	Y(m)	Z(m)	X(m)	Y(m)	Z(m)	X(m)	Y(m)	Z(m)	X(m)	Y(m)	Z(m)
CP1	627245.019	172911.116	41.97	627243.93	172913.35	43.47	627243.083	172913.83	43.018	1.936	-2.722	-1.048	0.847	-0.488	0.452
CP2	627283.129	172317.634	19.90	627281.10	172314.34	17.74	627281.290	172315.438	17.565	1.839	2.196	2.335	-0.19	-1.098	0.175
CP3	626589.068	172887.325	33.06	626591.510	172886.730	34.23	626591.874	172887.645	35.835	-2.806	-0.32	-2.775	-0.364	-0.915	-1.605
CP4	626366.496	172904.957	25.63	626365.750	172904.10	24.30	626365.473	172903.689	23.805	1.023	1.268	1.825	0.277	0.411	0.495
CP5	626291.183	172295.360	20.27	626290.210	172291.635	19.10	626290.666	172292.890	18.262	0.517	2.47	2.008	-0.456	-1.255	0.838
CP6	626100.839	172458.595	29.93	626097.32	172459.95	31.01	626097.910	172459.254	32.565	2.929	-0.659	-2.635	-0.59	-0.696	-1.555
CP7	625564.008	173107.4914	30.35	625566.12	173107.42	30.83	625566.840	173107.331	28.873	-2.832	0.16	1.477	-0.72	0.089	1.957
CP8	624836.873	173396.6491	33.01	624838.18	173400.28	32.42	624838.481	173398.444	31.167	-1.607	-1.795	1.843	-0.3	1.836	1.253
CP9	624899.854	173960.7034	44.89	624902.65	173987.84	45.47	624902.003	173962.585	46.666	-2.153	-1.882	-1.77	0.647	1.255	-1.19
RMSE										±1.154	±1.284	±1.26	±0.849	±0.861	±0.82

Table 2: The Accuracy Assessment for ERDAS and PCI Geomatica Softwares based on GCP

	ERDAS			PCI			GPS			DIFF(ERDAS)			DIFF(PCI		
Points	X(m)	Y(m)	Z(m)	X(m)	Y(m)	Z(m)	X(m)	Y(m)	Z(m)	△X(m)	△Y(m)	△Z(m)	△X(m)	△Y(m)	△Z(m)
GCP1	626766.043	171956.327	24.41	626764.52	171953.445	23.17	626764.853	171954.513	21.793	1.19	1.814	2.617	-0.853	-1.068	1.377
GCP2	627652.980	171723.910	11.93	627652.481	171723.910	9.57	627652.480	171723.910	9.474	0.50	0.07	2.456	0.001	0.00	0.096
GCP3	627607.794	173335.268	76.93	627608.415	173334.61	80.48	627609.628	173332.666	78.572	-1.166	-2.398	-1.642	-1.213	1.944	1.908
GCP4	626680.960	173405.968	47.55	626680.823	173405.480	50.20	626680.803	173405.468	48.936	0.157	0.5	-1.386	0.02	0.012	1.264
GCP5	626529.959	172436.452	24.80	626529.760	172436.839	23.17	626529.759	172436.839	24.351	0.2	-0.387	0.449	0.001	0.00	-1.181
GCP6	627796.048	173610.612	137.57	627796.14	173611.02	136.48	627794.960	173611.726	135.905	1.088	-1.114	1.845	1.18	-0.706	0.575
GCP7	625796.310	173260.209	30.21	625796.190	173260.901	29.50	625796.150	173260.705	31.421	0.16	-0.496	-1.211	0.04	0.196	-1.921
GCP8	625972.318	172913.307	36.82	625972.218	172913.999	37.50	625972.208	172913.997	38.095	0.11	-0.69	-1.275	0.01	-0.002	-0.595
GCP9	625990.207	172205.823	18.81	625990.619	172205.208	17.51	625990.629	172205.191	16.966	-0.422	0.632	1.844	0.006	0.017	0.544
GCP10	625290.567	173948.470	68.07	625290.215	173948.211	69.47	625290.256	173948.182	69.575	0.31	0.288	-1.505	0.041	0.029	-0.105
GCP11	624856.010	172702.567	24.95	624856.280	172702.102	24.38	624856.274	172702.010	24.620	-0.264	0.557	0.33	0.006	0.092	-0.24
GCP12	625578.312	171835.556	35.47	625578.898	171835.436	38.47	625578.823	171835.336	37.854	-0.511	0.22	-2.384	0.075	0.10	0.616
GCP13	627817.845	172414.345	61.94	627817.601	172414.598	62.51	627817.594	172414.555	63.942	0.251	-0.21	-2.002	0.007	0.043	-1.432
RMSE										±1.604	±1.214	±1.864	±0.585	±0.574	±0.906

Table 3 : The summary of accuracy assessment for the results using ERDAS and PCI software

Description	ERDAS	PCI
Accuracy based on GCP	RMSE X= ±1.604 m RMSE y= ±1.214 m RMSE z= ±1.864 m	RMSE X= ± 0.685 m RMSE y= ± 0.574 m RMSE z= ± 0.906 m
Mean RMSE	± 0.491 m	± 0.265 m
Accuracy based on CP	RMSE X= ±1.154 m RMSE y= ±1.284 m RMSE z= ±1.260 m	RMSE X=± 0.849 m RMSE y= ± 0.861m RMSE z= ± 0.820 m
Mean RMSE	± 0.393m	± 0.297m

Table 4 : The accuracy assessment ERDAS and PCI geomatica softwares based on measured distances

POINT	distains	ERDAS	PCI	(ERDAS)	(PCI)
S1	32.87	32.15	32.95	0.72	-0.08
S2	33.37	34.60	34.51	-1.23	-1.14
S3	33.02	33.17	33.13	-0.15	-0.11
S4	47.10	48.93	47.30	-1.83	-0.20
S5	19.71	19.13	19.42	0.58	0.29
S6	37.24	37.02	37.18	0.22	0.06
S7	24.40	24.11	24.25	0.29	0.15
S8	18.31	18.14	18.21	0.17	0.10
S9	19.40	19.91	19.53	-0.51	0.13
S10	27.54	27.52	27.50	0.02	0.04
S11	37.26	37.14	37.17	0.12	0.09

S12	45.05	45.28	45.13	-0.23	-0.08
S13	37.30	37.26	37.38	0.04	-0.08
S14	40.45	40.01	40.51	0.44	-0.06
S15	24.73	24.61	24.79	0.12	-0.06
S16	17.50	17.20	17.51	0.13	-0.01
S17	38.25	38.67	38.36	-0.42	-0.11
S18	30.66	30.79	30.63	-0.13	0.03
S19	37.36	36.55	37.32	0.81	0.04
S20	24.45	24.44	24.45	0.01	0.0
S21	35.72	36.50	35.70	-0.78	0.02
S22	19.00	18.85	19.06	0.15	-0.06
S23	37.53	37.51	37.53	0.02	0.0
S24	30.50	30.55	30.51	-0.05	-0.01
S25	19.56	19.58	19.56	-0.02	0.0
S26	19.55	19.82	19.57	-0.27	-0.02
S27	13.27	13.01	13.19	0.26	0.08
S28	37.47	37.74	37.40	-0.27	0.07
S29	18.72	18.80	18.70	-0.08	0.02
S30	19.90	19.25	19.86	0.65	0.04
				± 1.122	± 0.86

Digital Topographic Map

ERDAS

In this study, apart for producing Orthophoto, the digital map was also produced using ERDAS software. The digital map is produced by digitalizing stereo model. Figure 4 shows the digital topographic map produced using ERDAS and based on four aerial photograph.

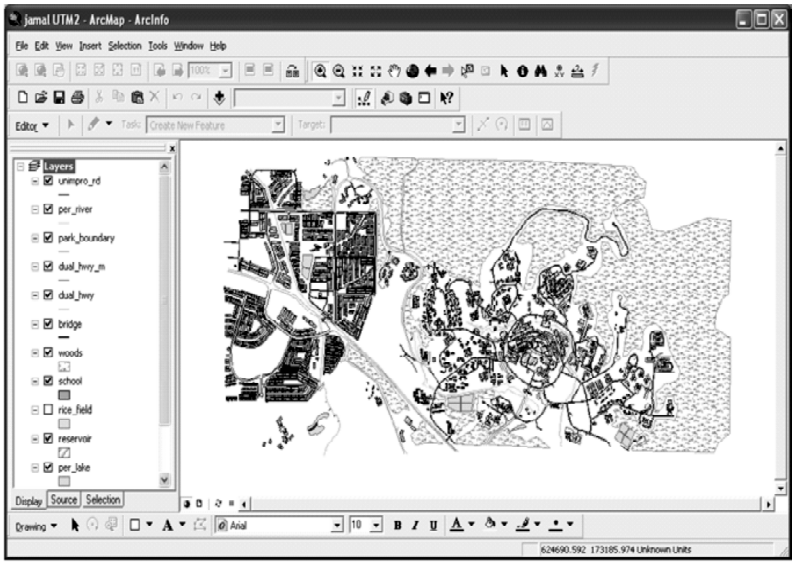

Fig 4: Digital topographic map of UTM main campus from ERDAS software

PCI Geomatica

The digital topographic map was also produced using PCI. Figure 5 shows the digital topographic map of UTM main compus.

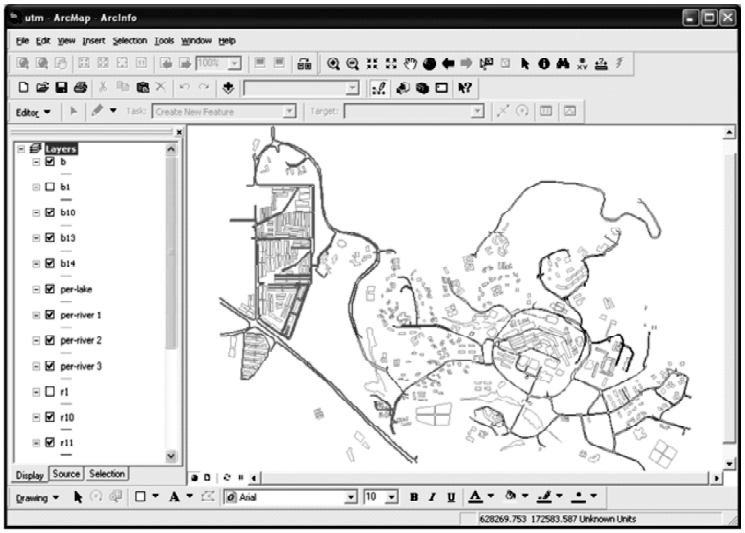

Fig 5: Digital topographic map of UTM main campus from PCI software

Visualization Analysis

In this analysis, digitizing was done from orthophoto generated via PCI and ERDAS softwares. Digitizing process was done for two type of features i.e. road and building. The features that are digitized and than compared with the building's plan. Surveyed using total station. Figure 6 shows the building and road digitized using ERDAS software and over loyed with the same feature surveyed using total station. *Figure 7* shows the same feature digitized with PCI and compared the results with the results of total station from both figures it was found that PCI produce better result as compared to ERDAS.

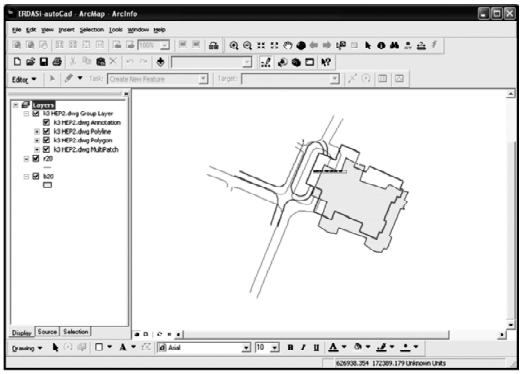

Fig 6: Visualization using ERDAS software - Total Station

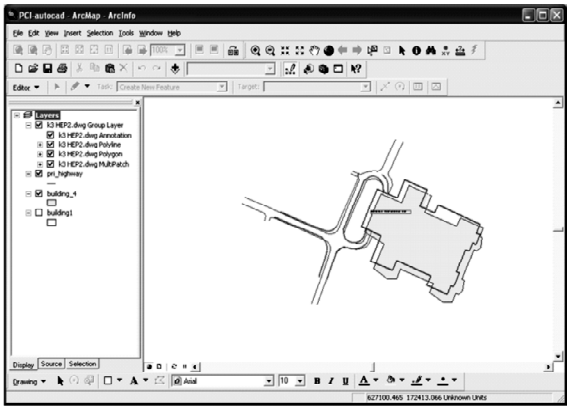

Fig 7: Visualization using PCI software - Total Station

Deductions from analysis

From the above analysis, it was concluded that as per the sample data used for the analysis and comparison, PCI had better resulting orthophotos in terms of planimetric and Stereo - model accuracy as compared to ERDAS. It also produced

very clear visualizations of the resulting orthophoto and was relatively user friendly, but taking a longer time to process compared to the ERDAS.

CONCLUSION

Photogrammetry as an art and science has now almost completely been taken over by the use of computers and digital photogrammetric software especially in the production of orthophoto. Different companies continue to emerge and create software for the generation of orthophoto, and they also keep updating these softwares with newer and newer versions almost every year.

However it is this researcher's conclusion that PCI is slightly better that ERDAS in all aspects of the criterion used to compare these softwares. For ERDAS the cost of the software is relatively less, and is more users friendly when compared to PCI software. ERDAS also takes less time to process the aerial photo when compared to PCI and when all these factors are put together, ERDAS shows slightly shows an advantage compared PCI.

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Studies on the Effect of Different Temperature on Drying Characteristics of Blanched and Unblanched Onion

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ABSTRACT

The experiment were planned to compare the performance of tray dryer of blanched and unblanched onion at different temperature viz. (60, 65, 70 and 75^0C). In all drying experiment, the quality of dried product was evaluated in terms of final moisture content and drying rate.

The Tray drying at 70°C onion gives best quality product in both its blanched and unblanched forms. The moisture content of dried onion slices was strongly affected by the blanching of onion slices and the airflow rate. The final moisture content of dried onion slices ranged from (6.1% to 7.15% dry-basis) depending on the drying temperature cycle. Effect of the individual variables (airflow rate, onion slice, moisture removed, and their interactions) on the drying rate was statistically analyzed.

Keywords: *Onion dehydration, drying, blanched onion slices*

INTRODUCTION

Onion (*Allium cepa* L.) belongs to the family Aliaceae. It is an important vegetable crop in most parts of the world, particularly the varieties that are grown for bulbs. It is a naturally packaged vegetable consisting of fleshy, concentric scales enclosed in paper-like wrapping leaves, connected at the base by a flattened stem disc. It is valued for its distinct pungent flavour and is an essential ingredient for the cuisine of many regions. Mild flavoured or colourful bulbs are often chosen for salads. The bulbs are used in soups, sauces, condiments, spice, in medicine, seasoning of many foods and for the preparation of value added edible products like powder, flakes and

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salts. A distinct characteristic of onion is its alliaceous odour, which accounts for their use as food. The pungency in onion is due to a volatile compound known as allyl-propyl disulphide. Onion has many uses as folk medicine and recent reports suggests that onion plays an important role in preventing heart diseases and other ailments.

India is the second largest producer of onion in the world next to China. According to 2010 FAO estimates, India contributes nearly 19.25 percent of world onion production. Though the second largest onion producer, India significantly lags behind in the productivity or yield of the onion. The Republic of Korea has the highest onion productivity of 63.84 tonnes/ha in the world followed, by USA (55.26 tonnes/ha), Spain (46.51 tonnes/ha), Japan (45.52 tonnes/ha) and Netherlands (45.10 tonnes/ha). The yield of onion in India (14.21 tonnes/ha) is lowest among 20 countries after Indonesia. Some of the reasons behind low productivity in India include poor irrigation facilities, use of local variety seeds, small land holding and poor economic background of farmers, lack of use of improved method of cultivation, less use of chemical fertilizers and pesticide, higher post-harvest losses and absence of good scientific storage facilities.

There are many methods for preservation of the foods. Among all the possible food preservation methods, dehydration is well accepted and probably the oldest method practiced by mankind **Mazumdar, (1985)**. It is relatively economical method. The removal of moisture prevents the growth and reproduction of decay causing organisms and minimizes many of the moisture induced deteriorative reactions. It also reduces both weight and volume of foods substantially, minimizing packaging, storage and transportation costs in addition to enhancing their shelf life.

Currently, dehydrated onions command considerable importance in the international market. These dehydrated onions are the single largest import item in Germany, United States, United Kingdom and Netherlands both in quantity and value items, as it is used by every canteen, cafeteria, restaurant and other institutional food establishment **Sagar, (2001)**. According to International Tread Centre (ITC) Geneva, the demand for dehydrated onion alone in European Union (EU) was estimated at more than 45000 tones per year. Therefore dehydrated onion is product of considerable importance in world tread. **Pawar *et al.*, (1988)**.

A onion variety should have high total solids content(15-20%), high degree of pungency, high insoluble solids (about 1.0%) and total reducing sugars (2.5-4 %) to impact good consistency and rehydration properties to the dehydrated products and relative freedom from joints **Anand, (1972)**.

The purpose of processing is to maintain and enhance the quality of agricultural products and to make the products marketable along with increase in shelf life and nutritive value. Onions are dried from initial moisture content of 88% to 6% or less sufficient for storage and processing **Sager, (2001)**. The simplest and economical method for dehydration of food is air-drying; although certain problem such as the considerable shrinkage caused by cell collapse following the loss of water, the poor re-hydration characteristics of dried products and unfavorable change in colour, texture, flavor and nutritive value may occur.

MATERIALS AND METHODS

The experiment were planned to compare the performance of tray dried of blanched and unblanched onion slices at different temperature viz. (60, 65, 70 and 75 ^{0}C). In all drying experiment, the quality of dried product was evaluated in terms of final moisture content and drying rate. The detail of the material and equipment used, the experimental plan and methodology, are presented in following section.

Materials

Fresh well-graded, dark pink colored, good quality onions were procured from local market of Meerut. Care was taken to select onions of uniform shape, size and without any defect on visual inspection, so as to maintain the quality of raw material.

Equipment

Tray dryer

The Tray dryer (Lab Hot Air Oven Dryer) was used for drying studies of onion. Dryer consists of an air delivery system, air heating system, temperature controller, drying chamber with eight trays, two doors and two adjustable openings at the top etc. it work in the range of 50^{0}C to 250^{0}C. A voltage stabilizer was used to provide constant input voltage to the unit. The dryer consist of a heating and heating control unit, an electric fan measurement sensors, an air duct and drying chamber. The heating control unit included an electric heater placed inside a duct. The drying chamber is constructed from sheet iron with the cavity dimension of 450 x 450 x 450 mm .The product was spread in a thin layer on a glass petty disc just below the thermocouple in the center of the chamber. The air passed from the heater at the desired temp, entered into the chamber from opening on the right side wall of the chamber and flowed out through opening on the left side wall of the drying chamber. The velocity was kept at aconstant value of 1.20+_0.03 m/s and the temp, was also verified by using T- type

thermocouple with the accuracy of +_ an analytical balance (Lab Hot Air Oven Dryer)with measurement precision of +_ 0.01 g was used for mass measuring.

Experiment design

Full factorial design is used to decide the combination of independent variable levels in each experiment.

Tray dryer

Variables in tray drying study

Independent variables	Number of levels	Range
Temperature, ^{0}C	4	60, 65, 70, 75
Treatment	2	Blanched, Unblanched
Drying of onion in hot air oven dryer (tray dryer)		

Experimental procedure

Fresh and mature onion bulbs were cleaned, peeled, trimmed, sliced (2-3 mm) and blanched in the laboratory.

FLOW CHART OF SLIDE & CRUSHED ONION

Procurement of onion (Nasik Red)
↓
Peeling
↓
Trimming
↓
Slicing
↓
Blanching
↓
Weighing
↓
Tray Drying
↓
(60, 65, 70, 75^{0}C)
↓
Reading
↓
Analysis
↓
Storage

Moisture Content

The following method recommended by **Ranganna (1986)** and **IS-4626:1968** was used for determination of moisture content.

A thin layer of asbestos was spread into a flat bottom metallic dish and dried in a hot oven at 110^0C for a period of an hour. It was quickly covered, cooled in a desiccators and weighed (W_1). The sample was kept over the asbestos layer and weighed as quickly as possible to avoid loss of moisture (W_2). The cover was removed and the samples were kept in hot air oven at 102 ± 1^0C. The samples were dried until two to three consecutive weights did not vary more than 5mg and final weight was recorded (W_3). The moisture content was calculated using the following formula:

$$= \frac{[(W2 - W1) - (W3 - W1)\ 1 \text{ x } 100}{(W3 - W1)}$$

Moisture content, % (d. b)

Equilibrium Moisture Content

Equilibrium Moisture Content was required for calculations of moisture ratio (MR). It was determined using a method developed by **Henderson and Perry (1976)**, in which last three moisture content readings of drying experiment were considered. Following equation was used to determine the equilibrium moisture content.

$$\text{EMC (\% d.b.)} = \frac{M_1 X M_3 - (M_2)^2}{M_1 + M_3 - 2M_2}$$

Where,

M_1 = Moisture Content (%db) at time t_1

M_2 = Moisture Content (%db) at time t_2

M_3 = Moisture Content (%db) at time t_3

Moisture content should be considered with the following condition

$(t_3 - t_2) = (t_2 - t_1)$.

RESULTS AND DISCUSSION

The experimental data of dehydration of sliced onion in relation to moisture content and drying rate are depicted in *Table 1 - 4*. After pre-treatment, the samples were dried up to safe level of moisture content, which is about 6-7% (d.b.) for high moisture foods, reported by different researchers **(Van arsdel, 1963; Mangaraj *et al.*, 2001)**. *Figures 1- 4* shows the drying curves of drying rate versus time. The moisture content and drying rate at different time interval were also calculated and were used for studying the drying behaviour.

Variation in moisture content with drying time is shown in *Figs.1- 4*. It can be observed from the figures that initially moisture removal of onion shreds was at a fast rate up to 45 min. As the drying progressed, the moisture decrease with time. It was also observed that increase in drying temperature caused an increase in drying rate, thus the drying time was decreased. With drying, the time taken to reduce the initial moisture content of about 614% (d.b) for Blanched and unblanched sample. The treated sample requires less drying time than the non treated sample. The reason behind decrease in drying time lies in the fact that treatment increases the energy absorption of the product leading to elevated product temperature and shorted drying time and expected due to an increased heat transfer potential between the air and onion slices, thus, enhancing the evaporation of water from onion slices. In all the cases the moisture content decreases nonlinearly with drying time.

Variation of Moisture Content with drying duration at 60^0C

It can be observed from *Table.1* that moisture content of the product reduced with the passage of time. The initial moisture was 614.28 (% db) in the starting of the experimentation. The drying was completed in 210 and 255 min at temperature 60^0C for blanched and unblanched sample respectively.

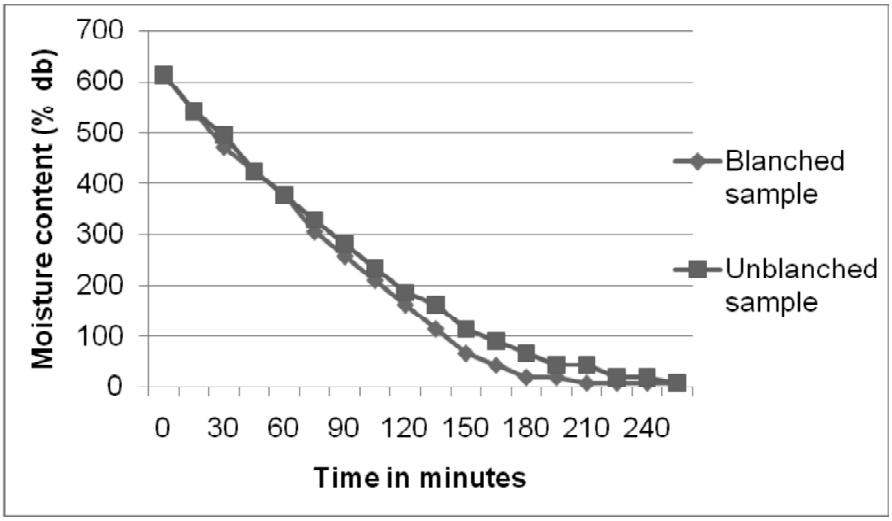

Figure 1. Relationship between Moisture content and Drying Time of blanched and unblanched onion sample at 60 ^{0}C.

The result of Analysis of Variance (ANOVA) for variation in moisture content (% db) verses time in minutes of onion is presented in *Tables 1(a)*. From *Table 1(a)*, it is explicit that the effect of treatments was found non- significant at $p<0.01$ and $p<0.05$ level of significance. It can be observed from fig 1 that moisture content reduced with the drying duration. It can be further be noted that moisture content reduced faster at higher drying temperature, which is evident due to high moisture transfer rates at higher temperatures . Similar faster reduction in case of higher temperature has also been reported by **Kumar *et al.* (2011).**

Table. 1 (a): ANOVA for moisture content and drying time of blanched and unblanched onion at 60^{0}C.

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Rows	1382491	17	81322.97	506.9114	1.2355841	2.271893
Columns	4286.103	1	4286.103	26.71661	0.000077	4.451322
Error	2727.282	17	160.4284			
Total	1389504	35				

Table. 1 - Moisture content and Drying Time of blanched and unblanched onion at 60^{0}C.

Time (min.)	Weight of unblanched sample (gm)	Weight of blanched sample (gm)	% Moisture Content (db) of unblanched sample	% Moisture Content (db) of blanched sample
0	30	30	614.28	614.28
15	27	27	542.85	542.85
30	24	25	471.42	495.23
45	22	22	423.8	423.8
60	20	20	376.19	376.19
75	17	18	304.76	328.57
90	15	16	257.14	280.95
105	13	14	209.52	233.33
120	11	12	161.9	185.71
135	9	11	114.28	161.9
150	7	9	66.66	114.24
165	6	8	42.85	90.47
180	5	7	19.04	66.66
195	5	6	19.04	42.85
210	4	6	7.14	42.85
225	4	5	7.14	19.04
240	4	5	7.14	19.04
255	4	4	7.14	7.14

Variation of Moisture Content with drying duration at 65 ^{0}C

It can be observed from *Table.2*. that moisture content of the product reduced with the passage of time. The initial moisture was 614 (% db) in the starting of the experimentation. The drying was completed in 195 and 240 min at temperature 65 ^{0}C for blanched and unblanched sample respectively.

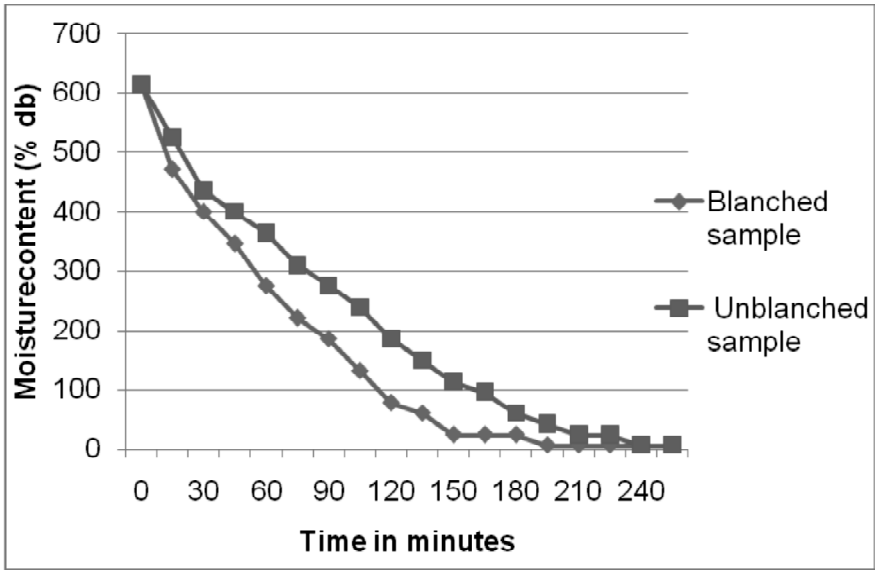

Figure 2. Relationship between Moisture content and Drying Time of blanched and unblanched onion sample at 65 ^{0}C.

The result of Analysis of Variance (ANOVA) for variation in moisture content (% db) verses time in minutes of onion is presented in *Table 2(a)*. From *Table 2(a)*, it is explicit that the effect of treatments was found non- significant at $p<0.01$ and $p<0.05$ level of significance. It can be observed from fig. 2 that moisture content reduced with the drying duration. It can be further be noted that moisture content reduced faster at higher drying temperature , which is evident due to high moisture transfer rates at higher temperatures. Similar faster reduction in case of higher temperature has also been reported by **Kumar *et al.* (2011).**

Table. 2 (a) ANOVA for moisture content and drying time of blanched and unblanched onion at 65 ^{0}C.

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Rows	1204736	17	70866.81	98.41582	1.2200	2.271893
Columns	26768.78	1	26768.78	37.17497	0.000011	4.451322
Error	12241.28	17	720.0754			
Total	1243746	35				

Table 2. Moisture content and Drying Time of blanched and unblanched onion at at 65^{0}C .

Time (min.)	**Weight of unblanched sample (gm)**	**Weight of blanched sample (gm)**	**% Moisture Content (db) of unblanched sample**	**% Moisture Content (db) of blanched sample**
0	40	40	614	614
15	33	32	471.42	525
30	30	28	400	436
45	28	25	346.42	400
60	26	21	275	364
75	23	18	221.48	310
90	21	16	185.71	275
105	19	13	132.14	239.28
120	16	10	78.57	186
135	14	9	60.71	150
150	12	7	25	114.28
165	11	7	25	96.42
180	9	7	25	60.71
195	8	6	7.14	42.85
210	7	6	7.14	25
225	7	6	7.14	25
240	6	6	7.14	7.14

Variation of Moisture Content with drying duration at 70 ^{0}C

It can be observed from *table. 3* that moisture content of the product reduced with the passage of time. The initial moisture was 614 (% db) in the starting of the experimentation. The drying was completed in 180 and 240 min at temperature 70^{0}C for blanched and unblanched sample respectively.

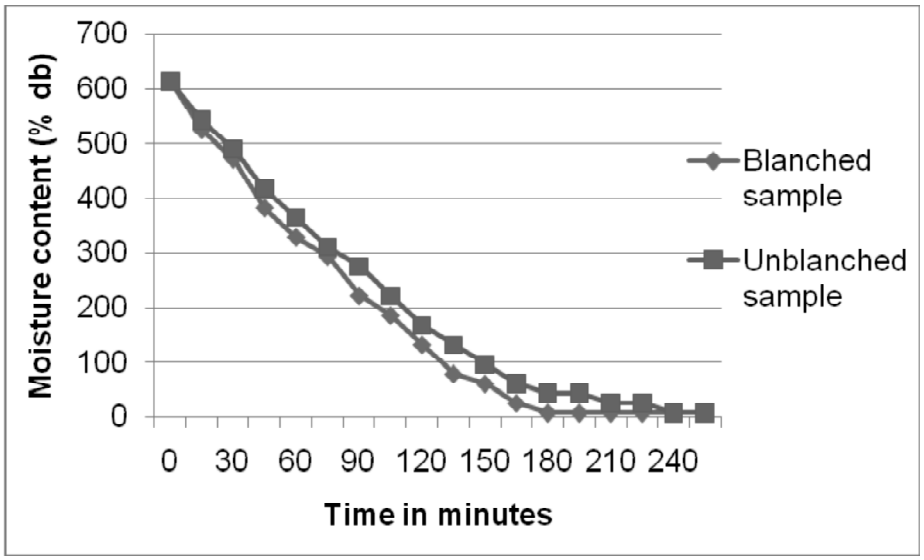

Figure 3. Relationship between Moisture content and Drying Time of sliced and crushed onion at 70^{0}C.

The result of Analysis of Variance (ANOVA) for variation in moisture content (% db) verses time in minutes of onion is presented in *Table 3(a)*. From *Table 3(a)*, it is explicit that the effect of treatments was found non- significant at $p<0.01$ and $p<0.05$ level of significance. It can be observed from *fig. 3* that moisture content reduced with the drying duration. It can be further be noted that moisture content reduced faster at higher drying temperature, which is evident due to high moisture transfer rates at higher temperatures. Similar faster reduction in case of higher temperature has also been reported by **Kumar *et al.* (2011)**.

Table. 3 (a) ANOVA for moisture content and drying time of blanched and unblanched onion at 70^{0}C.

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Rows	1380135	17	81184.39	597.0191	3.08928	2.271893
Columns	6456.658	1	6456.658	47.4814	2.61544	4.451322
Error	2311.709	17	135.9829			
Total	1388903	35				

Table 3. Moisture content and Drying Time of blanched and unblanched onion at at 70^{0}C.

Time (min.)	**Weight of unblanched sample (gm)**	**Weight of blanched sample (gm)**	**% Moisture Content (db) of unblanched sample**	**% Moisture Content (db) of blanched sample**
0	40	40	614.28	614.28
15	35	36	525	542.85
30	32	33	471.42	489.28
45	27	29	382.14	417.85
60	24	26	328.57	364.28
75	22	23	292.85	310.71
90	18	21	221.42	275
105	16	18	185.71	221.42
120	13	15	132.14	167.85
135	10	13	78.57	132.14
150	9	11	60.71	96.42
165	7	9	25	60.71
180	6	8	7.14	42.85
195	6	8	7.14	42.85
210	6	7	7.14	25
225	6	7	7.14	25
240	6	6	7.14	7.14

Variation of Moisture Content with drying duration at 75^{0}C

It can be observed from *Table. 4* that moisture content of the product reduced with the passage of time. The initial moisture was 614 (% db) in the starting of the experimentation. The drying was completed in 180 and 225 min at temperature 75 ^{0}C for blanched and unblanched sample respectively.

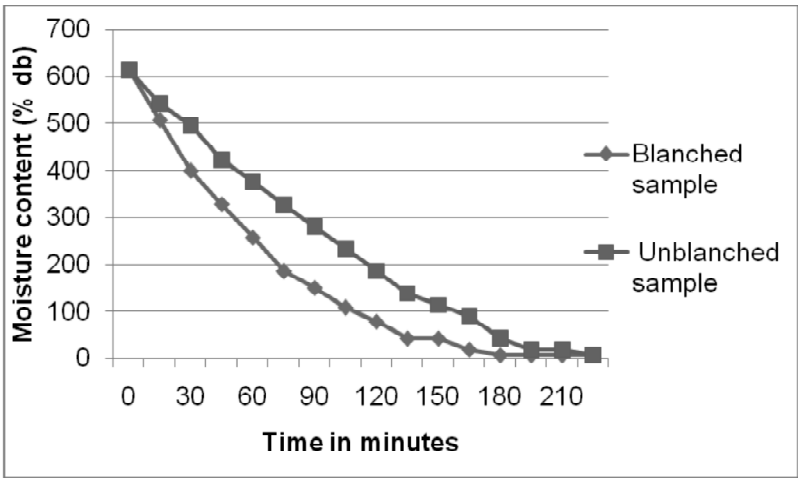

Figure 4. Relationship between Moisture content and Drying Time of sliced and crushed onion at 75^{0}C.

The result of Analysis of Variance (ANOVA) for variation in moisture content (% db) verses time in minutes of onion is presented in *Table 4 (a)*. From *Table 4. (a)*, it is explicit that the effect of treatments was found non- significant at $p<0.01$ and $p<0.05$ level of significance. It can be observed from *fig. 4* that moisture content reduced with the drying duration. It can be further be noted that moisture content reduced faster at higher drying temperature, which is evident due to high moisture transfer rates at higher temperatures. Similar faster reduction in case of higher temperature has also been reported by **Kumar *et al.* (2011).**

Table. 4 (a) ANOVA for moisture content and drying time of blanched and unblanched onion at 75^{0}C.

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Rows	1152935	15	76862.31	63.30687	8.3209	2.403447
Columns	41132.14	1	41132.14	33.87807	0.000033	4.543077
Error	18211.84	15	1214.123			
Total	1212279	31				

Table 4. Moisture content and Drying Time of blanched and unblanched onion at at 75^{0}C.

Time (min.)	**Weight of unblanched sample (gm)**	**Weight of blanched sample (gm)**	**% Moisture Content (db) of unblanched sample**	**% Moisture Content (db) of blanched sample**
0	20	30	614.28	614.28
15	17	27	507.00	542.85
30	14	25	400.00	495.23
45	12	22	328.57	423.80
60	10	20	257.14	376.10
75	8	18	185.71	328.10
90	7	16	150.00	280.57
105	6	14	108.76	233.33
120	5	12	78.57	185.71
135	4	10	42.85	138.09
150	4	9	42.85	114.00
165	3	8	19.04	90.47
180	2	6	7.14	42.85
195	2	5	7.14	19.04
210	2	5	7.14	19.04
225	2	4	7.14	7.14

CONCLUSION

Onion is the most important spice crop of India and the World. It is grown widely all over the world as it is required daily in a number of food items for improving taste due to volatile flavour and other components. Onion is perishable in nature; therefore, its shelf life needs to be extended to use it during off season. It has a very high level of moisture content which causes deterioration during storage, hence it needs preservation. Dehydration is the most important method for preservation of onions with an ultimate aim of improving storability by reducing its moisture content. Removal of water from onions prevents microbial growth and thus makes storage without refrigeration possible.

After compare the performance of tray dryer of blanched and unblanched onion at different temperature viz. (60, 65, 70 and 75 ^{0}C). The tray dried onion slices at 70°C gives best quality product in both its blanched and unblanched forms. The moisture content of dried onion slices was strongly affected by the blanching of onion slices and the airflow rate. The final moisture content of dried onion slices ranged from (6.1% to 7.15% dry-basis) depending on the drying temperature cycle.

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Effect of Cooking on mineral of spinach leaves influenced by cooked in five different metals and teflon coated utensils

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ABSTRACT

The effect cooking on palatability and mineral constituent of spinach cooked in five different metals utensils i.e. aluminum, brass, steel, iron, and teflon coated (non-stick) was studied. Estimation of calcium, phosphorous, iron and organoleptic characteristics (aroma, colour, appearance, texture and flavour) were also evaluated. It was observed from the above study that during cooking, the iron content of spinach increased while calcium and phosphorus decreased in all the five cooking utensils. The increase was highest (365.4 percent) in case of iron content of cooked spinach in iron utensil followed by brass (100 percent),nonstick (41.5 percent), aluminum (29.2 percent)and steel (61 percent). Meanwhile, minimum loss of calcium content was observed when cooked in aluminum utensils and that of phosphorus was found in aluminum and steel utensils.

Key words: *palatability, metals, minerals, utensils and organoleptic.*

INTRODUCTION

Leafy vegetables have been a part of the diet from ancient times. They are nutritionally very important since they are rich in vitamins and minerals. Minerals, though needed in small quantities, play an important role in the regulation of the metabolic activities in the body. They are vital in the formulation of body structure and skeleton as they constitute about 4-6 percent of human weight. On an average, man excretes 20-30g of minerals daily; and this must be made good by an adequate intake of these minerals through our food. Spinach or in italics is a native of southwest Asia and extensively cultivated in India. It belongs to genus in italics and family in

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italics **Gopalan, (2007)**. Spinach ranks high among all green vegetables. Its leaves are cooling and very nutritive. They contribute roughage, which helps prevent cancer and is an extremely rich source of antioxidants and anticancer components. Also, they have a soothing effect on the skin and the muscles membrane. They increase the secretion and discharge of urine and thus their juice cleanses the digestive tract by removing the accumulated waste. Spinach nourishes the intestines and increases their tone. The vegetables is a valuable source of high-grade iron- which taken in the system is used in the formation of hemoglobin in the blood cells. It is also rich source of calcium, which is essentials for preserving the alkalinity of the blood and therefore prevents chronic diseases **Yadav *et al.* (2002)**. Vegetables are cooked to improve the colour, flavor and texture by which overall palatability and digestibility is improved. Their fibers soften, starch gets gelatinized and protein gets coagulated. Cooked vegetables add variety to the diet. Use of proper cooking utensils is one of the effective ways of preserving nutrients- especially minerals they can even increase the nutrient content of vegetables. Hence, the present study was undertake to see which cooking utensils is most appropriate so as to best preserver the mineral constituents and access the organoleptic acceptability of spinach.

MATERIALS AND METHODS

The present study was conducted at the Halina School of Home Science (Department of food and Nutrition), SHIATS Allahabad. Spinach leaves used for the study were purchased from the local market. Different cooking utensils, namely aluminum, non-stick, ware steel and iron were used for cooking. The recipe was standardized and the leaves were cooked in all the five utensils. then, The minerals were analyzed chemically. three mineral constituents, namely calcium and phosphorous (by volumetric method)and iron (by ortho-phenopthaline method) were determined.the palatability was assessed according to the 9 point hedonic socre card.scores were awarded as 9 (Extremely liked), 8 (very much), 3 (moderately disliked), 2 (very much disliked), 1 (Extremely disliked) by a panel of 5 judges selected for assessment of the product for the ranking test.

RESULT AND DISCUSSION

Different metallic utensils affect the nutritive value and palatability of cooked vegetables. One of the best methods to conserve their essential nutrients is the use of appropriate utensils for cooking.

Table1. Average calcium, phosphorous and iron content of spinach leaves cooked in different cooking utensils (mg/100g).

Treatment	Calcium(mg)	Phosphorous (mg)	Iron (mg)
Control	73	21	11.3
Brass	61.3	23.2	22.6
aluminium	66.6	26.1	14.6
Non-stick	61.3	20.3	16.0
Steel	64	26.1	12.0
Iorn	64	24.7	52.6

Significant at 5% probability

From the above given *table 1* , it was found that the calcium content in the control was 73mg/100g. Minimum calcium loss was found in aluminum utensil since the amount of calcium was found to be 66.6 mg/100g for the fresh sample; the phosphorus content was 21mg/100g. Minimum phosphorus loss was found in aluminum and steel since the amount of phosphorus was found to be 26.1mg/100g in both. The iron content for the fresh sample was 11.3mg/100g. Minimum iron was loss found in the iron utensil. The amount of iron was found to be 52.6mg/100g in it.

Organoleptic acceptance

The mean value and test of significance for flavour and aroma in *table 2* showed that there was no significant difference between the cooking utensils. similarly the mean scores for colour and appearance, texture, and doneness showed non-significant difference between different cooking utensils . the present result have been attributed to the finding of **Devdas (1972)**, who studied the organoleptic acceptability of italics cooked in iron, aluminium and brass vessels and concluded that oranoleptic acceptability in terms of colour and appearance was higher in aluminium pan cooked Amaranthus. The mean score of taste and bitterness showed significant difference in the spinach cooked in different utensils. the best taste was observed in the aluminium utensil.

Table 2. Average score for flavour and aroma, colour and appearance and texture taste, doneness & bitterness of spinach leaves cooked in different cooking utensils.

Treatment	Flavour & aroma	Colour & appearance	Texture	Taste	Doneness	Bitteress
Brass	5.8	6.9	6.9	5.8	6.9	6.9
Aluminium	6.6	7.1	7.2	6.6	7.1	7.2
Non-stick	6.1	6.7	7	6.1	6.7	7
Steel	5.9	6.4	6.7	5.9	6.4	6.7
Iron	6.3	6.7	7.0	6.3	6.7	7

From the above result and discussion it was concluded that the aluminum utensil was most appropriate for cooking of spinach as it retained the maximum organoleptic properties in an efficient way, while iron content significantly increased when cooked in iron utensils without causing much losses in calcium and phosphorus.

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Comparative study on Shelf Life of Grapes under different storage methods

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ABSTRACT

A study was undertaken during the year 2009-2010 in Sam Higinn Bottom Institute of Agriculture, Technology and Sciences (SHIATS), Allahabad to find out suitable method for prolonging the shelf life of grapes. The duration of experiment was from the month of July to September, these months are hot and humid and this time shrinkage and fungal growth is very much susceptible to the fruits and vegetable which has high water content. Grapes were kept in viz. Open basket, Polyethylene bags, Refrigerator and Janta Cool Chamber for the study. Grape fruit recorded maximum shelf-life (19 days) in Refrigerator followed by Janta Cool Chamber (l0 days). However, grapes fruits kept in Polyethylene bags and open basket recorded the minimum shelf life (4 days).

Keywords: *Grapes, storage, shelf-life, Janta Cool Chamber.*

INTRODUCTION

Grapes, a fruits which is highly perishable in nature. Due to its high water content it is liable to rapid spoilage at room/ambient temperature. The maximum life of grapes is approximately for 3 to 4 days at ambient temperature depending on weather. Refrigerator is a solution for prolonging the shelf life of grapes for 10-15 days but it is not sufficient and affordable for everyone due to its cost. It runs on electricity which is not available everywhere. Thus for this burning problem a low cost Janta Cool Chamber*** was designed by author which is made by locally available materials.

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*** Janta Cool Chamber: It was made of entirely from the sand, red and black soil in 3:2:1,the designed model named as Janta Cool Chamber, as it is mainly designed and constructed for the villagers/small fruits and vegetable growers. It is an earthen structure in a shape of a box which has been divided into three parts: i) One outer box ii) Trays three in no. and iii) Three lids for each tray. The size of Janta Cool Chamber is 94.5x63cm, height is 26cm and capacity to store 12kg of fruit

Its working principal is based on evaporative cooling. The Janta Cool Chamber enhances the shelf life of grapes for 10 days.

MATERIALS AND METHODS

The experiment was held in the Halina School of Home- Science SHIATS, Allahabad.

The selected storage materials and structures are:

1. Polyethylene bags
2. Open basket
3. Refrigerator
4. Janta Cool Chamber

Amount of grapes in each storage condition = 500gms.

Steps followed for the study:

1. Grape was kept in Open basket, Polyethylene bag, Refrigerator and Janta Cool Chamber for the storage study and these structures placed in semi-open area with good ventilation.
2. Every third day fruit were turned and observations were recorded.
3. Observation regarding the fruit, to when they start to show the symptoms of decay.
4. As in when fruit of any treatment showed the sign of decay the date was recorded.
5. Required attention was given in all treatment as and when required.

Experimental Findings:

The recorded data regarding the shelf life of grapes is given in *Table no.l* and graph is illustrated in *Fig.l.*

Table 1 :- Shelf life of grapes during storage period.

Storage Conditions	Shelf life (Days)
Open Basket	4
Refrigerator	19
Polyethylene Bag	4
Janta Cool Chamber	10

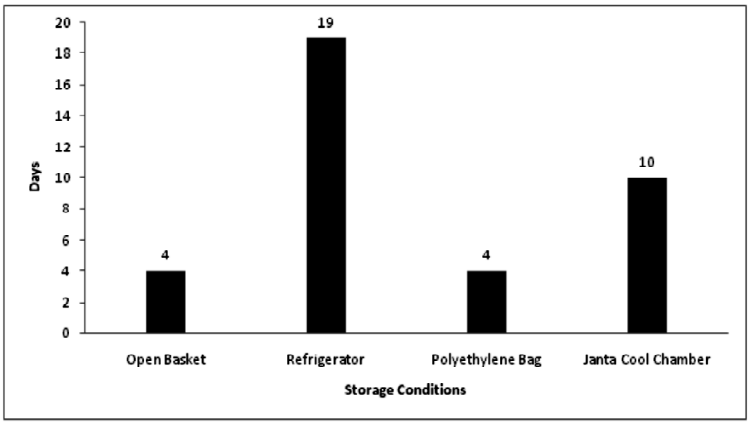

Fig. Shelf life of grapes during storage period

RESULT AND DISCUSSION

From the *Table l* and *Fig. l* it is very clear that the shelf life of grapes (19 days) recorded maximum in refrigerator followed by Janta Cool Chamber (10 days), whereas in Open Basket and Polyethylene Bags shelf life (4 days) was recorded minimum.

Grape, a living entity respire even after harvesting, in open basket due to high temperature respiration rate increases and cause rapid moisture loss resulting short life of grapes.

In, polyethylene bags due to accumulation of carbon di-oxide temperature increases and grapes got affected and makes it unfit for consumption after a short period of life.

Refrigerator retains the moisture of grapes in the storage environment, so delayed the ripening of fruits. Resulting prolong life of grapes. Same observations cold stored grape fruits had a low weight loss due to temperature effects on vapour pressure difference and increased water retention **Tasdelen and Bayindirli, (1998)**.

Similar results were reported by **Bussel and Kenigsberger (1975)** in green bell pepper and **Efiuvwev were *et al.* (1991)** in oranges.

In Janta Cool Chamber 7-8 ^{0}C less temperature than ambient temperature is maintained with high humidity which helps in delayed the ripening of fruit during storage period and minimum loss was found. Same observations were recorded by **Murugan AM *et al.* (2011)** in tomato, grape and brinjal after nine days of storage

in earthen pot cool chamber, that loss in weight was 5.3% for grapes, 7.5% for tomato and 1.69% for brinjal. Whereas, in refrigerator the loss in weight wasl O% for grape, 10% for tomato and 2.35% for brinjal whereas, in room storage the weight loss was higher than refrigerator and EPCC.

SUMMARY AND CONCLUSIONS

The shelf life of grapes was studied under four storage conditions namely Open basket, Refrigerator, Polyethylene bag and Janta Cool Chamber. Among the four treatments the best result was recorded in refrigerator (19 days).

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Nutritional profile of women of Trans Yamuna area Allahabad district

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ABSTRACT

A study was conducted to assess the nutritional profile of women in Allahabad district of U.P. The majority of women (57.33%) belonged to joint families. The family size of 7-8 was on (30.67%) category and the least categories (16.67%)had smallest family members (4 only). Out of 150 women studied, 64.99% were literate women. The daily intake of cereal was lower (250 g/day) as compared to the ICMR Standard value (446g/day). The consumption of cereals consumed constituted of wheat, rice and pearl millet with small amount of pulse consumption (35g/day) which is lower than RDA value. The consumption of leafy vegetables and Rooty vegetables were also megre (58g/day)against the RDA. Only 18% of the respondents consumed fruits daily. The consumption of milk was only 200g and that too in the form of tea the average calorie intake was less (1565.75 Kcal/ day) due to low consumption of cereals and on the basis of anthropometric measurement and prevalence of CED only 40% women belonged to the normal category which is below the average value.

Key words: *Nutritional status, Consumption, Recommended Dietary Allowances, Prevalence*

INTRODUCTION

Allahabad is located at 25^{0}27′N81^{0}50′E in the eastern part of the Uttar Pradesh at an elevation of 98 meters (322 ft.) and stands at the confluence of two, the Ganges and Yamuna. Allahabad district has a population of 4,936,105 as per the 2001 census.

The current world food price crisis is having a severe impact on women. Around the world, millions of people eat two or three times a day, but a significant percentage of women eat only once. And, now, many women are denying themselves even that

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one meal to ensure that their children are fed. These women are already suffering the effects of even more severe malnutrition, which inevitably will be their children's fate as well. The impact of this crisis will be with us for many years.

A woman's body endures more than a man. It has to go through a myriad changes in one life cycle. From building a healthy body to creating another being, a woman's body deals with multiple changes, both physically and mentally. Thus, it's essential to follow a balanced diet for women to live a hale and hearty life.

During adolescence and early adulthood, women need to consume foods rich in calcium to build peak (maximum) bone mass. This will reduce the risk of developing osteoporosis, a progressive condition where there is a loss of bone that leaves those affected more susceptible to fractures. Women also need an adequate iron intake because they lose iron through menstruation. Women also need an adequate intake of calories to support energy and nutritional needs in order for the body to function properly. The amount of calories that an individual needs varies for each person and is based on age, gender and activity level. As a general recommendation, women between 23 and 50 years of age generally need between 1,700 and 2,200 calories per day to maintain their current energy needs and body weight. Older women generally require fewer calories to support and sustain energy needs. Consuming fewer than 1,500 calories per day, even in attempts to lose weight, can put women at nutritional risk and can result in malnutrition and poor health.

According to **Jean Ziegler** (the United Nations Special Rapporteur on the Right to Food for 2000 to March 2008), mortality due to malnutrition accounted for 58% of the total mortality in 2006: "In the world, approximately 62 million people, all causes of death combined, die each year. One in twelve people worldwide is malnourished. [12] In 2006, more than 36 million died of hunger or diseases due to deficiencies in micronutrients".

MATERIALS AND METHODS

The study was conducted in two blocks Chaka and Jasara,Trans Yamuna areaof Allahabad district. The study comprised of 150 women of 18-60 years from two blocks. Pregnant, lactating and chronically ill women were not included in the study. A structured interview questionnaires were used to collect information regarding age, education, occupation, type and size of family, Relizon, caste, total family income and percapita income, type of house and fuel. Nutritional knowledge of the subject was assessed by using questionnaires.

Twenty-four hour dietary recall and food frequency questionnaire methods were used to assess the dietary intake of rural women. Average of different nutrients intake values was calculated by using Food composition table values **Gopalan *et al,* (2002)**. The calculated value was compared with RDA **ICMR, (1998)**. The anthropometric measurements of rural women like height, weight were measured as per standard methods given by **Park (2002)**. BMI of the respondents was computed from body weight in kilograms divided by height in meter square. Classification system **Gibson, (1990)** was used to define the extent of malnutrition in the subjects in the form of chronic energy deficiency (CED). Hemoglobin concentration was estimated (Sahli,s method).

RESULTS AND DISCUSSION

Majority of the women were living in joint families (57.33%). The family size up to 4 members was found only in 16.67% of the families followed by 52.67% in 5-6 category and 30.67& in 7-8 category. The availability of electricity was excellent (92.67%). Out of total population (150 women) 12% were illiterate, 6.67% were just literate and and literacy rate was found to be 64.99%. In activity pattern most of the women were moderate worker 52.67% followed by heavy worker 40% and sedentary worker 8.67%. It is interesting to note that 59.33% women were engaged in farming but only 6.67% women were engaged in service. There was slight difference in service and agricultural laborer. Wood fuel was the main fuel for respondents.

Dietary intake of women

The daily intake of cereals of womenswas 250g/ day *(Table-2)* which is lower than the values as reported by ICMR (446g/day). The main cereals and millets consumed were wheat, rice, Pearl Millet. Pulse consumption intake was 35g day-1, which is also lower than recommended allowance (32 g/ day). The data presented in *Table - (2)* shows that consumption of green leafy vegetables and Rooty vegetables both was less than RDA (58g/day). Fats and oils were consumed daily by all the respondents were 30g-1. The averageconsumption milk and milk products was 200g/ day. Most of them were consuming it the form of tea. The mean fruit intake was 35g/ day. Fruits were consumed daily only 18% respondents. The non-vegetarian respondents were consumed meat or fish once a week. The consumption of sugar jeggery was 25% among respondents.

Table -1 Socio-economic profile of rural women of Allahabad district

Characteristics	N=150	Percentage
Nuclear	64	42.67
Joint	86	57.33
Family size		
Up to 4	25	16.67
5-6	79	52.67
7-8	46	30.67
Electric facility		
Yes	139	92.67
No	11	7.30
Education		
Illiterate	39	26.0
Just literate	20	13.33
Primary	41	27.33
High school	30	20.00
Intermediate	14	9.33
Graduation	4	2.67
Post graduation	2	1.33
Activity pattern		
Sedentary	13	8.67
Moderate	79	52.67
Heavy	60	40.00
Type of house		
Kuchcha	23	15.33
Pucca	127	84.66
Occupation		
Farming	89	59.33
Service	10	6.67
House wives	42	28.00
Agricultural Laborer	9	6.00
Fuel used		
Wood	84	56.00
L.P.G	56	37.33
Kerosene oil	10	6.66

Table:2 Average consumption of food groups (N=150)

Food groups	Consumption (g /day)
Cereals	250
Pulses	35
Green leafy vegetables	100
Roots and tubers	65
Oils and fats	30
Milk and milk products	200
Meat	40
Fruits	75
Sugar and jiggery	25

Table:3Average Nutrient consumption of rural women

Nutrients	Consumption (g/ day)
Protein	45.16
Energy	1565.75
Fat (g)	24.40
Carbohydrate (g)	224.47
Calcium (mg)	445.7
Iron (mg)	16.37
Carotene (µg)	1925.0

The average protein intake of womens was 45.16g. Pulses were the main source of protein for the respondents as the consumed it in various forms like dal, stuffed roti, kadhi, pakora. The average fat intake was 24.40g day.

Average calorie intake was calculated to be 1565.75 Kcal per day. This was lower than the RDA **ICMR, (1992)** The reason for the energy deficit in the respondents were due to the less consumption of cereals in their diet. The average daily intake of

carbohydrate was 224.47 g/ day. This is further seen that total fat consumption of respondents falls too short of the RDA value. The intake of iron and calcium was also low among respondents as compared to30.1and 368mg respectively recommended by ICMR. Most of the Iron in the diet was provided by green leafy vegetables. Iron was also provided by the cereal based diet. Among consumption of B -carotene was 1925ug.

Table 4: Anthropometric measurements

Variables	Mean value
Height (cm)	165
Weight (kg)	50.2
BMI (kg/m2)	18.59

Table 5: Prevalence of chronic energy deficiency among women of Allahabad district

CED Grade (BMI)	N=(150)	Percentage
CED Grade III(≤16)	9	6.0
CED GradeII (16.0-17.0)	15	10.0
CED Grade I 17.0-18.5)	24	16.0
Low weight normal (18.5-20.0)	31	20.67
Normal (20.0-25.0)	62	40.0
Obesity Grade I (25.0-30.0)	9	6.0

Nutritional status of rural women

The mean anthropometric measurements of women of Allahabad are presented in *Table 4*. The mean body height, weight and body mass index (BMI) were 165 cm, 50.0kg and 18.5gm 2-1, respectively.

The prevalence of CED among rural women of Allahabad according to BMI grades is given in *Table-5*. Among study population 40% women belonged to the category of normal, 20.67% women were low weight normal, 16% were 32% were chronic energy deficient and 6%women were obese (Grade I). The extent of malnutrition as mild, moderate and sever was 16%, 10%, 6% respective.

Table 6: Classification of respondents according to the hemoglobin levels

Degree of Anaemia	Hb level (g/100ml)	N=150	Percentage
Severe	$\leq$ 7	12	8
Moderate	7-10	36	24
Mild	10-12	83	53.3
Non anaemic	$\geq$ 12	19	12.67

Prevalence of anemia in the study population was 85.3%. The hemoglobin level ranging between 53.3% was in 10-12 g / 100ml, 24% in 7-10gml / 100ml and 8% were in $\leq$ 7g/100ml.

A positive and significant correlation was found between iron intake and hemoglobin level. The present study revealed that the rural women of Allahabad region have access to diversified foods particularly green leafy vegetables and fruits. This is reflected in the absence of clinical signs of nutritional deficiency is 85.3%. Energy and iron intake were low in comparison to RDA, which was reflected in their Hemoglobin percentage. Study reveals fact only 12.67%women were found Non anemic where as 53.3 %were mild anemic, 24% were moderate and 8% were severanemic.

CONCLUSION

It is concluded that unawareness, poor dietary pattern and low intake of protective foods (fresh fruits and vegetables) providing ascorbic acid and iron could be probable reason for high prevalence of anemia among rural women of Allahabad district. Hence, in order to meet the daily requirement and consequently to increase the quantitative intake of foods being already consumed by the rural women. To make the rural women nutritionally aware, there is need to include nutrition education program in village levels. Thus, different long term strategies need to be planned timely at different stages of life during pregnancy and lactation to overcome nutrient deficiencies.

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Assessment of nutritional status of adolescent girls of allahabad

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ABSTRACT

Adolescence is generally considered to begin with puberty, the process that leads to sexual maturity ability to reproduce. The study carried out with the objectives to assess the nutritional status of the selected adolescent girls of Allahabad of Uttar Pradesh. An exploratory research design was adopted for the study, Allahabad Uttar Pradesh has been selected, purposively for research. Survey method was used for the collection of data. The sample size was 150 respondents comprising of 55 girls from Allahabad Intermediate college, 45 from AryaKanya Intermediate college, and 50 from Hindu Mahila Intermediate college .The survey schedule consist of the general profile, anthropometry in which height and weight were taken, dietary pattern by 24 hour recall methodand clinical assessment. Result shows that 33.33 percent of 14-15 years of adolescent girls and 20 percent of girls of 16-18 years were malnourished. 26.66 percent girls of 14-15 years were at risk of malnutrition and 13.33 percent girls of 16-18 years were at risk of malnutrition and only 4 percent girls of 14-15years and 2.66 percent girls of 16-18 years were at normal .

Key Words: *Adolescent, Nutritional status, Malnutrition, nutrient intake, Assessment*

INTRODUCTION

Adolescence is one of the most challenging periods in human development. The relatively uniform growth of childhood is suddenly altered by a rapid increase in the growth rate. These sudden changes create special nutritional needs. Adolescents are considered especially vulnerable nutritionally for several reasons. First, they have an increased in physical growth and development. Second, the changes in life style and food habits of adolescents affect nutrient intake and needs. Third, adolescents have

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special nutrient needs associated with participation in sports, pregnancy, development of an eating disorder, malnutrition, dieting, use of alcohol and drugs, or other situations common to adolescents **Spear, (2002).**

Now a day's our media and models lay great emphasis on a lean body structure for women which may prompt our adolescent girls to adopt severe measures to reduce body weight. As the media has a strong influence during adolescent period there is a need to investigate the nutritional status of the adolescent girls.

MATERIALS AND METHODS

The present study was conducted using the materials and methods described below:

1. Selection of sample:

a. **Selection of district :** Allahabad district of U.P. was selected purposively for the present study because of accessibility.

b. **Selection of location :** Inter colleges namely Allahabad Intermediate College, Arya Kanya Inter College and Hindu Mahila Intermediate College were selected purposively for the study.

c. **Selection of respondents :** For the study, adolescents girls between age group 14-18 years were considered as respondents.

d. **Preparation of instruments and tools for data collection :** For data collection, structured survey schedule comprising general information, anthropometry, dietary and clinical assessment were adopted.

2 a. The schedule was consisted of the following different parts:

(i) General profile :- In general profile respondent's general information regarding name, age, educational qualification, family type, etc. were recorded.

(ii) Anthropometric measurement **Gibson, (1990)**

(iii) Dietary pattern - 24 hour dietary recall method **Park, (2002)**

(iv) Clinical assessment **Park, (2002)**

4. Statistical Analysis

The data collected was tabulated and analyzed with the help of statistical techniques. Statistical techniques viz frequency, percentage, mean score, paired 't' test was applied. **Imran and Cover, (1983)**

RESULTS AND DISCUSSIONS

The pooled data showed that majority of the respondents (25.33 percent) in all the three Intermediate Colleges were 17 years old. Very few respondents (18 percent) were 18 years old. Maximum respondents in all the three age groups were Hindus, the pooled data showed that 56.6percent belonged to the Hindu religion and remaining 43.3 percent were muslims. Maximum respondents 84percent in all three colleges lived in nuclear families and only 16 percent of the girls lived in joint families. Data shows that majority number of respondents (32 percent) families earned between 10000-20000 rupees per month, (30 percent) had a monthly family income is between 20000-30000 rupees per month. Majority number of respondents (64 percent) were vegetarian, 18.66 percent were non-vegetarian and 16.66 percent were eggitarian. Maximum respondents (43.81 percent) of adolescents girls had Breakfast, lunch, evening tea, dinner as their routine dietary habits followed by (23.81 percent) girls who had only lunch and dinner as their routine dietary habit due to their consciousness about their body image. Food consumed daily by all respondents including cereals, pulses, milk and milk products, green leafy vegetables, root and tubers, fruits, meat and poultry, fats and oils, sugar and jaggery. Regarding the consumption of cereals, it was found that all respondents consumed cereals daily and pulses consumed daily by 66 percent respondents, 16.66 percent respondents consumed it 4 to 6 times twice a week, 13.33 percent consumed it 2 to 4 times a week whereas 3.33 percent consumed it occasionally. Milk and milk products were consumed daily by 46.66 percent respondents, 20 percent consumed it 4 to 6 times a week and 16.66 percent consumed it 2 to 4 times a week, whereas 3.33 percent consumed it occasionally.

The NCHS standard values *(Fig.1)* at 50th percentile were greater than the observed mean height of adolescents girls in all the age groups and among all the three groups. When t-test applied it was found that the calculated value of t was greater than the table value of t at 5 percent probability level. It was seen that the observed height of adolescent girls when compared with NCHS 50th standards and on 2 degrees of freedom. Therefore it was concluded that the mean height of adolescents girls were significantly lower than the NCHS standards.

Fig. 2 shows the observed mean weight of adolescent girls. The comparision of observed mean with NCHS standard values 50 thpercentile, showed that the observed mean weight of the adolescent girls was lesser than the NCHS standards in all the age groups of adolescents girls belonging to the three groups. When t-test was applied

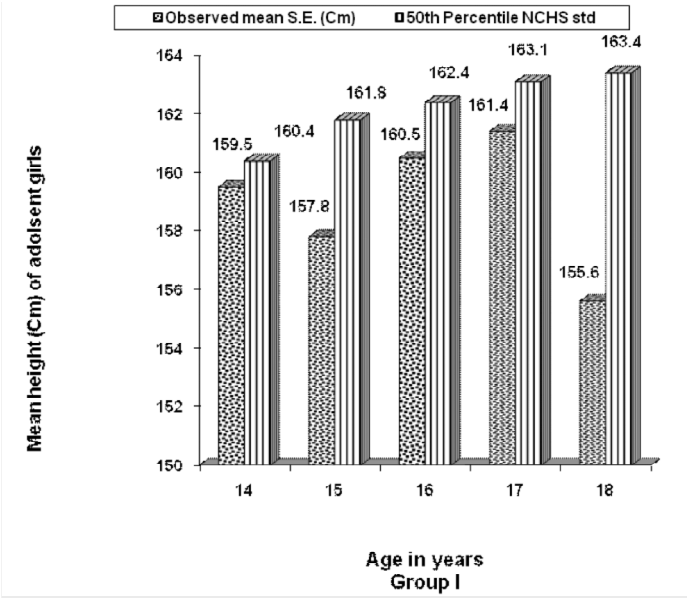

Fig.1: Comparison of mean Height of adolescent girls with NCHS standard

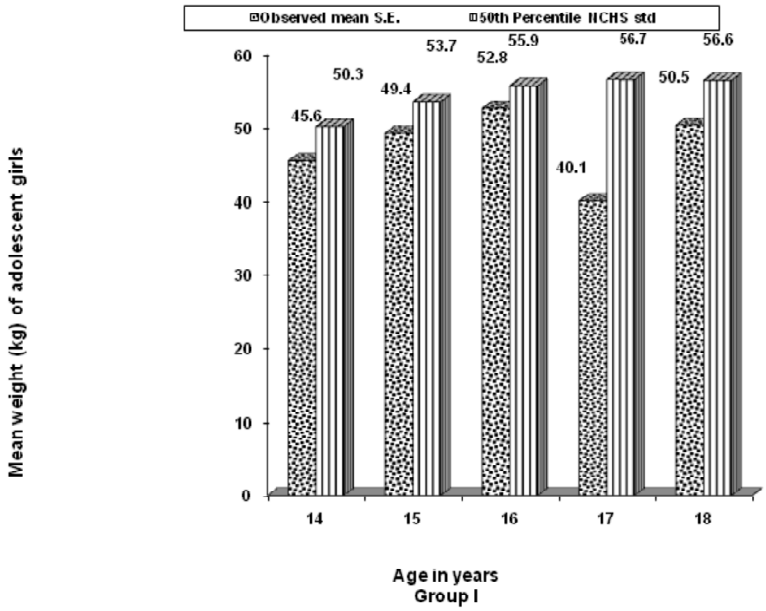

Fig. 2 Comparison of Mean weight of adolescent girls with NCHS standard.

it was found that calculated value of t was greater than the table value of t at 5percent probablity level and 2 degrees of freedom. Therefore it was concluded that the mean weight measurements of adolescent girls were significantly lower than the NCHS standards.

Similar results were found by **Saibaba and Syamolo (2002)** who found that more than 65 percent girls were found to have below normal values in all the indices of anthropomentry

Table 3 shows that majority of girls (30 percent) were found under grade 11 moderate malnutrition which is due to unawareness of the importance of nutrition in the diet and conscious about body image. Data shows that (26.66 percent) girls were under grade 1 mild malnutrition and (16.66 percent) girls were low weight. Only (11.33 percent) girls were normal.

Adolescent girl's who became mildly malnourished first and are at greater risk of all deficiencies **NNMB, (2006)**

The mean nutrient intakes (energy, protein, fat, beta carotene,Vitamin A, Vitamin B1, Vitamin C, iron and calcium) of the respondents in all the groups were less than the ICMR RDA.

Table 4 clearly shows that there were a noticeable percentage of respondents having fatigue (90 percent) due to deficiency of iron. Depression and pale nails were found among (79.33 percent) and (60 percent) respectively. These signs are well recongnized to be due to deficiencies of iron, folic acid, Table shows that some of the nutrients were noticed in the considerable proportion of the vitamin B12 and vitamin C. Some were noticed having the problem of retarded growth, irritable behavior, pale skin problem.

The findings were similar with **Kapil and Bhavna, (2002)** who reported that despite India's substantial progress in human development since independence 7 to 9 percent of adolescents girls are anaemic in a particular selected geographic area, 53 percent have the vitamin B deficiencies and 7 percent have goiter. The body cannot synthesise them, so they must be available through the diet. Deficiencies if these micronutrients are known to have devastating effects on health.

Table 5 shows that 33.33 percent of 14-15 years of adolescent girls and 20 percent of girls of 16-18 years were malnourished. 26.66 percent girls of 14-15 years were

at risk of malnutrition and 13.33 percent girls of 16-18 years were at risk of malnutrition and only 4 percent girls of 14-15years and 2.66 percent girls of 16-18 years were at normal.

Similar findings were also reported by **Story (2000)** that 56 percent of adolescent girls who suffers from eating disorders were malnourished whereas 34 percent were at risk of becoming malnourished and only 10 percent were normal

Table 3 Distribution of adolescent girls according to BMI:-

BMI Range	**Group I 55**		**Group II 45**		**Group III 50**		**Total 150**	
	n	%	N	%	N	%	N	%
Grade III severe Mal. (<16.0)	5	9.090	8	17.77	10	20	23	15.33
Grade II Moderate Mal. (16-17)	15	27.27	10	22.22	20	40	45	30
Grade I Mild Mal. (17-18)	20	36.36	12	26.66	8	16	40	26.66
Low weight Normal (18.5-20)	10	18.18	8	17.77	7	14	25	16.66
Normal (20.5-24.5)	5	9.09	7	15.55	5	10	17	11.33
Obese (25-30)	-	-	-	-	-	-	-	-
Obese grade >30	-	-	-	-	-	-	-	-

Source **Park, (2002)**

Table 4 Distribution of adolescent girls according to clinical assessments

Clincal status	**Group I 55**		**Group II 45**		**Group III 50**		**Total 150**	
	N	%	N	%	N	%	N	%
General appearance								
Very good	15	27.77	11	24.44	14	28	40	26.66
Good	19	12.66	14	31.11	17	34	50	33.33
Fair	16	29.90	16	35.55	15	30	47	31.33
Poor	5	9.09	4	8.88	4	8	13	8.66
Pale conjunctiva								
Absent	39	70.90	29	64.44	37	74	105	70
Present	16	29.09	16	35.55	13	26	45	30
Nail colour								
Normal	10	18.18	15	33.33	35	70	60	40
Pale	45	81.8	30	66.66	15	30	90	60
Growth								
Normal	35	63.63	20	44.44	31	62	86	57.33
Retarded	20	36.36	25	55.55	19	38	64	42.66
Skin colour								
Pale	49	89.09	27	60	22	44	96	64
Normal	6	10.90	18	40	28	56	52	34.66
Behavioral implication								
Irritable	36	65.45	41	91.11	39	78	116	77.33
Normal	19	34.54	4	8.88	11	22	34	22.66
Fatigue								
Present	50	90.90	42	93.33	43	86	135	90
Absent	5	9.09	3	6.66	7	14	15	10
Depression								
Present	46	83.63	32	71.11	41	82	119	79.33
Absent	9	16.36	13	28.88	9	18	31	20.66
Gums								
Normal	35	63.63	28	62.22	21	42	84	56
Bleeding	15	27.77	17	37.77	29	58	51	34

Source :- **Park, (2002)**

Table 5 Distribution of adolescent girls according to their nutritional status

S.No.	Age group	Nutritional Assessment score	N = 150	%
1.	14-15 years	16 points	50	33.33
2.	16-18 years	16 points	30	20
3.	14-15 years	20 points	40	26.66
4.	16-18 years	20 points	20	13.33
5.	14-15 years	24 points	6	4
6.	16-18 years	24 points	4	2.66

Gernot, (2001)

Malnutrition Indicator score:- Less than 17 points- malnourished

17 to 23.5 points- at risk of malnutrition

More than 23.5 points- normal.

CONCLUSION

The study reveals that the nutritional status of adolescents girls residing in Allahabad is below standards. It is concluded that, the rate of malnourished girls were maximum.The nutritional status of a good proportion 53.33 percent of the respondents was is unsatisfactory including BMI, showing inadequate intake of important nutrients required for proper growth and development among girls and the presence of clinical signs of nutritional deficiencies is a matter of concern.

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A Study on Knowledge and Adoption of Organic farming practices in Paddy Cultivation among the Tribal Farmers of Lalburra Block in Balaghat District (Madhya Pradesh)

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ABSTRACT

The present study was carried out during 2011-2012 in one selected block of Balaghat district. One hundred twenty randomly selected tribal formers were practicing organic farming were interviewed to collect the primary data in the light of objectives set growth. The collected data were tabulated and analyzed statistically to draw appropriate conclusion.

More than 59.17 per cent of the organic farming had medium knowledge level about Paddy cultivation practices. Fifty five per cent of the respondents had fall under medium adoption category. Education have effects the adoption process of organic farming, educated farmers adopt the organic farming grater than the illiterate farmers.

The economically viable farmers, income turned up to 30001 to 50000 per annum were adeptly the organic farming, due to which the organic farmers had low risk bearing capacity, low purchasing power of agricultural input and consequently medium to low adoption of organic farming practices in paddy cultivation financial sound farmers adopt the organic farming. Respondents of the selected area were not enough well-versed to the teaching aids. This is one of the major issues to non-adoption of organic farming in scientific way. So there is wide use of extension methods for transfer of technology from institutions to rural community.

Special training in relation to organic farming is highly required as it was observed that the farmers who attend the training programmes more than two were having more knowledge about organic farming and also their adoption level was high.

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INTRODUCTION

Rice is the most consumed cereal grain in the world; it forms the dietary staple food for more than half of the earth planet's human population.

In Asian countries, rice is the major staple crop covering about ninety per cent of rice grown in the world. In the entire world, rice occupies an area of 156.7 million hectares, with a total production of 650.2 million tones in 2007. India is the second largest producer after china has an area of over 44.0 million hectares under rice crop and production 144.1 million tones of rice in 2007 **FAO, (2008)**.

Organic farming which is a holistic production management system for promotion and enhancing health of agro eco-system, has gained wide recognition as a valid alternative to conventional food products and ensures safe food for human consumption.

Organic farming is not a new conception India. It dates back to ancient period during Indus valley civilization and its mention was made in Rigveda, Athervaveda, Kautaliya's Arthasastra etc. The animal dung, green manure, oil cakes, etc., were using in ancient time and today again the need to use organic wastes to improve soil organic matter is re-emphasized by modern science to sustain agricultural production and productivity. Keeping the above feeds in view the study was undertaken with the following specific objectives.

1. To ascertain the socio-economic characteristics of the respondents.
2. To determine the extent of knowledge and level of adoption of organic farming practices in paddy cultivation among the respondents.

MATERIALS AND METHODS

The study was purposively conducted in the Lalburra block basis of selection of Balaghat District in Madhya Pradesh. Six Villages were selected randomly on the basis of majority of tribal farmers were practicing organic farming. The sample size was 120 for the present study. Head of the selected households were interviewed. In this study, Data related to socio-personal, socio-economic, communicational, situational and socio-psychological profile of respondents and information need was collected with the help of specially pre structured interview schedule. Data collected through interview schedule were verified and supported by the observation technique and informal interpersonal discussion with the villagers or key information. The data collected was analysed by applying simple statistical techniques like frequency, percentage, mean, coefficient of correlation and multiple regression.

RESULTS AND DISCUSSION

1. Socio-personal characteristics

It is seen from Table 1 that the majority of the respondents (70.83 %) belonged to middle age group (30 to 45 year), 15.00 per cent respondents were under young age group (up to 29 year) and 14.17 per cent respondents were of old age group (above 45 years). This finding is in conformity to the findings reported by **Deshmukh *et al.* (2007) and Naik *et al.* (2009)**.

It is observed that the 43.33 per cent of the respondents were illiterate followed by 37.50 per cent respondents were found under the categories of up to primary school. Whereas, 12.50 per cent respondents were educated up to middle school and 3.33 per cent had education up to high school, about 1.67 per cent respondents had education up to higher secondary level and only 1.67 per cent respondents were educated up to college and above. Thus findings were strongly supported by the findings of **Raji *et al.* (1996), Ramesh and Santha (2008)**.

It was found that the majority of respondents (52.50%) had 4-6 family members involved in agriculture followed by 34.17 per cent respondents who had more than 6 members involved in agriculture and only 13.33 per cent respondents were found to have only 1-3 members involved in agriculture. Thus, the results clearly indicate that most of the respondents who had 4-6 of family members involved in agricultural practices. This finding is in conformity to the findings reported by **Yomota and Tom-Cruz Agustina (2007)**.

It was found that 42.50 per cent respondents were having their annual income up to Rs. 30001- 50000, followed by 34.17 per cent respondents were having their annual income Rs. 10000-30000, whereas 13.33 per cent and 10.00 per cent respondents were found in the income level of Rs. 50001- 70 000 and Rs. 70 001-90000 respectively. This findings is similar to the findings of **Ramesh and Santha (2008)**.

The data in *Table 1* infers that majority of the respondents (71.67%) reported medium level of availability of infrastructure facilities, followed by 17.50 per cent of respondents have low level of availability of infrastructure facilities. Only 10.83 per cent of the respondents were found to have had high level of infrastructure facility. This showed that the infrastructure facilities required by the respondents during the use of organic farming were moderately available with them and needs improvement.

Table 1: Distribution of respondents according to their socio-personal characteristics **(N =120)**

S. No.	Characteristics	Frequency	Percentage
1.	Age		
	Young (up to 29 years)	18	15.00
	Middle (30 to 45 years)	85	70.83
	Old (above 45 years)	17	14.17
	Total	120	100.00
		(= 37.37,S.D = 7.98)	
2.	Education		
	Illiterate	52	43.33
	Primary school	45	37.50
	Middle school	15	12.50
	High school	04	03.33
	Higher Secondary school	02	01.67
	College and above	02	01.67
3.	Total number family member involved in farming		
	1-3 member	16	13.33
	4-6 members	63	52.50
	More than 6 members	41	34.17
4.	Annual income		
	Rs.10,000-30,000	41	34.17
	Rs 30,001-50,000	51	42.50
	Rs 50,001-70,000	16	13.33
	Rs 70,001-90,000	12	10.00
5.	Overall level of availability of infrastructure facilities		
	Low level of use of Infrastructure facility	21	17.50
	Medium level of use of Infrastructure facility	86	71.67
	High level of use of Infrastructure facility	13	10.83
6.	Overall uses of information sources by the respondents		
	Low level utilization of information Sources	75	62.50
	Medium level utilization of information Sources	36	30.00
	High level utilization of information Sources	09	07.50
7.	Attitude of the respondents towards organic farming practices		
	Unfavourable (low level) attitude	28	23.34
	Moderately favourable (medium level) attitude	79	65.83
	Favourable (high level) attitude	13	10.83

The data furnished in *Table 1* indicates that majority of the respondents (62.50%) had low level of exposure to various sources of information for getting the information about organic farming practices, followed by 30.00 per cent of the respondents were found to have medium level of exposure to various sources of information and slightly more than one tenth of the respondents (7.50%) were found to have high level use of information sources.

Information sources utilization of the tribal farmers showed a positive and significant relationship with adoption. It may be due to the effective utilization of information sources on organic farming practices such as friends, neighbours, progressive farmers and radio etc. The finding is also similar to the findings of **Ramesh and Santha, (2008)**.

It can be seen from *Table 1* that majority of the respondents (65.83%) had moderately favorable attitude regarding adoption of organic farming practices, only 23.34 per cent had unfavorable attitude as only 10.83 per cent of respondents showed their favorable attitude toward organic farming practices.

There is a need to change the attitude of the respondents through guidance, persuasion and conducting demonstration on organic farming at farmer's field to show their effectiveness in organic training in paddy cultivation among farmers.

Extent of knowledge and adoption of organic farming practices in paddy cultivation among the respondents

a) Overall level of knowledge about organic farming practices in paddy cultivation

The data presented in the *Table 2* indicates that the majority of the respondents (59.17%) had medium level of knowledge regarding organic farming practices, whereas, 30.00 and 10.83 per cent of respondents were having low and high level of knowledge, respectively. It can be said that, most of the respondents had medium level of knowledge regarding organic farming practices in paddy.

b) Overall extent of adoption of organic farming practices in paddy cultivation:

It is clearly indicated from the *Table 2(2)* that 55.00 per cent of respondents had medium level of adoption about organic farming practices in paddy cultivation, followed, by 36.67 per cent were low level adoption category and only 8.33 per cent of the respondents were found in high level of adoption category.

Thus, there is a wide scope to improve the level of adoption of organic farming; the findings pointed out that adequate effort should be made to introduce the low cost

Table 2: Extent of knowledge and adoption of organic farming practices in paddy cultivation. **(N =120)**

S. No.	Characteristics	Frequency	Percentage
1.	**Overall level of knowledge pertaining to organic farming practices in paddy cultivation**		
	Low level knowledge	36	30.00
	Medium level knowledge	71	59.17
	High level knowledge	13	10.83
2.	**Overall extent of adoption of organic farming practices in paddy cultivation**		
	Low adoption	44	36.67
	Medium adoption	66	55.00
	High adoption	10	08.33

ILLUSTRATIONS

technology as well as to popularize organic farming system to the door steps of farmers. Almost similar findings are reported by **Ranganatha *et al.* (2001), Khan, *et al.* (2002) and Pandit *et al.* (2007)**.

CONCLUSION

In Madhya Pradesh organic farming is mostly preferred in socio-economically backward tribal dominated areas. The socio- economic status of the respondents low level. It was found that literacy level had adverse impact on the adoption process. Education have effects on the adoption process of organic farming, educated farmers

adopt the organic farming better than illiterate farmers. Respondents of the selected areas were not enough well-versed to the teaching aids. This is one of the major issues to non-adoption of organic farming in scientific way. Majority of the respondents had medium level of knowledge regarding organic farming practices in paddy cultivation Special training in relation to organic farming should be provided to the farmers which will be helpful for more knowledge about organic farming and also have higher level of adoption.

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Application of Anthropometry measurements in designing ergofriendly work station for the elderly

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ABSTRACT

Ergonomic is a technology of measuring various human physical traits as size, mobility and strength. Anthropometric measures vary considerably with factors such as gender, race, ethnic group, occupation, physical fitness, secular growth, age and sex. It is a statically and dynamics measurements. A statically measurement is natural body measurements and dynamics measurements is a working position measurements. The present study focused on the use of anthropometric measurements in designing ergofriendly work station design for the elderly. Eighty elderly (M=40, F=40) participated in the study and their homes were visited for anthropometric measurements in sitting and standing positions and the work station were not found ergo friendly in relation to their body dimensions. They are aged between 60-65 years, 65-70 years and 70-75 years. Ergonomic have a very important role in anthropometric measurements and with the help of anthropometric measurements we can decide the right dimension for any type buildings and work areas. And with the ergo-friendly environment the elderly can improve to their quality of life.

Keywords: *Ergonomic, Anthropometric and Elderly.*

INTRODUCTION

Ergonomics is a Greek word where Ergo means work and Nomos means Science. Ergonomics is a scientific study of the relationship between a person and his/her environment **Ergonomic Society, (2003)**. The application of Ergonomics is particularly concerned with the design and redesigned of working method, equipment and physical as well as organizational environment within which work takes place.

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The various capabilities, capacities and limitations of human beings are also studied so that working people may be integrated into a well planned human machine system in order to increase their satisfaction without affecting their health and safety **International Ergonomic Association, (2000)**. It is a technology of measuring various human physical traits as size, mobility and strength. Anthropometric measures vary considerably with factors such as gender, race, ethnic group, occupation, physical fitness, secular growth, age and sex. It is a statically and dynamics measurements. A Stastical measurement is natural body measurements and dynamics measurements is a working position measurements.

Standing position measurements in included Height, waist height, Knuckle, Span, Eye level height, Shoulder height, Elbow height, Knee height, Arm reach length and height, Dactylion and Buttocks width.

Sitting position (on chair) measurements included Height, Acromial height, Eye level height, Shoulder height, Elbow rest height, Knee height, Waist height, Miscellaneous measurements included inner arm length, total arm length, palm length, finger length, fore arm length, and elbow width in closed and relaxed position. Functional leg length, Thigh clearance height, Buttocks knee length and buttocks popliteal length. Reach measurement included Vertical plane and Horizontal plane **Kothiyal, K. and Tettey, S. (2000)**.

In old age, physical strength deteriorates, mental stability diminishes and money power becomes bleak coupled with negligence from younger generation. Some children want to help and stay with their parents but they are living outside the home for their job purposes, so they are unable to do so. Although internal changes in elderly are not as readily observable as external ones, they are more pronounced and widespread **Hurlock, E.B., (2003)**.

Thus for measuring these body dimensions, a clearly defined body position is necessary. Usually a body position is standing and sitting erected.

The person stand with his feet closed hand his body vertically erected, while heels, buttocks and shoulders touch the same vertical plane. The person sits with body vertically erected, while buttocks and shoulders touch the same vertical plane.

There are two method of collecting anthropometric measurements analyzing photograph of body parts, measuring directly parts of the body and Statistical means (derivation from other measurements) photograph are permanent records.

MATERIALS AND METHODS

The present study was conducted in the Trans Yamuna areas of Allahabad. The data was collected from elderly males and females between the of age 60 - 75 years. The six villages selected were "Mahewa", "Gangotri Nagar", "Dandi", "Ganjia", "Maduka". The sample size selected for the study was 80 which consisted of 40 elderly males and 40 elderly females.

Tools and anthropometric measurements

With the help of Anthropometric rod, anthropometric, stature meter and weighing balance used for in static and dynamic positions.

To design ergonomically modified kitchen for the elderly the anthropometric measurements of 80 respondents were taken. A total of 37 measurements were recorded and categorized under the following heads.

The method of taking measurements is depicted under taken following.

PICTORIAL VIEW OF TAKING ANTHROPOMETRIC MEASUREMENT TO DESIGN WORK STATION

1- Standing Position Measurements

Standing position measurements included Height, Waist Height, Knuckle, Span, Eye level height, Shoulder height, Elbow height, Knee height, Arm reach length and height, Dactylion and Buttocks width.

2- Sitting Position (on chair) Measurements

Sitting position (on chair) measurements included Height, Acromial height, Eye level height, Shoulder height, Elbow rest height, Knee height, Waist height, Functional leg length, Thigh clearance height, Buttocks knee length and Buttocks popliteal length.

3- Reach Measurements

Reach measurement included Vertical plane and Horizontal plane.

4- Miscellaneous Measurements

Miscellaneous measurements included inner arm length, total arm length, palm length, finger length, fore arm length, and elbow width in closed and relaxed position.

5- Interpretation of data

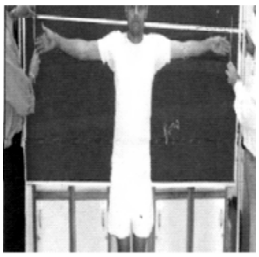
In stastical analysis averages were used for interpretation of data.

Height

Eye Level Height

Elbow Height

Knee Height



Span

Hip Breadth

Thigh Circumference

Sitting Height

RESULT AND DISCUSSION

The results of the present research in accordance with the objectives, derived through the use of required methodology and standard tools have been presented in this chapter. Following are the main heads under which the research results have been presented and discussed.

Important Anthropometric Measurements of elderly males and females used for designing work station

Average anthropometric measurement of the elderly males and females of Trans Yamuna area of the Allahabad.

Table-1 : The table presented below shows the anthropometric measurement in standing position of the elderly males and elderly females

1- Anthropometric Measurements		
Standing position	**N=40 Women Average Measurement in cm.**	**N=40 Men Average Measurement in cm.**
Weight	52.56	54.75
Height	150.38	155.39
Waist height	100.00	101.1
Knuckle	17.6	17.89
Span	157.13	160.8
Eye level height	142.5	149.13
Shoulder height	132.15	133.28
Elbow height	99.95	98.23
Knee height	48.34	48.65
Arm reach length and height	68.95	69.03
Crotch	13.9	15.49
Dactylion	7.51	8.49
Buttock extension	120.5	100.4
Total Respondents = 80		

The above *table 1* shows the anthropometric measurements of elderly men and women in standing position of weight ,height, waist height, knuckle, span, eye level shoulder, shoulder height, elbow height, arm reach length and height crotch, dactylion and buttock extension.

In anthropometry measurements the males measurements was 1 cm high as compared women but in the measurement of buttock extension women found 20 cm. high as compares men.

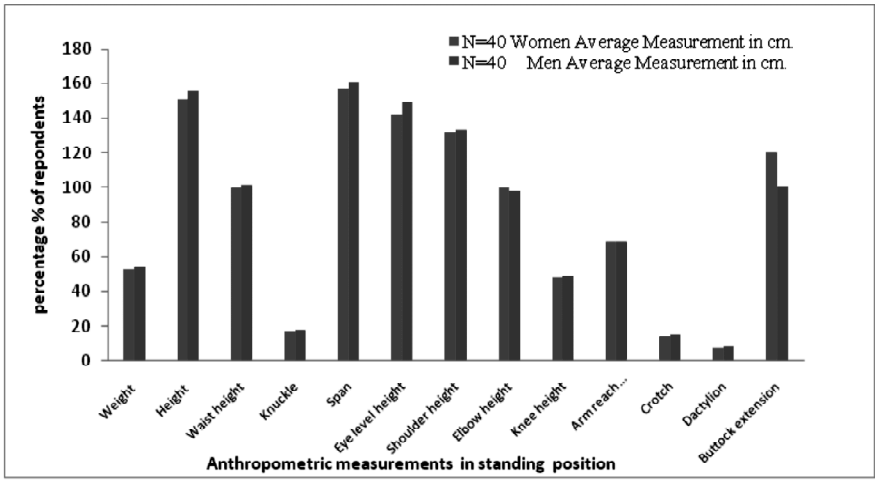


Fig-1 Distribution of elderly according to their standing measurements.

Table-2 : The table presented below shows the anthropometric measurement in sitting position of the elderly males and elderly females.

2- Anthropometric Measurements		
Sitting position (on chair)	**N= 40 Women Average Measurement in cm.**	**N= 40 Men Average Measurement in cm.**
Height	109.93	120.65
Acromial height	58.15	58.98
Eye level height	102.9	111.6
Shoulder height	55.13	57.05
Elbow rest height	22.48	21.85
Knee height	49.7	49.09
Waist height	26.48	28.63
Functional leg length	73.06	79.79
Thigh clearance height	12.03	11.27
Buttock knee length	52.2	48.01

Buttock popliteal length	43.15	41.6
Popliteal height	42.6	45.28
Chest breadth	44.49	46.67
Hip breadth	46.33	48.0
Elbow to elbow length (closed position)	47.5	45.73
Elbow to elbow length (relaxed position)	56.78	57.73
Total Respondents = 80		

The above *table 2* shows the anthropometric measurements of elderly men and women in sitting position of weight ,height, acromial height,waist height, knuckle, eye level shoulder, shoulder height, elbow height, Thigh clearance height, Buttock knee length, Buttock popliteal length, Popliteal height, Chest breadth, Hip breadth, Elbow to elbow length closed position closed and relax position. In anthropometry measurements the males measurements was 1 cm high as compared women.

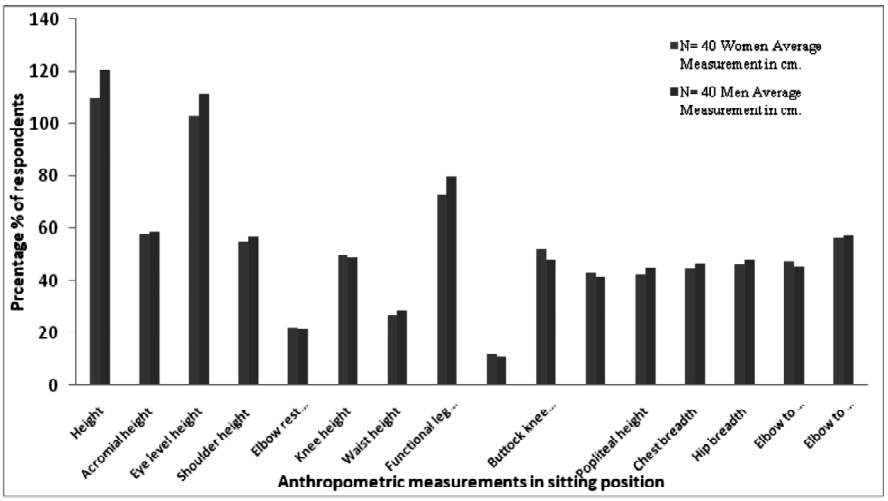


Fig-2 Distribution of elderly according to their sitting position measurements.

Table-3 : The table presented below shows the miscellaneous anthropometric measurements of the elderly males and elderly females.

3- Anthropometric Measurements		
Miscellaneous Measurements	**N= 40 Women Average Measurement in cm.**	**N= 40 Men Average Measurement in cm.**
Inner arm reach	63.7	64.5
Total arm length	67.61	67.97
Palm length	16.83	18.52
Finger length	7.38	9.0
Fore arm length	25.63	33.28
Total Respondents = 80		

The *table 3* presented below shows the miscellaneous anthropometric measurements of elderly male and female Inner arm reach, Total arm length, Palm length, Finger length and fore arm length.

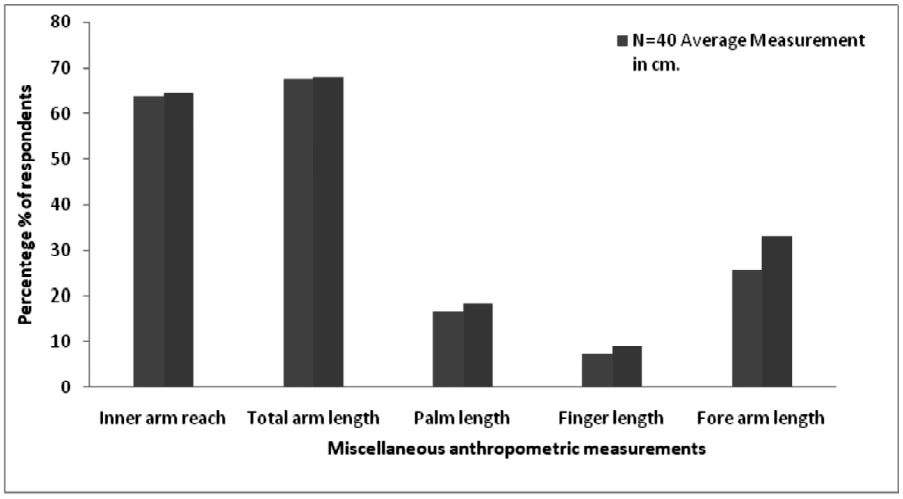


Fig -3 Distribution of elderly according to their miscellaneous measurements.

Table-4 : The table presented below shows the anthropometric reach measurements (normal reach) of the elderly males and elderly females.

Anthropometric Measurements		
Reach Measurements	**N= 40 Women Average Measurement in cm.**	**N= 40 Men Average Measurement in cm.**
Normal reach		
Vertical plane	184.03	202.15
Horizontal plane	65.6	67.45
Total Respondents = 80		

The *table 3* presented below shows the reach measurements of elderly male and female Vertical plane, Horizontal plane.

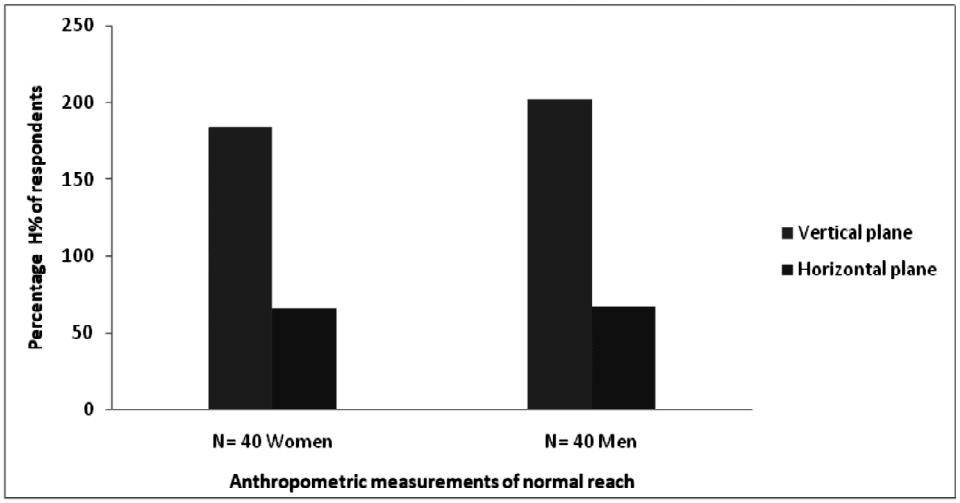


Fig-4 Distribution of elderly according to their normal reach measurements.

Table-5 : The table presented below shows the anthropometric reach measurements (maximum reach) of the elderly males and elderly females.

5- Anthropometric Measurements		
Reach Measurements	**N= 40 Women Average Measurement in cm.**	**N= 40 Men Average Measurement in cm.**
Maximum reach		
Vertical plane	196.6	207.48
Horizontal plane	78.75	80.83
Elbow width	51.78	52.35
Total Respondents = 80		

The *table 5* presented below shows the reach measurements of elderly male and female maximum reach of Vertical plane, Horizontal plane and elbow width.

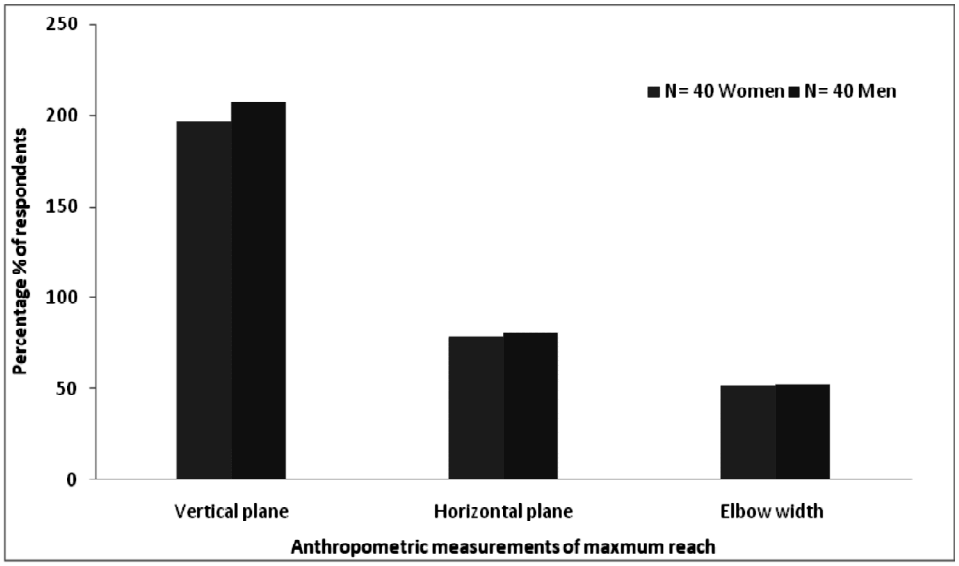


Fig-5 Distribution of elderly according to their maximum reach measurements.

CONCLUSION

Thus ergonomic have a very important role in anthropometric measurements and with the help of anthropometric measurements we can decide the right dimension for any types building.

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Preparation of Nutritive Flavored Candy using Pumpkin

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ABSTRACT

The present research work was conducted with the objective to utilize pumpkin, orange, groundnut and soy flour in the preparation of flavored candy, to evaluate the organoleptic quality of the prepared candy and to calculate the nutritive value and cost of the prepared candy.Nutritional flavored candy was prepared by using three different treatments T_1 (pumpkin 60 percent, orange 20 percent, groundnut 15 percent, soy flour 5 percent), T_2 (pumpkin 50 percent, orange 30 percent, groundnut 15 percent, soy flour 5 percent) and T_3 (pumpkin 40 percent, orange 40 percent, groundnut 15 percent, soy flour 5 percent) with Orange/ Mango/Pineapple essence were added to give variation in flavor to the prepared candy. Sensory evaluation of the prepared product was carried out using the nine point hedonic scale. Overall, treatment T_3O scored highest in terms of color, flavor and taste and overall acceptability.

Key Words: *Nutritive Value, Pumpkin, Candy, Sensory Acceptability, Flavour*

INTRODUCTION

Malnutrition is a tangle of two mutually reinforcing factors: insufficient nutrient intake and illness, according to the report. Its root cause, therefore, is poverty at the household, community and national levels which results in lack of access to such basic necessities as food, health care, safe drinking water and sanitation **Frehiwot Bekele, (1998)**. Pumpkin is incredibly rich in vital anti-oxidants and vitamins. This humble backyard vegetable is very low in calories yet good source of vitamin A, flavonoid poly-phenolic antioxidants like lutein, xanthine and carotenes **Manay and Shadaksharaswamy, (2008)**. Oranges, like other citrus fruits, is an excellent source of vitamin C. Vitamin C is a powerful natural antioxidant. Consumption of foods rich

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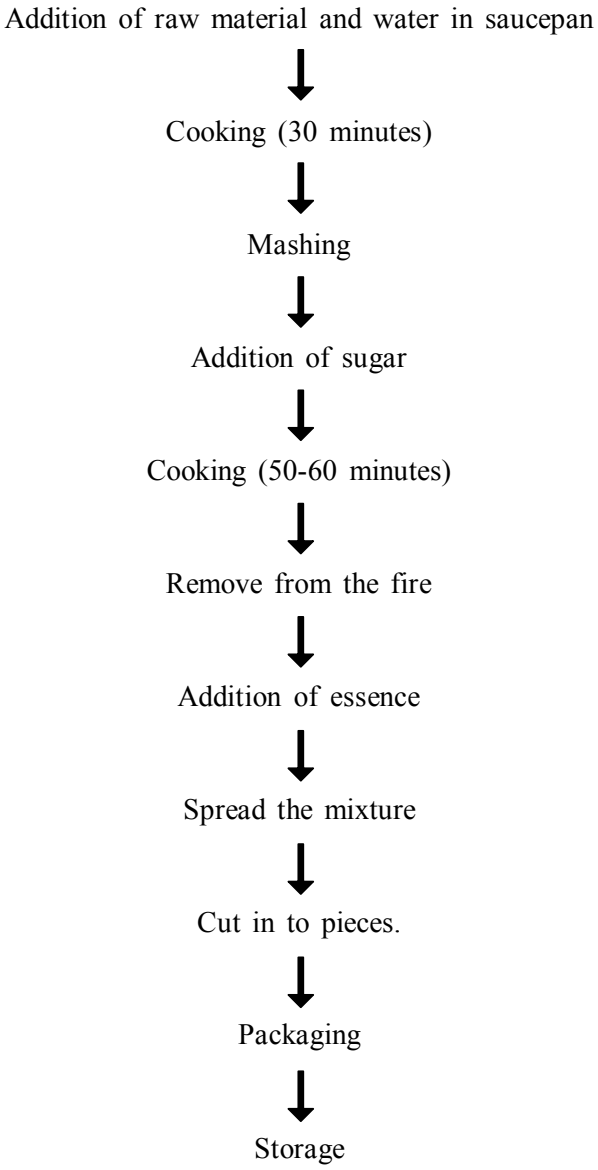
in vitamin C helps body develop resistance against infectious agents and scavenge harmful, pro-inflammatory free radicals from the blood. It is also a very good source of B-complex vitamins such as thiamin, pyridoxine, and foliates **Prasad, (2008)**. Groundnuts and groundnut products are very beneficial in the treatment of hemophilia and other such inherited blood disorders.Groundnuts are rich vitamins and contain at least 13 different types of vitamins that include Vitamin A, B, C and E.Soy foods are the richest dietary source of Isoflavons. Isoflavons are phytoestrogens, and have a chemical structure similar to that of estrogen **Mridula and Gupta, (2007)**.

MATERIALS AND METHODS

The study entitled **"Preparation of nutritive flavored candy using pumpkin"** was carried out with appropriate methodology in the Ethelind School of Home Science, SHIATS, Allahabad. Pumpkin was used for preparation of nutritive flavored candy. The whole experiment was repli-cated four times with treatments T_1, T_2, T_3 in which orange, mango and pineapple essence were added respectively.

The organoleptic evaluation of freshly prepared candy was done by a panel of 5 judges to assess the acceptability of the product based on the various sensory attributes like color, appearance, texture, flavor and taste. The evaluation was done on the 9- point Hedonic Scale based score card.The nutritive value of the prepared candy was calculated using food composition tables from the book of Nutritive value of Indian Foods by 9 **Gopalan *et al.* (2004)**. The cost of the product was calculated on the basis of price of raw ingredients at rupees\kgand the data was statistically analyzed by using analysis of variance (two way classification) and critical difference techniques.

Preparation method of Candy



Source : **Srivastava and Kumar (2009)**

Details of Treatment :

T_1 : Pumpkin 60 percent , Orange20 percent , Groundnut 15 percent, Soy flour 5 percent

T_2 : Pumpkin 50 percent, Orange 30 percent, Groundnut 15 percent, Soy flour 5 percent

T_3 : Pumpkin 40 percent, Orange 40 percent, Groundnut 15 percent, Soy flour 5 percent

All treatments were replicated 4 times.

Essence of orange, mango and pumpkin were added in prepared candy (2-3 drops) to give varia-tions in flavor. These added essence were not effect the nutritive value and cost of the prepared candy.

RESULTS AND DISCUSSION

The data collected on different aspects as per the methodology have been tabulated and analyzed statistically. The findings are also illustrated diagrammatically. The result obtained from the analysis are presented and discussed in the following headings.

Table - 1 : Average sensory scores for different parameters for nutritive flavored candy with Orange flavor.

Treatments	Color	Body and Texture	Flavor and Taste	Overall Accep-tability
	Mean ± SE	Mean ± SE	Mean ± SE	Mean ± SE
T_1O	7.55 ± 3.07	8.09 ± 3.20	8.15 ± 3.34	7.93 ± 2.43
T_2O	7.80 ± 5.31	7.57 ± 4.20	8.19 ± 3.20	7.85 ± 3.25
T_3O	8.5 ± 2.74	7.47 ± 4.26	8.61 ± 2.24	8.19 ± 2.24
Result	**S**	**NS**	**S**	**S**

Table-2: Average scores for different parameters for nutritive flavored candy with Mango flavor.

Treatments	Color	Body and Tex-ture	Flavor and Taste	Overall Accep-tability
	Mean ± SE	Mean ± SE	Mean ± SE	Mean ± SE
T_1M	7.73 ± 2.86	8.10 ± 2.86	8.47 ± 3.04	8.10 ± 2.14
T_2M	7.42 ± 2.63	7.21 ± 2.32	8.26 ± 2.81	7.63 ± 2.28
T_3M	7.5 ± 2.68	7.40 ± 4.87	8.31 ± 3.57	7.73 ± 2.95
Result	**NS**	**S**	**S**	**S**

Table-3: Average scores for different parameters for nutritive flavored candy with Pineap-ple flavor.

Treatments	Color	Body and Tex-ture	Flavor and Taste	Overall Accep-tability
	Mean ± SE	Mean ± SE	Mean ± SE	Mean ± SE
T_1P	8.15 ± 3.30	8.10 ± 4.29	8.10 ± 3.17	8.11 ± 2.63
T_2P	8.10 ± 3.17	7.45 ± 4.42	8.15 ± 3.62	7.9 ± 3.21
T_3P	7.95 ± 5.68	7.90 ± 5.59	8.25 ± 5.36	8.03 ± 2.01
Result	**NS**	**S**	**S**	**S**

With regards to all sensory characteristics in case of candy with orange flavor T_3O had the highest scores in overall acceptability (8.19) followed by T_1O (7.93) and T_2O (7.85).

In case of candy with mango flavor T_1M had the highest scores in overall acceptability (8.10) followed by T_3M (7.73) and T_2M (7.63).

In case of candy with pineapple flavor T_1P had the highest scores in overall acceptability (8.11) followed by T_3P (8.03) and T_2P (7.9).

Table-4: Nutritive value of different treatments of prepared flavored candy. (per100gm)

Nutrients	**T_1**	**T_2**	**T_3**
Energy (Kcal)	291	293	295
Protein(g)	6.77	6.70	6.04
Carbohydrates (g)	50.20	50.83	51.46
Fat (g)	7.13	7.14	7.15
Calcium (mg)	39.80	41.40	43
Phosphorus (mg)	99.6	98.60	97.60
Iron (mg)	1.06	1.05	1.04
βCarotene (µg)	38.55	35.05	31.55

Table-4 shows that T_3 was high in content of energy (Kcal) 295 followed by T_2 293 and then T_1 with 291. T_1 washigh in protein (g) 6.77 followed by T_2 6.70 and then T_3 with 6.04. Carbohydrates (g) content was high in T_3 51.46 followed by T_2 50.83 and then T_1 with 50.20. Fat (g) was high in T_3 7.15 followed by T_2 7.14 and then T_1 with 7.13. Content of calcium (mg) was high in T_3 43 followed by T_2 41.40 and then T_1 with 39.80. Phosphorous (mg) content was high in T_1 99.60 followed by T_2 98.60 and then T_3 with 97.60. Iron (mg) content was high in T_1 1.06 followed by T_2 1.05 and then T_3 with 1.04. The content of βcarotene (µg) was found high in T_1 38.55 followed by T_2 35.05 and then T_3 with 31.55 in all three flavors (orange, mango and pineapple)

Table-5: Cost of the prepared flavored pumpkin candy.

Treatments	**Pumpkin 20 Rs/Kg**		**Orange 50 Rs/Kg**		**Groundnut 80 Rs/Kg**		**Soy flour 35 Rs/Kg**		**Sugar 36 Rs/Kg**		**Total Cost**
	Quantity (gm)	Cost (Rs)	Quantity (gm)	Cost (Rs)	Quantity (gm)	Cost (Rs)	Quantity (gm)	Cost (Rs)	Quantity (gm)	Cost (Rs)	(Rs)
T_1O	720	14.4	240	12	120	9.6	60	2.1	480	17.80	56.28
T_2O	600	12	360	18	120	9.6	60	2.1	480	17.80	59.88
T_3O	480	9.6	480	24	120	9.6	60	2.1	480	17.80	63.48

Table-5 shows that Total cost for T_1 is Rs.56.28, T_2 is Rs.59.88 and T_3 is Rs.63.48. It is therefore, concluded that the treatment T_1 (pumpkin 60 percent, orange 20 percent, groundnut 15 percent and soy flour 5 percent) has lowest cost and T_3 (pumpkin 40 percent, orange 40 percent, groundnut 15 percent and soy flour 5 percent) has highest cost because incorporation of pumpkin decrease the cost of the flavored candy and incorporation of orange increase the cost of the flavored candy.

CONCLUSION

Results obtained from the present study revealed that nutritive flavored candy using pumpkin, orange, groundnut and soy flour was well acceptable. On the basis of findings, it was concluded that in case of candy with all three essence or flavor (orange, mango, pineapple) T_3O was found to be best with regards to color, flavor & taste and overall acceptability. The nutritive value of flavored candy with all three flavor T_3 was highest in energy, carbohydrates, fat and calcium, T_1 was highest in protein, phosphorus and β carotene and the lowest cost was obtained for treatments T_1 in all three flavors.

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Comparison of the nutritional status of beneficiaries and non-beneficiaries of Mid-day Meal programme in Chaka block, Allahabad District

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ABSTRACT

The present study pertaining to the "Comparison of the nutritional status of beneficiaries and non-beneficiaries of Mid-day Meal programme in Chaka block, Allahabad District "This was a cross-sectional study were was carried out with the following objectives- To assess the nutritional status of selected beneficiaries and non- beneficiaries of Mid- Day Meals, to compare the nutritional status of selected beneficiaries and non- beneficiaries of Mid-day meals. A total 120 school going children aged between 7-12 years were selected, out of which 60 respondents (26 boys and 34 girls) were from Group I (Mid-day Meal beneficiaries) and 60 respondents (31 boys and 29 girls) from Group II (Non-mid day meal beneficiaries). Based on the acceptability, 60 children from government school and 60 children from non-government school were selected for the study. Four Schools were selected purposively for the present study, two were Government primary schools namely Primary school of Mahewa Paschim Patti Allahabad, Primary school of Tignauta, Vikas Khand Chaka Allahabad, other two were Non- government schools namely Hindi Vidhyapith, Mahewa Allahabad, Madarsa Academy school, Gangotri Nagar Allahabad, because of easy accessibility and convenience for authentic collection of data. The anthropometric measurements of the respondents (height in cm and weight in kg) were recorded. Dietary intake was determined by 24 hours dietary recall method and the average nutrient intake was calculated by using the food consumption tables, and compared with RDA. (ICMR, 2004). To sum up all the observations it is concluded that Group I (Mid-day Meal beneficiaries), the mean daily intake of energy, protein, fat, calcium, iron, β - carotene and Vitamin C

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were more than the RDA of both boys and girls, while in Group II (Non mid-day meal beneficiaries) regarding protein, fat and Vitamin C were lesser than the RDA of also both boys and girls. It is also observed from findings that in Group I average height and weight was better than the Group II. So it is concluded that the nutritional status of Mid-day Meal beneficiaries were better than the Non mid- day meal beneficiaries.

INTRODUCTION

The "Mid-Day Meal Scheme" is the popular name for school meal programme in India which started in the 1960s. It involves provision of lunch, free of cost, to school-children on all working days. The key objectives of the programmeare: protecting children from classroom hunger, increasing school enrolment and attendance, improved socialization among children belonging to all castes, addressing malnutrition, and social empowerment through provision of employment to women. The scheme has a long history especially in the state of Tamil Nadu which introduced statewide by the then Chief Minister K. Kamaraj in 1960s and later expanded by M.G Ramachandran government in 1982 has been adopted by most of the states in India after a landmark direction by the Supreme Court of India on November 28, 2001. The success of this scheme is illustrated by the tremendous increase in the school participation and completion rates in the state of Tamil Nadu. 12 crore (120 million) children are so far covered under the Mid-Day Meal Scheme, which is the largest school lunch programme in the world. Allocation for this programme has been enhanced from Rs 3010 crore to Rs 4813 crore (Rs 48 billion 1.3 million) in 2006-2007 **(http://WWW.naandi.org/)**.

The School-age period has been called the latent time of growth. The rate of growth slows and body changes occur gradually. Girls usually out distance boys by the latter part of this period.The slows rate of growth during this period results in gradual decline in the food requirement per unit of body weight. **Srilakshmi, (2005)**

MATERIALS AND METHODS

Selection of sample: Three stage of sampling was adopted for the present study-

Selection of area: Chaka block area of Allahabad district was selected purposively keeping in mind the constraints of time and resources and also because it was convenient and easily accessible so that regular visits could be made for authentic collection of data.

Selection of schools : Chaka Block area of Allahabad district, Gangotri Nagar and Friends Colony Naini, Allahabad were selected purposively because of easy accessibility and convenience for authentic collection of data. Four Schools were selected purposively for present study, Two were Government primary school namely Primary school of Mahewa Paschim Patti Allahabad, Primary school of Tignauta, Vikas Khand Chaka Allahabad, other two were Non- government school namely Hindi Vidhyapith, Mahewa Allahabad, Madarsa Academy School, Gangotri Nagar Allahabad were selected purposively because of easy accessibility and convenience for authentic collection of data. These were selected as study on nutritional status of school going children has not been done before.

Selection of respondents : Total 120 School going children were selected between the ages of 7-12 years. Stratified random sampling techniques were used for the selection of respondents. 60 children from government school and 60 children from non-government school were selected for the study. Different numbers of boys and girls were taken from each school.

Collection of data : Survey method was adopted to collect the data from the selected respondents with the help of pre-tested schedule. The School going children were personally interviewed during the period of study for the collection of required information.

Assessment of nutrient intake : 24 hour dietary recall method was adopted and nutrients intake per day was calculated **Swaminathan, (2004)**. Calculation of nutrients intake was done with the help of Nutritive Value of Indian foods and compared with RDA Given by ICMR **Gopalan *et.al.* (2004)**.

Anthropometric assessment : Height and weight of respondents were measured as given by **Srilakshmi, (2005)**.

Statistical analysis : Appropriate statistical tools viz. Standard Deviation and t- test were used for statistical analysis.

RESULTS AND DISCUSSION

Under the general profile age, sex, class, type of family, religion, family occupation, food habits, number of siblings, school performance etc of the respondents are considered. From the study it was reported that 46.6 per cent, were found in age group of 7-9 years, 32 per cent were 10-12 years. While, in group II (Non- mid day meal beneficiaries) 56.6 per cent children were between 7 - 9 years and 48.4 per cent

children were between 10-12 years., in group I (Mid Day Meal beneficiaries) maximum 42.8 per cent of boys and 57.2 per cent of girls were found in age group of 7-9 years, while, 43.7 per cent of boys were found in age group of 10-12 years and 56.3 per cent of girls found in same age group. In group II (Non-Mid Day Meal beneficiaries) majority of them 47 per cent of boys and 53 per cent of girls were found in age group of 7-9 years, while, 57.6 per cent of boys were found in age group of 10-12 years and 42.4 per cent of girls were found in same age group. In group I (Mid-day meal beneficiaries) majority of them 86.6 percent of children belonged to nuclear family and 13.4 per cent belonged to joint family. While in group II (Non- mid day meal beneficiaries) 56.6 per cent belonged to nuclear family and 43.4 per cent were belonged to joint family. In group I (Mid- day meal beneficiaries) majority of them 86.6 percent of children belonged to nuclear family and 13.4 per cent belonged to joint family. While in group II (Non- mid day meal beneficiaries) 56.6 per cent belonged to nuclear family and 43.4. In group I (Mid- day meal beneficiaries) majority of them, 75 percent of children belonged to Hindu religion, 20 per cent belonged to Muslim religion and 5 per cent were belonged to Christian religion. While in group II (Non- mid day meal beneficiaries) 68.3 per cent belonged to Hindu religion, 13.4 per cent belonged to Muslim, 10 and 8.3 per cent belonged to Christian and Other religions such as Sikh. In group I (Mid-day meal beneficiaries) maximum 33.4 per cent of children's fathers occupation were farmers, 66.6 per cent of children's father's occupation was having as labourers. While in group II (Non-mid day meal beneficiaries), 23.3 per cent children's fathers were farmers, 36.6, 16.6 and 13.5 per cent children's father occupations were as labourers in service and in business respectively. In group I (Mid- day meal beneficiaries) majority of them 68.4 per cent had 1-2 siblings, 31.6 per cent had 3 and above siblings. In group II (Non-mid day meal beneficiaries) 48.4 per cent had 1-2 siblings and 51.6 per cent had 3 and above siblings. in group I (Mid- day meal beneficiaries) maximum of respondents 1.67 per cent children who were excellent in school performance, 10, 31.6, 40 and 16.6 per cent were found to be very good, good, average and poor in school performance respectively. While in group II (Non- mid day meal beneficiaries) 3.4 per cent were found to be excellent in school performance, 13.4, 26.6, 43.3 and 13.3 per cent were found very good, good, average and poor in school performance respectively.

Anthropometric measurement of the respondents:

Comparison of Mean Weight according to Height of School going children's (7 - 12 years) of Group I and Group II:

The height and weight measurement of the boys and girls (7-12 years) which are recorded in the present study are given in the *Table 4.5.1 to 4.5.4* and *figure*.

Height : Study showed that, the observed mean height in comparison to standard values of NCHS at 50th percentile of group I (Mid - day meal beneficiaries). The observed mean height of 7- 12 years of boys and girls were more than NCHS standard values such as in 7 years of boys (124.8 cm) and girls (124.6 cm), 8 years of boys (131.6 cm), 9 years of girls (146.3 cm), 10 years of boys (141.89 cm) and girls (143.77 cm), 11 years of boys (147.4 cm) and girls (148.64 cm) and in 12 years of boys (155.57 cm) and girls (154.87 cm), except only 9 years of boys (132.4 cm) and 8 years of girls (127.8 cm). Among in group II (Non-mid day meal beneficiaries), *Table 4.5.2* and *fig 4.13* shows the observed mean height of boys and girls were less than the NCHS standard such as in 7 years of boys (121.66 cm), 8 years of boys (125.2 cm) and girls (125.12 cm), 9 years of boys (132.6 cm) and girls (131 cm), 10 years of boys (133 cm) and girls (138.46 cm), 11 years of boys (141.4 cm) and girls (145.8 cm) and in 12 years of boys (147.28 cm) and girls (152.28 cm), except only 7 years of girls (124.87 cm).

Weight : Study showed that, the observed mean weight in comparison to standard values of NCHS at 50th percentile of group I (Mid - day meal beneficiaries). The observed mean weights were more than NCHS standard values of boys and girls such as in 7 years of boys (24.09 kg) and girls (24.05 kg), 8 years of boys (27.84 kg) and girls (27.09 kg), 9 years of boys (29.84 kg) and girls (32.34 kg), 10 years of boys (35.31 kg) and girls (34.81 kg), 11 years of boys (38.55 kg) and girls (39.35 kg) and in 12 years of girls (45.42 kg), except only 12 years of boys and 10 years of girls. Among in group II (Non-mid day meal beneficiaries), *Table 4.5.4* and *fig 4.15* shows the observed mean weight of boys and girls were less than the NCHS standard such as in 7 years of boys (20.33 kg) and girls (20.87 kg), 8 years of boys (23.75 kg) and girls (25.75 kg), 9 years of boys (25.6 kg) and girls (27.79 kg), 10 years of boys (29.5 kg), 11 years of boys (35.42 kg) and girls (34.72 kg) and in 12 years of girls (43.54 kg), except only 12 years of boys (42.57 kg) and 10 years of girls (35 kg).

On applying paired t-test, it was found that the calculated values of (t), in most cases is greater than the table value at 5% probability level, therefore it can be concluded that there were significant differences in the average height and weight of boys and girls in Group I than Group II comparison to NCHS standard values. It was observed that the average height of boys and girls of all age group were more than the average height of boys and girls of same age groups in group II. The average weight of Group I of boys and girls of maximum age group were more than the Group II of boys and girls.

Average daily nutrient intake of the respondents-

Average nutrient intake per day of school going children (7-12 years) of Group I and Group II

According to the table most of the mean average daily intake of all the nutrients with reference to energy, protein, fat, calcium, iron, ascorbic acid and β - carotene was compared to (RDA). The average intake of school going children of Group I (Mid-day meal beneficiaries), age 7-9 years shows the average nutrient intake of boys, energy, protein, fat, calcium, β - carotene and vitamin C (1975 kcal/day, 48g/day, 33.5g/day, 429.1 mg/day, 2409 µg/day, 43.50 mg/day respectively) were more than the RDA, while intake of iron (24.1 mg/day) were less than the RDA. In girls average nutrient intake of energy, protein, fat, iron, β - carotene and vitamin C (1953 k cal/ day, 54.7 g/day, 36.1 g/day, 26.3 mg/day, 2431.2 µg/day and 40.3 mg/day) were more than the RDA, andcalcium (362.5 mg/day)were less than theRDA.While the same age group of average nutrient intake of school going children of Group II (Non- Mid day meal beneficiaries) of boys, energy, protein, fat, iron, calcium, β - carotene and vitamin C(1892 kcal/day, 38.8 g/day, 23.8 g/day, 23.1 mg/day, 337.5 mg/day, 2187 µg/day and 34 mg/day) were less than the RDA while in girls, energy, protein, iron and β - carotene (1912 kcal/day, 40.6 g/day, 24.0 mg/day and 2243.7 µg/day) and vitamin C (38 mg/day) were less than RDA while Fat and calcium (34.6 g/day and 461.1 g/ day) were more than the RDA.The average intake of school going children of Group I (Mid- day meal beneficiaries), age 10-12 years shows the average nutrient intake of boys, energy, protein, fat, calcium, iron and vitamin C (2209 kcal/day, 59.39 gm/ day, 27.07 g/day, 569.65 mg/day, 42.82 mg/day and 46 mg/day) were more than the RDA while β - carotene (2343.3 µg/day) were less than the RDA While in girls, energy, protein, fat, iron, β - carotene and vitamin C (1995.46 kcal/day, 52.46 gm/ day, 27.43 g/day, 25.33 g/day, 2384.37 µg/day and 55 mg/day) were more than the

RDA only except calcium (554.16 mg/day).While in Group II, the same age group of average intake of school going boys, energy, protein, calcium, iron, β - carotene and vitamin C (2175 kcal/day, 50.5 gm/day, 343.3 mg/day, 25.4 mg/day, 2226.6 µg/day and 35.9 mg/day) were less than the RDA only fat (27 gm/day) were more than the RDA While in girls, protein, fat and iron (51.3 gm/day, 26 g/day and 19.8 mg/day) were more than the RDA, while remaining nutrient such as energy, calcium, β - carotene and vitamin C (1904 k cal/day, 473.7 mg/day, 2109 µg/day and 37.2 mg/day) were less than the RDA.

On applying of t- test, significant difference were found between actual intake and RDA of 7-9 years of respondents energy, protein, fat, calcium, vitamin C, iron and β - carotene for both boys and girls of 7-9 years of both group (Group I and Group II) as the calculated value of t, while non significant difference was found between RDA and actual intake in case of iron in boys and β - carotene in girls of Group I, while in Group II also iron and β - carotene were found in both boys and girls. On applying of t- test, significant difference were found between actual intake and RDA of 10-12 years of respondents energy, protein, fat, calcium, vitamin C, iron and β - carotene for both boys and girls of 10-12 years of both group (Group I and Group II) as the calculated value of t, while non significant difference was found between RDA and actual intake in case β - carotene in boys and calcium in girls of Group I, while in Group II also calcium and β - carotene in boys and energy, calcium and β - carotene were found in girls.

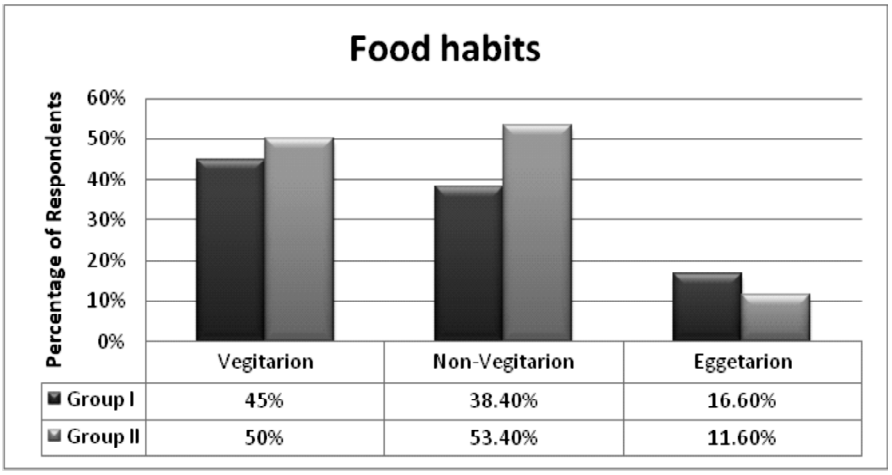

Fig. Distribution of respondents according to their food habits:

Table - Clinical signs and symptoms of Nutritional deficiency among MDM beneficiaries and Non- beneficiaries (7-12 Years):

S.N	Particulars	Group I N=60	%	Group II N=60	%	Total N=120	%
a.	Pale conjunctiva	4	6.6	3	5	7	5.8
b.	Pale/grayish skin	3	5	2	3.4	5	4.1
c.	Pale Palm	6	10	9	15	15	12.5
d.	Pale Nails	11	18.4	12	20	23	19.2
e.	Less lusture in Nails	8	13.3	2	3.4	10	8.3
f.	Loss of appetite	3	5	2	3.4	5	4.1
g.	Shortness of breath on excretion	2	3.4	1	1.6	3	2.5
h.	Headache	2	3.4	4	6.6	6	5
i.	Weakness/ tiredness	17	28.3	18	30	35	29.3
j.	Poor Memory	4	6.6	7	11.6	11	9.2

CONCLUSION

To sum up all the observations it is concluded that Group I (Mid-day Meal beneficiaries), the mean daily intake of energy, protein, fat, calcium, iron, β- carotene and Vitamin C were more than the RDA of both boys and girls, while in Group II (Non mid- day meal beneficiaries) regarding protein, fat and Vitamin C were lesser than the RDA of also both boys and girls. It is also observed from findings that in Group I average height and weight wad better than the Group II. So it is concluded that the nutritional status of Mid-day Meal beneficiaries were better than the Non mid-day meal beneficiaries.

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Preparation and Standardization of Herbal Vegetable Juice

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ABSTRACT

Bottle gourd is an excellent vegetable for hypertensive patients. Vegetable juice is often mixed with fruits such as tomatoes or carrot to improve flavour. Juices are valuable in relief of hypertension, cardiovascular and kidney diseases and obesity. The bottle gourd fruit juice is used in the treatment of insanity, epilepsy and other nervous diseases, in treatment of acidity, indigestion and ulcers. Fiber helps in preventing constipation and other digestive disorders such as flatulence and piles. It also helps in overcoming jaundice and the juice is helpful in losing weight. Ginger, Aloe Vera and mint herbs were added separately in different product of vegetables juice namely Bottle gourd, Carrot, Tomato. And mixed of three herbs (Ginger, Aloe Vera and mint) were added in vegetable juice of Bottle gourd, Carrot, Tomato. The product was prepared by using standard drink. The higher proportion of herbal extract gives positive effective to the color of vegetable juice. Hence, most acceptable treatment was T_2 (10 % incorporation level of mint extract) for vegetable juice. In same way, vegetable juice T_2 (10% incorporation level of mixed extract) was the most acceptable. Vegetable juice was successfully prepared by using different kinds of herbs and flavour such as Ginger, Aloe Vera and Mint **Chandel (2006)**. All experimental treatments was successfully acceptable on sensory parameter like colour, consistency and flavour sensory attributes with reference to overall acceptability was found in treatment. The nutritional content of vegetable juice in ginger extract Vitamin 'A' is the highest nutrient content where T_3 followed (1,047mg) and lowest T_0 was (1,041mg). In nutrient content Aloe Vera extract with vegetable juice Vitamin A is the highest (1,045mg) in T_2 and only (1,041mg) in T_0. Similarly Vitamin 'A' is the highest content (1,203mg) in T_2 and lowest content (234mg) in T_3 in the

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nutrient mint extract of vegetable juice. In nutrient content mixed extracts of vegetable juice value of the Vitamin A content T_3 is highest (102mg) where T_2 was lowest (6 mg) **Gopalan (2004)**. This is good for therapeutic purposes and can be included in the diets of people with various degenerative diseases as diabetes the hyperglycaemic compounds in vegetable juice. Vegetable juice is highly beneficial in lowering sugar levels in blood and urine and also promote, glucose tolerance and to control the levels of insulin. Hence it can be concluded that incorporated Herbal vegetable can be successfully in the prepared juice extract.

Keywords: *Vegetable (Bottle gourd,Carrot,Tomato) juice, herbs extract, Nutritive value.*

INTRODUCTION

Vegetable juice is a drink made primarily of blended vegetables. Vegetable juice is often mixed with fruits such as tomatoes or carrot to improve flavour. Vegetable juice at home is an alternative to buying commercial juices, and may be beneficial for supplementing diets low in vegetables and fruits. Compared to a higher speed blender or fruit juices, the slower speed protects the vegetables from oxidation and heat (from friction), which reduces nutrient breakdown. Juices are valuable in relief of hypertension, cardiovascular and kidney diseases and obesity.The high buffering capacities of the juices reveal that they are very valuable in the treatment of hyperchlrohydri **Jackson (2006)**.

Bottle gourd is a wonder vegetable that is curing people worldwide. It is rich in dietary fiber with very low content of fat and cholesterol. Approximately 96 percent of Bottle gourd is water and is therefore a great thirst quencher. It also contains sodium and potassium. It is a good source of vitamin B. Hundred grams of edible portion of Bottle gourd contains 87.9 gm moisture, 2.3 gm protein, 0.7 gm fat, 1.7 gm mineral, 1.3 gm fiber, 6.1 gm carbohydrates, 39 Kcal energy, 80 mg calcium and 59 mg phosphorus, Bottle gourd is one of the favorite vegetable of Indians and have numerous health benefits **Gopalan *et al.* (2004)**.

Tomatoes are low in carbohydrates and helps to control the glucose level. Raw tomato is especially effective in reducing inflammation of liver due to hepatitis and cirrhosis; best taken for 1-3 days exclusive of other food, either bulk or raw juice; may be mixed with carrot juice for flavor and extra therapeutic benefit.

Carrot juice has very good anti-inflammatory, anti-cancerous and anti-aging properties. Carotene is a known anti-oxidant, which can prevent degenerative processes in the cells and has great anti-aging effects. The compounds containing in carrot juice also have antiseptic and anti-bacterial properties. That is why it can be effective to treat wounds and insect bites with some carrot juice, which in such case will also bring some slight relief for pain and help to avoid swelling. Also, drinking raw carrot juice can be helpful for lowering the symptoms of stresses and normalizing the function of your digestive system. Carrot juice is thought to reduce the risks of many different types of cancer including skin and breast cancer. The cancer-fighting properties of carrot juice are often thought to be excellent due to the high amounts of beta carotene. Beta carotene changes to Vitamin A in the body. Studies have connected Vitamin A with cancer prevention by its antioxidant properties that help to eliminate cancer-causing free radicals in the body.

Ginger, Aloe Vera and Mint are also beneficial for health. Mint is good flavor to the taste, it is a powerful antibacterial such as malaria, cholera, diphtheria, typhoid for centuries. Of course it is a natural breath freshener. It is also a natural diuretic and has been used to relieve Irritable Bowel Syndrome and colitis. The oil may reduce and relieve the pain of hemorrhoids. There herbs contains good amounts of Vitamin A, C, B12, Folic acid, Thiamine and Riboflavin, as well as, minerals such as, calcium, copper, fluoride, iron, manganese, phosphorus, potassium, selenium and zinc. Ginger is used for treating dyspepsia and colic diseases and is especially recommended to people who suffer from gall bladder stones. Using human WBC (white blood corpuscles) the ayurvedic herb helps in increasing the killing of macrophages, the stem is used in conditions like generalized weakness, pyrexia's of unknown origin (fevers) swine flu and many urinary tract infections. The biggest health benefits from aloe Vera juice or capsules are that aloe fights inflammation that is caused by health ailments like colitis, gastritis and arthritis. Bottle gourd, Carrot and Tomato are very good for balancing liver function. When the liver is inflamed that cannot efficiently process food for maximum nutrition and its assimilation. Bottle gourd, Carrot and Tomato juice used daily for treating many gastrointestinal disorders. The juice was useful in treating insanity (madness) epilepsy and other nervous diseases. Therefore, it is essential to enrich it by extract of some herbal extracts Ginger, Aloe Vera, and Mint to enhance its color, texture flavor and nutritional composition of Bottle gourd juice. These herbs Ginger, Aloe Vera, and Mint are rich sources of vitamin C, B, E, D, K and folic acid, carotene, fat, calories, protein cholesterol, mineral, iron. Some of these vitamin and minerals shows powerful antioxidants, beta-carotene, tryptophan, anti-bacterial, anti-

inflammatory enzyme and antiseptic properties prevent cell damage by free radicals. These herb were improves human health. Bottle gourd is rich source of Vitamin C and B-complex, dietary fiber, iron and protein content.

Following objectives were considered for the study.

1. To prepare herbal drink by using combination of vegetable juices and herbs.
2. To evaluate sensory acceptability of the prepared herbal vegetable juice.
3. To determine the nutritive value of the prepared herbal vegetable juice.

MATERIALS & METHODS

The detail of materials experiments, procedure and techniques followed during the course of the present investigation has been elaborated in this chapter under the following heads:

1. Experimental site:

The experiment was carried out in the foods laboratory, Nutrition Research Laboratory of Foods and Nutrition Department, Ethelind School of Home Science Sam Higginbottem Institute of Agriculture, Technology and Sciences, Allahabad U.P

2. Procurement of raw material:

Bottle gourd, Carrot, Tomato, Ginger, Aloe Vera, Mint, were purchased from the local market of Allahabad.

3. Experimental design:

The basic recipe was standardized and served as control (To) three treatment i.e. incorporation of Vegetable juice as different level was referred to as T1, T2, and T3 respectively for each of three products.

4. Details of Treatments:

T_1G_1 - Treatment with Ginger extract of 5% + 95% Vegetable juice

T_2G_2 - Treatment with Ginger extract of 10%+ 90% Vegetable juice

T_3G_3 - Treatment with Ginger extract of 15% +85% Vegetable juice

T_1Al_1- Treatment with Aloe vera extract of 5% + 95% Vegetable juice

T_2Al_2- Treatment with Aloe vera extract of 10% + 90% Vegetable juice

T_3Al_3 - Treatment with Aloe vera extract of 15% + 85% Vegetable juice

T_1M_1 - Treatment with Mint extract of 5% + 95% Vegetable juice

T_2M_2 - Treatment with Mint extract of 10% + 90% Vegetable juice

T_3M_3 - Treatment with Mint extract of 15% + 85% Vegetable juice

T_1Mix_1- Treatment with Mix extract (Ginger, Aloe Vera, Mint) of 5% + 95% Vegetable juice

T_2Mix_2- Treatment with Mix extract (Ginger, Aloe Vera, Mint) of 10% + 90% Vegetable juice

T_3Mix_3- Treatment with Mix extract (Ginger, Aloe Vera, Mint) of 15% + 85% Vegetable juice

- **Replications:** Each experiment was replicated 3 times:

4. Preparation of Herbal Extract

Procurement of Herbs

↓

Ginger, Aloe Vera, Mint

↓

Peeling

↓

Washing

↓

Crushing blindrisetion

↓

Juice extraction

↓

Sieving

↓

Collection of extract

Fig: Preparation of Herbal Extract

Source: Srivastava R.P. (2009)

Procurement of vegetables

↓

Peeling

↓

Washing

↓

Cutting

↓

Juice Extraction by mixer grinder with little water

↓

Sieving

↓

Collection of vegetable juice

Fig- Preparation of vegetable juice

Source- Srivastava R.P., (2009)

5. Preparation of herbal drinks:

In the process of making a vegetable juice of Bottle gourd, Carrot and Tomato, first of all these vegetable were peeled washed and then it was cut in a small pieces. A little bit amount of water was added in a small pieces vegetable and mixed with mixer grinder. Finally I collected 100 ml vegetable juice by sieving.

7. Sensory evaluation of herbal drink :

The sensory evaluation of herbal health drink (Ginger, Aloe vera, and Mint) was done by a panel of judges using a 9-point Hedonic Scale. Five experienced staff members of Ethelind School of Home Science were served as a judging team and evaluated the sample of different treatment of herbal drink. Numerical score were allocated for flavor, texture and taste and overall acceptability of herbal drink. The numerical score were used as an indicator of the quality. The judges were also identifying the sensory qualities they considered to be unsatisfactory **Srilakshmi, (2003)**.

8. Method of calculation of nutritive value of the herbal vegetable juice:

Calculation of Protein, Fat, Fiber, Carbohydrate, Energy as calculated as per the reference value given in food composition table **Gopalan *et. al.*, (2004).**

9. Statistical Analysis of herbal vegetable juice:

The data obtained from the experiment were subjected to statistical analysis by using analysis of variance techniques (i.e. two way classification and RBD). Significant difference between treatments was determined by using critical difference test **Chandel, (2006)**.

RESULTS & DISCUSSION

Table No. 1 : Average sensory score of Vegetable juice with incorporate Ginger extract.

Sensory	**T_0**	**T_1**	**T_2**	**T_3**
	Mean±SE	**Mean±SE**	**Mean±SE**	**Mean±SE**
Colour and appearance	7.9±0.36	7.7±0.66	7.06±1.65	7.8±0.99
Statistical analysis	F=6.84,	Significant,	P≤ 0.05,	CD=0.445
Consistency	7.6±0.66	7.7±0.66	8.0±0.66	7.5±1.32
Statistical analysis	F= 5.2,	Significant,	P≤ 0.05,	CD=0.259
Taste and flavour	7.6±0.33	7.8±0.66	7.4±0.99	5.5±9.94
Statistical analysis	F= 4.97	Significant,	P≤ 0.05	CD=0.353
Overall acceptability	7.7±1.98	7.6±0.33	9.7±10.6	7.3±2.32
Statistical analysis	F= 0.98	Non-Significant,	P≤ 0.05	CD=3.313

The highest score obtained for colour and appearance of vegetable juice with incorporate ginger extract from was recorded (7.9) in T_0 followed by (7.8) in T_3, (7.7) in T_1 and (7.0) in T_2. The highest score obtained for consistency of vegetable juice with incorporate ginger extract was recorded (8.0) in T_2 followed by (7.7) in T_1, (7.6) in T_0, (7,5) in T3. The highest score obtained for taste and flavour of from vegetable juice with incorporate ginger extract was recorded (7.8) in T_1 followed by (7.6) in T_0, (5.5) in T_3, (7.4) in T_2. The highest score obtained for over all acceptability of vegetable juice with incorporate ginger extract was recorded (9.7) in T_2 followed by (7.7) in T_0, (7.6) in T_1 and (7.3) in T_3.

Table No. 2-Nutrient content of vegetable juice value added with Ginger extract.

	Treatments			
Nutrients/100g	**T_0**	**T_1**	**T_2**	**T_3**
Energy (kcal)	41.5	44.85	48.2	51.55
Protein(g)	1.5	1.615	1.73	1.845
Carbohydrate(g)	8.35	8.965	9.58	10.195
Fat (g)	0.2	0.245	0.29	0.335
Fiber(g)	1.25	1.37	1.49	1.61
Calcium(mg)	60	61	62	63
Iron (mg)	1.645	1.82	1.995	2.17
Riboflavin(mg)	10.01	11.51	13.01	14.51
Vitamin 'A'(gm)	1,041	1,043	1,045	1,047
Vitamin 'C'(mg)	17	17.3	17.6	17.9

Table 2- shows that T_3 (51.55 kcal) was high in content of energy (kcal) followed by T_2 (48.2 kcal) followed by T_1 (44.85 kcal), T_4 (41.kcal 5). and then T_3 with (1.845g), T_1 (1.615g), was high in protein followed by T_2 (1,73g), T_0 (1.5g), and then T_3 with (10.195g), T_2 (9.58g) was high in Carbohydrate. followed by T_1 (8.965g), T_0 (8.35g) and then T_3 with (0.335g) T_1 (0.245g) was high in fat followed by T_2 (0.29g), T_0 (0.2g), and then T_3 with (1.61g), T_2 (1.49g), was high in fiber followed by T_1 (1.37g), T_0 (1.25g) and then T_3 with (63mg), T_2 (62mg), Was high in calcium followed by T_1

(61mg), T_0 (60 mg) and then T_3 with (2.17mg). T_2 (1.995mg) was high Iron Followed by T_1 (1.82mg), T_0 (1.645mg), and then T_3 with (14.51mg) T_2 (13.01 mg) was high in Riboflavin followed by T_1 (11.51 mg), T_0 (10.01mg), and then T_3 with (1,047mg), T_2 (1,045 mg) was high in Vitamin 'A' followed by T_1 (1,043 mg), T_0 (1,041mg), and then T_3 with (17.9mg), T_2 (17.6mg) was high in Vitamin "C' followed by T_1 (17.3), T_0 (17). **Gopalan *et al.*, (2004).**

Table No.3 : Average sensory score of Vegetable juice with incorporate AloeVera extract.

Sensory	**T_0**	**T_1**	**T_2**	**T_3**
	Mean±SE	**Mean±SE**	**Mean±SE**	**Mean±SE**
Colour and appearance	7.6±3.58	7.7±0.36	7.8±0.36	7.6±0.36
Statistical analysis	F= 7,	Significant,	P≤ 0.05,	CD=0.130
Consistency	6.9±0.99	7.1±1.65	7.8±0.76	7.5±0.36
Statistical analysis	F= 8.21	Significant,	P≤ 0.05	CD=0.438
Taste and flavour	7.8±0.36	7.6±1.32	7.5±0.99	7.1±0.33
Statistical analysis	F= 5.28	Significant	P≤ 0.05	CD=0.406
Overall acceptability	7.7±0.66	7.75±0.46	7.3±1.09	7.1±0.33
Statistical analysis	F= 6.32	Significant	P≤ 0.05	CD=0.361

The highest score obtained for colour and appearance of vegetable juice with incorporate alovera extract from was recorded (7.8) in T_2 followed by (7.7) in T_1, (7.6) in T_0, (7.6) in T_3. The highest score obtained for consistency of vegetable juice with incorporate alovera extract was recorded (7.8) in T_2 followed by (7.5) in T_3, (7.1) in T_1, (6.9) in T_0, in. The highest score obtained for taste and flavour of from vegetable

juice with incorporate alovera extract was recorded (7.8) in T_0 followed by (7.6) in T_1, (7.5) in T_2, (7.1) in T_3, in. The highest score obtained for over all acceptability of vegetable juice with incorporate alovera extract was recorded (7.7) in T_0 followed by (7.7) in T_1, (7.3) in T_2, (7.1) in T_3.

Table No.4 - Nutrient content of vegetable juice value added with Aloe Vera extract.

	Treatments			
Nutrients	**T_0**	**T_1**	**T_2**	**T_3**
Energy (kcal)	41.5	48.05	54.6	61.15
Protein(g)	1.5	1.5445	1.58	1.63
Carbohydrate(g)	8.35	9.846	11.54	13.13
Fat (g)	0.2	0.215	0.23	0.24
Fiber(g)	1.25	1.275	1.3	1.32
Calcium(mg)	60	60.15	80	70
Iron (mg)	1.645	1.845	101.64	3.205
Riboflavin(mg)	10.01	10.01	10.06	10.08
Vitamin 'A'(mg)	1,041	1,043	1,045	1,041
Vitamin 'C'(mg)	17	19.05	21.1	23.15

Table.4- shows that T_3 (61.15kcal) was high in content of energy (kcal) followed by T_2 (54.6kcal) followed by T_1 (48.05kcal), T_0 (41.5kcal). And then T_1 with (1.5445g), T_3 (1.63g), was high in protein followed by T_2 (1.58g), T_0 (1.5g), and then T_3 with (13.13g), T_2 (11.54g) was high in Carbohydrate. followed by T_1 (9.846g), T_0 (8.35g) and then T_1 with (0.21g 5) T_3 (0.24g) was high in fat followed by T_2 (0.23g), T_0 (0.2g), and then T_1 with (1.275g), T_3 (1.32g), was high in fiber followed by T_0 (1.25g), T_2 (1.3g) and then T_2 with (80mg), T_3 (70mg), Was high in calcium followed by T_1 (60.15mg), T_0 (60mg) and then T_2 with (101.64mg), T_3 (3.205mg) was high in Iron followed by T_1 (1.845mg), T_0 (1.645mg) and then T_1 with (10.01 mg) T_3 (10.08mg) was high in Riboflavin followed by T_2 (10.06mg), T_0 (10.01 mg), and then T_0 with

(1,041 mg), T_2 (1045 mg) was high in Vitamin A followed by T_1 (1,043mg), T_3 (1,041mg) and then T_3 with (23.15mg), T_2 (21.1mg) was high in Vitamin "C' followed by T_1 (19.05mg), T_0 (17mg).

Table No.5 : Average sensory score of Vegetable juice with incorporate Mint extract.

Sensory	T_0	T_1	T_2	T_3
	Mean±SE	**Mean±SE**	**Mean±SE**	**Mean±SE**
Colour and appearance	8.4±0.66	7.8±1.12	7.6±1.12	6.8±1.72
Statistical analysis	F= 7.41	Significant	P≤ 0.05	CD=0.731
Consistency	7.6±0.99	7.9±0.36	7.7±0.33	7±1.12
Statistical analysis	F=6.23	Significant	P≤ 0.05	CD=0.489
Taste and flavour	7.8±0.66	7.2±0.66	7.5±1.32	7.2±0.66
Statistical analysis	F=5.55	Significant,	P≤ 0.05	CD=0.541
Overall acceptability	7.8±0.66	7.8±1.42	7.6±0.23	6.9±1.22
Statistical analysis	F= 4.86	Significant,	P≤ 0.05	CD=0.586

The highest score obtained for colour and appearance of vegetable juice with incorporate mint extract from was recorded (8.4) in T_0 followed by (7.8) in T_1, (7.6) in T_2, (6.8) in T_3, in. The highest score obtained for consistency of vegetable juice with incorporate mint extract was recorded (7.9) in T_1 followed by (7.7) in T_2, (7.6) in T_0, (7) in T_3, in. The highest score obtained for taste and flavour of from vegetable juice with incorporate mint extract was recorded (7.8) in T_0 followed by (7.5) in T_2, (7.2) in T_1, (7.2) in T_3. The highest score obtained for over all acceptability of vegetable juice with incorporate mint extract was recorded (7.8) in T_0 followed by (7.8) in T_1, (7.6) in T_2, (6.9) in T_3.

Table No.6 - Nutrient content of vegetable juice value added with Mint extract.

	Treatments			
Nutrients	**T_0**	**T_1**	**T_2**	**T_3**
Energy (kcal)	41.5	43.9	46.3	7.2
Protein(g)	1.5	1.74	1.98	0.72
Carbohydrate(g)	8.35	8.64	8.93	0.87
Fat (g)	0.2	0.23	0.8	0.09
Fiber(g)	1.25	1.35	1.45	0.3
Calcium(mg)	60	70	80	30
Iron (mg)	1.645	101.64	3.205	2.34
Riboflavin(mg)	10.01	110.01	10.03	0.03
Vitamin 'A'(mg)	1,041	1,141	1,203	234
Vitamin 'C'(mg)	17	18.35	19.7	4.05

Table 6 - shows that T_2 (46.3kcal) was high in content of energy (kcal) followed by T_1 (43.9kcal) followed by T_0 (41.5kcal), T_3 (7.2kcal). And then T_2 with (1.98g), T_1 (1.74g), was high in protein followed by T_0 (1.5g), T_3 (0.72g), and then T_2 with (8.93g), T_1 (8.64g) was high in Carbohydrate. followed by T_0 (8.35g), T_3 (0.87g) and then T_1 with (0.23g) T_3 (0.09g) was high in fat followed by T_2 (0.08g), T_0 (0.2g), and then T_2 with (1.45g), T_1 (1.35g), was high in fiber followed by T_0 (1.25g), T_3 (0.3g) and then T_2 with (80mg), T_1 (70mg), Was high in calcium followed by T_0 (60mg), T_3 (30mg) and then T_1 with (101.64mg), T_2 (3.205mg) was high in Iron followed by T_3 (2.34mg), T_0 (1.645mg). and then T_1 with (110.01) T_2 (10.03mg) was high in Riboflavin followed by T_0 (10.01mg), T_3 (0.03mg), and then T_2 with (1,203mg), T_1 (1,141mg) was high in Vitamin 'A' followed by T_0 (1,041mg), T_3 (234mg), and then T_2 with (19.7mg), T_1 (18.35mg) was high in Vitamin "C' followed by T_0 (17mg), T_3 (4.05mg).

Table No.7 : Average sensory score of Vegetable juice with incorporate Mixed extract.

Sensory	T_0	T_1	T_2	T_3
	Mean±SE	Mean±SE	Mean±SE	Mean±SE
Colour and appearance	7.6±1.65	7.3±1.32	7.4±0.33	6.8±0.99
Statistical analysis	F= 7.89	Significant,	P≤ 0.05	CD=0.398
Consistency	7.4±0.66	7.2±0.66	7.6±0.66	7±0.66
Statistical analysis	F=6.66	Significant,	P≤ 0.05	CD=0.301
Taste and flavour	7.5±0.99	7.4±0.66	7.1±0.36	6.8±0.99
Statistical analysis	F=5.77	Significant,	P≤ 0.05	CD=0.406
Overall acceptability	7.5±0.33	7.4±1.32	7.3±0.66	6.8±1.32
Statistical analysis	F= 4.78	Significant,	P≤ 0.05	CD=0.424

The highest score obtained for colour and appearance of vegetable juice with incorporate overall extract from was recorded (7.6) in T_0 followed by (7.4) in T_2, (7.3) in T_1, (6.8) in T_3. The highest score obtained for consistency of vegetable juice with incorporate overall extract was recorded (7.6) in T_2 followed by (7.4) in T_0, (7.2) in T_1, (7) in T_3, in. The highest score obtained for taste and flavour of from vegetable juice with incorporate overall extract was recorded (7.5) in T0followed by (7.4) in T_1, (7.2) in T_2, (6.8) in T_3. The highest score obtained for over all acceptability of vegetable juice with incorporate overall extract was recorded (7.5) in T_0 followed by (7.4) in T_1, (7.3) in T_2, (6.8) in T_3.

Table No.8 - Nutrient content of vegetable juice value added with mixed extract.

	Treatments			
Nutrients	**T_0**	**T_1**	**T_2**	**T_3**
Energy (kcal)	11.5	13.1	10.05	34.65
Protein(g)	0.95	0.089	0.345	1.384
Carbohydrate(g)	1.8	3.192	1.845	6.837
Fat (g)	0.05	0.03	0.135	0.215
Fiber(g)	0.35	0.05	0.36	0.76
Calcium(mg)	10	0.3	3	13.3
Iron (mg)	0.9	0.4	0.525	1.825
Riboflavin(mg)	5	0.05	4.5	9.55
Vitamin 'A'(mg)	96	0	6	102
Vitamin 'C'(mg)	15.5	4.1	0.9	20.5

Table.8- shows that T_3 (34.65kcal) was high in content of energy (kcal) followed by T_1 (13.1kcal) followed by T_0 (11.5 kcal), T_2 (10.05kcal) and then T_3 with (1.384g), T_2 (0.345g), was high in protein followed by T_3 (0.95g), T_1 (0.089g), and then T_1 with (3.192g), T_2 (1.845g) was high in Carbohydrate. followed by T_3 (6.837g), T_0 (1.8g) and then T_3 with (0.215g) T_2 (0.135g) was high in fat followed by T_3 (0.03g), T_0 (0.05g), and then T_3 with (0.76g), T_2 (0.36g), was high in fiber followed by T_3 (0.35g), T_1 (0.05g) and then T_1 with (13.3mg), T_0 (10mg), Was high in calcium followed by T_3 (3mg), T_4 (0.3mg) and then T_1 with (1.825mg), T_2 (0.525mg) was high in Iron followed by T_3 (0.9mg), T_4 (0.4mg). and then T_3 with (9.55mg) T_2 (5) was high in Riboflavin followed by T_3 (4.5mg), T_4 (0.05mg), and then T_3 with (102mg), T_0 (96mg) was high in Vitamin 'A' followed by T_2 (6mg), T_4 (0mg), and then T_3 with (20.5mg), T_2 (15.5mg) was high in Vitamin "C' followed by T_1 (4,1mg), T_4 (0.9mg).

CONCLUSION

- Vegetable juice was successfully prepared by using different kinds of herbs and flavour like Ginger, Aloe vera and Mint.

- All experimental treatments was successfully acceptable on sensory parameter like colour, consistency and flavour sensory attributes with reference to overall acceptability was found in treatment T_2 mint extract of 10 percent + 90 percent vegetable juice and treatment T_2 mix extract of 10 percent + 90 percent vegetable juice.
- The nutritional content of vegetable juice in ginger extract Vitamin A is the highest of the increase level nutrient content where T_3 followed (1,047mg) and lowest of the decrease level T_0 was (1,041mg). In nutrient content aloe vera extract with vegetable juice Vitamin A is the highest (1,045mg) in T_2 and only (1,041mg) in T_0. Similarly Vitamin A is the highest content (1,203mg) in T_2 and lowest content (234mg) in T_3 in the nutrient mint extract of vegetable juice. In nutrient content mixed extracts of vegetable juice value of the Vitamin A content T_3 is highest (102mg) where T_2 was lowest (6mg).

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Nutritional enrichment of Bengal gram flour based products with Rice-bran powder

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ABSTRACT

Rice bran is the hard layer of grain and consists aleurone and pericarp. It is rich in protein, fat, starch, free sugar, B-vitamins and dietary fiber. Therefore rice bran has a tremendous potential for utilization as food by virtue of its nutritional quality. Gram commonly known as "chick pea" or Bengal gram is the most important pulse crop of India. Chick pea is mostly consumed in the form of processed whole seed (boiled, yeasted, fried, steamed, sprouted etc) or dal flour (besan). Gram is the good source of protein, carbohydrate and fat. Rice bran powder was incorporated into four recipes viz. chilla, chakli, pakori and laddoo using their standard recipes and methods of preparation. Rice bran was incorporated with Bengal gram flour at four different levels- T_1 (7.5% rice bran & 92.5% Bengal gram), T_2 (15% rice bran & 85% Bengal gram), T_3 (22.5 rice bran & 77.5% Bengal gram) and T_4 (30% rice bran & 70% Bengal gram). The products were subjected to organoleptic test by a panel of judges using the Nine-point Hedonic Scale and chemical analysis was done by standardized methods **AOAC (1980)**. Cost was estimated on the basis of prevailing prices of raw materials purchased from the local market of Allahabad. Based on sensory scores, (in treatments) all the products were acceptable with T_1 having the maximum overall acceptability, for chilla, chakli, pakori and laddoo. The treatment control (T_0) was found to be more acceptable than T_1 based on sensory scores of all the products. So it was concluded from the results that the products formulated by incorporating rice bran at different levels were at par with control food products. Nutrient analysis of products showed an increase in energy, fat and fiber but decreased in carbohydrate. So it was concluded from the result that incorporation of 7.5% of rice bran powder can be suitable for product formulation.

Key words- *Rice bran, bengal gram flour, incorporation, product development*

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INTRODUCTION

Rice bran powder, a by product of the rice milling industry constitutes 8.8-11.5 percent by weight of brown rice and consists of outer bran layers of the kernel and part of the germ. It is rich in protein, fat, starch, free sugars, B-vitamins and minerals and dietary fiber. Therefore rice bran powder has a tremendous potential for utilization as food by virtue of its nutritional quality. Since rice bran protein is of relatively high nutritional value, it is incorporated in bread, muffins, breakfast and snack food and biscuits. The protein efficiency ratio values reported for bran protein generally range from 1.6 to 1.9 compared to a casein value of 2.5. the digestibility of protein in rice bran powder is reported to be around 73 percent. Defatting of rice bran powder and using in many foods could be possible which not only improves the nutritional quality but also increases the shelf-srability.

OBJECTIVES

1. To prepare and identify the most suitable combination of fortifying gram flour with rice-bran powder for the prepared products (Chilla, Chakli, Pakori and Laddoo).
2. To evaluate the organoleptic attributes of the products.
3. To assess the nutritional analysis of Bengal gram flour based products enriched with rice bran powder.

MATERIALS AND METHODS

The present study entitled "Nutritional enrichment of Bengal gram flour based products with Rice-bran powder" was carried out in the Nutrition Research Laboratory in the Department of Foods and Nutrition, Ethelind School of Home Science, Sam Higginbottom Institute of Agriculture Technology & Sciences (Deemed to be University) Allahabad.

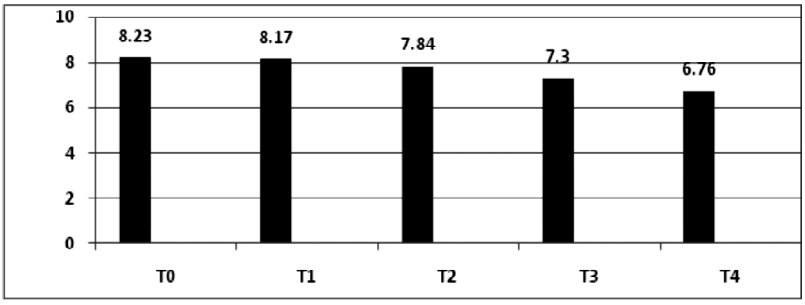
1. **Procurement of raw materials:** Bengal gram flour, rice bran powder and other products (Flour, refined oil, dry fruits, spices, sugar and salt) were purchased from the the local markets of Allababad city.
2. **Development of foods products:** Basically Bengal gram and Rice bran powder were used for developing products namely chilla, chakli, pakori and laddoo.

3. **Experimental site:** The investigation was carried out in the Nutrition Research Laboratory of the Department of Foods and Nutrition, Ethelind School of Home Science, Sam Higginbottom Institute of Agriculture Technology & Sciences (Deemed to be University) Allahabad.
4. **Treatments and replications of products:** Bengal gram flour and Rice bran powder were used for development of products namely chilla, chakli, pakori and laddoo. The whole experiment was replicated 5 times with treatments as T_0, T_1, T_2, and T_4 at 7.5%, 15%, 22.5% and 30% respectively. T_0 was considered as control. T_1 : consist of a mixture of 7.5% rice bran & 92.5% Bengal gram, T_2: 15% rice bran & 85% Bengal gram, T_3 : 22.5 rice bran & 77.5% Bengal gram and T_4 : 30% rice bran & 70% Bengal gram
5. **Nutrients analysis:** Nutrients analysis for protein, fat, carbohydrate and fiber was determined by AOAC method. Protein and fat was determined by kjeldahl method and soxhlet method.
6. **Sensory evaluation of cooked products:** Sensory evaluation of Bengal gram flour products viz- chilla, chakli, pakori and laddoo was done by a panel of 5 judges. The judges were requested to score the product with the help of 9 point hedonic scale.
7. **Statistical Analysis:** The data obtained from the experiment was statistically analyzed using analysis of variance technique Two-way Classification and Critical Difference.

RESULTS AND DISCUSSION

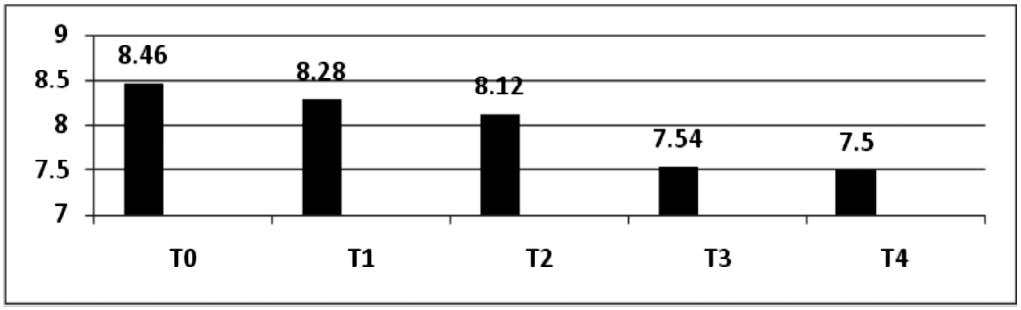
1. ORGANOLEPTIC CHARACTERISTICS OF THE PRODUCTS:-

Graph 1.1: The effect of incorporation of Rice bran powder at different levels on the Overall acceptability of "Chilla".



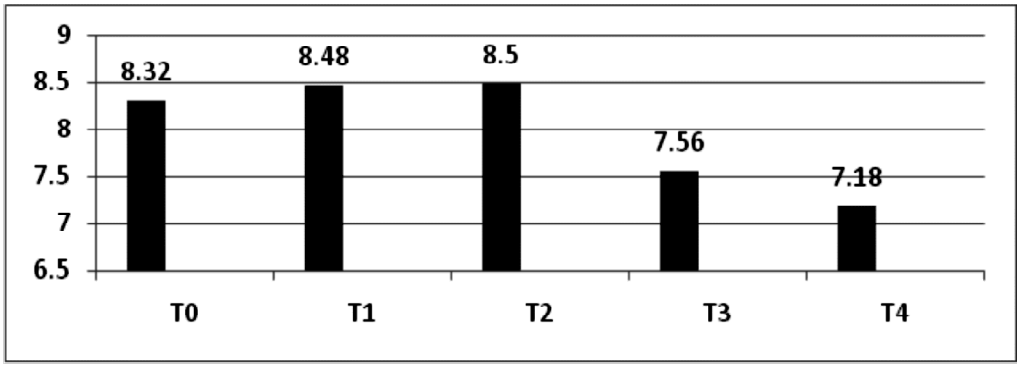
Graph 1.1 indicated that the average sensory scores of different parameters in control and treated sample of Chilla, clearly indicate that T_0 had the highest score for overall acceptability of laddoo than T_1(8.17), T_2(7.84), T_3(7.3) and T_4(6.76).

Graph 1.2: The effect of incorporation of Rice bran powder at different levels on the Overall acceptability of "Chakali".



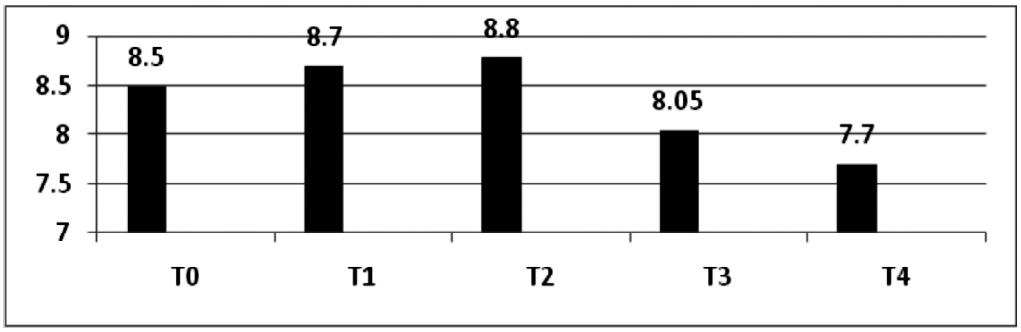
Graph 1.2 indicated that the average sensory scores of different parameters in control and treated sample of chakali clearly indicate that T_0 had the highest score for overall acceptability of Chakli than T_1 (8.28), T_2 (8.12), T_3 (7.54) and T_4 (7.5).

Graph 1.3: The effect of incorporation of Rice bran powder at different levels on the Overall acceptability of "Pakori".



Graph 1.3 indicated that the average sensory scores of different parameters in control and treated sample of pakori, clearly indicate that T_2 had the highest score for overall acceptability of pakori than T_0 (8.32), T_1 (8.48), T_3 (7.56) and T_4 (7.18) making it quite obvious that the addition of 15% rice bran powder increase the overall acceptability of pakori.

Graph 1.4: The effect of incorporation of Rice bran powder at different levels on the Overall acceptability of "Laddoo".



Graph 1.4 indicated that the average sensory scores of different parameters in control and treated sample of laddoo, clearly indicate that T_2 had the highest score for overall acceptability of laddoo than T_0 (8.5), T_1 (8.7), T_3 (8.05) and T_4 (7.7), making it quite obvious that the addition of 15% rice bran powder increase the overall acceptability of laddoo.

2. NUTRITIONAL COMPOSITION OF PRODUCTS

Table 2.1: Average percentage of nutrients in control and treated sample of "Chilla"

Nutrients / Treatments	Carbohydrate (g)	Energy (Kcal)	Protein (g)	Fat (g)	Fiber (g)
T_0	34.92±0.74	425±0.20	8.93±0.72	27.50±0.22	0.68±0.33
T_1	34.32±0.64	426±0.20	8.74±0.83	28.10±1.20	1.03±0.17
T_2	33.86±0.73	427±0.17	8.62±0.58	28.50±0.33	1.12±00
T_3	33.37±0.72	428±0.26	8.46±0.24	28.90±0.59	1.23±0.10
T_4	33.01±0.50	430±0.17	8.32±0.17	29.30±0.68	1.34±00

Table 2.1 shows that the average nutritional composition (g/100) of chilla with or without incorporation of rice bran in Bengal gram flour. Result reveal the carbohydrate and protein contents of chilla with incorporation of rice bran were less than the control group. Calorific values of product were found to provide good amount of calorie to an individual from 100g of product. Fat and fiber content of the product

chilla with incorporation of rice bran were more than the control group. The statistical analysis showed significant difference between treatments with regard to nutrients.

Table 2.2: Average percentage of nutrients in control and treated sample of "Chakli"

Nutrients / Treatments	Carbohydrate (g)	Energy (Kcal)	Protein (g)	Fat (g)	Fiber (g)
T_0	30.3±0.20	360±0.14	8.26±0.14	22.44±0.26	0.5±0.42
T_1	29.6±1.50	361±3.80	8.32±0.30	23.04±0.30	0.73±0.30
T_2	29.4±0.80	362±3.80	8.16±0.31	23.83±0.20	0.83±00
T_3	29.9±1.90	364±0.14	8.0±0.80	23.43±00	0.93±00
T_4	28.5±1.50	364±27.70	7.56±0.26	24.23±0.61	1.04±0.14

Table 2.2 shows that the average nutritional composition (g/100) of chakli with or without incorporation of rice bran in Bengal gram flour. Result reveal the carbohydrate and protein contents of laddoo with incorporation of rice bran were less than the control group. Calorific values of product were found to provide good amount of calorie to an individual from 100g of product. Fat and fiber content of the product chakli with incorporation of rice bran were more than the control group.

Table 2.3: Average percentage of nutrients in control and treated sample of "Pakori"

Nutrients / Treatments	Carbohydrate (g)	Energy (Kcal)	Protein (g)	Fat (g)	Fiber (g)
T_0	34.92±0.74	425±0.20	8.93±0.72	27.5±0.22	0.68±0.33
T_1	34.32±0.64	426±0.20	8.74±0.83	28.1±1.20	1.03±0.17
T_2	33.86±0.73	427±0.17	8.62±0.58	28.5±0.33	1.12±00
T_3	33.37±0.72	428±0.26	8.46±0.24	28.9±0.59	1.23±0.10
T_4	33.01±0.50	430±0.17	8.32±0.17	29.3±0.68	1.34±00

Table 2.3 shows that the average nutritional composition (g/100) of pakori with or without incorporation of rice bran in Bengal gram flour. Result reveal the

carbohydrate and protein contents of pakori with incorporation of rice bran were less than the control group. Calorific values of product were found to provide good amount of calorie to an individual from 100g of product. Fat and fiber content of the product pakori with incorporation of rice bran were more than the control group.

Table 2.4: Average percentage of nutrients in control and treated sample of "Laddoo"

Nutrients / Treatments	Carbohydrate (g)	Energy (Kcal)	Protein (g)	Fat (g)	Fiber (g)
T_0	56.43±0.82	507±0.22	8.74±0.37	27.62±0.66	0.73±00
T_1	55.82±0.94	503±0.17	8.62±0.17	28.03±0.66	0.83±00
T_2	55.34±0.93	503±0.24	8.42±0.26	28.45±0.31	0.93±00
T_3	54.86±4.75	510±0.17	8.33±0.14	28.85±0.46	1.042±0.03
T_4	54.52±0.93	512±0.20	8.14±0.17	29.5±0.10	1.16±00

Table 2.4 shows that the average nutritional composition (g/100) of laddoo with or without incorporation of rice bran in Bengal gram flour. Result reveal the carbohydrate and protein contents of laddoo with incorporation of rice bran were less than the control group. Calorific values of product were found to provide good amount of calorie to an individual from 100g of product. Fat and fiber content of the product laddoo with incorporation of rice bran were more than the control group. Energy, fat and fiber content of the product laddoo with incorporation of rice bran were more than the control group.

CONCLUSION

From the result summarized above, it can be concluded that rice bran powder can suitably be incorporated in Chilla, chakali, pakori and Laddoo. Regarding sensory scores and overall acceptability of all products decreased with the increasing levels of incorporation of rice bran powder. The amount of energy, fat and fiber increased as the incorporation levels increased. Cost of the products decreased as the levels of incorporation with rice bran powder increased. Chilla and Pakori was the cheapest product.

RECOMMENDATION

Incorporation of Rice bran powder in recipes for use in the daily diet can be recommended to the community in order to improve their nutrient intakes; particularly of Energy, Fat and Fibre. Thus these food products can be easily included in the diet of preschoolers which can definitely increase their energy intake and will meet their requirements.

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Efficacy of Spinosad Against First and Second Instar Larvae of *Helicoverpa armigera* (Hub.) in chickpea

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ABSTRACT

Different concentrations of Spinosad 45 SC 100 ppm, 200 ppm, 300 ppm and 400 ppm were tested under laboratory condition against first and second instar larvae of *Helicoverpa armigera* at Department of Plant Protection, Sam Higginbottom Institute of Agriculture, Technology and Sciences, Allahabad. Results showed that, this insecticide was very effective for first instar larvae at 300 ppm concentration giving maximum mortality after 48 hours and at 400 ppm concentration, it gave complete mortality after 48 hours. 400 ppm concentration also gave maximum mortality for second instar larvae of *H. armigera* after 48 hours.

Key words :- *Helicoverpa armigera, Spinosad, Insecticidal mortality.*

INTRODUCTION

Helicoverpa armigera is the major pest of many crops and considered as the main pest of chickpea. No plant seems to be strong enough to avoid attack of Helicoverpa armigera **Thirasack, (2001)**. Earlier reports showed that the pyrethoids were the most potent against this pest and that these insecticides had reduced the population and damage of *H. armigera* effectively. Indiscriminate use of insecticides resulted in *H. armigera* becoming resistant to the insecticides. Now, it has also become difficult to control this pest because it has developed resistance against several conventional insecticides from the Organophosphate, Pyrethroid and Carbamate groups. Resistance has been reported from different parts of the world, especially from India **Ramsubramanian, (2004)**, Australia **Gunning *et al.,* (1992)** and Spain **Torres-vila *et al.,* (2002)**. Different control measures can be adopted to control this pest in which

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chemical control is the most important. Conventional insecticides are harmful to the beneficial insects and due to resistance in *H. armigera* it has become necessary to use such insecticide which are ecologically safe for natural enemies. Spinosad belongs to a new chemical group of insecticides which is naturally derived and produced by fermentation of the bacterium (*Saccharopolyspora spinosad*). It is mixture of related spinosyn-A and spinosyn-D, safe to the natural enemies such as predators and parasitoids **Nasreen *et al.* (2003)** and **Williams *et al.* (2003)** and considered among the best insecticide to control the lepidopteron pest. Keeping the above in view, efficacy of spinosad against first and second instar larvae of *H. armigera* at different concentrations was evaluated under lab conditions.

MATERIALS AND METHODS

Insect

First and second instar larvae of *H. armigera* were collected from the nearby fields of chickpea. These larvae were used for the experimental purpose.

Insecticide

Spinosad was used in the present experiment at 100, 200, 300 and 400 ppm concentrations.

Bioassays

Newly emerged first instar (2.5-5 mm) and newly moulted second instar (6-12 mm) larvae of *H. armigera* were exposed to the test insecticide at four different concentrations. The leaf dip method was used as recommended by the Insecticide Resistance Action Committee of GIFAR **Khan *et al.*, (2010)**. Unsprayed chickpea leaves were taken and washed. These were dipped in test solution for ten seconds with gentle agitation and were placed on filter paper for drying. The leaves were placed in a plastic box with a thin layer of agar underneath to avoid desiccation in three replicates. In each box five larvae were placed with a fine camel hair brush and boxes were placed with lids in order to keep everything under controlled environmental conditions.

RESULTS AND DISCUSSION

The mortality of newly emerged first instar larvae of *H. armigera* was noted after 24 and 48 hours of treatment with four different concentrations (100 ppm, 200 ppm, 300 ppm and 400 ppm) of spinosad given in *table 1* and depicted in *fig-1*.

Table 1. Mean mortality of first and second instar larvae of Helicoverpa armigera treated with spinosad 45 SC

Conc.	Mean mortality in first instar larvae of *H.armigera*		Mean mortality in second instar larvae of *H.armigera*	
	after 24 hr	after 48 hr	after 24 hr	after 48 hr
Control	0.00	0.00	0.00	0.00
100 ppm	0.67	1.67	0.33	1.33
200 ppm	2.67	3.00	1.67	2.00
300 ppm	4.33	4.67	2.33	2.66
400 ppm	5.00	5.00	2.67	4.33
S. Ed. (±)	0.365	0.298	0.422	0.298
C. D. (P = 0.05)	0.762	0.622	0.880	1.050

All concentrations of insecticide gave statistically significant mortality of first instar larvae of *H.armigera* as compared to the control after 24 hours of exposure. Maximum mortality was noted in the treatment at 400 ppm concentration (5.00) and minimum mortality was noted in the 100 ppm concentration (0.67). Concentrations at 200 ppm (2.67) and 300 ppm (4.33) were found statistically non-significant when compared to 400 ppm concentration. After 48 hours of exposure 300 ppm concentration also gave maximum mortality (4.67) and was statistically non significant with 200 ppm (3.00) and significant with 100 ppm (1.66) concentrations.

The mortality of newly moulted second instar larvae of *H. armigera* noted 24 and 48 hours after treatment with four different concentrations (100 ppm, 200 ppm, 300 ppm and 400 ppm) of spinosad is given in *table 1*. When second instar larvae were treated with four different concentrations of spinosad all the treatments were statistically significant when compared with the control. 400 ppm concentration gave maximum mortality (2.67) and was at par when compared with 200 ppm (1.67) and 300 ppm (2.33) concentrations. Minimum mortality was noted in 100 ppm concentration (0.33) and was at par with 200 ppm and 300 ppm concentrations which were statistically non significant among themselves. After 48 hours maximum mortality was noted in 400 ppm concentration (4.667) and was at par with 300 ppm concentration (3.000). 300 ppm concentration was at par with 200 ppm (2.00) and

100 ppm concentration (1.33) which gave minimum mortality. Spinosad at 400 ppm is more toxic in first instar larvae of *Helicoverpa armigera*. The same results were observed by **Khan *et al.* (2010)** who tested indoxacarb and spinosad against *Helicoverpa armigera*. First instar larvae was observed to be more susceptible to spinosad. **Ramos *et al.* (2004)** also showed that spinosad was more active on first instar larvae of *Helicoverpa armigera*.

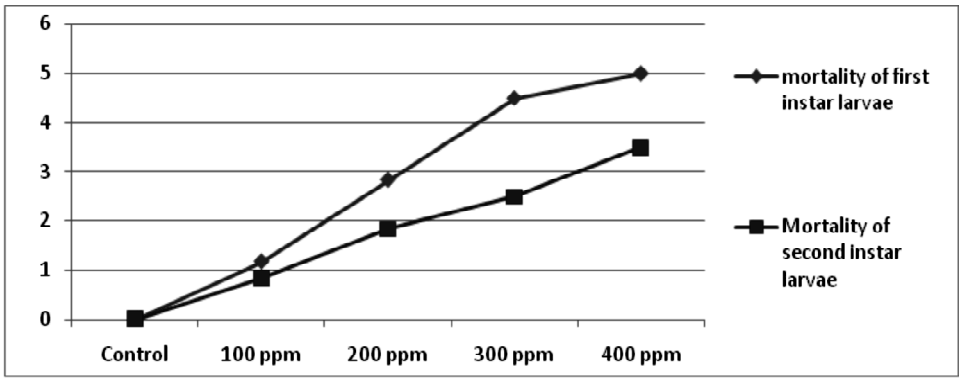

Fig. 1- Mean mortality of first and second instar larvae of H. armigera

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Efficacy of selected fungicides and bioagents in the management of damping off disease of chilli (*Capsicum annum* L.)

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ABSTRACT

Chilli is often found affected by damping-off disease in nursery stage. Owing to the great loss of the seedling an investigation was undertaken to manage the damping off disease on chilli. The experiment was conducted under in vitro and in situ conditions to observe the effect of bio-agents and fungicides against *Pythium aphanidermatum*. Six treatments were taken up with four replications and data collected was analyzed using CRD. Maximum inhibition per cent was observed in *Trichoderma viride* (66.21%) followed by *Pseudomonas fluorescens* (58.10%), Ridomil MZ (62.83%), copper oxy chloride (54.72%), carbendazim (45.40%) as compared to control (0.00%). *Trichoderma viride* was significantly superior as compared to other treatments. In pot condition six treatments were taken up with five replications and data collected was analyzed using RBD. Sterilized soil (1kg) was mixed with the pathogen inoculum @ 100g (multiplied on sorghum medium) and filled in pots. The treatments taken up were Carbendazim (@2g/kg seed), Ridomil (5g/kg seed), copper oxy chloride (3g/kg seed), *Trichoderma viride* (4g/kg seed), *Pseudomonas fluorescens* (5g/kg seed) and untreated control. The treated seeds were sown in pathogen inoculated soil @100 seeds per pot and irrigated daily. Pathogen alone inoculated pots served as control. The observation was recorded on 14 days after sowing. The results revealed that seed treatment with the fungicides and bio-agents against damping off (*Pythium aphanidermatum*) as compared to check were significant. Maximum germination per cent was recorded in *T. viride* (90%) followed by *P. fluorescens* (86%), carbendazim (82%), copper oxy chloride (78.4%), Ridomil MZ (77.4%), as compared to control (72%). *Trichoderma viride* was superior as compared to other treatments.

Key words: *Fungicides, Bio-agents, Pythium aphanidermatum, chilli.*

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INTRODUCTION

Chilli (*Capsicum annum* L.) is one of the important spice crop of the world, which is affected by several fungal, bacterial and viral diseases. Among the fungal diseases, damping-off incited by *Pythium* species is very common and may cause 60 per cent mortality of the seedlings **Manoranjitham *et al.*, (2000)**. The present study was undertaken to investigate the effect of different soil types on the incidence of damping-off disease of chilli. *Pythium* species are commonly referred soil and water saprophytes, feeding on organic matter. Pythium infection leads to damping off in seedlings and crown and root rot in older plants. The genus *Pythium* is a complex genus containing over 200 described species. The most economically important members of this genus are plant pathogens which have a broad host range and cause losses by both pre and post emergence damping - off as well as by reduction in plant growth and yield due to root rot **Dick (2001), Hendrix and Campbell (1973), Erwin and Ribeiro (1996), Plaats - Niterink (1918)**. Management of *Pythium* is very difficult due to it's wide host range, soil-borne nature and prolonged survival of propagules in the soil. Traditionally, this disease is controlled by the application of synthetic fungicides. But the indiscriminate use of fungicides resulted in the accumulation of residual toxicity, environmental pollution and altered the biological balance in the soil by over killing the non-targeted microorganisms. Besides development of resistance to fungicides in the pathogen *Pythium spp.* It is therefore essential to develop an effective, cheap and environmentally safe non-chemical method for the management of damping-off disease. Hence, biological control has been developed as an alternative to synthetic fungicides and considerable success has been achieved by utilizing antagonistic microorganisms for controlling soil borne pathogens.

MATERIALS AND METHODS

The trial was laid out in completely randomized design (CRD) with four replications and six treatments including check in the experimental laboratory of Department of Plant Protection, Sam Higginbottom Institute of Agriculture, Technology and Sciences (SHIATS), Allahabad. In the lab experiment, efficacy of fungicides (Carbendazim @0.2 %, Ridomil MZ @0.5 % and Copper oxy chloride @0.3 %) and bio-agents (*Trichoderma viride and Pseudomonas fluorescens*) were tested by applying poison food and dual culture techniques against *Pythium aphanidermatum*. The observations of the mycelium growth inhibition per cent were recorded at 24, 48, 72 and 96 hrs. In pot condition six treatments were taken up with five replications

and data collected was analyzed using RBD. Sterilized soil (1kg) was mixed with the pathogen inoculum @ 100g (multiplied on sorghum medium) and filled in pots. The treatments taken up were Carbendazim (@ 2g/kg seed), Ridomil (5g/kg seed), copper oxy chloride (3g/kg seed), *Trichoderma viride* (4g/kg seed), *Pseudomonas fluorescens* (5g/kg seed) and untreated control. The treated seeds were sown in pathogen inoculated soil @100 seeds per pot and irrigated daily. Pathogen alone inoculated pots served as control. The observation was recorded on 14 days after sowing.

RESULTS AND DISCUSSION

Effect of fungicides and bio-agents on the mycelial growth (mm) of *Pythium aphanidermatum* at different time interval after inoculation:

The data on the mycelial growth (mm) was influenced by fungicides and bio-agents are given in the *table 4.1*.

At 24, 48, 72 and 96 hrs after inoculation of the pathogen (*Pythium aphanidermatum*) on PDA medium significant differences in mycelial growth were observed among the treatments. Minimum mycelial growth was recorded with *Trichoderma viride*@ 0.4% (0.36, 0.58, 0.81 and 1.25 mm), which was statistically on par with Ridomil MZ@ 0.5% (0.38, 0.63, 0.99 and 1.35 mm) followed by copper oxy chloride @0.3% (0.51, 0.78, 1.21 and 1.67 mm), *Pseuodomonas fluorescens* @0.5% (0.52, 0.82, 1.40 and 1.75 mm), carbendazim @0.2% (0.58, 0.86, 1.71 and 2.02 mm) while it was highest in control (0.96, 1.31, 2.31 and 3.70 mm). All statistically significant but among the treatments (*Trichoderma viride* and Ridomil MZ), (copper oxy chloride and *Pseuodomonas fluorescens*) and (*Pseuodomonas fluorescens* and carbendazim) are non significant.

Table 1: In vitro effect of fungicides and bio-agents on mycelial growth (mm) of Pythium aphanidermatum.

Treatments	Radial growth of Pythium aphanidermatum (mm)			
	24 hrs	**48 hrs**	**72 hrs**	**96 hrs**
Control	0.96	1.31	2.31	3.70
Carbendazim	0.58	0.86	1.71	2.02
Ridomil MZ	0.38	0.63	0.99	1.37
Copper oxy chloride	0.51	0.78	1.21	1.67
Trichoderma viride	0.35	0.58	0.81	1.25
Pseudomonas fluorescens	0.52	0.82	1.40	1.75
S.Ed. (±)	0.042	0.054	0.119	0.183
C.D.(P = 0.05)	0.061	0.096	0.466	0.558

It was observed that the growth of *Pythium aphanidermatum* was inhibited by fungicides carbendazim (0.2%), Ridomil MZ (0.5%), copper oxy chloride (0.3%) and bio-agents *Trichoderma viride* (0.4%), *Pseudomonas fluorescens* (0.5%) in vitro. Maximum inhibition was observed with *Trichoderma viride* (66.21%).

Table 2: Effect of fungicides and bio-agents on per cent inhibition (mm) of Pythium aphanidermatum.

Treatments	**Per cent inhibition at 96 hrs**
Control	0.00
Carbendazim	45.40
Ridomil	62.83
Copper oxy chloride	54.72
Trichoderma viride	66.21
Pseudomanas fluorescens	58.10
S.Ed. (±)	1.01
C.D.(P = 0.05)	0.55

The per cent growth inhibition of mycelial growth at 96 hrs:

The data on the inhibition per cent of mycelial growth as influenced by fungicides and bio-agents are given in *table 4.2*.

A significant difference in inhibition per cent of mycelial growth was observed among the treatments. Maximum per cent inhibition was recorded in *Trichoderma viride* @0.4% (66.21%), which was statistically on par with Ridomil MZ @0.5% (62.83%), *Trichoderma viride* was statistically superior than *Pseudomonas fluorescens* @0.5% (58.10 %), followed by copper oxy chloride @0.3% (54.72%), carbendazim @0.2% (45.40%), while it was lowest in control (0.00%). All treatments statistically significant but among the treatments (*Trichoderma viride* and Ridomil MZ) and (*Pseudomonas fluorescens* and copper oxy chloride) are non significant.

The present result showed that all fungi tested exhibited antagonistic activities against damping-off caused by *Pythium aphanidermatum*. Radial growth of the pathogen was considerably hindered by all the test antagonists under the condition of this study. *Trichoderma viride* was most antagonistic and inhibited the radial growth of the pathogen. *Trichoderma spp.* are known to be the most commonly used antagonists against *P. aphanidermatum* as they have more than one mechanism of action. Similar finding have reported by **Chet *et al.*, (1981), Hazarika *et al.*, (2000), Manoranjitham *et al.*, (2001)**.

Efficacy of selected bio-agents and fungicides against *Pythium aphanidermatum* under pot culture conditions:

The results of the pot experiment shown in *Table 3* reveal maximum germination per cent was observed in *Trichoderma viride* seed treatment @4g/kg of seed (90%), followed by *Pseudomonas fluorescens*@5g/kg seed (86%), Bavistin @2g/kg of seed (82%), copper oxy chloride @3g/kg of seed (78.4%), Ridomil @5g/kg of seed (77.4%)as compared to control (72%).

Table 3: Effect of fungicides and bio-agents in damping-off of chilli:

Treatments	Germination per cent
Control	72
Bavistin seed treatment @ 2g/kg of seed	82
Ridomil MZ seed treatment @5g/kg of seed	77.4
Copper Oxy chloride seed treatment of @3g/kg of seed	78.4
Trichoderma viride seed treatment of @4g/kg of seed	90
Pseudomonas fluorescens seed treatment of @5g/kg of seed	86
S. Ed. (±)	1.25
C.D.(P = 0.05%)	2.33

A significant difference in germination per cent was recorded among treatments. Maximum germination per cent was recorded with *Trichoderma viride* @4g (90%) which was statistically at per with *Pseudomonas fluorescens* (86%), followed by carbendazim @2g (82%), copper oxy chloride @3g (78.4%), Ridomil MZ @5g (77.4%), while it was lowest in control (72%). All the treatments statistically significant but among the treatments (control and Ridomil MZ), (Ridomil MZ and copper oxy chloride) (copper oxy chloride and carbendazim), (carbendazim and *Pseudomonas fluorescens*), (*Pseudomonas fluorescens* and *Trichoderma viride*) are non significant.

This may probably be due to the potential of *T. harzianum* for mycoparasitism rather than antagonism through antibiosis, **Yobo *et al.*, (2010)**. also reported *Trichoderma spp.* produced significantly higher plant growth and biomass of needles, trunks and roots than uninoculated plants. *T. harzianum* showed stimulatory effect on seedling growth and biomass of pine. *Trichodema spp.* reportedly produce hormone like metabolites and release nutrients from soil or organic matter thereby facilitate better plant growth. The applications of bio-agents reduced diseases severity, promote

the plant growth and thereby increased the plant height significantly as compared to control. **Gogoi and Mahanta (2013)** reported that application of *Trichodema spp.* was found effective in increasing the yield of French bean (54%) over control. This may be due to the fact that *Trichodema spp.* colonized on root structure of a host plant attaking and killing soil borne pathogens before they could harm the plant. Then, the *Trichodema spp.* multiplied and thrive zed as the host plant grew providing season-long protection, while sending messages through biochemical pathways to improve plant performance and yield, **Sing *et al.*, (2010), Bharathi and Sudhakar (2011), and Sharma *et al.*, (2012)** also reported similar result, **Christopher *et al.* (2010)** reported similar result on *Trichodema spp.* in tomato.

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Genetic variability and character association among yield and yield components and quality traits in rice (*Oryza sativa* L.) gerplasm

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ABSTRACT

Analysis of variance indicated highly significant difference among 47 genotypes of rice (*Oryza sativa* L) for the 19 quantitative and qualitative characters. High yield per plant performance was exhibited by genotype PAU-3042 (66.66). Broad sense heritability estimates were higher for all the traits studies ranging from 76.80 to 100.00 percent. The correlation analysis studies indicate that flag leaf length had highest positive and significant association with seed yield per plant followed by flag leaf width, number of panicle per hill, number of spikelets per panicle, harvest index, biological yield, kernel width grain width after cooking and head rice recovery. Path coefficient analysis indicated highest positive direct effect of biological yield on seed yield per plant followed by harvest index, test weight, number of spikelets per panicle and grain width after cooking.

Key word : *Rice (Oryza sativa L), variance, heritability, correlation and path Coefficient.*

INTRODUCTION

Food security, which is the condition of having enough food to provide adequate nutrition for a healthy life, is a critical issue in the developing countries like India. About 3 billion people, nearly half word population, depend on rice for survival. In Asia as a whole, much of the population consumer rice in every meal. In many counties, rice accounts for more than 70% of human caloric intake. Genotype and environmental factors have extensive affects on growth and yield of rice. The study of relationships among quantitative traits is important for assessing the feasibility of joint selection

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for two or more traits instead of selection of secondary traits on genetic gain for the primary traits under the consideration **Ezeaku and Mohammed, (2006)** Path coefficient analysis is a statistical tool, which being to study the direct and indirect effects of independent traits on dependent traits through a path diagram that is based on experimental results **Samonte, (1998)**. Therefore during the selection process, time and resources saves by study of direct and indirect effects on some traits on grain yield. It may increase the selection efficiency. Keeping the above facts in mind the present investigation was carried out to obtain information for selection indices in rice.

MATERALS AND METHODS

The present experiment was conducted with 47 genotypes during Kharif -2009 at field experimentation center, Department of Genetics and Plant Breeding, SHIATS, Allahabad, Randomized block design. Twenty eight days seeding were transplanted with a spacing of 20 cm and 15 cm between rows and plants, respectively. Five representative plants of each genotype in each replication were randomly selected to record observation for quantitative characters viz. Plant height (cm), number of panicle/ plant, flag leaf length (cm), flag leaf width (cm), panicle length (cm), number of spikelets per panicle, biological yield /plant harvest index (%), test weight (gm), grain yield/hill(gm), kernel length (mm), kernel width (mm),grain length and width before cooking (mm), grain length & width after cooking, and head rice recovery (%). Days to 50% flowering were computed on plot basis. The mean data after computing for each character were subjected to standard method of analysis of variance following **Panse and Sukhatme (1967)**. Phenotypic and genotypic coefficient of variation (PCV & GCV), heritability in broad sense and genetic advance as percent of mean were estimated by the formulae suggested by **Burton (1952)** and **Johanson *et al.* (1955)**. Correlation coefficient was calculated using INSTAT software. The total correlation coefficients of variance yield contributory characters with regard to grain yield was partitioned into components of direct and indirect effects following the method adopted by **Dewey and Lu (1959)**.

RESULTS AND DISCUSSION

In the present investigation, PCV values were slightly higher than GCV values for different characters which indicate lesser role of environment on the expression of various quantitative characters (*Table-1*). Heritability estimates revealed that characters like grain length after cooking (100.00) and grain length before cooking

Table1: Analysis of variance for 19 characters of rice genotypes.

S.No.	Parameters	Mean Sum of Squares		
		Replications (d.f =2)	**Treatment (d.f = 46)**	**Error (d.f =92)**
1.	Days to 50 % flowering	5.11	98.84**	3.56
2.	Plant height (cm)	8.84	601.15**	2.25
3.	No. of tillers/ hill	1.09	12.93**	0.81
4.	No. of Panicle/hill	0.24	13.39**	0.73
5.	Panicle length (cm)	4.16	14.69**	1.34
6.	Flag leaf length(cm)	6.65	113.94**	5.76
7.	Flag leaf width (cm)	0.004	0.22*	0.003
8.	No. of spikelets / panicle	20.79	7881.41**	12.06
9.	Biological yield (g)	2.41	1375.11**	2.61
10.	Harvest index (%)	3.24	379.11**	3.13
11.	Test weight (g)	1.27	25.29**	0.34
12.	Kernel length	0.004	1.90**	0.007
13.	Kernel width	0.001	0.20*	0.003
14.	Grain length before cooking	0.0001	1.73**	0.0003
15.	Grain width before cooking	0.0005	0.06*	0.0003
16.	Grain length after cooking	0.0001	2.42**	0.0002
17.	Grain width after cooking	0.0002	0.10*	0.0003
18.	Head rice recovery	0.49	122.78**	0.60
19.	Seed yield / plant	15.92	287.59**	2.49

*and ** Significant at 5%&1% level respectively.

Table 2. Genetic parameter of 29 rice genotypes for yield and yield attributes.

S. No.	Characters	VG	VP	GCV	PCV	h^2 (bs) (%)	GA	GA as % of mean
1.	Days to 50 % flowering	31.36	35.32	6.09	6.42	89.90	11.00	11.89
2.	Plant height (cm)	199.63	201.88	11.08	11.14	98.90	28.94	22.70
3.	No. of tillers/ hill	4.04	4.85	14.01	15.35	83.20	3.77	26.33
4.	No. of Panicle/hill	4.21	4.95	17.12	18.56	85.10	3.90	32.54
5.	Panicle length (cm)	4.44	5.79	7.89	9.00	76.80	3.80	14.24
6.	Flag leaf length(cm)	36.06	41.83	16.20	17.45	86.20	11.48	30.99
7.	Flag leaf width (cm)	0.07	0.07	16.33	16.73	95.30	0.54	32.85
8.	No. of spikelets / panicle	2623.11	2635.18	24.84	24.90	99.50	105.26	51.05
9.	Biological yield (g)	457.53	460.15	26.90	26.98	99.40	43.93	55.27
10.	Harvest index (%)	125.32	128.46	24.46	24.77	97.60	22.77	49.77
11.	Test weight (g)	8.31	8.66	12.48	12.73	96.00	5.82	25.20
12.	Kernel length	0.63	0.63	8.74	8.79	98.90	1.62	17.90
13.	Kernel width	0.06	0.06	9.66	9.68	99.60	0.53	19.86
14.	Grain length before cooking	0.57	0.57	11.11	11.12	99.90	1.56	22.89
15.	Grain width before cooking	0.02	0.02	6.67	6.72	98.40	0.30	13.64
16.	Grain length after cooking	0.80	0.80	9.87	9.87	100.0	1.85	20.33
17.	Grain width after cooking	0.03	0.03	6.83	6.86	99.10	0.39	14.01
18.	Head rice recovery	40.70	41.3	11.03	11.11	98.50	13.04	22.55
19.	Seed yield / plant	95.03	97.52	27.21	27.56	97.40	19.82	55.33

VG-Genotypic variance GCV - Genotypic coefficient of variance VP -Phenotypic variance h^2(bs)-Heritability (broad sense) PCV- Phenotypic coefficient of variance GA- Genetic Advance

(99.90), exhibited highest heritability followed by kernel width (99.60), number of spikelets per panicle (99.50), biological yield (99.40), grain width after cooking (99.10), plant height(98.90), and kernel length (98.90) (*Table 2*). Estimates of Genetic advance estimates revealed that character number of spikelets per panicle (105.26 percent), followed by biological yield (43.93 percent), plant height (28.94 percent), harvest index (22.77) seed yield per plant (19.40 percent). However the characters exhibited high value of genetic advance percent of mean were seed yield per plant (55.33), biological yield (55.27 percent), number of spikelets per panicle (51.05 percent), harvest index (49.77 percent) and flag leaf width (32.85 percent). In present investigation characters viz., flag length (0.72), grain length after cooking (0.61), grain length before cooking (0.60), number of panicle per hill (0.59),flag leaf width (0.58), number of spikelets per panicle (0.53), biological yield (0.45), kernel width (0.40), grain width before cooking (0.38) and head rice recovery (0.37) were found have significant and positive correlation with seed yield at phenotypic level. Seed yield was significantly and positively associated with flag leaf length (0.78),grain length after cooking (0.61), grain length before cooking (0.60), number of panicles per hill (0.59), flag leaf width (0.51), number of spikelets per panicle (0.51), flag leaf length (0.47), harvest index (0.46), biological yield (0.41), kernel width (0.41),grain width before cooking (0.38) and head rice recovery (0.37) at genotypic level. The result of path analysis at phenotypic level indicated that biological yield (0.773) had maximum positive direct effect on seed yield per plant followed by harvest index (0.712), test weight (0.169), number of spikelets per panicle (0.157), grain length after cooking (0.109), number of tillers per hill (0.058) and grain width after cooking (0.046). The results of path analysis at genotypic level indicated that biological yield (0.765) had maximum positive direct effect on seed yield per plant followed by harvest index (0.692), test weight (0.197) **Ram, (1992), Mehertre *et al.*, (1994), Samonte *et al.*, (1998), Surek *et al.*, (1998)**, number of spikelets per panicle (0.178), grain length after cooking (0.114), number of panicles per hill (0.081), **Lin and Wu, (1981), Yang, (1986)**, number of tillers per hill (0.026), grain width after cooking (0.032) and head rice recovery (0.029) **Panwar and Bansal (1989)** believed that the number of spikelets per panicle and number of reproductive tillers have high direct effect on seed yield. In conclusion the finding of this research show that grain length after cooking and number of spikelets per panicle have high heritability with high genetic advance and these have positive association and direct effect on seed yield, hence selecting for them may improve the grain yield.

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Effect of Trichoderma species neem cake and carbendazim on chickpea (*Cicer arietinum* L.) wilt

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ABSTRACT

Chickpea (*Cicer arietinum* L.) is the world third most important pulse crop. India is the largest producer of chickpea accounting for 64% of global chickpea production but it production is adversely affected by several pathogens. An experiment was conducted at Sam Higginbottom Institute of Agriculture, Technology, Sciences (SHIATS), Allahabad in Rabi Season of 2011-2012 to manage the wilt disease eight treatment with three replication were taken up using RBD, Soil application of Trichoderma viride @ 60 g/m^2, *Trichoderma viride* + FYM @ 60 g/m^2 + 1000 gm/m^2, *Trichoderma harzianum* 60 g/m^2, *Trichoderma harzianum* + FYM 60 + 1000 g/m^2, neem cake 50 g/m^2 and seed treatment with carbendazim 2.5 g a.i/ kg seed were applied before sowing. The highest per cent disease (wilt) control was observed in *Trichoderma viride* @ 60 g/m^2.

Key words: - *Chickpea wilt, Fusarium oxysporum f.sp. ciceri, Trichoderma spp.*

INTRODUCTION

Chickpea (*Cicer arietinum* L.) is the world's third most important pulse crop, after dry beans (*Phaseolus vulgaris* L.) and dry peas (*Pisum sativum* L.) **Vishwadhar and Gurha, (1998)**. Although chickpea is predominantly consumed as a pulse, dry chickpea is also used in preparing a variety of snack foods, sweets and condiments and green fresh chickpeas are commonly consumed as a vegetable. Chickpea ranks second in cultivated area and third in production perhaps is the largest producer of chickpea in the world covering 80 percent area and 85 percent of total production with a productivity of 716kg per ha. **Pal, (1998)**. 50 different pathogens have so far been reported on chickpea **Nene *et al.*, (1989)** including diseases caused by fungal, bacterial, nematodes phytoplasma and viral pathogen. The chickpea wilt caused by

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Fusarium oxysporum f.sp. *ciceri* was reported to be widely distributed in near about 32 countries of the world. Annual chickpea yield losses from Fusarium wilt vary from 10 to 100% depending on the environment condition **Grewal and Pal, (1970)**. In a highly susceptible cultivar wilting can be observed within 15 days after sowing in the field. The affected seedlings show drooping of the leaves and paler colour. They may collapse and lie flat on the ground. When split vertically from the collar region downward show a brown discolouration of the internal tissue. The pathogen is both seed and soil borne, facultative saprophyte and can be surviving in soil up to six years in the absence of susceptible host considering the nature of damage and survival ability of the fungus use of resistant varieties is the only economical and practical solution. Therefore, integrated management strategies are the only solution to maintain plant health. These strategies should includes minimum use of chemical for checking the pathogen population, encouragement of beneficial biological agents to reduce pathogen inoculums, modification of culture practices **Bendre and Barhate, (1998)**.

MATERIALS AND METHODS

The efficacy of eight treatments was tested against wilt disease of field chickpea at research field of Department of Plant Protection, Sam Higginbottom Institute of Agriculture, and Technology & Sciences (SHIATS) Allahabad in Rabi Season of 2011-2012. Seed of chickpea variety "*Radhey*" were sown in randomized block design (RBD) with three replications and eight treatments including check. The unit plot size was $2 \times 1m^2$ with spacing 30 ×10 cm and seed were sown on 4 November 2011, before sowing the inoculum was added to soil sick method **Kolte *et al.*, (1998).**

Isolation of pathogen and bioagent

Chickpea plants naturally infected and wilted with typical symptoms of wilt were collected from farmers' field and brought to the laboratory. All samples collected from different locations were subjected to isolation on potato dextrose agar (PDA) in the laboratory. Isolation of bioagnts by the serial dilution method (10-6).

Pathogenocity test

The pathogenocity of the isolated fungus was tested by koch's postulates in a vivo experiment on chickpea which were found most susceptible to wilt under natural conditions.

Multiplication of pathogen and bioagent

The culture of *Fusarium oxysporum* f.sp. *ciceri* was multiplied on sand chickpea flour medium (1:1). 15 g of chickpea flour was mixed in 85 g of river bed sand and was filled in the conical flasks of 250 ml capacity (50 g/flask) and sterilized in autoclave at 15lbs for 30 min. Then the flasks were inoculated asceptically with pure culture of *F. oxysporum* f.sp. *ciceri* and incubated at room temperature for 15 days. After 15 days inoculum was added to the (inoculum) soil *Trichoderma viride* @ 60 g/m^2, *Trichoderma viride* + FYM @ 60 g/m^2 + 1000 g/m^2, *Trichoderma harzianum* @ 60 g/m^2, *Trichoderma harzianum* + FYM @ 60+ 1000 gm/m^2, neem cake @50 g/m^2, seed treatment with carbendazim 2.5 g a.i/ kg seed were applied before sowing. The data was recorded at 30, 60 and 90 DAS. The data collected was statistically analyzed.

The disease incidence was calculated by the following formula

$$\text{Disease Incidence (\%)} = \frac{\text{Number of wilted plant}}{\text{Total number of plant}} \times 100$$

RESULTS AND DISCUSSIONS

All the treatment were significantly effective in reducing the disease incidence when compared to untreated check *(Table 1) Trichoderma viride* (soil application) was found to be most effective in reducing the incidence (2.333, 3.333 and 5.333 %) at 30, 60, and 90 days after sowing (DAS), plant height (8.806, 20.866 and 44.353 cm) at 30, 60, and 90 DAS, root length (5.716, 12.833 and 17.783 cm) at 30,60 and 90DAS, and yield (29.653 q/ha), followed by *Trichoderma viride* + FYM (SA) which was the next treatment in superiority in controlling disease incidence (2.626, 3.810 and 5.906 %), plant height (2.390, 2.756 and 44.353 cm), root length (5.166, 12.400 and 17.466 cm), yield (29.663 q/ha) in comparison to (untreated, treated) control where disease incidence was (9.136, 9.940 and 12.623%), plant height (6.740, 17.533 and 39.020 cm), root length (3.816, 10.033 and 14.833 cm), yield (22.653 q/ha), and comparison with inoculated control where disease incidence (15.643, 17.160 and 24.300 %), plant height (6.546, 17.313 and 38.773 cm), root length (3.316, 9.783 and 14.800 cm), yield (20.876 q/ha). It can be concluded that *Trichoderma viride* (SA) was highly effective treatment against Fusarium wilt of chickpea. These results are in accordance to **Prasad *et al.* (2002)**, **Lable *et al.* (2005) and Zote *et al.* (1983)**

Table no 1 : Effect of Trichoderma species, neem cake and carbendazim on chickpea wilt.

TREATMENT		Plant height (cm)			Root length (cm)			Disease incidence (%)			Yield q/ha
		30 DAS	60 DAS	90 DAS	30 DAS	60 DAS	90 DAS	30 DAS	60 DAS	90 DAS	
T0	Uninoculated Control.	6.740	17.533	39.020	3.816	10.033	14.833	9.136	9.940	12.623	22.653
T1	Inoculated Control.	6.546	17.313	38.773	3.316	9.783	14.800	15.643	17.060	24.300	20.876
T2	*Trichoderma viride* (Soil treatment)	8.806	20.886	44.353	5.716	12.833	17.783	2.333	3.333	5.333	29.653
T3	*Trichoderma viride* + FYM (Soil treatment)	8.520	20.686	44.046	5.166	12.400	17.400	2.626	3.810	5.906	29.663
T4	*Trichoderma harzianum* (Soil treatment)	8.320	20.093	41.973	4.666	11.016	16.133	4.100	4.450	6.810	27.330
T5	*Trichoderma harzianum* + FYM (Soil treatment)	8.226	19.046	41.133	4.300	10.683	15.833	4.086	5.296	7.273	26.886
T6	Neem cake (Soil treatment)	7.993	18.873	43.326	4.166	10.833	15.683	4.320	5.596	7.826	26.433
T7	Carbendazim (Seed treatment)	8.380	20.020	40.826	5.000	11.866	17.150	3.003	3.816	6.020	27.496
SEd (+)		0.455	0.463	0.775	0.248	0.284	0.336	1.086	1.170	0.653	1.107
CD (p= 0.05 %)		0.976	0.993	1.662	0.531	0.609	0.722	2.334	2.509	1.405	2.375

CD = Critical Difference

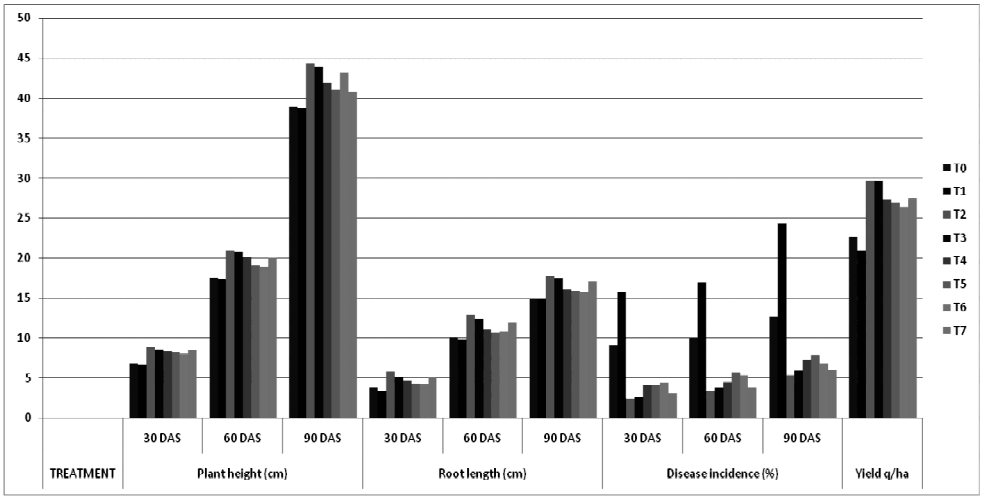

Fig. no 1 : Effect of Trichoderma species, neem cake and carbendazim on chickpea wilt.

who had reported soil application (*Trichoderma viride*) management of wilt disease of chickpea. Reported effective control of chickpea wilt (*Fusarium oxysporum* f.sp. *ciceri*) with carbendazim (0.1% seed treatment). **Somasekhara *et al.* (1996)**, **Kolte *et al.* (1998)** observed effectiveness of *Trichoderma viride*, *Trichoderma harzianum*, neem cake, carbendazim against *Fusarium oxysporum* f. sp. *ciceri* and increase in the yield.

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Antifungal activity of some plant extracts against Rhizoctonia solani causing damping-off of Tomato

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ABSTRACT

Aqueous leaf extracts of *Azadirachta indica, Eucalyptus globulus, Lantana. camara, Calotropis procera*, and Carbendazim (0.2%) was tested for their effectiveness against *R. solani* causing damping off disease in tomato. Each leaf extract was tested at three concentrations at 20%, 40% and 60% with increasing concentrations the effectiveness of each leaf extract increased. Result revealed that most effective treatment was Carbendazim (0.2%) which inhibit the growth of the fungus 100%. In plant extracts, the extract of *A. indica* increased the percent inhibition by 73.61%, 79.44% and 85.42% at three tested concentrations respectively; followed by *L. camara*, which increased the % inhibition by 70.97%, 73.33% and 81.94% at three concentrations respectively. The results revealed that plant extracts and fungicide Carbendazim (0.2%) against R. solani were significant as compared to control.

Key words: *Antifungal activity, Plant extracts, Rhizoctonia solani, Tomato*

INTRODUCTION

Tomato (*Lycopersicon esculentum* Mill.) is one of the most widely grown Solanaceae vegetable crops. It is an important source among all the vegetables through out the world. It is native to Peruvian and Mexican region. It is commercially important crop throughout the world and a rich source of lycoperies, minerals, vitamins A and C **Jones, (1999)**. Tomatoes are used for soup, salad, pickles, ketchup, puree, sauces and in many other ways. It is also used as salad vegetable. Tomato suffers from several diseases in which damping-off of seedlings is very important. Damping off is responsible for poor germination and stand of seedlings in nursery beds **Singh, (1998)**. Among the fungal diseases, damping-off caused by *Rhizoctonia solani* is very common in the nursery. *Rhizoctonia solani* is essentially soil borne and consequently affect the

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seedlings of all vegetables wherever the nurseries are raised. Soil borne pathogens are very difficult to control because of their multiplication and continual persistence in the soil.

The impact of plant disease in crop losses and well being of man has been recognized for a long time. Soil borne diseases are most difficult to control. Elimination of an established soil pathogen by chemicals is costly and sometimes hazardous. In addition, due to the development of new physiological races of pathogens, many of systemic fungicides are gradually becoming ineffective **Wellman, (1977)**. Several of the synthetic fungicides are widely used in plant protection but their continuous use cause adverse effects to the treated soil ecosystems because of their pollutive and non-biodegradable nature. Higher plants in tropics are reservoir of different secondary metabolites and provide an inexhaustible source of useful chemicals which may be used for their different biological properties **Edwards, (1973); Sbragia, (1975); Swaminathan, (1978)**. Higher plants contain a wide spectrum of secondary substances viz. phenols, flavonoides, quinones, limnoids, tannins, essential oils, alkaloids, saponins and steroids.

MATERIALS AND METHODS

Collection of disease materials:

Stem parts were collected from infected tomato plant showing characteristic symptoms of damping-off.

Isolation and Purification of the fungal pathogens:

For isolation of the fungus from infected host tissue from the collar region was taken and washed with tap water and then cut into small pieces of about 2-5 mm and transferred to sterile petridishes. The pieces are then surface sterilized will 0.1 % mercuric chloride solution for about half minute. Immediately after this treatment the tissue sections were transferred to petrdishes. The dishes were incubated at suitable temperature, generally around 22-27^{0}C and examined daily for the growth of fungus. The fungus isolated from the disease tissues was purified by the single hyphae method of **Rangaswami and Mahadevan, (2004)**.

Identification of Rhizoctonia solani:

Rhizoctonia solani is facultative necrotrophic i.e. they are capable of prolonged existence in saprophytic state in soil. Formation of sclerotia is irregular size and shape but of uniform texture, brown or black more or less loosely packed. The cells of the

hyphae are barrel shaped, anatomizing frequently, branching more or less at right angles and pale brown to brown in colour. Conidia are not produced. The genus is a heterogeneous assemblage of mycelia of Basidiomycetes, Ascomycetes and Deutermycocetes **Mehrotra and Aneja, (1999)**.

Collection of plant materials

Different plant and their products as leaves were collected from different places of SHIATS, Allahabad and identified for their antifungal activity.

S.No.	Plants name	Common name	Family
1	Azadirachta indica	Neem	Meliaceae
2	Eucalyptus globulus	Fever tree	Mrtyaceae
3	Lantana camara	Wild sage	Verbinaceae
4	Calotropis procera	Madar	Asclepiadaceae

Preparation of leaf extracts

The collected fresh leaves of selected plants were washed thoroughly with tap water followed by sterilized water to remove dust and other impurities. One gram of leaf was added in one ml distilled water separately for each plant extract and filtered through a doubled layered muslin cloth. The extracts were subjected to low speed centrifugation (5000 rpm for 5 min.) and the clear supernatants were used *in vitro* to calculate the antifungal effect on mycelial growth of *Rhizoctonia solani* **Gerard Ezhilan *et al.*, (1994)**.

Antifungal activity of leaf extract:

Antifungal activity was tested by poisoned food technique method adopted, **Nene and Thapliyal, (1993)**. Potato dextrose agar was prepared in flask and required concentrations (20%, 40% and 60%) of the leaf extract was added and then sterilized. The plant extract along with medium was poured into Petri plates and then inoculated with 5 mm disc from the culture of *Rhizoctonia solani* isolated form tomato seedling and incubated at 25 ± 2^0C. Medium without extract served as control and with Carbendazim (0.2%) served as check. The fungal colony diameter was determined after 5 days of inoculation. Observations were recorded on the mycelial growth of the test pathogen. Each treatment was replicated four times. Colony diameter of the test fungus in treatment and control sets will be measured in mutually perpendicular direction and

fungitoxicity recorded in terms of percent mycelial growth inhibition as per formula given by **Vincent (1947)**.

$$I = \frac{C - T}{C} \times 100$$

Where,

I = Per cent inhibition

C = Growth in control

T = Growth in treatment

RESULTS AND DISCUSSION

The effect of plant products at various concentrations on the growth of *Rhizoctonia solani* in the present studies, found that the antifungal activity of all the tested plant extracts increased significantly with the increase in concentration, being the highest at 60% concentration.

Data recorded in the *table no. 1* revealed that all concentrations (20, 40% and 60%) of the treatments were found effective to inhibit the fungal growth of *Rhizoctonia solani* up to six days after inoculation and the rate of inhibition gradually increased by increasing the concentration. Carbendazim was the superior in all the treatments which inhibit the 100% mycelial growth and second on best is the *Azadirachta indica* (85.42%) followed by *Lantana camara* (81.94%) at 60% concentration.

Dubey *et al.* (1983) observed that leaves of *Chenopodium ambrosioides* exhibited strong fungitoxicity against the mycelial growth of *Rhizoctonia solani* causing damping-off diseases of some seedlings. **Kotasthane and Lakpale (1994)** found that extracts of *Oryza sativa*, *Phalaris minor* and Lycopersicon esculantum against germination of sclerotia, mycelial growth and sclerotial production of *Rhizoctonia solani* to greater extent. **Bisht and Khulbe (1995)** reported that plant extract of *Datura stramonium* inhibited the mycelial growth of *H. sativum*. Mycelial growth and sclerotia formation of *Rhizoctonia solani* was inhibited by extract of *A. indica*, *Parthinium* sp. and *Datura stramonium*. **Sundarraj *et al.* (1996)** screened thirty-five plant products and faces of seven animals against *Rhizoctonia solani*. Among the plant extracts, *Allium sativum* bulb extract at 10% concentration recoded complete inhibition of the fungal growth and it was on at with Bavistin. **Zambonelli**

and Bianchi (1996) evaluated the efficacy of some natural plant products like neem, garlic etc. in vitro against fungal pathogen *Rhizoctonia solani*, and found that neem oil gave consistently good protection against this fungi. **Shylaja and Reddy (1997)** found that growth and sclerotial production of *R. solani* was significantly inhibited by leaf extracts of *Lantana camara*. **Sindhan *et al.* (1999)** tested the efficacy of different leaf extracts against the mycelial growth of *R. solani* and *R. bataticola*. The result showed that all the plant extracts *A. indica*, *E. globulus, O. sanctum* were inhibitory to *R. solani* then to *R. bataticol*.

Amadioha (2001) reported the leaf extracts of *Piper guinensis, Ocimum sanctum, O. gratissimum and Cymbopogon citratus* were effective in reducing the radial growth of *Rhizoctonia solani in vitro*. **Sehajpal *et al.* (2009)** evaluated antifungal effect of 44 plant extracts and 8 plant oils against the pathogen *Rhizoctonia solani* by disc diffusion method. Among all the plant extracts, *A. sativum* exhibited strong fungitoxicity even at the lowest concentration, i.e. 100 ppm. **Ravichandar (1987)** reported that the growth of *Rhizoctonia solani* was completed inhibited with the leaf extract of *Acacia nilotica*. Neem and akven leaf extracts are also known to reduce the viability of *R. solani* and mycelial grow considerably in vitro **Manibhushanrao *et al.*, (1988)**. The presence of antifungal compounds in higher plants is well recognized and considered valuable for plant disease control **Singh and Dwivedi, (1987)**.

CONCLUSION

From the above facts and figures, the following conclusion can be drawn that all the plant extracts had strong antifungal activity with significant inhibition on the growth of *R. solani*. Antifungal activity of all the tested plant extracts increased significantly with the increase in concentration, Carbendazim (0.2%) was the superior in all the treatments against *R. solani*. In addition the inhibitory magnitude of the tested plant extracts to the tested pathogen was proportional to the applied concentrations. Because Neem was more efficiency, therefore it might be a promising material to manage this fungus.

Table no. 1: In vitro effect of plant extracts on the mycelial growth and % inhibition of Rhizoctonia solani:

Treatments	Colony diameter of mycelial Growth in mm			% inhibition		
	20%	40%	60%	20%	40%	60%
Control (T_0)	90.00	90.00	90.00	-	-	-
Azadirachta indica (T_1)	23.75	18.50	13.13	73.61	79.44	85.42
Eucalyptus globulus(T_2)	42.88	20.75	19.63	52.36	76.94	78.19
Lantana camara (T_3)	26.13	24.00	16.25	70.97	73.33	81.94
Calotropis procera (T_4)	37.13	32.88	27.63	58.75	63.47	69.31
Carbendazim 0.2% (T_5)	0.00	0.00	0.00	100.00	100.00	100.00
S. Ed (±)	1.626	0.982	1.635	1.626	0.982	1.635
C.D. at (5%)	3.464	2.092	3.484	3.464	2.092	3.484

All the values are means of four replications

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Economics of treatments for management of Lentil aphid (*Aphis craccivora* Koch) on lentil (*Lens esculentus* L.)

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The experiment was conducted on efficacy of some indigenous plant extracts and cow urine against lentil aphid (*Aphis craccivora* Koch) at research farm Department of Plant Protection SHIATS Allahabad during Rabi season of 2011-2012. Result showed that significantly higher Seed yield and net return were recorded with spraying of NSKE + Cow urine 5% followed by spraying of Neem oil + Cow urine 0.5% or NSKE 5%, respectively were statistically at par with it. The benefit cast ratio descending order was Cow urine (5.0%) >NSKE + Cow urine (5.0%)>Neem oil + Cow urine (0.5%)> Tobacco extracts (1.0%)> Neem oil (0.5%)> NSKE (5.0%), but maximum cost benefit (C:B) ratio was obtained by spraying of cow urine 5% as comparable to neem oil + cow urine 0.5% spraying, respectively.

Key words: *Aphid, Cow urine, Lentil, Neem oil, NSKE, Tobacco extract.*

INTRODUCTION

Lentil (*Lens esculentus* L.) is one of the oldest food crops. Its cultivation dates back to beginning of agriculture itself. It plays an important role in human, animal and soil health improvement occupying a unique position in cropping systems. Lentil aphid, *Aphis craccivora* Koch (Hemiptera: Aphididae) has become a major pest of lentil in last few years. Aphid sucks the cell sap from the stems, twigs buds, flowers and developing pods causing a significant loss in yield. Aphid population and rate of infestation are very much dependent on sowing time **Islam *et al.*, (1991)**. It was found that, sowing of lentil by mid November received poor aphid infestation **Anonymous, (2000)** if not controlled; feeding by aphids can destroy 25-50% of developing plants. Several botanical and insecticides have been recommended for the control of insect pest of lentil. The present investigation was conducted to determine the economic feasibility in term of cost benefit ratio.

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MATERIALS AND METHODS

The study on the "Efficacy of some indigenous plant extracts and cow urine against lentil aphid" was undertaken during Rabi season 2011-12 at the Plant Protection Research Farm, SHIATS, Allahabad. The field trials were laid out for the assessment of economics and effect of treatments on marketable yield of Lentil in a R.B.D. with 7 (Botanicals and Cow urine) treatments, in three replication. The treatments: Cow urine (5.0%), NSKE + Cow urine (5.0%), Neem oil + Cow urine (0.5%), Tobacco extracts (1.0%), Neem oil (0.5%), NSKE (5.0%), and untreated control. To know the significance of difference among various treatments, yield data were subjected to statistical analysis. The benefit cost ratio was found out for all the treatment by taking into account the market price of botanical and market price of lentil. The yield grained cost of treatment were worked out for each treatment to find out the benefit cost ratio and the net profit for each treatment. Value of yield grain over control was calculated on the basis of prevailing market price in Allahabad at the time of harvesting.

RESULTS AND DISCUSSIONS

Grain yield gave the significantly increased over the control *(Table 1)*. Maximum grain yield was recorded in NSKE with Cow urine 5% spray. But it was statistically at par with Neem oil with cow urine 0.5% spraying followed by spraying of Tobacco extract 1.0%. But it was statistically on par with Neem oil 0.5%, NSKE 5% and Cow urine 5% spraying respectively. While the minimum grain yield was found from control. The results revealed that NSKE and cow urine performed significant for yield parameters and reduction for aphid population whereas synthetic neem formulation nimbicidine, M. ferrugenia and cow urine gave intermediate response Similar increased in grain yield controlling aphid in mustard reported by **Singh and Sachan (2000)** and **Gupta and Pathak (2009)**.

Spraying of NSKE + Cow urine 5.0% recorded the highest gross income (Rs. 22057.3 ha-^{1}) followed by spraying of Neem oil + Cow urine 0.5% was recorded the highest gross income of Rs. 19918 ha^{-1}. While, spraying of cow urine 5.0 % was recorded the lowest (Rs. 8592 ha^{-1}). Spraying of NSKE + Cow urine (5.0%) in lentil *(Table 1)*. The highest incremental net benefit of Rs. 19657.3 ha^{-1} followed by Neem oil + Cow urine 0.5% spraying gave net benefit of Rs. 17638 ha^{-1}. Hence, the superior to tobacco extracts 1.0 % and NSKE 5.0 % spraying gave net benefit of Rs. 10502.7 and 10454 ha^{-1}, respectively. However, the cow urine 5.0 % sprayed gave minimum net benefit of Rs. 7692 ha^{-1}.

Table 1. Incremental economics of different treatments during the rabi season of 2011-12.

Treatments	Grain Yield (q/ha)	Straw Yield (q/ha)	Increase yield over the control		Gross return (Rs/ha)	Total cost	Net return	CBR
			(Rs/ha) Grain yield	(Rs/ha) Straw yield				
T_0 - Control	10.38	13.42	0	0	0	0	0	0
T_1 - Neem oil (0.5 %)	13.26	16.67	2.88	3.25	11844.7	1980	9864.67	5.982
T_2 - NSKE (5.0 %)	13.4	18.16	3.02	4.74	12554	2100	10454	5.978
T_3 - Tobacco extracts (1.0 %)	13.42	17.85	3.04	4.43	12602.7	2100	10502.7	6.001
T_4 - Cow urine (5.0 %)	12.61	16.94	2.06	3.52	8592	900	7692	9.546
T_5 - Neem oil + Cow urine (0.5%)	15.2	19.8	4.82	6.38	19918	2280	17638	8.735
T_6 - NSKE + Cow urine (5.0%)	15.74	19.59	5.36	6.17	22057.3	2400	19657.3	9.190

The highest cost benefit ratio (9.54667) was recorded with cow urine 5.0 % sprayed followed by spraying of NSKE + Cow urine 5.0% and Neem oil + Cow urine 0.5% spraying which was on par with another. While the lower benefit: cost ratio was recorded with Neem oil (0.5 %) and NSKE (5.0 %) were similar. These results were in agreement with the findings of **Gupta and Pathak (2009)** and also **Patel and Patel (2010)**.

It is concluded that spraying of NSKE + Cow urine 5% and Neem oil +cow urine 0.5% was benefited seed yield and plant biomass, which was presumably due to reduction of aphid numbers; protection of crops from pest pressure has frequently been found to result in yield and net return increases, which is very important in the context of the socio-economic conditions of Allahabad.

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Effect of bio-agent and chemical against the pigeonpea wilt pathogen Fusarium udum Butler *in vitro*

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ABSTRACT

Pigeonpea wilt caused by *Fusarium udum* Butler is the most important disease and causes upto 100% yield loss in the susceptible cultivars. Effect of two antagonists, *Trichoderma viride* and *Trichoderma harzianum* and one botanical neem cake powder were compared with fungicide Carbendazim against *Fusarium udum in vitro. Trichoderma viride* was best in inhibiting the growth of pathogen by 72.40 percent and neem cake least affected among the bio-agents with 58.52 percent inhibition. Fungicide Carbendazim, completely inhibit the growth of pathogen at all concentration (100, 250, 500 ppm).

Key Words: - *Pigeonpea, Fusarium udum, Trichoderma sp.*

INTRODUCTION

Pigeonpea [*Cajanus cajan* (L.) Millsp.] is one of the major grain legume crops of tropics and sub-tropics countries and most extensively grown legume crop in India, suffers from wilt disease caused by *Fusarium udum*. The fungus can survive on the infected plant debris in the soil for about three years and causes serious yield losses, sometimes even upto 100 per cent in susceptible cultivars **Kiprop *et al.,* (2002)**. The disease can occurs at any stage of the crop. The total production loss due to this disease in India alone as estimated to be approximately 97,000 tones per year **Saxena *et al.,* (2010)**.

Fusarium wilt is characterized by wilting of the affected plants and characteristic internal browning or blackening of the xylem vessels extending from the root system to stems **Amin *et al.,* (1976)**. In partially wilted plants purple bands appear. When the bark of such bands is peeled off, browning of the wood is seen. Wilted plants when split open, exhibit brown discoloration of the vascular bundles. Effective disease

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control requires application of combination of broad spectrum fungicide with bio-agents. The present paper reports the results of laboratory studies taken under using dual culture method and poisoned food technique in order to find out an effective bio-agent and a chemical against Fusarium udum Butler, the pigeonpea wilt pathogen.

MATERIALS AND METHODS

The pathogen was isolated from wilted pigeonpea plant from research farm of SHIATS, Allahabad and maintained on Potato dextrose agar medium. The antagonists, *Trichoderma viride* and *Trichoderma harzianum* were isolated from the plant rhizosphers soil by serial dilution technique on PDA medium. The antagonistic effect of *Trichoderma* sp. against the pathogen was tested by the dual culture technique **Dennis and Webster, (1971)**.

In the dual culture experiment, each treatment was replicated thrice and control was maintained. A mycelium disc of 5 mm diameter of the pathogen was placed at end of Petri plate with PDA. An opposite end 5 mm diameter disc of antagonists was placed. Radial growth of the pathogen was measured and per cent inhibition was calculated by the following formula:

$$\text{Inhibition percent} = \frac{\text{Growth of the pathogen in the control plate} - \text{Growth of the pathogen in the presence of antagonist}}{\text{Growth of the pathogen in the control plate}} \times 100$$

To evaluate the effect of Carbendazim (at 100, 250, 500ppm) and Neem cake powder (at 3%, 5%, 7%), concentrations were tasted by poison food technique **Nene and Thapliyal, (1993)**.

The PDA medium was prepared with double the recommended strength and sterilized in an autoclave. Carbendazim solution was prepared double the test concentration. Carbendazim solution was mixed thoroughly with molten PDA medium in a sterilized Petri plate under aseptic conditions and allowed 5 to 10 minutes to solidify. The neem cake powder were also mixed into the molten PDA at 3, 5 and 7 percent concentration in sterilised Petriplates under aseptic condition and allowed to solidify. Appropriate controls were maintained using distilled water. From seven day old culture plates, 5 mm discs were cut from outer margin of vigorously growing

fungus with sterilized cork borer and transferred to the centre of the plates containing fungicidal medium. Three replications were maintained for each treatment. The whole procedure was carried out under aseptic conditions. The Petri plates were than incubated at 25±2^{0}C. The diameter of fungal colony was measured when the growth of the fungus in controls plates was complete. Finally per cent inhibition was calculated by the formula.

$$\text{Inhibition per cent} = \frac{\text{Diameter of colony in the control plate} - \text{Diameter of colony in the treated plate}}{\text{Diameter of colony in the control plate}} \times 100$$

RESULTS AND DISCUSSION

The results of dual culture technique revealed the effectiveness of all the antagonists with varying degrees of inhibition of the growth of the pathogen, *(Table 1)*. Among the antagonists, *Trichoderma viride* was the best in inhibiting the growth of the pathogen by 72.40 per cent followed by *Trichoderma harzianum* 67.90 per cent. Both the treatments were statistically different from each other. Similar results were obtained by the **Goudar and Kulkarni (1998)**.

Table 1: Effect of Trichoderma sp. on the radial growth of Fusarium udum in in vitro (Dual culture technique)

Treatment	Radial growth of Fusarium udum (mm)*	Percentage inhibition on control
T_0 Control	90	-
T_1 *Trichoderma viride*	24.83	72.40
T_2 *Trichoderma harzianum*	28.83	67.96
*Mean of three replications		
S.Ed (±)		0.50
CD at 5%		1.24

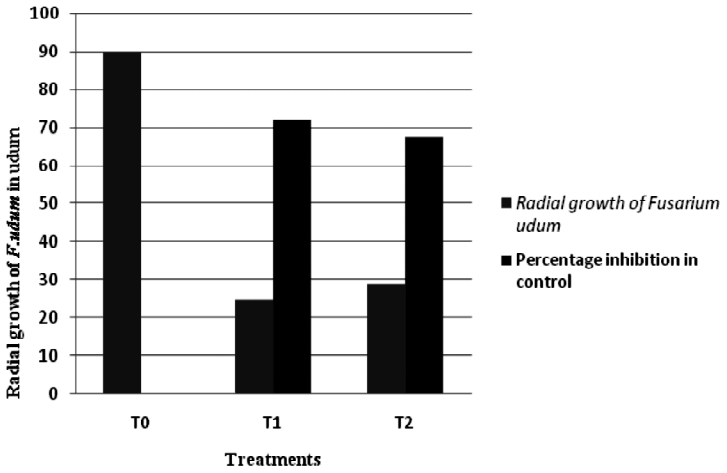

Fig. 1: Effect of Trichoderma sp. on the radial growth of Fusarium udum in vitro (Dual culture technique)

Table 2: Effect of bio-agent and carbendazim on the radial growth of Fusarium udum in vitro (Food poisoned technique)

Treatment	Concentration	Radial growth of Fusarium udum (mm)*	Percentage inhibition on control
T_0 Control		90	-
T_1 Carbendazim	100 ppm	0	100
T_2	250 ppm	0	100
T_3	500 ppm	0	100
T_4 Neem cake	3%	45.08	49.91
T_5	5%	37.33	58.52
T_6	7%	38.83	56.85

*Mean of three replications

S.Ed (±) 1.10

CD at 5% 2.37

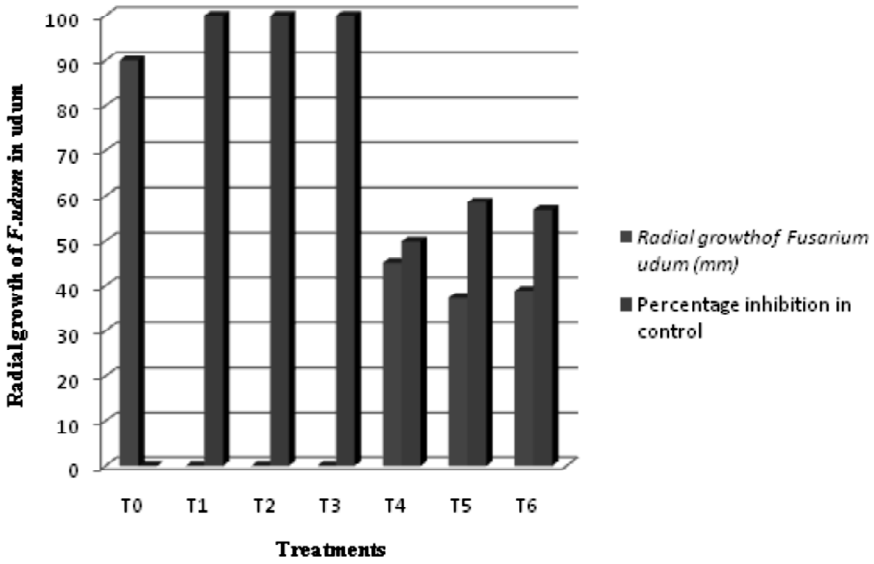

Fig. 2: Effect of bio-agent and carbendazim on the radial growth of Fusarium udum in in vitro (Food poisoned technique)

The result *(Table. 2)* of poisoned food technique revealed that both neem cake and carbendazim treatments inhibited the radial growth of pathogen significantly as compared to control at different concentrations. However carbendazim inhibited the growth of fungus at all concentrations followed by neem cake powder at 5% concentration (58.52%).

Similar result was reported by **Raju *et al.*, (2008)** in the respect to inhibition of the mycelia growth of *Fusarium udum*. Therefore it was concluded that the antagonist, Trichoderma viride and systematic fungicide, carbendazim can be successfully utilized for the control of pigeonpea wilt pathogen.

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Estimation of genetic variability parameters for yield and its related traits in Indian mustard (*Brassica juncea* L. Czern and Coss) under late sown condition

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ABSTRACT

The better way of exploiting genetic variability with several traits having high heritability is to construct a selection index that combines information on all the characters, which having decisive role in influencing the yield. Therefore, an experiment was conducted involving 46 genotypes of Indian mustard to determine genetic variability parameter and mutual relationship between various yield components viz. days to flowering, days to maturity, plant height, number of primary branches per plant, number of secondary branches per plant, number of siliqua per plant, siliqua length, beak length, number of seeds per siliqua, length of main raceme, number of siliqua on main raceme, density of siliqua on main raceme, 1000 seed weight, biological yield per plant, harvest index and seed yield per plant. Significant genotypic differences were observed for all the traits studied indicated considerable amount of genetic variation among genotypes for each character. The estimates of genotypic coefficient of variation and phenotypic coefficient of variation were high for number of siliqua per plant, beak length, harvest index and seed yield per plant. The remaining traits recorded moderate to low PCV and GCV estimates. Siliqua per plant, siliqua length, length of main receme and siliqua on main raceme contributed high heritability coupled with high genetic advance and these characters showed additive gene action which might be utilize in the improvement of mustard genotypes under late sown condition. Hence, these characters may serve as an effective selection parameter during breeding programme for crop improvement.

Key words: *Indian mustard, variability, heritability and genetic advance.*

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INTRODUCTION

The genus brassica is an important member of the crucifereae family. It comprises of several economically important species which yield edible root, stems, leaves, buds, flowers and seed condiment. Indian mustard (*Brassica juncea* L. Czern & Coss) popularly known as Rai, Raya or Laha, is one of the most important oilseed crop of the country and it contributes around 7% in the global production **Singh *et al.*, (2010)**. It is the second largest cultivated oilseed crop in India after soybean and cultivated in rabi season mainly in north-west India. It contributes nearly 27 % to edible oil pool of the country **AICRP, (2011)**. In Bihar, it is most important edible oilseed grown under timely sown irrigated, rainfed condition and as late sown crop in rice fallows after the harvesting (15th November onwards) of late Aman paddy. The genetic variability is of great value while planning an efficient breeding programme for the improvement in any crop species like Indian mustard. Germplasm, the sum of variability present in any crop species and relatives, is important for exploitation to fulfill most of the changing needs for developing improved crop varieties. Genetic variability in a population can be partitioned into heritable and non heritable variation with the aid of genetic parameters such as variance, genotypic coefficient of variation, heritability and genetic advance which serve as a basis for selection of some outstanding genotypes from existing ones. Choice of parents is not only based on desirable agronomic traits, components of yield and extent of variability but also depends on heritability of yield contributing traits. The environment, in which selection is made is also important because heritability and genetic advance vary with change in environment. Variability for economic traits must exist in the working germplasm for profitable exploitation of recombination breeding and selection.

MATERIALS AND METHODS

The experimental material comprising of forty six genotypes of Indian mustard were grown in Randomized Block Design with three replications at the research farm of Tirhut College of Agriculture, Dholi, Muzaffarpur (Rajendra Agricultural University-Pusa) Bihar during rabi season of 2010-11. Each genotype was sown in a plot consisting of three rows of 5 m length with inter and intra row spacing of 30 cm x 10 cm. Recommended package of practices for Indian mustard ware followed to raise a healthy crop. Data were recorded on five randomly selected competitive plants of each genotype in all the replications for sixteen characters viz., days to flowering, days to maturity, plant height (cm), number of primary branches per plant, number

of secondary branches per plant, number of siliqua per plant, siliqua length (cm), beak length (cm), number of seeds per siliqua, length of main raceme (cm), number of siliqua on main raceme, density of siliqua on main raceme, 1000 seed weight (g), biological yield per plant (g), harvest index (%) and seed yield per plant (g). The mean values were subjected to various statistical and biometrical analysis. Test of significance for each character were analyzed as per methodology advocated by **Panse and Sukhatme (1967)**. Phenotypic coefficient of variation (PCV) and Genotypic coefficient of variation (GCV) were calculated by the formula given by **Burton (1952)**, heritability in broad sense (h^2) by **Burton and De Vane (1953)** and genetic advance i.e. the expected genetic gain were calculated by using the procedure proposed by **Johnson *et al.* (1955)**.

RESULTS AND DISCUSSION

The analysis of variance was highly significant among the genotypes for all the sixteen traits under study, which revealed the presence of considerable variability among the studied genotypes *(Table 1)*. This suggested that adequate scope are available for selection of superior genotypes aimed at enhancing the genetic yield potential of *Brassica juncea*. Genetic parameters *(Table 2)* were studied to examine genetic worth of yield and yield attributing traits, based on genetic variability estimates viz., mean, range, phenotypic coefficient of variation (PCV), genotypic coefficient of variation (GCV), heritability (h^2), genetic advance(GA) and genetic advance as percent of mean (GAM). It was observed that all the character studied except siliqua density, siliqua length and seeds per siliqua, exhibited wide range of variation. Most pronounced range of variation was observed for number of siliqua per plant, number of secondary branches per plant, length of main raceme, siliqua on main raceme and 1000 seed weight. Higher estimates of phenotypic coefficient of variation than genotypic coefficient of variation for all the traits studied, reflected influence of environmental factor on these traits with variable influence. The high estimates of GCV and PCV for beak length, harvest index and seed yield per plant, was earlier reported by **Kardam and Singh (2005)**. It was interesting to note that except for seeds per siliqua, which was under moderate influence of environment, all other traits related to siliqua namely siliqua per plant, siliqua on main raceme and siliqua length were least influenced by environment and may be considered as distinguishing characters for mustard. Contrastingly, number of primary branches per plant, number of secondary branches per plant, 1000 seed weight, biological yield per plant, harvest- index and seed yield per plant were highly influenced by environment. High GCV was found

Table 1: Analysis of Variance of different quantitative characters in Indian mustard.

S. No.	Characters	Mean sum of squares		
		Replications	**Treatments**	**Error**
	Degree of freedom	**02**	**45**	**90**
1	Days to flowering	4.72	39.68**	1.58
2	Days to maturity	1.57	38.58**	1.21
3	Plant height	2.69	354.27**	11.43
4	Primary branches per plant	0.35	1.21**	0.31
5	Secondary branches per plant	2.57	6.54**	0.79
6	Siliqua per plant	87.81	18442.82**	48.11
7	Siliqua length	0.001	0.81**	0.02
8	Beak length	0.001	0.01**	0.004
9	Seeds per siliqua	1.012	4.53**	0.36
10	Length of main raceme	14.59	258.05**	4.66
11	Siliqua on main raceme	3.04	117.83**	1.91
12	Density of siliqua on main receme	0.009	0.03**	0.006
13	1000 seed weight	0.02	0.51**	0.04
14	Biological yield per plant	72.05	269.34**	22.89
15	Harvest index	0.58	67.18**	4.80
16	Seed yield per plant	1.12	15.54**	0.69

** Significant at 1 % level of significance

Table 2: Estimates of mean, range, coefficient of variation (PCV and GCV), heritability, genetic advance and genetic advance as percent of mean for sixteen characters of Indian mustard.

Characters	Mean	Range		GCV	PCV	h^2 (%)	GA	GAM
		Min.	Max.					
Days to flowering	57.09	46.67	62.33	6.24	6.62	89.00	6.92	12.13
Days to maturity	117.56	114.33	132.67	2.91	3.15	91.00	6.91	5.88
Plant height	195.01	169.40	217.00	5.48	5.75	91.00	20.91	10.77
Primary branches/ plant	4.96	3.93	6.87	11.06	15.69	50.00	0.71	16.06
Secondary branches/ Plant	8.49	4.33	11.20	16.32	19.38	71.00	2.40	28.31
Number of Siliqua/ plant	340.10	176.87	515.13	23.02	23.11	99.00	160.67	47.24
Siliqua length	5.11	4.06	6.17	10.05	10.43	93.00	1.02	19.96
Beak length	0.87	0.49	1.25	20.27	21.60	88.00	0.34	39.18
Number of seeds/ Siliqua	12.92	9.57	14.93	9.13	10.25	79.00	2.16	16.73
Length of main raceme	55.69	42.87	73.47	16.50	16.95	95.00	18.43	33.09
Number of siliqua on main raceme	42.66	34.53	55.40	14.57	14.93	95.00	12.41	29.21
Density of siliqua on main raceme	1.31	1.10	1.56	6.91	8.95	60.00	0.15	11.15
1000 seed weight	3.01	1.84	3.79	13.86	15.21	82.00	0.78	25.86
Biological yield/ plant	52.45	29.00	73.33	17.28	19.54	78.00	16.51	31.48
Harvest index	20.67	13.76	33.43	22.06	24.47	81.00	8.47	40.96
Seed yield/ plant	10.57	7.40	14.87	21.05	22.48	88.00	4.29	40.62

GCV = Genotypic coefficient of variation, PCV = Phenotypic coefficient of variation, h^2 (bs) = Heritability (broad sense) GA = Genetic advance, GAM= Genetic advance as percent of mean

for number of siliqua per plant, beak length and harvest index indicated that selection with these characters may be good approach for enhancing the seed yield of the genotypes. Similar result was also reported by **Singh *et al.* (2002)**. Genetic co-efficient of variation help to measure the range of genetic variability present in population for the particular character. However, it is not possible to determine the amount of heritable variation with the help of GCV alone. **Burton, (1952)** suggested that genetic co-efficient of variation along with heritability estimate would be more useful than the heritability value alone. **Panse, (1956)** suggested that if the heritability is mainly due to non-additive genetic effect, the genetic gain would be low. On the other hand where heritability is chiefly due to additive effect of gene may gives high genetic advance. Heritability and genetic advance when considered together would prove more useful in predicting the resultant effect of selection on phenotypic expression **Johnson *et al.*, (1955)**. Based on this consideration the attributes reflecting high heritability coupled with high genetic advance as percent of mean were identified. These attributes were number of siliqua per plant, harvest index, seed yield per plant and length of main raceme. Thus, these attributes indicated greater contribution of additive genetic component and may be exploited through selection in early generations for the development of high yielding mustard genotypes under late sown agro-ecoogical situation. The finding of **Mahla *et al.* (2003)**, **Singh (2004)**, **Kumar and Mishra, (2007)** were in accordance with the present investigation.

From the present study, it may be concluded that the character like; siliqua per plant, secondary branches per plant, length of main raceme, siliqua on main raceme, harvest index, 1000 seed weight and seed yield per plant should be given top priorities during selection for genetic improvement of the Indian mustard.

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Induced Breeding and Larval Rearing of Anabas testudineus (Bloch) Under the Agroclimatic Conditions of Assam, India

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ABSTRACT

The climbing perch Anabas testudineus (Bloch) locally known as Kawoi or Koi, is one of the highly priced fish in Assam, India. The paper embodies to develop an economically viable breeding protocol for induced breeding and larval rearing of this fish. The rearing of the brooders was carried out in the cemented tanks and induced breeding was performed by intramuscular hormonal injection (Ovaprim: 2 ml/kg). The spawning took place after 10-12 hours of hormonal injection followed by hatching after 25-27 hours. The fertilisation percentage was around 85%. The fertilized eggs of the climbing perch are transparent, round in shape and floats freely in the water surface measuring 0.7-0.8 mm. in diameter with a single large oil globule. The newly hatched larva was slender, semitransparent and measuring 2.0-2.10 mm. in length. The yolk sac absorbed after 92-96 hrs. The larvae were fed with Paramoecium along with other dry food. The larvae of A. testudineus reached juvenile stage after 25-28 days of hatching. The results of the study could produce a substantial number of seed of Anabas testudenius.

Keywords : *Anabas testudineus, induced breeding, larval rearing.*

INTRODUCTION

A. testudineus which is also known as climbing perch and locally known as Kawoi or Koi, is a species that possess labyrinth organ in the head region by which they can breathe in terrestrial condition **Shinsuke *et al.*, (2008)**. This fish is highly esteemed

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for its highly nourishing quality and freshness. The muscle of the fish is rich in nutrient quality for sick and convalescent having high medicinal and therapeutic value **Hussain, (2005), Wimalasena and Jayasuriya, (1996)**. This fish is suitable for cultivation in ponds, reservoirs and rice field. In recent times, because of its higher market value, the species has come under considerable pressure and are nearly threatened in some areas may be due to environmental changes and over-fishing **Sverdrup-Jensen, (2002), Das *et al.,* (2009)**.

The major constraint in the culture of this species is the non-availability of quality seeds. Hence, it is expedient to introduce an enduring system of producing seeds of climbing perch through induced breeding as an alternative to the present unreliable dependence on wild seed collections. To utilize and manage this species judiciously in culture system, understanding of reproductive biology, seed production and larval rearing techniques are very essential. Numerous studies on the biology, embryonic, larval development and growth of this candidate species have been carried out by the scientists **Riehl and Baensch, (1991), Yakupitiyage *et al.,* (1998), Amornsakun *et al.,* (2005), Sarkar *et al.,* (2005)**. The reports are also available for the bredding of A. testudineus in laboratory condition **Banerji and Thakur, (1981), Zalina *et al.*, (2012)**. However, the report failed to establish the protocol for seed production of this important species.

Therefore, the study was carried out to establish the induced breeding techniques to develop economically viable seed production protocol helpful for the different stakeholders and also to gather adequate knowledge on the subject.

MATERIALS AND METHODS

The present study was conducted for a period of two years from January 2009 to August 2010 at West Jalukbari in Guwahati, Assam, India under natural condition. This area lies between the latitude and longitude of $26^0 6'$ N and $91^0 48'$E respectively. The brood fish were collected from Deepor Beel and some natural water bodies in and around Jalukbari. Care was taken to select and collect the healthy brood fish during the time of collection. Male and female were segregated and stocked in separate tanks. The adequate water requirement, dissolved oxygen and availability of natural food was controlled and maintained for brood fish maintenance. The weight of the males ranged from 27.65 gm to 33.87 gm and the female from 35.34 gm to 49.45 gm.

Four females and eight matured males were selected from the stock for induce breeding. The breeders were given intramuscular injections of Ovaprim (synthetic

hormone available at market) @ 2ml/kg body weight following the methodology of **Bhattacharyya and Homechaudhury, (2009)**. The optimum doses were found out based on experimental trial. All the breeders were released into two cemented tanks of size 150 cm X 60 cm X 75 cm with the ratio of 1:2 (female: male) in two equal halves (six numbers in each tank) for spawning. The cemented tanks were directly connected by a water pump to supply the water from the pond whenever required. Before releasing the brooders, the water of the tanks was filtered with synthetic cloth (50 cm mesh) to avoid entry of predators for the hatchlings like Cyclops. Outlets of the tanks were covered with proper mesh size net to avoid the escape of fish seeds. The temperature during the incubation period was 28-31^{0}C.

After hatching the breeders were immediately transferred into the stocking pond. The larvae were fed on the small sized natural food available in the tanks like Paramoecium etc. Artificial powder food, dried Daphnia powder available in the market along with yolk sac of the boiled egg of hen or duck were also supplied to the tank to avoid any scarcity of food item **Trieu and Long, (2001)**. Regular filtered water was supplied to the tanks from rearing ponds to avoid any contamination evolved from the supply of artificial food. After 8-10 days when the larvae attained a size of 7-8 mm, the mesh size of the net of the inlet pipes used for filtration increased to allow some comparatively bigger sized zooplankton like Daphnia, Cyclops etc. for the larvae of the tanks as natural food. It is found that the larvae can consume these type of zooplankton at this later stage which otherwise can cause severe damage during early period of larval rearing. The hatchlings were stocked @ 2 nos. /L in the cemented tanks. The care was also taken to avoid intra-brood cannibalism by removal of the 'shoot' fries. Later, 1 litre of space was provided to each fry for attaining maximum survivality with the supply of water regularly. One air pump was also fitted to the tanks to avoid any decrease dissolved oxygen when the water pump was not in use.

RESULTS AND DISCUSSION

After 10 to 15 minutes of Ovaprim inoculation, both male and female became active and chasing pattern were observed. The fishes became calm and went to the bottom of the cemented tank and remained side by side in the tank once the chasing was over after a period of half an hour. The second phase of chasing was again observed after 8-10 hours of injection and started rubbing their body into each other. Both male and female fishes nudged their snouts into the genitalia of each other.

Their dorsal spines were in erected position. Mating was preceded by elaborate courtship.

The fishes started spawning after about 10-12 hours of injection and it continued for six hours. The favorable water temperature was recorded between (28-31^{0}C) and it prefers to spawn during night. The brooders were removed from the tank and kept separately in another tank. The periodical spawning was observed with a fertilization percentage was 85%. The latency period was 10 to 12 hours and the hatching was

Table 1: Morphological Characters of Embryonic Developmental Stages

Stage	Observation
Egg (Two celled stage)	The cell dividing into two blastomers of nearly equal size after 30 minutes of fertilization
Just before hatching	After 9th hour of fertilization the differentiation of the embryo begins and the organs like tail, abdomen and head are formed
Newly hatched larvae	After 28th to 30th hour of fertilization the tail was the first organ to come out from the egg followed by other organs. The average total length of newly hatched larvae was 2.95 mm. (from 20 individuals).
36 hours old larva	The larvae become 3.31 mm. in length with fully developed eye.
72 hours old larva	The larvae become 3.45 mm. in length with fully developed digestive system consuming the natural food along with supplied dried powder food.
7 days old larva	The size of the larva increases upto 5.30 mm. the head and eyeball become large
15 days old fish	The length of the 15 days old larva increases to 1.4 cm. Fully formed ctenoid scales present on the belly portion. During this stage it swims to the surface of the water.
28 days old fish	It attains a length of 2.3 cm. Scales fully formed towards the end of the tail and head also.

observed after 25-27 hours. 80-82% survival was recorded after 9-10 days. Parental care was not noticed in this species.

The fertilized eggs of the climbing perch are transparent, round in shape and floats freely in the water surface measuring 0.7-0.8 mm. in diameter with a single large oil globule. The egg is highly laden with yolk, which remains at the vegetal pole. The fertilized eggs are adhesive in nature. The first cleavage commences thirty five to forty minutes after fertilization. The newly hatched larva was slender, semitransparent and measuring 2.0 - 2.10 mm. in length. The morphological characters during embryonic development are shown in *Table-1*.

The result of the present study showed that there was no color difference of the species examined during maturation and sexes were apart by girth, as that of female is larger particularly in spawning time which is quite different from earlier study conducted by **Mookherjee and Mazumdar (1946)**. The other features of sexual dimorphism were same as described by **Dehadrai and Banarji, (1973).**

The female *A. testudineus* attained sexual maturity in 40.20 ± 5.32 gm. The morphological characters of gonadal cycle have been described in *Table-2*. The fecundity of the fishes was analyzed and recorded 12, 084 to 48, 477 nos. /kg body weight which is higher as compared with other reports available in India. However, similar range of fecundity was also recorded by **Khan and Mukhopadhyay, (1972)**.

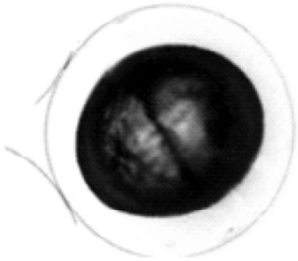
The result of the present study revealed that the larvae do not feed on micro-crustacean till it attains the size of 9 mm. in 6 to 8 days which is contrast to the study conducted by **Mookerjee and Mazumdar (1946)** who inferred that *Cyclpos*, micro-crustacean and rotifers are the preferred items of food for the larvae of *Anabas* right from the start of the feeding behavior which it manifests within 36 hours of the hatching. The yolk sacs were completely absorbed within 92 to 96 hours after hatching. However, it may be noted in this context that the larvae of climbing perch started feeding at 36 hours after hatching along with their remaining 50% yolk sacs.

As per observation, newly hatched larvae higher than 2 mm. in size, sluggish and buoyant are disposed to destruction by the larger broods of Anabas itself besides other harmful organisms. Ultimate number of survival in a brood of Anabas is found limited by belligerent tendency between the individuals in the same brood marked by the fact that nearly 3% of them out-grow the rest as 'shoot' fry.

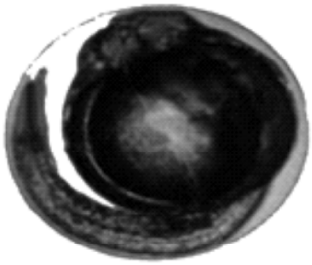
Table 2: Morphological Features of Gonadal Development Stages

Stage	Observations
Resting Phase (Male gonads)	Gonads are pinkish coloured, elongated and slender structure. Seminiferous lobules are small and packed with spermatogonia. This stage extends from August to January.
Resting Phase (Female gonads)	Presence of small filamentous pinkish white colored ovaries. This stage extends from August to January.
Maturing Phase (Male gonads)	Gonads become slightly swollen with pinkish color. This stage extends from last part of the January to first part of the March.
Maturing Phase (Female gonads)	In this period ovaries are increased in volume and become opaque and slight yellowish colored. This stage extends from last part of the January to first part of the March.
Male gonads	Seminiferous tubules increased in size filled up with sperms. This stage extends from March to May.
Female gonads	Well vascularized ovaries increased to fill the whole of body cavity in the months of March to May
Matured Male	The matured males are reddish colored and possess some bands at their lateral sides which become distinct during breeding season and generally longer and brighter than the female.
Matured Female	The fully ripe females have bulging yellowish abdomen with a prominent bulging at the vent resembling genital papilla

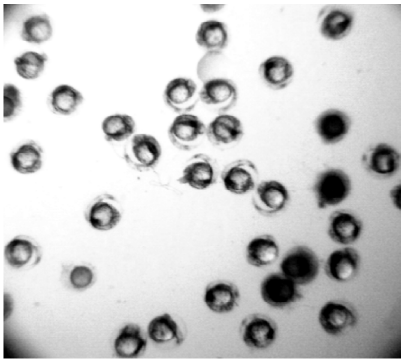
The larvae were stocked @ 2 nos. /L in the tanks, which was double of the stocking density as described by **Banerji and Prasad, (1974)**. Supply of minute planktons dominated by rotifers was supplied as food for sustaining the larvae in the tanks. 80-82% survival was recorded after 9-10 days. After 10 days till 28 days, the water volume in the tanks increased upto double to provide space @ 1 larvae / L. During this period the uptake of water by pump (uptake capacity 900 L/hr.) was made twice in an hour (early morning and late evening) since the plankton



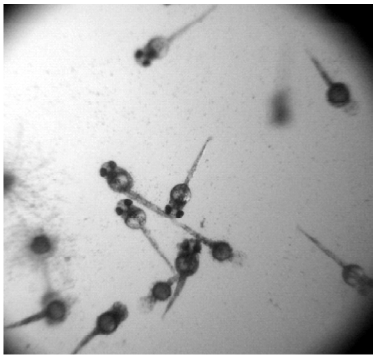
Fertilized eggs (Two celled stage)



Egg (just before hatching)

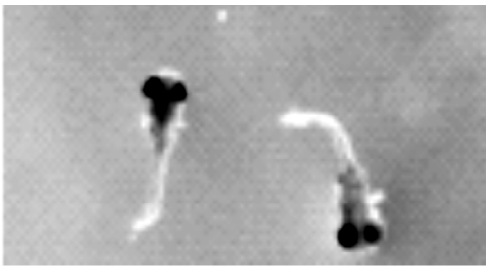


Embryonic development



Larval development

Newly hatched larvae



Fry (36 hours old)

Plate 1: Embryonic and Larval Development Stages

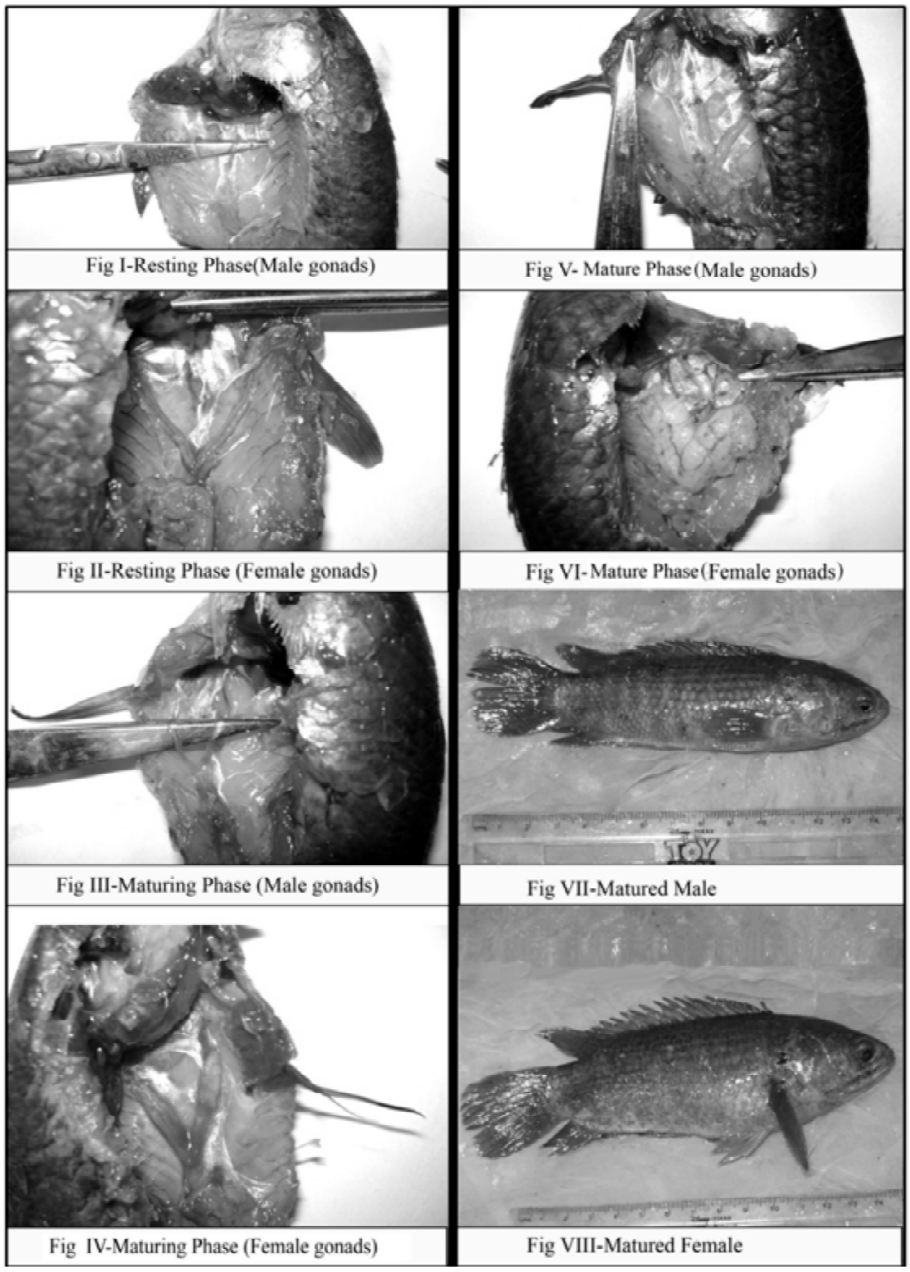


Plate 2: Gonadal Development of Anabas testudineus (Bloch.)

remains available at the surface. Maximum care should be taken to avoid intra-brood cannibalism.

The results of the present finding could produce a substantial number of seed of Anabas testudenius with the development of protocol for induced breeding and larval rearing of this important fish under the agro climatic condition of the region.

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Standardization of the Processes and Varietal Evaluation of Honey Coated Aonla Candy

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ABSTRACT

At the end of sugar impregnation rotating process was adopted just to absorb entire sugar along with complete removal of water. This was done just to avoid nutrition loss through unused processed syrup usually left at the end of processing. Honey coating not only makes glossy appearance but also improves captive flavor of the candy. Parameters viz TSS, Acidity, pH, Ascorbic acid and Optical density were analyzed before the segment impregnation into sugar, so that after product preparation the values may be evaluated as the impact of variety, honey and storage duration. Cultivars yielded significant results with parameters studied. This was further influenced when prepared Aonla candy were coated with honey. Among varieties in concern NA-6 proved much better with quality parameter studied. There was increase in the level of total soluble solids, acidity and browning and decrease in pH, ascorbic acid, and organoleptic taste during storage. The highest TSS was recorded in NA-6 (76.7%) and the lowest value was (75.9%) in Kanchan at 90 days of storage. Acidity was recorded highest in Kanchan (0.68%) and the lowest (0.58) in NA-6 after 90 days of candy storage. The maximum pH (4.28) was observed in Krishna while the minimum (4.23) was NA-6. The highest Ascorbic acid (102.15mg /100 g) was recorded in NA-6 and the lowest was (90.10 mg /100 g) with Kanchan. The highest browning was found (0.14 OD) in Kanchan and the same OD value (0.13OD) was recorded in NA-6, NA-7 and Krishna. The organoleptic quality was best (7.19 score) in NA-6 at 90 days of storage. Conclusively, varietal influence on parameter studied was significantly dominant. Honey coating gave encouraging results as it enhance all the qualitative traits and also improves nutritional value of the product. Variety

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NA-6 may be advocated for commercial scale Haney Coated Aonla candy preparation, adopting rotating process to consume entire sugar used during processing.

Key Words: *Aonla Candy, Honey, TSS, Acidity, pH, Ascorbic acid, Browning, Organoleptic Quality and Storability.*

INTRODUCTION

Aonla {*Emblica officinalis* Gartn.), the miracle of wasted land fruit plant has planned for massive planting in Northern India especially in Uttar Pradesh. Besides its medicinal, nutritional and religious significance. It occupies a sacred place in India mythology, the edible fruit tissue of Aonla contains about 3 times as much protein and 160 times as much vitamin 'C' as apple **Barthakur and Arnold (1991)**. The fruit contains a chemical substance called leucanthocyanin which retards the oxidation of Ascorbic acid. Antioxidant effect of Gallic acid, present in Aonla fruit is being well aknowledged. **Dahiya and Dhawan (2007)** reported that the fresh fruit of Aonla are very rich source of Ascorbic acid (454.40 mg/100g) and appreciable source of total sugar (7.53mg/100g), calcium (14.91 mg/100g), Iron (0.62 mg/100g) and phosphorus (11.81 mg/100g) and has great potential for processing. This fruit rightly acclaimed as Amrit kalash in Ayurveda being full of nutritional and medicinal properties in it. This fruit has vast amiability to value addition by processing in different ways.

Aonla preserve has the beneficial effect on blood purifying. This also helps in reducing the cholesterol level in blood and in improving eyesight. However, the use of preserve is often disliked by majority of people due to unease in handling during consumption. As fruit is preserved in sugar syrup, there is always a chance of spillage of syrup on clothes and hands become sticky too. During journey preserve become always unfit due to these difficulties. Its transportation and storage is also troublesome. Moreover stone has to be separated while eating the fruits. In order to avoid these difficulties and to popularize the consumption of Aonla products, Aonla Fruit Candies are being popularised now a days.

Candy is an intermediate moist food which is prepared after shade drying of drained fruits impregnated with cane sugar. According to the **Pathak *et al.* (2003)** cultivar Krishna is moderate in keeping quality hence an ideal variety for preparing candy and juice. NA-6 is reported an excellent variety for making preserve, candy and jam. While NA-7 is found good variety for making chavanprash, chutney, pickle,

jam and squash. Preserve prepared by using the fruit of optimum maturity also keep longer with better organoleptic qualities. Unfortunately, preserve can't be fortified with desired ingredients for particular purpose as therapeutics. Preserve also needs standard fruit maturity indices and bold translucent fruit bearing cultivars are ideal for the preserve. Contrary to this, Aonla Candy has no such limitations and judiciously may be fortified with differed maturity range of fruits.

Candies are becoming more and more popular because of high acceptability, minimum volume, higher nutritional value and longer storage life. These have additional advantage of being least thirst provoking and ready to eat snacks.

Honey is a natural sweetener with high energy carbohydrate food considered to be the best source of heat and energy given over 3200 calories/kg. Medicinally honey is non-irritant, promotes rapid growth of healthy tissues and is useful to cure bed sores, skin and intestinal disorders etc. It quickly replenishes the energy lost in various physical activities. It can be utilized in production of various fruits and vegetables preserves in place of white sugar or jiggery. Its applications with selected fruits and vegetables of medicinal value viz. Aonla, Sapota, Papaya, Karonda, carrot and cucumber etc, to develop designer foods with added therapeutic properties need some basic research related to standardization of recipes, characterization of product, packaging and self life studies, therapeutic values etc. Such utilization of honey will also enrich employment opportunities and enhance the economy of bee keeping in India.

Among the unique products of Aonla, the candy has much demand in domestic as well as export point of view. To strengthen market, storability and superior quality of Aonla Candy is of prime importance. It needs to fortify with nutrition rich sweeteners. It is also a matter of great interest to notice the influence of such sweeteners on different cultivars to reach on top quality parameters with grate acceptance by the commoners and elite both. Besides, economics of the fortified product should not exceed much higher and remain on the limits of purchasers. Therefore natural honey was used to coating the Candy to enhance nutrition value as well and other quality parameters maintaining the TSS intact of the product. Keeping above facts in view a laboratory trial was conducted on "Varietal evaluation of honey coated Aonla Candy at ambient storage conditions"

MATERIAL AND METHODS

The experimental work on varietal evaluation of honey coated Aonla candy at ambient storage conditions was conducted in the P.G. laboratory, Deportment of Horticulture, Sam Higginbottom Institute of Agriculture Technology & Sciences, Allahabad, during the year 2008-2009. Data were statistically analyzed and the significance of study was tested at 5% level **Panse and Sukhatme (1967)**. Mature fruits of aonla were procured from the orchard of the Department of Horticulture, Sam Higginbottom Institute of Agriculture Technology & Sciences, Allahabad in the month of December. Honey was procured from the Department of Horticulture K.A.P.G. Collage, Allahabad. The four cultivars viz. NA-6, NA-7, Krishna, and Kanchan were selected for candy preparation. Matured, uniform diseased free Aonla fruits were selected. Fruits were then washed properly in running water to clean the fruit. Fruits were pricked and dipped in 2% salt solution for 24 hrs., then washed with clean water and Kept pricked fruits in 2% $CaCo_3$ solution for 24 hrs and washed. Fruits were blanched in boiling water for 10 mins. Then seeds were removed and segments were separated. Two kilogram healthy, uniform size, disease, pest and bruises free were taken randomly from each genotype for the processing of aonla candy. Honey was used at the end of complete impregnation of sugar in Aonla segments. One kg of Aonla segments were coated with 100 gm honey. The values of physico-chemical parameters of candy viz. TSS, acidity, pH, ascorbic acid and organoleptic score were recorded at 0, 30, 60 and 90 days of storage. The candy was filled in glass jar and stored at ambient temperature. Total soluble solids (TSS) were determined by hand refracto-meter. The refractometer was first checked for accuracy before use by placing a few drops of distilled water on the prism in the specimen of the refractometer with the help of a glass rod after folding back the cover. For determining the TSS, the prepared paste of candy is placed on the prism and the percentage of dry substance in it was read directly. The values were corrected at 20^0C. TSS is expressed in oBrix. Ascorbic acid was determined according to the method, as described by **Ranganna, S. (1986)**. The pH values were recorded in Aonla candy with the help of an electronic pH meter. Here we are prepared candy paste and then sample was mixed in some amount of distilled water. Then the sensory evaluation of the product was done at monthly interval starting from zero days to eight months of storage. As per treatment data were recorded and values were evaluated on hedonic scale by a panel of five judges as described by **Amerine (1965)** to draw certain conclusions.

Flow chart for preparation of Honey Coated Aonla candy

Fresh Aonla were taken

↓

Washing under tap water twice

↓

Pricking

↓

Keeping pricked fruits in 2% $CaCo_3$ solution for 24 hrs.

↓

Drain out from solution and washed with fresh water 3 times

↓

Boiling in water until segments become tender and start separating

↓

Drain out fruits and then their segments separated from seeds

↓

Putting the segments in equal quantity of sugar in alternate layers in a steel pan for 24 hrs.

↓

Taking out segments from sugar syrup, addition of 5gram citric acid per kg of sugar and heating to dissolve the sugar completely in drained sugar syrup

↓

Replacing the segments into syrup and heating to raise the strength of syrup 70% TSS, leave the segments in the syrup for 24 hrs.

↓

Repetition of the above step to get ideal impregnation of the segments

↓

Drain the segments and remaining syrup was heated to get 75% TSS and then dipping segments for a week

↓

Now segments were put in rotated pain with low temperature for one and half an hour just to evaporate water and complete impregnation of sugar

↓

Mix well @100 gm honey per kg segments and keep for two days

↓

Then air drying in shade

↓

Honey coated Aonla candy packed in glass jars

↓

Storage

RESULT AND DISCUSSION

It is evident from *Table 1* that the total soluble solids of Honey coated Aonla candy was found to increased with storage period. The data were showing significant difference three months after storage. The maximum T.S.S. in variety NA-6-(76.7%) followed by NA-7-(76.2%), Krishna-(76.1%), while minimum was observed in Kanchan (76.0%). It might be due to loss of moisture during storage which may be responsible to increase total soluble solids of candy. TSS was found gradually increased with increase in storage period. This might be due to the conversion of polysaccharides into sugars during hydrolysis process. Increase in TSS might also be attributed to the reduction in moisture content of the product with storage. Increase in TSS with storage was also reported by **Tripathi *et al.* (1988), Kumar and Singh (2001)** and **Kumar *et al.* (1992)** in Aonla products. The total acidity content of honey coated Aonla candy was increased with the advancement of storage period. Maximum acidity (0.68%) was recorded in Kanchan while minimum were associated with NA-7- (0.58%) at 90 days after storage. Results were also observed by **Meghawal, (2006)** and **Goyal *et al.*, (2008)**. Retention of pH was found to be highest in the honey coated Aonla candy prepared from variety NA-7-(4.33) followed by Krishna -(4.28) while minimum retention was recorded in Na-6-(4.25) and Kanchan (4.23). Results showed that the most desirable candy prepared from NA-6 had least pH reduction.

Ascorbic acid retention was found highest in 0 day in honey coated aonla candy prepared from variety NA-6 (112.80 mg/100 g) followed by Krishna-(110.01 mg/100 g) and NA-7- (106.41) whereas minimum retention was associated with Kanchan (104.27 mg/100 g). Ascorbic acid was found after 90 days lose in minimum in NA-6-(10.65 mg/100 g) followed by Krishna-(12.56 mg/100 g), NA-7-(13.46 mg/100 g) and Kanchan-(14.17 mg/100 g). Similar results were also observed by **Singh *et al.* (1993)** and **Tripathi *et al.* (1988)**. **Agrawal and Chopra (2004)** carried out a study with regard to changes occurring in ascorbic acid and total phenols during storage in different Aonla products. They observed that the shreds registered greater loss in ascorbic acid followed by jam, candy and squash respectively. However, the candy showed greater loss in total phenols followed by shreds and squash while in jam recorded slight increase in total phenol content. These findings were in conformity with the findings of **Pathak (1988), Asmawi (2009)** and **Kumar (1990)**. Candy prepared from all the four varieties were acceptable. However, at 0 and 30,60 and 90 days of storage period, the variety NA-6 organoleptically scored 8.11 and 7.98, 7.70, and 7.19 followed by Kanchan 7.78 and 7.66, 7.37 and 6.85, respectively. At

Table. 1 : Chemical composition of tender Aonla segment just after boiling. (2008-09)

Treatment	TSS (%)	Acidity (%)	pH	Ascorbic acid(mg/100g)	Browning (OD)
	Tender segment (just boiled)	Tender segment (just boiled)	Tender segment (just boiled)	Tender segment (just boiled)	Tender segment (just boiled)
NA-6	11.34	1.63	1.63	493	0.03
NA-7	11.09	1.74	1.69	418	0.03
Krishna	10.49	1.87	1.88	438	0.04
Kanchan	10.74	1.93	1.93	397	0.04
SEm(±)	0.03	0.01	0.01	3.56	NS
CD (5%)	0.06	0.02	0.02	8.12	NS

Table. 2 : Changes in chemical composition in honey coated Aonla candy during storage.(2008-09)

Treatment	TSS (%)				Acidity (%)				pH				Ascorbic acid(mg/100g)				Browning (OD)			
	0 day	30 days	60 days	90 days	0 day	30 days	60 days	90 days	0 day	30 days	60 days	90 days	0 day	30 days	60 days	90 days	0 day	30 days	60 days	90 days
NA-6	75.2	75.6	76.3	76.7	0.54	0.56	0.58	0.60	4.40	4.37	4.32	4.25	112.80	109.10	106.21	102.15	0.04	0.07	0.11	0.13
NA-7	75.0	75.5	75.9	76.2	0.49	0.51	0.54	0.58	4.48	4.45	4.40	4.33	106.41	102.61	97.38	92.95	0.04	0.07	0.10	0.13
Krishna	75.1	75.4	75.9	76.1	0.55	0.57	0.60	0.65	4.43	4.40	4.35	4.28	110.01	108.15	103.25	97.45	0.05	0.07	0.11	0.13
Kanchan	75.2	75.4	75.7	76.0	0.58	0.60	0.64	0.68	4.38	4.35	4.30	4.23	104.27	100.55	96.38	90.10	0.05	0.07	0.11	0.14
SEm(±)	NS	NS	0.04	0.07	0.07	0.07	0.07	0.08	NS	NS	NS	NS	0.291	0.300	1.223	2.571	NS	NS	NS	NS
CD (5%)	NS	NS	0,07	0.14	0.14	0.14	0.15	0.16	NS	NS	NS	NS	0.637	0.647	2.673	5.438	NS	NS	NS	NS

Table. 3 : Changes in organoleptic parameters in honey coated Aonla candy during storage.(2008-09)

Treatment	Colour and appearance				Flavour				Texture				Taste				Overall acceptability			
	0 day	30 days	60 days	90 days	0 day	30 days	60 days	90 days	0 day	30 days	60 days	90 days	0 day	30 days	60 days	90 days	0 day	30 days	60 days	90 days
NA-6	8.09	7.94	7.67	7.25	7.47	7.29	6.86	6.04	8.40	8.30	8.05	7.55	8.48	8.40	8.22	7.92	8.11	7.98	7.70	7.19
NA-7	7.35	7.20	6.93	6.51	7.05	6.87	6.44	5.61	7.61	7.51	7.26	6.76	8.25	8.17	7.99	7.69	7.57	7.44	7.16	6.64
Krishna	7.92	7.77	7.50	7.08	7.24	7.06	6.63	5.77	7.97	7.87	7.62	7.12	8.00	7.92	7.74	7.44	7.78	7.66	7.37	6.85
Kanchan	7.74	7.59	7.32	6.90	7.29	7.11	6.68	5.75	8.21	8.11	7.86	7.36	7.55	7.47	7.29	6.99	7.70	7.57	7.29	6.75
SEm(±)	0.03	0.03	0.04	0.04	0.03	0.03	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.04
CD (5%)	0.07	0.07	0.09	0.09	0.06	0.04	0.04	0.05	0.07	0.06	0.06	0.09	0.07	0.06	0.06	0.09	0.07	0.06	0.04	0.03

90 days of storage both varieties were statistically at par. Organoleptic evaluation revealed that the acceptability of honey coated Aonla candy decreased with the storage period. Honey coated Aonla candy packed in glass jars maintained their acceptability up to 3 (three) months at ambient temperature. These findings were in line with the findings of **Deen (1992)** and **Ram (1974)**. It is evident from Table 2. that the acceptability in terms organoleptic taste was found better with the candy prepared from, NA-6, Krishna and Kanchan than that of and NA-7 at last interval of storage. Honey coated Aonla candy showed decreasing trend in overall acceptability in all the treatments during storage period which might be due to the changes in colour as indicated by increase in browning and changes in texture as indicated by the texture scores awarded by judges **Mulla, A. (2007), Relekar *et al.* (2011)**.

Based on the above facts, it may be concluded that in terms of TSS, acidity, pH, ascorbic acid, Browning and organoleptic taste the Aonla cultivars NA-6 shall be taken for honey coated Aonla candy preparation on commercial scale.

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Effect of chemical and packaging material on the shelf life of Kinnow mandarin (*citrus reticulata*)

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ABSTRACT

The present investigation entitled "Effect of chemical and packaging material on the shelf life of Kinnow Mandarin (*Citrus reticulate*). There were sixteen post harvest treatment and one storage condition i.e (Room temperature). Name of chemical use - Wax (0%), (2%), (4%) and (6%) Carbendazim (0.5%), (0.25%) and (0.1%). Their effects were accessed by complete randomized design with three replication. The treated fruit of Kinnow mandarin were stored at room temperature (9 -29 ^{0}C, 22-93% RH). There was decrease in vitamin C (mg) and acidity during storage period of kinnow mandarin fruit under room temperature. There was increase in TSS and juice pH. Physiological loss in weight of fruit increased in storage period Irrespective of post harvest treatment and room temperature. All the treatments were found better in respect of TSS & ascorbic acid content over Control. Post harvest application in T14 - waxol (6%) +carbendazim (0.25%)+ LDPE of kinnow mandarin fruit has result in better shelf life attributes during storage days over others treatment combinations .

Key Words: *Kinnow, Waxol, polythene bags, Carbendazim and LDPE.*

INTRODUCTION

Kinnow mandarin refers to tight skin citrus fruit. Kinnow mandarin is the second largest citrus fruit cultivated in the country. Main variety of sweet orange in India being cultivated on commercial scale are blood red, Mosambi, and Sathgudi. Sathgudi have originated from India. Sathgudi is extensively grown in Andhra Pradesh.

Kinnow mandarin matures in 9-12 months. Being a non-climacteric fruit, there is no improvement in color, taste and flavor after harvesting. Therefore fruits should be harvested when they are fully ripe and attain proper size, colour and acceptable sugar: acid ratio.

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Climatic conditions in India are not suitable for keeping the fruits for a longer period. Each year nearly 15-20% of the production is wasted in the producing area owing to lack of adequate transport and storage.

The maximum production of citrus fruits is centered in rural areas. Further the holdings are smaller. The growers cannot afford the high rates of cold storage. So they have to look for alternative means of storage where by the fruit can be stored in good physiological condition for short period of 3 to 4 weeks or till it disposed off. Whereas during lean periods there will be shortage in supply, consequently the prices go up.

Various viable technologies for improving shelf- life and storage of horticultural commodities have evolved during the post decades, like the use of fungicides, cold storage, controlled atmosphere storage, antitranspirants, wax coating, growth retardants, irradiation and different type of packing material etc, to increase the self-life of harvested fruits **Singh *et al.* (1988).**

The technology aim to preserve quality, nutritional and economic value and assure food safety and regulated supply of commodities for processing, domestic markets and export.

MATERIAL AND METHODS

Present investigation entitled "Effect of chemical and packaging material on the shelf life of Kinnow mandarin (*citrus reticulata*)" was conducted at Post Harvest Laboratory, Department of Horticulture, Allahabad Agricultural Institute- Deemed University, Allahabad, Uttar Pradesh during the year 2009. The experiment was laid out in a simple CRD with sixteen treatments, each replicated thrice. Carbendazim and Waxol was applied on a Kinnow fruits and packed in a polythene bags to extend the shelf life. Regular observations were taken at 7 days interval on T.S.S, diameter of fruits, titrable acidity, vitamin C, PH of the juice, acidity, and specific gravity and Physiological weight loss.

TREATMENT COMBINATIONS

T_0 Control, T_1Carbendazim (0.5%), T_2 Carbendazim (0.25%), T_3 Carbendazim (0.1%), T_4 Wax coating (2%), T_5 Carbendazim (0.5%) + Wax coating (2%), T_6 Carbendazim (0.25%) + Wax coating (2%), T_7 Carbendazim (0.1%) + Wax coating (2%), T_8 Wax coating (4%), T_9 Carbendazim (0.5%) + Wax coating (4%), T_{10} Carbendazim (0.25%) + Wax coating (4%), T_{11} Carbendazim (0.1%) + Wax coating (4%), T_{12} Wax coating (6%), T_{13} Carbendazim (0.5%) + Wax coating (6%), T_{14} Carbendazim (0.25%) + Wax coating (6%) and T_{15} Carbendazim (0.1%) + Wax coating (6%)

RESULT AND DISCUSSION

Physiological loss in weight (%) :

It is clear from *table 1* that the effect of different level of waxol and carbendazim was significant right from 7, 14, 21 & 28 days after storage. Minimum physiological

Table 1: The physiological loss on the shelf life of Kinnow mandarin.

Treatment	Physiological Loss In weight (PLW) (%)			
	7 Days	14 Days	21 Days	28 Days
T_1	4.85	5.46	8.34	11.71
T_2	4.72	6.71	8.94	10.25
T_3	4.12	6.02	8.11	10.00
T_4	4.87	5.49	8.55	11.17
T_5	4.03	5.89	7.92	9.92
T_6	4.19	6.79	8.34	10.16
T_7	4.12	6.71	8.25	10.05
T_8	4.10	6.54	8.14	9.95
T_9	4.00	6.27	8.11	9.72
T_{10}	4.37	6.16	8.25	10.14
T_{11}	4.15	6.08	8.09	10.05
T_{12}	4.05	5.89	7.92	9.93
T_{13}	4.49	6.40	8.3	9.65
T_{14}	3.85	6.24	7.60	10.05
T_{15}	4.15.	6.28	8.33	10.18
T_{16}	3.97	6.19	8.50	10.07
SE(d)	0.05	0.28	0.06	0.13
CD(p=0.05)	0.11	0.59	0.13	0.32
F-test	S	S	S	S

loss in weight was recorded with the treatment combination T_{14} (carbendazim 0.25%)+ (waxol 6%)+ LDPE i.e. 3.85, 6.24, 7.60, & 9.65 at 7, 14, 21, 28 days of storage respectively which is followed by (T_4) 4.88, 6.92, 8.34, & 11.71maximum physiological loss in weight was recorded with the treatment combination. T_0 (Waxol

Table 2 The physiological loss on the shelf life of Kinnow mandarin.

Treatment	FRUIT DIAMETER (cm.)			
	7 Days	**14 Days**	**21 Days**	**28 Days**
T_1	6.77	6.67	6.27	6.17
T_2	6.84	6.64	6.34	6.14
T_3	6.70	6.50	6.10	5.87
T_4	6.10	5.47	5.26	5.07
T_5	6.40	6.20	6.10	5.94
T_6	6.47	6.30	6.10	5.95
T_7	6.34	6.14	5.94	5.75
T_8	6.15	6.00	5.74	5.52
T_9	6.20	5.74	5.56	5.34
T_{10}	7.14	6.74	6.54	6.47
T_{11}	6.84	6.67	6.27	6.12
T_{12}	6.54	6.32	6.10	5.90
T_{13}	6.97	6.60	6.40	6.20
T_{14}	7.15	6.75	6.50	6.34
T_{15}	6.74	6.54	6.37	6.24
T_{16}	6.60	6.35	6.10	5.97
SE(d)	0.04	0.06	0.04	0.03
CD(p=0.05)	0.09	0.14	0.09	0.08
F-test	S	S	S	S

(0%) + carbendazim (0.0%)+ LDPE. Similar results were recorded by **Kaufman *et al.* (1956), Garg *et al.* (1971), Garg and ram (1972), Singh *et al.* (1987) and Bhardway *et al.* (2005).**

Diameter of fruits :

It is clear from *table 2* that the effect of different level of waxol and carbendazim was significant right from 7, 14, 21 & 28 days after storage. Maximum diameter of fruit was recorded with the treatment combination T_{14} (carbendazim 0.25%)+ (waxol 6%)+ LDPE i.e. 7.15, 6.75, 6.50, & 6.34 at 7, 14, 21, 28 days of storage respectively which is followed by (T_4) waxol (2%)+ carbendazim (0%) + LDPE 6.10, 5.47, 5.26, & 5.07 minimum diameter of fruit was recorded with the treatment combination. T_0 (Waxol (0%) + carbendazim (0.0%)+ LDPE.

Total soluble solid (%) :

It is clear that *table no 3* that the effect of different levels of waxol and carbendazim was significant from 7, 14, 21, & 28 days after storage. Maximum total soluble solid was recorded with the treatment combination (T_{14}) waxol (6%)+ carbendazim (0.25%)+ LDPE 9.77, 10.12 10.05, & 10.55 at 7, 14, 21, & 28 days. after storage which is followed by (T_4) waxol (2%) + carbendazim (0%)+ LDPE and minimum total soluble solid was recorded with the treatment combination This result was also in agreement with the work. **Zode *et al.* (2004) and Bhardway *et al.* (2005)**.

Specific gravity :

It is clear that *table 4* that the effect of different levels of waxol and carbendazim was significant right from 7, 14, 21, & 28 days after storage. Maximum specific gravity was recorded with the treatment combination T_{14} (Waxol (6%) + carbendazim (0.25%)+ LDPE i.e. 1.07, 1.05, 1.03, & 1.01 at 7, 14, 21 & 28 days of storage which is followed by (T_4) waxol (2%) carbendazim (0%)+ LDPE minimum specific gravity was recorded with the treatment combination T_0 (Waxol (0%) + carbendazim (0.0%).

pH of the juice :

It is clear that *table 5* that the effect of different level of waxol and carbendazim was significant right from 7, 14, 21 and 28 days of storage. Maximum acidity was recorded with the treatment combination T_{14} (Waxol (6%) + carbendazim (0.25%)+ LDPE i.e. 3.93, 3.99, 4.04 and 4.07 at 7, 14, 21 and 28 days of storage which is followed by T_4 (Waxol (2%) + Carbendazin (0%)+ LDPE and minimum acidity was recorded with the treatment .4.19 , 4.25, 4.30, & 4.33. **Subed *et al.* (1998)** and **Sing and Gupta (2004)**.

Table 3 The physiological loss on the shelf life of Kinnow mandarin.

Treatment	T.S.S.(Brix^0)			
	7 Days	**14 Days**	**21 Days**	**28 Days**
T_1	9.20	9.57	9.97	10.16
T_2	9.10	9.50	9.86	10.12
T_3	8.96	9.34	9.84	10.05
T_4	8.50	8.94	9.32	9.60
T_5	9.04	9.52	9.94	10.21
T_6	9.15	9.60	10.05	10.22
T_7	9.27	9.77	10.12	10.32
T_8	9.10	9.57	9.87	10.07
T_9	9.16	9.64	9.92	10.16
T_{10}	9.37	9.87	10.25	10.45
T_{11}	8.84	9.42	9.81	10.08
T_{12}	8.60	9.17	9.56	9.97
T_{13}	9.25	9.65	10.35	10.28
T_{14}	9.77	10.12	10.85	11.55
T_{15}	9.05	9.58	10.00	10.22
T_{16}	9.05	9.52	9.98	10.14
SE(d)	0.37	0.6	0.02	0.2
CD(p=0.05)	0.83	0.12	0.4	0.4
F-test	S	S	S	S

Acidity :

It is clear that *table 6* that the effect of different levels of (waxol +carbendazim) was significant right from 7, 14, 21 and 28 days of storage. All the treatment showed significant different for different interval of storage periods. Maximum acidity (0.97)

Table 4. The physiological loss on the shelf life of Kinnow mandarin.

Treatment	Fruit specific gravity			
	7 Days	**14 Days**	**21 Days**	**28 Days**
T_1	1.03	0.97	0.93	0.90
T_2	1.01	0.99	0.97	0.95
T_3	1.00	0.97	0.96	0.95
T_4	0.99	0.98	0.95	0.94
T_5	1.02	1.01	0.99	0.98
T_6	1.04	1.02	1.01	0.99
T_7	1.03	1.01	0.99	0.98
T_8	1.02	1.00	0.98	0.96
T_9	1.01	0.99	0.98	0.95
T_{10}	1.06	1.04	1.02	1.00
T_{11}	1.05	1.02	1.01	1.00
T_{12}	1.04	1.02	1.00	0.98
T_{13}	1.03	1.01	1.00	0.98
T_{14}	1.07	1.05	1.03	1.01
T_{15}	1.02	1.01	1.01	.98
T_{16}	1.00	.99	.97	0.97
SE(d)	0.05	0.38	0.06	0.13
CD(p=0.05)	0.11	0.86	0.13	0.32
F- test	S	S	S	S

was recorded with the treatment combination T_{14} (waxol 6% + carbendazim 0.25 %)+ LDPE followed by other treatment and minimum acidity (0.86%) was recorded with the treatment combination T_4 (waxol 2 % + carbendazim 0%)+ LDPE. This finding was supported by **Singh and Gupta (2004)** and **Zode *et al.* (2004)**.

Ascorbic acid (Vitamin C) content (mg/100g) :

It is clear that *table 7* that the effect of different levels of waxol, + carbendazim was significant right from 7, 14, 21 & 28 days during storage. All the treatment showed significant difference for different interval of storage periods. Maximum vitamin C was recorded with the treatment combination T_{14} (Waxol (6%) + carbendazim (0.25%)+

Table 5 : The physiological loss on the shelf life of Kinnow mandarin.

Treatment	PH OF THE JUICE (%)			
	7 Days	14 Days	21 Days	28 Days
T_1	4.18	4.22	4.26	4.31
T_2	4.17	4.22	4.26	4.31
T_3	4.16	4.21	4.25	4.30
T_4	4.19	4.25	4.30	4.33
T_5	4.12	4.17	4.22	4.27
T_6	4.18	4.22	4.26	4.31
T_7	4.16	4.21	4.26	4.30
T_8	4.08	4.11	4.16	4.22
T_9	4.05	4.11	4.16	4.21
T_{10}	3.96	4.01	4.05	4.09
T_{11}	4.01	4.07	4.12	4.17
T_{12}	4.11	4.16	4.26	4.31
T_{13}	3.97	4.02	4.07	4.10
T_{14}	3.93	3.99	4.04	4.07
T_{15}	3.98	4.05	4.12	4.14
T_{16}	4.00	4.10	4.16	4.17
SE(d)	0.004	0.009	0.008	0.006
CD(p=0.05)	0.007	0.019	0.015	0.013

Table 6 : The physiological loss on the shelf life of Kinnow mandarin.

Treatment	Titrable acidity (%)			
	7 Days	**14 Days**	**21 Days**	**28 Days**
T_1	0.93	0.91	0.90	0.87
T_2	0.99	0.97	0.96	0.94
T_3	0.98	0.97	0.96	0.94
T_4	0.92	0.90	0.87	0.86
T_5	0.94	0.92	0.91	0.90
T_6	0.98	0.96	0.95	0.93
T_7	0.97	0.96	0.94	0.92
T_8	0.96	0.94	0.92	0.91
T_9	0.94	0.92	0.91	0.90
T_{10}	1.00	0.98	0.95	0.93
T_{11}	0.99	0.97	0.95	0.94
T_{12}	0.97	0.95	0.93	0.92
T_{13}	.99	0.97	0.96	0.95
T_{14}	1.02	1.00	0.99	0.97
T_{15}	0.98	0.96	0.94	0.92
T_{16}	0.97	0.95	0.93	0.92
SE(d)	0.27	0.38	0.06	0.13
CD(p=0.05)	0.57	0.86	0.13	0.32
F-test	S	S	S	S

LDPE i.e. 21.82, 21.04, 20.35 and 19.60 at 7, 14, 21 and 28 days which is followed by T_4 (Waxol (2%) + carbendazim (0.%) + LDPE and minimum vitamin C was recorded with the treatment combination 19.35, 18.40, 17.68 & 16.57 This finding was supported by), **Wang *et al.* (1998)** and **Saraswati and Amanavala (1999)**.

Spoilage (%) :

It is clear that *table 8* that the effect of different levels of waxol + carbendazim significant right from 7, 14, 21 and 28 days at during storage. Minimum spoilage percentage recorded with the treatment combination T_{14} (Waxol (6%) + carbendazim

Table 7 The physiological loss on the shelf life of Kinnow mandarin.

Treatment	VITAMIN C (mg/100gm)			
	7 Days	14 Days	21 Days	28 Days
T_1	20.34	19.59	18.76	18.02
T_2	21.45	20.75	19.85	19.03
T_3	21.27	20.45	19.75	18.98
T_4	19.35	18.40	17.68	16.57
T_5	19.45	18.56	17.82	17.37
T_6	21.36	20.76	19.97	19.36
T_7	21.15	20.48	19.83	18.97
T_8	20.34	19.44	18.41	17.58
T_9	20.17	19.26	18.25	17.29
T_{10}	21.80	21.00	20.20	19.51
T_{11}	21.18	20.49	19.51	18.82
T_{12}	21.08	20.33	19.41	18.63
T_{13}	21.78	21.02	20.30	19.38
T_{14}	21.82	21.04	20.35	19.60
T_{15}	21.64	20.75	20.21	19.15
T_{16}	21.28	20.49	19.72	18.63
SE(d)	0.17	0.14	0.16	0.15
CD(p=0.05)	0.35	0.32	0.33	0.32
F test	S	S	S	S

Table 8 : The physiological loss on the shelf life of Kinnow mandarin.

Treatment	Fruit Spoilage %			
	7 Days	**14 Days**	**21 Days**	**28 Days**
T_1	1.55	9.75	20.35	38.50
T_2	1.80	4.15	10.80	20.24
T_3	2.40	5.60	12.75	22.65
T_4	3.02	6.75	13.36	24.85
T_5	3.20	4.20	8.85	17.40
T_6	1.10	1.20	4.26	15.32
T_7	1.60	1.20	4.00	16.30
T_8	2.40	2.60	4.18	18.22
T_9	2.20	3.11	6.16	12.85
T_{10}	2.60	2.70	4.05	13.70
T_{11}	3.00	3.07	4.32	14.17
T_{12}	3.40	4.25	4.90	16.20
T_{13}	1.00	1.25	3.07	14.10
T_{14}	-	1.00	1.00	10.35
T_{15}	-	1.20	1.80	12.35
T_{16}	-	4.10	2.60	13.17
SE(d)	0.004	0.009	0.008	0.006
CD(p=0.05)	0.007	0.019	0.015	0.013
F-test	S	S	S	S

(0.25%)+ LDPE 21 and 28 days of storage which is followed by T_4 (Waxol (2%) + carbendazim (0%) and maximum spoilage percentage was recorded with the treatment combination T_0 (Waxol 0%) + (carbendazim 0%)+ LDPE.

CONCLUSION

It is conducted from the investigation that the treatment combination T_{14} (Waxol (6%) + carbendazim(0.25%) proved to be the best in terms of fruit quality and better shelf life at room temperature. Since these finding are based on one year trial and therefore, further experiment may be done to substantiate the results.

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Effect of nitrogen and potassium levels on growth and yield of popcorn (*Zea mays everta* Sturt.) cv. VL Amber

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ABSTRACT

A field experiment was conducted during Rabi season 2011 at Crop Research Farm, Department of Agronomy, SHIATS, Allahabad with RBD (Randomized Block Design) having 9 treatments with three replicatons. To evaluate the effect of nitrogen and potassium levels on growth and yield of popcorn. The experiment consisted of 3 levels of nitrogen (90, 120 and 150 kg ha^{-1}) and 3 levels of potassium (40, 60 and 80 kg ha^{-1}). Out of them applied 150 kg ha^{-1} nitrogen combination with 60 kg ha^{-1} potassium was found to be statistically significant compared to other treatment combinations, which recorded highest plant height, plant dry weight, grain yield (4.99 t ha^{-1}) and stover yield (7.60 t ha^{-1}) of popcorn.

Key words: *Nitrogen, potassium, popcorn.*

INTRODUCTION

Popcorn (*Zea mays everta* Sturt.) is a popularly consumed as a nutritious snack. The majority of the world's popcorn is produced in the United States of America. The everta co-variety was cultivated since prehistoric times, being after some researchers the first cultivated corn. The species *Zea mays everta* Sturt., (popcorn variety) which has small grains, shiny, with colours from silver-white, sometimes yellow-orange or red, blue and even black. Grains have different shapes, the endosperm has a corn texture, except a small portion around the embryo. The species has a raised rising capacity. Today, the corn used for popcorn, is profitable for a lot of producers and traders.

Fertilizers play an important role in increasing the maize yield and their contribution is 40-45 percent. Balanced and optimum use of nitrogen, phosphorus and

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potassium fertilizers play a pivotal role in increasing the yields of cereals **Asghar *et al.* (2010a)**. Nitrogen and phosphorus are essential nutrients for plant growth and development especially that of corn **Wua *et al.* (2005)**. Potassium is an essential element for plant growth and development and is the most abundant cation in plants,making up 3-5% of a plant's total dry weight **Kumar *et.al.*, (2007)**.

MATERIALS AND METHODS

A field experiment was conducted during Rabi season 2011 at Crop Research Farm, Department of Agronomy, Allahabad School of Agriculture, SHIATS, Allahabad (U. P.) which is located at 25^0 24' 42" N latitude, 81^0 50' 56" E longitude and 98 m altitude above the mean sea level. The soil of experimental plots was a sandy loam with pH 7.4, having 0.34% organic matter and EC of 0.27 dSm^{-1}. The experiment was designed in a RBD (Randomized Block Design) having 9 treatments with three replications. The experiment consisted of 3 levels of nitrogen (90, 120 and 150 kg ha^{-1}) and 3 levels of potassium (40, 60 and 80 kg ha^{-1}).

VL Amber popcorn variety was used as planting material in this study. Seed was sown in the field by single row hand drill. All of potassium according to treatments, phosphorus (80 kg ha^{-1} was applied in all treatments) and half of nitrogen fertilizer doses were applied at sowing. The remaining half of nitrogen fertilizer doses were applied at knee-height stage. Thinning was done when crop attained the height of about 15 cm. the crop was harvested at maturity and data regarding plant height, plant dry weight, grain yield and stover yield, were collected. The data thus recorded were analyzed statistically by following standard procedures.

RESULTS AND DISCUSSION

Plant height (cm). The observations on plant height of popcorn were statistically analyzed and have been presented in *table 1* and *figure 1*. Result shows that the plant height at 50 DAS was significantly higher in treatment T_8 (150 kg ha^{-1} N + 60 kg ha^{-1} K) and it was statistically at par to the treatment T_1 (90 kg ha^{-1} N + 40 kg ha^{-1} K), T_3 (90 kg ha^{-1} N + 80 kg ha^{-1} K), T_4 (120 kg ha^{-1} N + 40 kg ha^{-1} K) and T_6 (120 kg ha^{-1} N + 80 kg ha^{-1} K), while at 25, 75 and 100 DAS highest plant height was found in treatment T_8 and there was no significant difference. Similar results were reported by **Asghar *et al.* (2010b)** reported that the maximum plant height was obtained from the application of higher dose of nitrogen. Nitrogen fertilizer is also one of the most important factor affecting plant growth.

Table 1. Effect of nitrogen and potassium levels on plant height of popcorn at different intervals

Treatment combinations		Plant height (cm)			
		25 DAS	**50 DAS**	**75 DAS**	**100 DAS**
T_1	90 kg ha^{-1} N + 40 kg ha^{-1} K	51.98	116.04	155.58	158.49
T_2	90 kg ha^{-1} N + 60 kg ha^{-1} K	48.98	97.84	157.26	159.05
T_3	90 kg ha^{-1} N + 80 kg ha^{-1} K	44.71	102.10	150.92	155.36
T_4	120 kg ha^{-1} N + 40 kg ha^{-1} K	55.03	111.79	159.42	162.30
T_5	120 kg ha^{-1} N + 60 kg ha^{-1} K	43.70	89.28	141.31	143.68
T_6	120 kg ha^{-1} N + 80 kg ha^{-1} K	50.92	110.92	160.56	162.00
T_7	150 kg ha^{-1} N + 40 kg ha^{-1} K	51.77	96.34	158.28	152.13
T_8	150 kg ha^{-1} N + 60 kg ha^{-1} K	58.11	120.40	167.36	169.34
T_9	150 kg ha^{-1} N + 80 kg ha^{-1} K	46.96	94.76	149.83	152.17
CD (P=0.05)		-	19.14	-	-

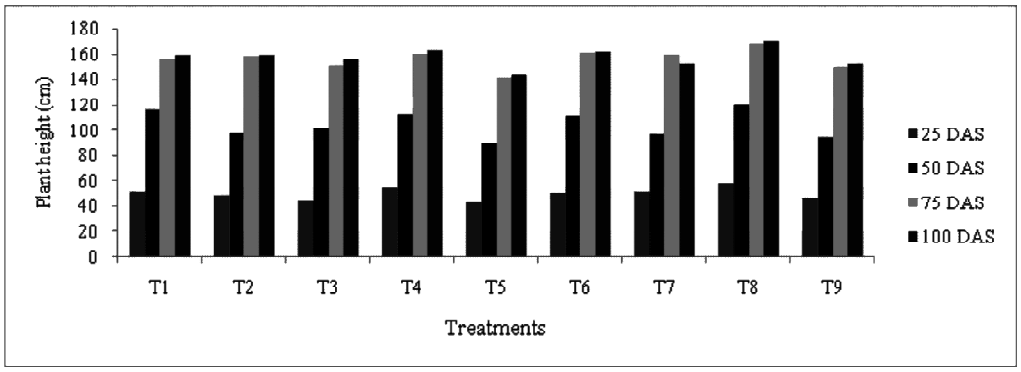

Fig. 1. Effect of nitrogen and potassium levels on plant height (cm) of popcorn at different intervals

Plant dry weight (g). The observations on plant dry weight of popcorn were statistically analyzed and have been presented in *table 2* and *figure 2*. Result clearly shows that the plant dry weight at 75 and 100 DAS was significantly higher in

Table 2. Effect of nitrogen and potassium levels on plant dry weight of popcorn at different intervals

Treatment combinations	Plant dry weight (g)			
	25 DAS	50 DAS	75 DAS	100 DAS
T_1 90 kg ha^{-1} N + 40 kg ha^{-1} K	0.85	11.20	40.08	81.26
T_2 90 kg ha^{-1} N + 60 kg ha^{-1} K	1.13	8.96	38.09	69.17
T_3 90 kg ha^{-1} N + 80 kg ha^{-1} K	0.95	10.24	36.82	75.98
T_4 120 kg ha^{-1} N + 40 kg ha-1 K	0.54	12.62	40.68	67.86
T_5 120 kg ha^{-1} N + 60 kg ha-1 K	0.95	11.93	40.57	69.05
T_6 120 kg ha^{-1} N + 80 kg ha-1 K	1.00	12.70	42.67	80.46
T_7 150 kg ha^{-1} N + 40 kg ha-1 K	1.20	12.03	44.10	81.87
T_8 150 kg ha^{-1} N + 60 kg ha-1 K	0.96	13.99	52.94	89.81
T_9 150 kg ha^{-1} N + 80 kg ha-1 K	1.38	15.09	48.24	88.71
CD (P=0.05)	-	-	5.44	14.95

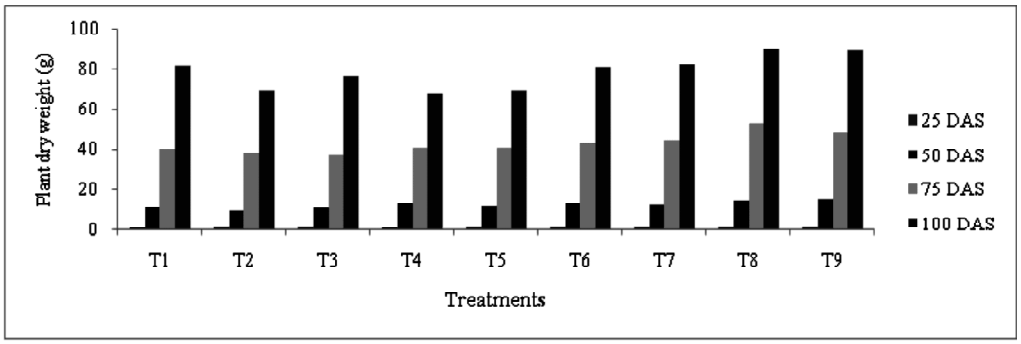

Fig. 2. Effect of nitrogen and potassium levels on plant dry weight (g) of popcorn at different intervals

treatment T_8 (150 kg ha^{-1} N + 60 kg ha^{-1} K) and at 75 DAS it was statistically at par to the treatment T_9 (150 kg ha^{-1} N + 80 kg ha^{-1} K), at 100 DAS it was statistically at par to the treatment T_1 (90 kg ha^{-1} N + 40 kg ha^{-1} K), T_3 (90 kg ha^{-1} N + 80 kg ha^{-1} K), T_6 (120 kg ha^{-1} N + 80 kg ha^{-1} K), T_7 (150 kg ha^{-1} N + 40 kg ha^{-1} K) and

T_9, while at 25 and 50 DAS highest plant dry weight was found in treatment T_9 and there was no significant difference. Similar results were reported by **Chabi *et al.* (2008)** and **Babak *et al.* (2012)**.

Table 3. Effect of nitrogen and potassium levels on grain yield (t ha-1) and stover yield (t ha^{-1}) of popcorn

Treatment combinations		Grain yield (t ha^{-1})	Stover yield (t ha^{-1})
T_1	90 kg ha^{-1} N + 40 kg ha^{-1} K	3.78	6.34
T_2	90 kg ha^{-1} N + 60 kg ha^{-1} K	3.84	5.95
T_3	90 kg ha^{-1} N + 80 kg ha^{-1} K	3.04	5.20
T_4	120 kg ha^{-1} N + 40 kg ha^{-1} K	3.50	6.37
T_5	120 kg ha^{-1} N + 60 kg ha^{-1} K	3.31	5.93
T_6	120 kg ha^{-1} N + 80 kg ha^{-1} K	4.43	7.05
T_7	150 kg ha^{-1} N + 40 kg ha^{-1} K	4.13	6.85
T_8	150 kg ha^{-1} N + 60 kg ha^{-1} K	4.99	7.60
T_9	150 kg ha^{-1} N + 80 kg ha^{-1} K	4.55	7.51
	CD (P=0.05)	0.96	0.97

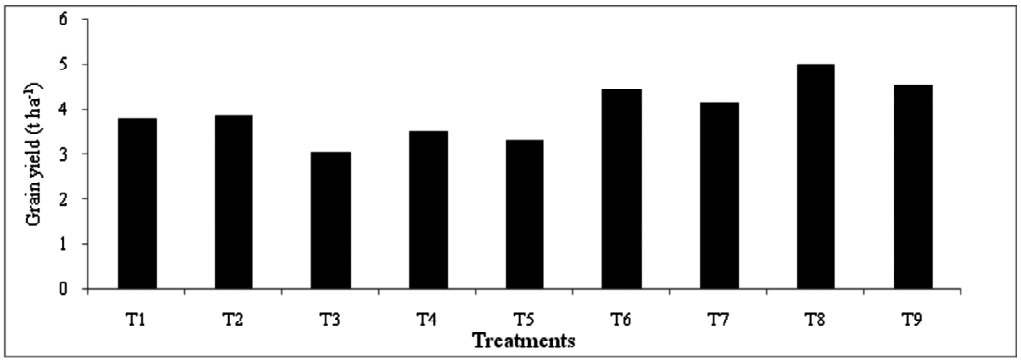

Fig. 3. Effect of nitrogen and potassium levels on grain yield (t ha^{-1}) of popcorn

Grain yield (t ha^{-1}). The observation on grain yield of popcorn was statistically analyzed and has been presented in *table 3* and *figure 3*. Result clearly shows that the grain yield (4.99 t ha^{-1}) in treatment T_8 (150 kg ha^{-1} N + 60 kg ha^{-1} K) was

significantly highest, although it was statistically at par to the treatment T_6 (120 kg ha^{-1} N + 80 kg ha^{-1} K), T_7 (150 kg ha^{-1} N + 40 kg ha^{-1} K) and T_9 (150 kg ha^{-1} N + 80 kg ha^{-1} K). Similar results were reported by **Huseyin *et al.* (2010)**, **Ozkan (2007)** and **Babak *et al.* (2012)**.

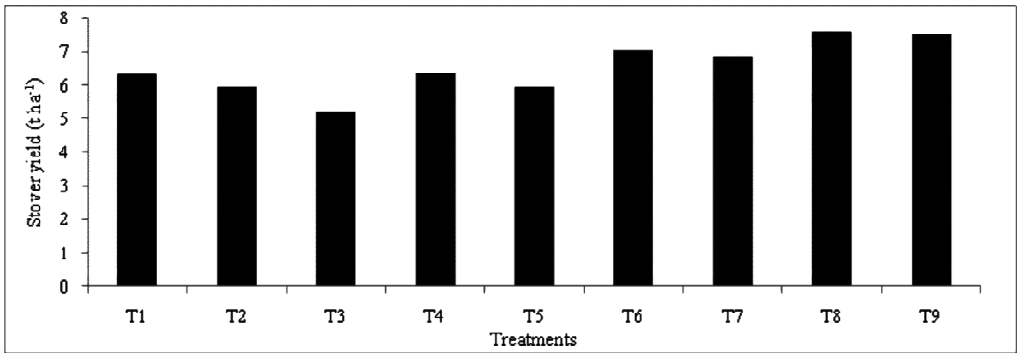

Fig. 4. Effect of nitrogen and potassium levels on stover yield (t ha^{-1}) of popcorn

Stover yield (t ha^{-1}). The observation on stover yield of popcorn was statistically analyzed and has been presented in *table 3* and *figure 4*. Result clearly shows that the stover yield (7.60 t ha^{-1}) in treatment T_8 (150 kg ha^{-1} N + 60 kg ha^{-1} K) was significantly highest, although it was statistically at par to the treatment T_6 (120 kg ha^{-1} N + 80 kg ha^{-1} K), T_7 (150 kg ha^{-1} N + 40 kg ha^{-1} K) and T_9 (150 kg ha^{-1} N + 80 kg ha^{-1} K). Similar results were reported by **Singh *et al.* (2003)** and **Ashok Kumar (2009)**.

CONCLUSION

From the above findings it may be concluded that among the all treatments, applied nitrogen 150 kg ha^{-1} combination with potassium 60 kg ha^{-1} was found to be the best for obtaining higher grain yield in popcorn. Since the findings are based on the research done in one season it may be repeated for confirmation.

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Effect of different organic sources of nitrogen on growth and yield of groundnut (*Arachis hypogaea* L.)

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ABSTRACT

The field experiment was conducted during the kharif season of 2009 to study the effect of different organic sources of nitrogen on growth and yield of groundnut (*Arachis hypogaea* L.). The result revealed that combinations of different organic sources of nitrogen recorded significantly influenced on various growth characters and yield attributes of groundnut. Combinations of organic manure significantly increased plant height, branches per plant, plant dry weight, Pods per plant, 100 seed weight, pod yield and haulm yield of groundnut. The maximum pod yield and haulm yield were found to be higher with the application of 25% RDN through FYM + 25% RDN through Vermicompost + 25% RDN through Poultry manure + 25% RDN through Neem cake.

Key words: *FYM, Groundnut, Growth, Neem cake, Poultry manure, Vermicompost and Yield.*

INTRODUCTION

Groundnut (*Arachis hypogaea* L.) is one of the important edible oilseed crops in India. Groundnut has the first place among all the oilseed crops in India accounting for more than 40% acreage and 60% production in the country. India ranks first in area of 8.4 million hectares contributing 8.4 million tonnes production of groundnut **Tank *et al.*, (2006)**. Among the oilseed crops, groundnut has first groundnut oil is primarily used in the manufacture of vegetable oil. In India the cultivation of groundnut is mostly confined to the southern Indian states viz., Gujarat, Andhra Pradesh, Karnataka, Tamil Nadu and Maharashtra.

Use of organic manures to meet the nutrient requirement of crop would be inevitable practices in the years to come for sustainable agriculture since, organic

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manures generally improve the soil physical, chemical and biological properties along with conserving the moisture holding capacity of soil and thus resulting in enhanced crop productivity along with maintaining the quality of crop produce. Although the organic manures contain plant nutrients in small quantities as compared to the fertilizers, the presence of growth promoting principles like enzymes and hormones, besides plant nutrients make them essential for improvement of soil fertility and productivity **Bhuma, (2001)**. Organic farming in recent years is gaining significance due to realization of inherent advantages.

MATERIALS AND METHOD

The experiment was carried out during kharif season 2009 at Crop Research Farm, Department of Agronomy, Sam Higginbottom Institute of Agriculture, Technology & Sciences, Allahabad, Uttar Pradesh. The farm is situated at 25.570 North latitude and 81.50 East longitudes at an altitude of 98m above sea level.

The soil was a sandy loam with a pH 7.76, organic carbon 0.54%. It was low in available nitrogen (185.3Kg/ha), available phosphorus (25.7Kg/ha) and available potash (315.5Kg/ha). The experiment was laid out in randomized block design, replicated thrice with 12 treatment combinations viz. Control (R.D. of N.P.K. through fertilizer), 100% RDN through FYM, 100% RDN through vermicompost, 100% RDN through poultry manure, 100% RDN through neem cake, 50% RDN through FYM + 50% RDN through vermicompost, 50% RDN through FYM + 50% RDN through poultry manure, 50% RDN through FYM + 50% RDN through neem cake, 5 % RDN through vermicompost + 50% RDN through poultry manure, 50% RDN through vermicompost + 50% RDN through neem cake, 50% RDN through poultry manure + 50% RDN through neem cake, 25% RDN through FYM + 25% RDN through vermicompost + 25% RDN through poultry manure + 25% RDN through neem cake). Control = Recommended dose of fertilizer N_{30} P_60 K_{40} kg/ha, RDN = Recommended dose of nitrogen and P and K inorganic fertilizer basal dose in all treatments. The N-P-K content of farmyard manure, vermicompost, poultry manure and neem cake were 0.5-0.2-0.5, 3.0-1.0-1.5 and 5.2-1.0-1.4 respectively. Groundnut cultivar Kaushal (G 201) was sown on 17 July 2009 with a spacing of 30 x 15 cm. All the recommended agronomic practices were followed to raise the crop. Various yield and yield attributes were recorded at harvest. The data on yield and yield attributes from randomly selected five plants from each net plot was recorded and mean value was found out. After harvesting the crop from net plot, the pods were separated from plants from the each

experimental plot; sun dried, cleaned thoroughly and weighed. All data were statistically analyzed by using WINDOSTAT Software Version-7. Significance of the treatments was determined on the basis of F test. Critical differences were calculated at 5% level of probability.

RESULTS AND DISCUSSION

Effect of organic manure :

The results revealed that combination of different organic manure significantly influenced on plant height, number of branches per plant, plant dry weight, number of pod per plant, 100 seed weight, pod yield and haulm yield of groundnut.

The chlorophyll content in the leaves might have been significantly improved with the application of organic source of nutrients. The application of different organic manures, which contain appreciable quantities of magnesium, might have helped in chlorophyll synthesis which in turn increased the rate of photosynthesis **Nehra *et al.* (2001)** and **Sanwal *et al.* (2007).**

The superioty of growth attributing characters i.e., plant height (37.50 cm), number of branches per plant (17.33) and plant dry weight (44.06) was observed with the application of 25% RDN through FYM + 25% RDN through vermicompost + 25% RDN through poultry manure + 25% RDN through neem cake which was significantly higher than all the other treatments but among the treatment 50% RDN through Vermicompost + 50% RDN through neem cake was found superior.

While organic sources besides supplying N, P and K also improved the soil condition, which enhanced the root proliferation and source - sink relationship. This significant influence on growth characters might have been due to the enhancement of uptake of nutrients favored by the addition of organic manures. **Bhattacharya and Ghosh (2001)** and **Gopalakrishnan (2007)**.

The superioty of yield attributing characters i.e., number of pod per plant (29 cm), 100 seed weight (95.50 g) pod yield (31.10 q/ha) and haulm yield (37.80 q/ha) was observed with the treatment application of 25% RDN through FYM + 25% RDN through vermicompost + 25% RDN through poultry manure + 25% RDN through neem cake which was significantly higher than all the other treatments but among the treatment (50% RDN through vermicompost + 50% RDN through neem cake was found superior.

Table 1. Effect of different organic sources of nitrogen on growth attributes of groundnut

Treatment	Plant height	Branches/plant (cm)	Plant dry weight (g)
Control (R.D. of N.P.K through fertilizer)	29.55	15.18	29.26
100% RDN through farm yard manure	27.10	11.36	27.15
100% RDN through vermicompost	25.80	12.06	27.28
100% RDN through poultry manure	20.66	09.33	21.08
100% RDN through neem cake	27.61	15.65	26.26
50% RDN through farm yard manure + 50% RDN through vermicompost	29.78	15.13	38.10
50% RDN through farm yard manure + 50% RDN through poultry manure	29.80	16.98	30.58
50% RDN through farm yard manure + 50% RDN through neem cake	34.95	17.10	42.06
50% RDN through vermicompost + 50% RDN through poultry manure	28.08	17.51	35.06
50% RDN through vermicompost + 50% RDN through neem cake	36.06	18.46	41.21
50% RDN through poultry manure + 50% RDN through neem cake	32.22	17.80	37.85
25% RDN through farm yard manure + 25% RDN through vermicompost + 25% RDN through poultry manure + 25% RDN through neem cake	37.81	20.90	44.38
SEm±	0.94	1.49	1.02
CD (P=0.05)	1.95	3.09	2.11

Table 2. : Effect of different organic sources of nitrogen on yield attributes of groundnut

Treatment	100 Pod weight (g)	Pod yield (q/ha.)	Haulm yield (q/ha.)
Control (R.D. of N.P.K through fertilizer)	72.42	19.90	30.90
100% RDN through farm yard manure	66.10	15.53	25.96
100% RDN through vermicompost	66.16	17.43	26.60
100% RDN through poultry manure	63.40	13.73	24.13
100% RDN through neem cake	69.40	19.00	28.56
50% RDN through farm yard manure + 50% RDN through vermicompost	90.43	25.40	34.13
50% RDN through farm yard manure + 50% RDN through poultry manure	74.70	19.66	34.40
50% RDN through farm yard manure + 50% RDN through neem cake	90.36	26.90	32.93
50% RDN through vermicompost + 50% RDN through poultry manure	86.56	22.63	32.23
50% RDN through vermicompost + 50% RDN through neem cake	93.16	28.43	36.80
50% RDN through poultry manure + 50% RDN through neem cake	89.50	24.03	32.36
25% RDN through farm yard manure + 25% RDN through vermicompost + 25% RDN through poultry manure + 25% RDN through neem cake	95.50	31.10	36.76
SEm±	2.11	1.65	2.67
CD (P=0.05)	4.38	3.43	5.54

CONCLUSION

On the basis of the findings of this experiment it may be concluded that the combination of 25% RDN through FYM + 25% RDN through vermicompost + 25%

RDN through poultry manure + 25% RDN through neem cake, have a significant direct effect on groundnut production. Application of different organic sources of nitrogen may be adopted for obtaining increased growth and yield of groundnut.

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Floristic Diversity and Utilization of some woody trees species of Allahabad (U.P.)

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ABSTRACT

Field surveys was conducted in recreational Park of Khusro Bagh, Allahabad during 2011 -12 to investigate floristic composition along with the quantitative structure in term of frequency, density, abundance, A/F ratio and Importance Value Index (IVI) with particular reference to Ethno-botanical and utilization. It was observed that Khusro Bagh contains 29 species of trees in which *Mangifera indica* and *Psidium guajava* were dominant tree species and Punica granatum, Ficus infectoria and *Magnolia grandiflora* were rare tree species on the basis of IVI. The IVI of this recreational Park ranged from 1.13-46.06. On the basis of analyzed A/F value of recorded forest revealed that no tree species showed regular distribution pattern whereas, *Borassus flabellifer*, *Bombax ceiba*, *Mangifera indica*, *Artocarpus heterophllus*, *Phoenix sylvestris*, *Ficus religiosa*, *Holoptelea integrifolia* and *Eugenia jambolana* showed random distribution pattern in Khusro Bagh. The remaining species showed contagious distribution pattern in Khusro Bagh Park. Utilization of medicinal plant, and various trees of the present study revealed that most of the trees species were used for fodder, fuel wood, medicinal value etc.

Key Words: *Floristic Diversity, Tropical Forest, Density, Important Value Index*

INTRODUCTION

Tropical dry deciduous forest plays an important role to stabilize the global environment. Tropical forest harbouring the highest biological diversity contributes 80 percent of the world's forest product requirement. About 70 percent of the global forest and 93 percent of the Indian forest is in the tropics. The dense forest cover has been reduced to 11 percent of which 52 percent of forest has lost the capacity of

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regeneration **FSI, (2000)**. Tropical forest degradation and its adverse ecological consequences have posed problems in connection with conservation of the environmental equality around the globe. Due to population pressure and urbanization, the district has lost a vast amount of forest cover. The census report on 1999 reported that the amount of forest per head of the district is 0.02 percent **FSI, (1999)**. Natural regeneration is reported to be a very slow process and during the process, the pace and progress of regeneration depends upon the coppicing potentiality of the denuded stump species and also on the availability of the soil and seed bank **Boring *et al.* (1992)**. So for the retention and future prospects of such forest is necessary to give information about the phyto-sociological structure of the forest in terms of species richness and diversity. Although floristic survey of this district have been made by some workers like **Banerjee *et al* (1992)**, **Kamilya and Paria (1994)**, **Ghosh and Das (1997)**, **Mukherjee and Banerjee (1999)** and conservation of ethno-medicinal plants through sacred grove in some parts of West Bengal has been studied by workers like **Bhagat and Sen (2008)**. Till date no systematic attempt for the complete ecological exploration have been done and therefore, the present work aims to make a comparative study of the phyto-sociological of some woody tree species at recreational Park of Khusro Bagh in Allahabad.

MATERIALS & METHODS

The present investigation "Floristic Diversity and Utilization of Some Woody Tree Species of Allahabad (U.P.)" was conducted in the form of extensive and intensive surveys for botanical exploration at Khusro Bagh Allahabad, during the period of 2011-2012. The details of the materials and methods adopted during the course of investigation have been described under appropriates headings.

Allahabad is located at an altitude of 98m above sea level at 28.87^0N latitude and 81.15^0E longitudes. Allahabad features the typical version of a humid subtropical climate. The maximum temperatures ranging from 40°C to 45°C, monsoon begins in early July and lasts till September. The winter season lasts from December to February. Temperatures rarely drop to the freezing point.

1: Vegetational studies :

The vegetational analysis of the selected area was carried out by using the quadrates of 10 X 10 m^2. In this method, 100m^2 quadrates were laid down randomly throughout the selected area. In each quadrate, the name and number of each tree species were recorded.

2: Phyto sociological analysis:

Phytosociological parameters analysis was carried out after collecting the data of various species which include frequency, density and abundance determined for each species of the plant community according to the formulae given by **Raunkiaer, (1934)**, **Hanson and Churchill, (1961)**. On the basis of frequency, density and abundance, their values have been calculated with relative frequency, relative density and relative Dominance, which were added for the determination of Importance Value Index (IVI) of each species. The formulae for the determination of relative frequency, relative density and relative Dominance as given by **Phillips (1959)** are reproduction below.

Distribution pattern of species gives an idea whether the species is clumped, uniform, or randomly distributed. The distribution pattern of each tree species of selected forest stands was analyzed by using the ratio of abundance to frequency **(Whitford, 1949)**. A value below 0.025 was considered as regular distribution, between 0.025 to 0.050 as random and more than 0.050 as contagious distribution **(Curtis and Cottam, 1956)**.

Distribution Pattern = Abundance/Frequency

$$\text{Per cent frequency} = \frac{\text{No. of sampling Quadrates in which the Species occurred}}{\text{Total number of Quadrates studied}} \times 100$$

Raunkiaer, (1934)

$$\text{Density} = \frac{\text{Total number of individuals}}{\text{Total Number of quadrates studied}}$$

Hanson and Churchill, (1961)

$$\text{Abundance} = \frac{\text{Total No. of individual of the species}}{\text{Total No. of quadrates in which the Species has occurred}}$$

Dominance = density for a species X average basal area for species

$$\text{Relative Dominance (RDO)} = \frac{\text{Dominance}}{\text{Total Dominance of all species}} \times 100$$

$$\text{Relative Density (RD)} = \frac{\text{No. of individuals of the species}}{\text{No. of individuals of all the species}} \times 100$$

$$\text{Relative Frequency (RF)} \quad \frac{\text{No. of Occurrence of the species}}{\text{No. of Occurrence of all the species}} \times 100$$

Importance Value Index = Relative Dominance +Relative density+ Relative frequency.

Phillips, (1959)

3: Utilization

Botanical name, local name, parts used and mode of Utilization, Medicinal plants, Wild edible fruits and seeds, Wild leafy vegetables, Wild edible roots, tubers corm, rhizome, Wild edible inflorescence, flower and flower buds, Under present study all the plants were identified with the help of different Monographs and revolutionary account of Botanical Survey of India, Allahabad.

RESULT & DISCUSSION

1: Floristic Diversity and Vegetation Composition:

The floristic diversity and vegetation composition recorded in 20 quadrates at Khusro bagh Allahabad are presented in *Table 1*. In Khusro Bagh four sub blocks were demarcated for 20 quadrates and five quadrates were laid down in each blocks viz. North-West, North-East, South-East and South-West respectively. Total 29 species of tree were recorded in all 20 quadrates but the main species found in North-West sub block was *Polyalthia* longifolia (16), North-East *Mangifera indica* (12), South-East *Psidium guajava* (21) and South-West *Psidium guajava* (17).

Table.1: Floristic Diversity of four sub block of Khusro Bagh of Allahabad

S.N	Species	North West	North East	South East	South West	Total No. of Species	Occurrence in Quadrates
1	*Aegle marmelos*	3	4	-	1	8	4
2	*Artocarpus heterophllus*	-	5	1	6	12	8
3	*Artocarpus lakoocha*	3	1	-	2	6	4
4	*Azadirachta indica*	3	2	2	-	7	5
5	*Bauhinia variegata*	-	-	2	-	2	1
6	*Borassus flabellifer*	10	6	8	-	24	13
7	*Bombax ceiba*	1	1	2	5	9	8
8	*Cassia fistula*	-	4	3	-	7	5
9	*Cordia dichotoma*	2	2	-	-	4	2
10	*Dalbergia sissoo*	-	-	5	-	5	3
11	*Delonix regia*	1	-	-	3	4	3
12	*Eugenia jambolana*	1	1	1	1	4	4
13	*Ficus religiosa*	1	3	-	1	5	5
14	*Ficus infectoria*	-	1	-	-	1	1
15	*Holoptelea integrifolia*	4	2	1	3	10	7
16	*Hyophorbe lagenicaulis*	-	-	-	3	3	1
17	*Litchi chinensis*	-	4	-	-	4	1
18	*Mangifera indica*	13	12	3	14	42	16
19	*Magnolia grandiflora*	-	-	1	-	1	1
20	*Moringa oleifera*	-	-	1	2	3	2
21	*Phyllanthus emblica*	7	-	4	6	17	6
22	*Phoenix sylvestris*	-	5	1	1	7	6
23	*Pithecellobium dulce*	-	-	7	3	10	3
24	*Polyalthia longifolia*	16	1	1	4	22	9
25	*Psidium guajava*	2	4	21	17	44	11
26	*Punica granatum*	1	-	-	-	1	1
27	*Swietenia mahogani*	1	4	5	-	10	4
28	*Tamarindus indica*	3	-	-	-	3	2
29	*Ziziphus mauritiana*	1	-	3	-	4	2

Table 2: phytosociological attribute of different Woody trees Species of Khosro Bagh, Allahabad

S.N.	Species	F%	D/h	Ab.	A/F	RF	RD	RDO	IVI
1	*Aegle marmelos*	20	0.4	2	0.1	2.87	2.90	2.73	8.50
2	*Artocarpus heterophllus*	40	0.6	1.5	0.038	4.30	5.80	7.72	17.81
3	*Artocarpus lakoocha*	20	0.3	1.5	0.08	2.15	2.90	1.69	6.74
4	*Azadirachta indica*	25	0.35	1.4	0.06	2.51	3.62	4.39	10.52
5	*Bauhinia variegata*	5	0.1	2	0.40	0.72	0.72	0.18	1.62
6	*Borassus flabellifer*	65	1.2	1.85	0.028	8.60	9.42	17.12	35.14
7	*Bombax ceiba*	40	0.45	1.125	0.028	3.23	5.80	5.88	14.90
8	*Cassia fistula*	25	0.35	1.4	0.06	2.51	3.62	2.95	9.09
9	*Cordia dichotoma*	10	0.2	2	0.2	1.43	1.45	0.75	3.63
10	*Dalbergia sissoo*.	15	0.25	1.67	0.111	1.79	2.17	1.96	5.93
11	*Delonix regia*	15	0.2	1.33	0.089	1.43	2.17	0.52	4.13
12	*Eugenia jambolana*.	20	0.2	1	0.05	1.43	2.90	1.29	5.62
13	*Ficus religiosa*	25	0.25	1	0.04	1.79	3.62	3.72	9.13
14	*Ficus infectoria*	5	0.05	1	0.2	0.36	0.72	0.34	1.42
15	*Holoptelea integrifolia*	35	0.5	1.43	0.041	3.58	5.07	2.01	10.67
16	*Hyophorbe lagenicaulis*	5	0.15	3	0.6	1.08	0.72	1.45	3.25
17	*Litchi chinensis*	5	0.2	4	0.8	1.43	0.72	1.21	3.36
18	*Mangifera indica*	80	2.1	2.63	0.033	15.05	11.59	19.41	46.06
19	*Magnolia grandiflora*	5	0.05	1	0.2	0.36	0.72	0.70	1.79
20	*Moringa oleifera*	10	0.15	1.5	0.15	1.08	1.45	0.42	2.95
21	*Phyllanthus emblica*	30	0.85	2.83	0.094	6.09	4.35	2.56	13.00
22	*Phoenix sylvestris*.	30	0.35	1.17	0.039	2.51	4.35	3.02	9.88
23	*Pithecellobium dulce*	15	0.5	3.33	0.222	3.58	2.17	1.61	7.37
24	*Polyalthia longifolia*	45	1.1	2.44	0.054	7.89	6.52	6.63	21.04
25	*Psidium guajava*	55	2.2	4	0.073	15.77	7.97	3.54	27.28
26	*Punica granatum*	5	0.05	1	0.2	0.36	0.72	0.05	1.13
27	*Swietenia mahogani*	20	0.5	2.5	0.13	3.58	2.90	4.32	10.80
28	*Tamarindus indica*.	10	0.15	1.5	0.15	1.08	1.45	1.45	3.97
29	*Ziziphus mauritiana*	10	0.2	2	0.2	1.43	1.45	0.40	3.28

F%=Frequency percent, D/h=Density/hector, Ab=Abundance, A/F=Abundance/Frequency, RF=Relative Frequency, RD=Relative Density, RDO=Relative Dominance, IVI=Importance Value Index.

2: Phyto-sociological aspects of forest trees:

Table 2 revealed that Importance Value Index of each species, it was calculated and it was found that *Mangifera indica* was the most dominant tree species with the highest value of IVI (46.06) followed by *Borassus flabellifer* L (35.14) and *Psidium guajava* (27.28) respectively. However other species recorded were *Aegle marmelos* (8.50), *Artocarpus heterophllus* (17.81), *Artocarpus lakoocha* (6.74), *Azadirachta indica* (10.52), *Bauhinia variegata* (1.62), *Bombax ceiba* (14.90), *Cassia fistula* (9.09), *Cordia dichotoma* (3.63), *Dalbergia sissoo*, Roxb. (5.93), *Delonix regia* (4.13), *Eugenia jambolana, Lamk* (5.62), *Ficus religiosa* (9.13), *Ficus infectoria, Roxb* (1.42), *Holoptelea integrifolia* (10.67), *Hyophorbe lagenicaulis* (3.25), *Litchi chinensis* (3.36), *Magnolia grandiflora* (1.79), *Moringa oleifera* (2.95), *Phyllanthus emblica* (13.00), *Phoenix sylvestris. Roxb* (9.88), *Pithecellobium dulce* (7.37), *Polyalthia longifolia* (21.04) *Punica granatum* (1.13), *Swietenia mahogani* (10.80), *Tamarindus indica*, (3.97) and *Ziziphus mauritiana* (3.28).

The analysis of A/F values of various recorded for different species of Khusro Bagh revealed that no species showed regular distribution pattern whereas *Borassus flabellifer*, *Bombax ceiba*, *Mangifera indica*, *Artocarpus heterophllus*, *Phoenix sylvestris, Ficus religiosa, Holoptelea integrifolia* and *Eugenia jambolana* showed random distribution pattern. The remaining species showed contagious distribution pattern in Khusro Bagh forest.

3: Ethno botanical plants and its Utilization:

Data from *Table 3* recorded that some species in Khusro Bagh were being used as medicines, wild edible fruits and seeds, wild leafy vegetables, wild edible roots, tubers corm and rhizome and wild edible inflorescence, flower and flower buds. Depending upon requirements, the headmen (Gurus) collect roots, rhizomes, tubers, stems, bark, leaves, flowers, flower buds, latex, fruits, seeds, juice, etc. of the specific 'sacred' species and prepare the required medicines.

Aegle marmelos fruits are usually eaten by people and also used in the preparation of many medicines in the villages. *Artocarpus heterophyllus* are chiefly as fruit. The cream coloured pulp is eaten raw. Boiled or fried fruit when immature are cooked as vegetable or in soups. *Artocarpus lakoocha* fruit is edible by humans, and is sold in local market as a pickle. *Azadirachta indica* is used against itching and worms; antiseptic for skin diseases, wounds and boils, chicken-pox, measles, small pox etc. Traditional neem juiced induces contractions and facilitates child birth and arrests

bleeding **Kaur, (1995)**. *Bauhinia variegata* bark is an astringent tonic and dried buds are useful in diarrhea. The leaves, flowers and flower buds are some times eaten as vegetable. *Borassus flabellifer* top portion of the fruit must be cut off to observe the three sweet jelly seed pockets, translucent pale-white, similar to that of the lychee but with a milder flavor and no pit. *Bombax ceiba* roots are sweet, cooling, stimulant, restorative, astringent, alternative, aphrodisiac, demulcent, emetic and tonic. Young fruits are useful in calculus affections, chronic inflammations and ulceration of bladder and kidney. *Cassia fistula* is widely planted as a handsome ornamental tree, the plant is being considered as a firewood source in Mexico. The bark has been employed in tanning, often in conjunction with avaram. *Cordia dichotoma* is used for boat building, well curbs, gun stocks and agricultural implements. Decorative veneers can be cut on a rotary machine. It is also used for packing cases. The bark contains 2 percent tannin and has medicinal value. *Dalbergia sissoo* is eminently suitable for railway sleepers, but due to its great usefulness in constructional and cabinet purposes, it is rarely used for sleepers. It is a preferred species for building railway coaches, truck and lorry bodies. Sissoo leaves are used as fodder. *Delonix regia* is mainly planted for its ornamental flowers with light-green foliage in garden and avenue trees. *Eugenia jambolana* is a sweet fruit, rich in potassium, magnesium and phosphorus that are also known for its many medicinal uses, some of them act as important anti-cancer and anti-viral benefits from its extracts have been observed in some clinical trials and studies. Tree of life known as *Ficus religiosa* has also got the medicinal value. The juice of its leaves extracted by holding them near the fire can be used as the ear drop. *Ficus glomerata* fruit is used to consume during their travels. *Ficus infectoria* is suited to parks and large gardens as an ornamental tree. *Hyophorbe lagenicaulis* is nearly extinct in its natural habitat but is now widely commercially grown for its ornamental use. Litchi chinensis fruits are generally eaten fresh. *Mangifera indica* wood is extensively used for low cost furniture, floor, ceiling boards, window frames, heavy cases, match splints, brush back, oar blades, agricultural implements, with three moisture proof Plywood suitable for Tea chest plywood. The green unripe fruits are used in curries, sharbats and pickles. Both the green and ripe fruits are nutritive. *Magnolia grandiflora* bark has been shown to reduce allergic and asthmatic reactions. *Moringa oleifera* seed oil is also applied in rheumatism and gouts. *Phyllanthus emblica* plant is used in various Ayurvedic/Unani medicine (*Jawarish amla*) herbal preparations, including the fruit, seed, leaves, root, bark and flowers. *Phoenix sylvestris* fruit is of inferior character. Sap - it can be concentrated into syrup or fermented into alcohol.

Table 3: Ethno Botanical Survey of some Woody Trees Species and their Utilization.

S.N.	Botanical Name	Local Name	Parts Used	Made of Utilization
1	Aegle maarmelos	Bel	Fruit, Leave, Wood	Fodder, Fruit edible, Commercial
2	Artocarpus heterophllus	Katahal	Fruit, Leaves, Wood	Fodder, Commercial, Fruit edible
3	Artocarpus lakoocha	badahar	Leaves, Fruit, Flower, wood, Bark	Fodder, Fruit edible, Commercial
4	Azadirachta indica	Neem	Wood, Fruit, Leaves	Fodder, Fuelwood, Insecticides, Medicinal, Neem oil,
5	Bauhinia variegate	Kachnar	Leaves, Bark, Wood, Seed	Fodder Dye, Ornamental, Oil & fat
6	Borassus flabellifer, L	Tad	Leaves, Fruit,	Fruit edible, Commercial, Medicinal
7	Bombax ceiba	Semal	Wood, Seed, Bark, Leaves, Flower bud	Fodder, Fiber, Commercial, Vegetable, Silk cotton, gum, Medicinal,
8	Cassia fistula, Linn.	Amaltas	Root, Bark, Wood	Ornamental tree, Cabinetwork, Commercial, Medicinal,
9	Cordia dichotoma	Lasora	Wood, Bark, Leaves, Fruit,	Fruit edible, Tannin, Medicinal, Fodder,
10	Dalbergia sissoo, Roxb.	Sissoo	Leaves, Wood,	Fodder, Commercial, fuelwood
11	Delonix regia	Gulmohar	Flower, Seed	Ornamental flower, Gum, Food Industries
12	Eugenia jambolana,	Jamun	Fruit, Wood, Seed,	Medicinal, Fruit edible, Commercial
13	Ficus Religiosa	Pipal	Leaves, Wood,	Fodder, Fiber, Commercial, Lac, Religious plant
14	Ficus infectoria, Roxb	Pakar	Leaves, Fruit, Wood	Fodder, Commercial, Fruit edible
15	Holoptelea integrifolia	Chilbil	Leaves, Bark, Wood	Fodder, Bark used as rheumatic pain, Commercial

S. N.	Botanical Name	Local Name	Parts Used	Made of Utilization
16	Hyophorbe lagenicaulis	Botalpam	Whole tree	ornamental on roadside
17	Litchi chinensis	Lychee	Fruit, Wood	Fruit edible, fuelwood
18	Mangifera indica	Aam	Fruit, Flower, Wood	Medicinal, Fruit edible, Commercial
19	Magnolia grandiflora	Him champa	Flower, Bark, Bud,	traditional Chinese medicine, Medicinal,
20	Moringa oleifera	Saijan	Leaves, Fruit, Root, Flower	Fodder, Fiber Oil and fat, Fruit edible, Medicinal
21	Phyllanthus emblica	aamla	Fruit, leaves bark	Medicinal, Fruit edible, Fodder
22	Phoenix sylvestris.Roxb	Khajur	Fruit, Flower, Leaves	Medicinal, Fruit edible, Commercial
23	Pithecellobium dulce	Jangal Jalebi	Fruit, Leaves, Twigs, Wood, Seed	Fruit edible, Fodder, Commercial, Fatty oil, ornamental on roadside
24	Polyalthia longifolia	Ashok	Wood, Bark, Fruit	Commercial, Medicinally as a febrifuge, Fruit edible, Matches
25	Psidium guajava	Amrud	Fruit, leaves bark	Medicinal, Fruit edible,
26	Punica granatum	Anar	Fruit, Bark, Seed, Flower	edible seeds, Medicinal, vitamin C and B5,
27	Swietenia mahagoni	Mahogany	Wood,	Cabinet work, Plywood, Interior decoration
28	Tamarindus indica, Linn	Imli	Wood,	Construction, Firewood, Gun powder, charcoal
29	Ziziphus mauritiana	Ber	Leaves, Fruit	Fodder, Fruit edible, Commercial, Fuelwood,

The flow of 5 liters per day for several months, it constitutes 14 percent sugar. *Pithecellobium dulce* timber is usually used for agricultural implements, packing cases, paneling of doors and windows, for general construction work and for posts. Leaves and twigs are used as fodder for sheep, goats, horses and cattle. *Polyalthia longifolia*

tree is extensively planted for its dense shade and elegant appearance. The bark is used medicinally used to reduce fever. *Psidium guajava* roots, bark, leaves and immature fruits, are commonly employed to halt gastroenteritis, diarrhea and dysentery, reported in tropical countries tropical. The leaf decoction is taken as a remedy for coughs, throat and chest ailments, gargled to relieve oral ulcers and inflamed gums it also used as an emmenagogue and vermifuge, and treatment for leucorrhea. *Punica granatum* rind of the fruit and the bark of the tree are used as a traditional remedy against diarrhea, dysentery and intestinal parasites. The seeds and juice are considered a tonic for the heart and throat, and classified as a bitter astringent. *Swietenia mahagoni* timber is considered superior throughout the world for furniture and cabinet work. It is eminently suitable for ship building on account of its strength and durability. *Tamarindus indica* used for constructional purposes, but it is highly prized for cart-wheels, rice pounders and oil pressure. It is valuable firewood. The wood also yields excellent charcoal which is particularly valuable for gun powder. *Ziziphus mauritiaa* timber locally used for agricultural implements, boot and shoe-lasts, shafts, house posts and struts, axe and hoe-handles, bedstead legs, poles etc. It is a rich source of vitamins and mineral salts.

CONCLUSION

Khusro Bagh contains 29 species in which *Mangifera indica* and *Psidium guajava* were dominant tree species and *Punica granatum, Ficus infectoria and Magnolia grandiflora* were rare tree species on the basis of IVI. The IVI of this forest ranged from 1.13 - 46.06. regular distribution pattern whereas, *Borassus flabellifer*, *Bombax ceiba, Mangifera indica, Artocarpus heterophllus, Phoenix sylvestris, Ficus religiosa, Holoptelea integrifolia* and *Eugenia jambolana* showed random distribution pattern in Khusro Bagh. The remaining species showed contagious distribution pattern in Khusro Bagh Park.

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Evaluation of value added cheese from the different cultivars of apple (*Malus domestica* Borkh).

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ABSTRACT

The experiment on value added apple cheese was carried out in the Post Harvest Technology Laboratory, Department of Horticulture, Sam Higginbottom Institute of Agriculture, Technology and Sciences Allahabad, during 2009-2010. The investigation was laid out in C.R.D factorial with three replication. There were 12 treatments with 3 variety (Red Delicious, Maharaji and American Apriouge) and 3 herbal (Tulsi, Mint and Rose) with each of equal level (1%). The treatment $V_2 T_2$ (Maharaji + Mint @ 1%) was found to be statically significant than other treatment. This treatment has recorded highest T.S.S in apple herbal cheese (76.68), total titrable acidity (0.990%), ascorbic acid (1.130 mg/100g), overall acceptability (7.34) and in the case pH maximum score (3.802) was observed with American Apirouge + Untreated (V_3T_0).

Keywords : *Apple, cheese, tulsi, mint and overall acceptability.*

INTRODUCTION

Apple (*Malus domestica Borkh*), belongs to family Rosaceae, and sub family Pomoideae. The genus Malus has 17 basic chromosome numbers with somatic chromosome numbers with somatic chromosome number of 34. It is believed that the primary centre of origin of apple is to be the region which includes Asia minor, The Caucasus, soviet central Asia and Himalayan India and Pakistan **Wilcox, (1962)**. Apple is highly nutritive food. It contains minerals and vitamins in abundance. The food value of the apple is chiefly constituted by its contents of sugar which ranges from 9 to 11% of this, fruit sugar constitutes 60% and glucose 25% and cane sugar only 15% per 100 gm of apple contains moisture 84%, protein 0.2%. Fat 0.5%, Minerals 0.3%, Fiber 1.0% carbohydrates 13.4%. Among mineral and vitamins it contains 10 mg of Ca, 14 mg of phosphorus and 1 mg iron per 100 g of fruit. 100 g of apple gives calorific

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values of 59 Calories. Thus fruit are an important supplement of the human diet as they possess almost all the nutritive components required for the growth and development of the human body leading to a healthy physique and mind. Therefore it is very important to conduct the researches develop the new recipes and for value addition from different cultivars of apple. Tulsi (*Ocimum sanctum*) is a biennial or shrub popularly known as Holy/Auspicious basil. It belongs to family Lamiaceae. It primarily occurs in green (Lakshmi Tulsi) and purple (Krishana Tulsi) morphotypes all over India. Mint (*Mentha arvensis*) belonge to family Lamiaceae. It dark green leaves and pleasing flavor is most easily by the fresh fragrance that is unique to this herb. It is common herb which is present mostly in all the home gardens/kitchen gardens of the country. Mint just say the word cool, refreshing image come to mind; frosty glasses of lemonade gamished with curl spring of spearmint, the clean, chilling taste of mint candy cane. Even chewing gum, Swirled mint ice cream, frozen desserts, herbal yoghurt, various delicious recipes and other uses **Srivastava and Kumar, (2007)**.

MATERIALS AND METHODS

The Experimental work of "Evaluation of value added cheese from the different cultivars of apple" was conducted in the post harvest technology laboratory, Department of Horticulture, SHIATS, Allahabad during 2009-2010. The value added apple cheese prepared having 12 treatments with 3 replications were stored for 90 days under ambient room temperature. The twelve treatments consisted as V_1T_0 (Red Delicious untreated) V_1T_1 (Red Delicious Tulsi - 1%), V_1T_2 (Red Delicious Mint-1%), V_1T_3 (Red Delicious Rose-1%), V_2T_0 (Maharaji Untreated), V_2T_1 (Maharaji Tulsi - 1%), V_2T_2 (Maharaji Mint-1%), V_2T_3 (Maharaji Rose-1%), V_3T_0 (American Apriouge Untreated), V_3T_1 (American Apriouge Tulsi-1%), V_3T_2 (American Apriouge Mint-1%) and V_3T_3 (American Apriouge Rose-1%). Observation were recorded on T.S.S in apple herbal cheese (0Brix), total titrable acidity (%), ascorbic acid (mg/100g), texture colour and appearance, flavor, taste, overall acceptability, cost benefit ratio and pH.

RESULTS AND DISCUSSION

Total soluble Solids

The data with respect to total soluble solids is present in the *table 1* and it reveal that there was a subsequent increase in total soluble solids and significant differences among all the treatments of value added cheese prepared from different varieties and

Table 1 : Effect of different treatment combinations and their interaction on total soluble solids (°Brix) of value added apple cheese at different periods of storage.

0 Day

Variety (V)	Treatment (Herbal extracts) (T)				Mean (V)
	T_0 (untreated)	T_1 (Tulsi 1%)	T_2 (Mint 1%)	T_3 (Rose 1%)	
V_1 (Red Delicious)	72.35	74.31	75.35	74.26	**74.07**
V_2 (Maharaji)	72.37	75.30	75.45	74.27	**74.35**
V_3 (American Apirouge)	72.32	74.29	75.33	72.38	**73.58**
Mean (T)	**72.35**	**74.63**	**75.38**	**73.64**	
		F-test	**S. Ed. (±)**	**C. D. at 5%**	
Variety (V)		S	0.01	0.02	
Treatment (Herbal extract) (T)		S	0.01	0.02	
Interaction (V x T)		S	0.02	0.03	

30 Days

Variety (V)	Treatment (Herbal extracts) (T)				Mean (V)
	T_0 (untreated)	T_1 (Tulsi 1%)	T_2 (Mint 1%)	T_3 (Rose 1%)	
V_1 (Red Delicious)	72.62	74.65	75.61	74.51	**74.35**
V_2 (Maharaji)	72.63	75.52	75.67	74.52	**74.59**
V_3 (American Apirouge)	72.60	74.54	75.54	72.66	**73.84**
Mean (T)	**72.62**	**74.90**	**75.61**	**73.90**	
		F-test	**S.Ed.(±)**	**C.D. at 5%**	
Variety (V)		S	0.01	0.02	
Treatment (Herbal extract) (T)		S	0.01	0.02	
Interaction (V x T)		S	0.02	0.03	

60 Days

Variety (V)	Treatment (Herbal extracts) (T)				Mean (V)
	T_0 (untreated)	T_1 (Tulsi 1%)	T_2 (Mint 1%)	T_3 (Rose 1%)	
V_1 (Red Delicious)	72.80	74.94	75.86	74.33	**74.48**
V_2 (Maharaji)	72.81	75.81	75.87	74.81	**74.83**
V_3 (American Apirouge)	72.78	74.82	75.85	72.82	**74.07**
Mean (T)	**72.80**	**75.19**	**75.86**	**73.99**	
		F-test	**S.Ed.(±)**	**C.D. at 5%**	
Variety (V)		S	0.01	0.01	
Treatment (Herbal extract) (T)		S	0.01	0.01	
Interaction (V x T)		S	0.01	0.02	

90 Days

Variety (V)	Treatment (Herbal extracts) (T)				Mean (V)
	T_0 (untreated)	T_1 (Tulsi 1%)	T_2 (Mint 1%)	T_3 (Rose 1%)	
V_1 (Red Delicious)	72.94	75.07	76.05	74.85	**74.73**
V_2 (Maharaji)	72.96	75.19	76.68	75.05	**74.97**
V_3 (American Apirouge)	72.89	75.07	75.99	72.98	**74.23**
Mean (T)	**72.93**	**75.11**	**76.24**	**74.29**	
		F-test	**S.Ed.(±)**	**C.D. at 5%**	
Variety (V)		S	0.01	0.01	
Treatment (Herbal extract) (T)		S	0.01	0.01	
Interaction (V x T)		S	0.01	0.02	

herbal at 0, 30, 60, and 90 days of storage. The initial TSS was recorded 90 days of storage among the different additive the maximum score (76.240 Brix) was observed with Mint @1% and minimum score (72.93) was observed with Untreated. In different variety the maximum score (74.97) was observed with Maharaji and minimum score (74.23) was observed with American Apirouge. Among the interaction effect the maximum score (76.680 Brix) was observed with Maharaji + Mint @ 1% followed by (76.050 Brix) Red Delicious + mint @ 1% and minimum (72.890 Brix) was observed with American Apirouge + Untreated. Overall maximum score (76.240 Brix) was observed in additive of apple as compared to the variety. The total soluble solid of apple cheese was showed increasing trend in additive and variety and their interaction during storage. The total soluble solids content of apple cheese was showed increasing trend in all values additive variety of apple and their interaction during storage. An increase in total soluble solids content of apple cheese during storage **Singh *et al.*, (1983)** in guava cheese; **Kumar, (1990)** in Papaya and **Dube, (1984)** in Bael. The increase in the T.S.S of the apple cheese may be due to the hydrolysis of polysaccharides (starch) to monosaccharides (sucrose, fructose, glucose). Generally, during the storage there was loss of moisture due to which the total soluble solids showed an increasing trend **Kumar *et al.*, (1992)**.

Total titrable Acidity

The data on effect of additive, variety of apple and their interaction on acidity content of cheese at ambient temperature is shown in *table 2*. The data were found reveal statistically significant at 0, 30, 60 and 90 days of storage. The acidity percent showed something constant in the treatment. The initial acidity was recorded 90 days of storage among the different additive the maximum change (0.992) was observed with Mint @ 1% and minimum score (0.607) was observed with Untreated. In different variety the maximum score (0.852) was observed with Maharaji and minimum score (0.759) was observed with American Apirouge. Among the interaction effect the maximum score (1.000) was observed with Maharaji + Mint @ 1% followed by (0.998) Red Delicious + mint @ 1% and minimum (0.605) was observed with American Apirouge + Untreated. Overall maximum score (0.852) was observed in variety as compared to the additive. Similar finding have been reported by **Joshi and Wallrauch, (1996)** in apple pomace sauce **Sogi and Singh, (2001)** in Kinnow jam and candy **Chopra and Kothari, (2003)** in wood apple jelly.

Table 2 : Effect of different treatment combinations and their interaction on acidity (%) of value added apple cheese at different periods of storage.

0 Day

Variety (V)	Treatment (Herbal extracts) (T)				Mean (V)
	T_0 (untreated)	T_1 (Tulsi 1%)	T_2 (Mint 1%)	T_3 (Rose 1%)	
V_1 (Red Delicious)	0.600	0.850	0.980	0.810	**0.810**
V_2 (Maharaji)	0.602	0.960	0.990	0.820	**0.843**
V_3 (American Apirouge)	0.580	0.830	0.970	0.609	**0.747**
Mean (T)	**0.594**	**0.880**	**0.980**	**0.746**	
		F-test	**S. Ed. (±)**	**C. D. at 5%**	
Variety (V)		S	0.002	0.004	
Treatment (Herbal extract) (T)		S	0.002	0.004	
Interaction (V x T)		S	0.004	0.008	

30 Days

Variety (V)	Treatment (Herbal extracts) (T)				Mean (V)
	T_0 (untreated)	T_1 (Tulsi 1%)	T_2 (Mint 1%)	T_3 (Rose 1%)	
V_1 (Red Delicious)	0.602	0.851	0.982	0.812	**0.812**
V_2 (Maharaji)	0.604	0.963	0.994	0.824	**0.846**
V_3 (American Apirouge)	0.590	0.832	0.973	0.610	**0.751**
Mean (T)	**0.599**	**0.882**	**0.983**	**0.749**	
		F-test	**S.Ed.(±)**	**C.D. at 5%**	
Variety (V)		S	0.002	0.004	
Treatment (Herbal extract) (T)		S	0.002	0.004	
Interaction (V x T)		S	0.004	0.007	

60 Days

Variety (V)	Treatment (Herbal extracts) (T)				Mean (V)
	T_0 (untreated)	T_1 (Tulsi 1%)	T_2 (Mint 1%)	T_3 (Rose 1%)	
V_1 (Red Delicious)	0.603	0.853	0.990	0.815	**0.815**
V_2 (Maharaji)	0.606	0.971	0.996	0.824	**0.849**
V_3 (American Apirouge)	0.602	0.837	0.977	0.612	**0.757**
Mean (T)	**0.604**	**0.887**	**0.988**	**0.750**	
		F-test	**S.Ed.(±)**	**C.D. at 5%**	
Variety (V)		S	0.001	0.003	
Treatment (Herbal extract) (T)		S	0.002	0.003	
Interaction (V x T)		S	0.003	0.006	

90 Days

Variety (V)	Treatment (Herbal extracts) (T)				Mean (V)
	T_0 (untreated)	T_1 (Tulsi 1%)	T_2 (Mint 1%)	T_3 (Rose 1%)	
V_1 (Red Delicious)	0.606	0.857	0.998	0.816	**0.819**
V_2 (Maharaji)	0.609	0.974	1.000	0.826	**0.852**
V_3 (American Apirouge)	0.605	0.839	0.979	0.615	**0.759**
Mean (T)	**0.607**	**0.890**	**0.992**	**0.752**	
		F-test	**S.Ed.(±)**	**C.D. at 5%**	
Variety (V)		S	0.001	0.003	
Treatment (Herbal extract) (T)		S	0.002	0.003	
Interaction (V x T)		S	0.003	0.006	

Table 3 : Effect of different treatment combinations and their interaction on pH of value added apple cheese at different periods of storage

0 Day

Variety (V)	Treatment (Herbal extracts) (T)				Mean (V)
	T_0 (untreated)	T_1 (Tulsi 1%)	T_2 (Mint 1%)	T_3 (Rose 1%)	
V_1 (Red Delicious)	3.798	3.669	3.143	3.674	**3.571**
V_2 (Maharaji)	3.798	3.145	3.142	3.673	**3.440**
V_3 (American Apirouge)	3.802	3.672	3.144	3.795	**3.603**
Mean (T)	**3.799**	**3.495**	**3.143**	**3.714**	
		F-test	**S. Ed. (±)**	**C. D. at 5%**	
Variety (V)		S	0.002	0.005	
Treatment (Herbal extract) (T)		S	0.003	0.006	
Interaction (V x T)		S	0.005	0.010	

30 Days

Variety (V)	Treatment (Herbal extracts) (T)				Mean (V)
	T_0 (untreated)	T_1 (Tulsi 1%)	T_2 (Mint 1%)	T_3 (Rose 1%)	
V_1 (Red Delicious)	3.796	3.667	3.139	3.670	**3.568**
V_2 (Maharaji)	3.795	3.142	3.138	3.670	**3.436**
V_3 (American Apirouge)	3.798	3.668	3.140	3.792	**3.599**
Mean (T)	**3.796**	**3.492**	**3.139**	**3.711**	
		F-test	**S.Ed.(±)**	**C.D. at 5%**	
Variety (V)		S	0.002	0.004	
Treatment (Herbal extract) (T)		S	0.002	0.004	
Interaction (V x T)		S	0.004	0.008	

60 Days

Variety (V)	Treatment (Herbal extracts) (T)				Mean (V)
	T_0 (untreated)	T_1 (Tulsi 1%)	T_2 (Mint 1%)	T_3 (Rose 1%)	
V_1 (Red Delicious)	3.798	3.664	3.136	3.668	**3.567**
V_2 (Maharaji)	3.793	3.138	3.134	3.665	**3.433**
V_3 (American Apirouge)	3.796	3.664	3.136	3.789	**3.596**
Mean (T)	**3.796**	**3.489**	**3.135**	**3.707**	
		F-test	**S.Ed.(±)**	**C.D. at 5%**	
Variety (V)		S	0.003	0.005	
Treatment (Herbal extract) (T)		S	0.003	0.006	
Interaction (V x T)		S	0.005	0.011	

90 Days

Variety (V)	Treatment (Herbal extracts) (T)				Mean (V)
	T_0 (untreated)	T_1 (Tulsi 1%)	T_2 (Mint 1%)	T_3 (Rose 1%)	
V_1 (Red Delicious)	3.791	3.661	3.134	3.666	**3.563**
V_2 (Maharaji)	3.790	3.136	3.131	3.664	**3.430**
V_3 (American Apirouge)	3.793	3.662	3.134	3.786	**3.594**
Mean (T)	**3.791**	**3.486**	**3.133**	**3.705**	
		F-test	**S.Ed.(±)**	**C.D. at 5%**	
Variety (V)		S	0.001	0.003	
Treatment (Herbal extract) (T)		S	0.002	0.003	
Interaction (V x T)		S	0.003	0.006	

pH

The data on effect of additive, variety of apple and their interaction on pH content of cheese at ambient temperature is shown in *table 3*. The data were found reveal statistically significant at 0, 30, 60 and 90 days of storage. The pH showed something constant in the treatment. The initial pH was recorded 90 days of storage among the different additive the maximum changes (3.791) was observed with untreated and minimum score (3.133) was observed with mint @ 1%. In different variety the maximum score (3.594) was observed with American Apirouge and minimum score (3.430) was observed with Maharaji.Among the interaction effect the maximum score (3.793) was observed with American Apirouge + Untreated followed by (3.791) Red Delicious + untreated and minimum (3.131) was observed with Maharaji + mint @ 1%. Overall maximum score (3.791) was observed in additive as compared to the variety of apple. The pH content of apple cheese was showed decreasing trend in all value addition varieties of apple and interaction during storage. Similar finding have been reported by **Jawaheer and Goburdhun, (2003)** in guava jam and juice.

Ascorbic acid (mg/100g)

The data on effect of additive, variety of apple and their interaction on ascorbic acid content of cheese at ambient temperature are shown in *table 4*. The data were found statistically significant at 0, 30, 60 and 90 days of storage. The ascorbic acid showed decreasing trend in all treatment. The initial ascorbic acid was recorded 90 days of storage among the different additive the maximum change (1.163) was observed with mint @ 1% and minimum score (0.955) was observed with untreated. In different variety the maximum score (1.050) was observed with Maharaji and minimum score (1.001) was observed with American Apirouge. Among the interaction effect the maximum score (1.190) was observed with Maharaji + mint @ 1% followed by (1.70) Red Delicious + Mint @ 1% and minimum (0.883) was observed with American Apirouge + untreated. Overall maximum score (1.163) was observed in additive of apple as compared to the variety. The ascorbic acid content of apple cheese was showed decreasing trend in all values addition, varieties of apple and interaction during storage. Finding with respect to the ascorbic acid during storage are in conformity with the results obtained by **Singh *et al.*, (1983)** in guava cheese up to 90 days and decrease therefore **Aradhit *et al.*, (1996)** in Guava jelly.

Table 4 : Effect of different treatment combinations and their interaction on ascorbic acid (Vitamin C) (mg/100 g) of value added apple cheese at different periods of storage

0 Day | **30 Days**

Variety (V)	Treatment (Herbal extracts) (T)				Mean (V)	Treatment (Herbal extracts) (T)				Mean (V)
	T_0 (untreated)	T_1 (Tulsi 1%)	T_2 (Mint 1%)	T_3 (Rose 1%)		T_0 (untreated)	T_1 (Tulsi 1%)	T_2 (Mint 1%)	T_3 (Rose 1%)	
V_1 (Red Delicious)	0.997	1.220	1.300	1.090	**1.152**	0.991	1.150	1.220	0.998	**1.090**
V_2 (Maharaji)	1.010	1.250	1.330	1.110	**1.175**	0.996	1.170	1.250	0.998	**1.104**
V_3 (American Apirouge)	0.891	1.200	1.280	1.050	**1.105**	0.888	1.130	1.210	0.997	**1.056**
Mean (T)	**0.966**	**1.223**	**1.303**	**1.083**		**0.958**	**1.150**	**1.227**	**0.998**	
		F-test	**S. Ed. (±)**	**C. D. at 5%**			**F-test**	**S.Ed.(±)**	**C.D. at 5%**	
Variety (V)		S	0.002	0.004			S	0.002	0.003	
Treatment (Herbal extract) (T)		S	0.002	0.004			S	0.002	0.004	
Interaction (V x T)		S	0.003	0.007			S	0.003	0.007	

60 Days | **90 Days**

Variety (V)	Treatment (Herbal extracts) (T)				Mean (V)	Treatment (Herbal extracts) (T)				Mean (V)
	T_0 (untreated)	T_1 (Tulsi 1%)	T_2 (Mint 1%)	T_3 (Rose 1%)		T_0 (untreated)	T_1 (Tulsi 1%)	T_2 (Mint 1%)	T_3 (Rose 1%)	
V_1 (Red Delicious)	0.989	0.997	1.170	0.994	**1.038**	0.985	0.994	1.050	0.991	**1.005**
V_2 (Maharaji)	0.992	1.020	1.190	0.996	**1.050**	0.986	0.995	1.130	0.991	**1.026**
V_3 (American Apirouge)	0.883	0.996	1.130	0.993	**1.001**	0.879	0.992	0.998	0.991	**0.965**
Mean (T)	**0.955**	**1.004**	**1.163**	**0.994**		**0.950**	**0.994**	**1.059**	**0.991**	
		F-test	**S.Ed.(±)**	**C.D. at 5%**			**F-test**	**S.Ed.(±)**	**C.D. at 5%**	
Variety (V)		S	0.002	0.003			S	0.001	0.003	
Treatment (Herbal extract) (T)		S	0.002	0.004			S	0.002	0.004	
Interaction (V x T)		S	0.003	0.006			S	0.003	0.006	

Table 5 : Effect of different treatment combinations and their interaction on scores for overall acceptability of value added apple cheese at different periods of storage

0 Day

Variety (V)	Treatment (Herbal extracts) (T)				Mean (V)
	T_0 (untreated)	T_1 (Tulsi 1%)	T_2 (Mint 1%)	T_3 (Rose 1%)	
V_1 (Red Delicious)	6.02	7.13	7.26	7.09	**6.87**
V_2 (Maharaji)	6.13	7.13	7.34	7.11	**6.93**
V_3 (American Apirouge)	5.99	7.13	7.15	6.88	**6.79**
Mean (T)		**6.05**	**7.13**	**7.25**	**7.02**
		F-test	**S. Ed. (±)**	**C. D. at 5%**	
Variety (V)		S	0.007	0.015	
Treatment (Herbal extract) (T)		S	0.009	0.018	
Interaction (V x T)		S	0.015	0.031	

30 Days

Variety (V)	Treatment (Herbal extracts) (T)				Mean (V)
	T_0 (untreated)	T_1 (Tulsi 1%)	T_2 (Mint 1%)	T_3 (Rose 1%)	
V_1 (Red Delicious)	6.23	7.29	7.46	7.27	**7.06**
V_2 (Maharaji)	6.25	7.31	7.48	7.27	**7.08**
V_3 (American Apirouge)	6.15	7.28	7.32	7.20	**6.99**
Mean (T)		**6.21**	**7.29**	**7.42**	**7.24**
		F-test	**S.Ed.(±)**	**C.D. at 5%**	
Variety (V)		S	0.007	0.014	
Treatment (Herbal extract) (T)		S	0.008	0.016	
Interaction (V x T)		S	0.014	0.028	

60 Days

Variety (V)	Treatment (Herbal extracts) (T)				Mean (V)
	T_0 (untreated)	T_1 (Tulsi 1%)	T_2 (Mint 1%)	T_3 (Rose 1%)	
V_1 (Red Delicious)	6.38	7.43	7.62	7.41	**7.21**
V_2 (Maharaji)	6.42	7.46	7.68	7.42	**7.24**
V_3 (American Apirouge)	6.36	7.42	7.49	7.39	**7.16**
Mean (T)	**6.38**	**7.44**	**7.60**	**7.40**	
		F-test	**S.Ed.(±)**	**C.D. at 5%**	
Variety (V)		S	0.008	0.017	
Treatment (Herbal extract) (T)		S	0.009	0.019	
Interaction (V x T)		S	0.016	0.033	

90 Days

Variety (V)	Treatment (Herbal extracts) (T)				Mean (V)
	T_0 (untreated)	T_1 (Tulsi 1%)	T_2 (Mint 1%)	T_3 (Rose 1%)	
V_1 (Red Delicious)	6.52	7.66	7.80	7.59	**7.39**
V_2 (Maharaji)	6.56	7.66	7.95	7.61	**7.44**
V_3 (American Apirouge)	6.48	7.63	7.70	7.45	**7.31**
Mean (T)	**6.52**	**7.65**	**7.82**	**7.55**	
		F-test	**S.Ed.(±)**	**C.D. at 5%**	
Variety (V)		S	0.008	0.017	
Treatment (Herbal extract) (T)		S	0.009	0.019	
Interaction (V x T)		S	0.016	0.033	

Overall acceptability

The data on effect of additive, variety of apple and their interaction on overall acceptability of cheese stored at room temperature are shown in *table 5*. The data were found statistically significant at 0, 30, 60 and 90 days of storage. The overall acceptability showed increasing trend in all treatment. The initial overall acceptability was recorded after 90 days of storage among the different additive the maximum change (7.82) was observed with mint @ 1% and minimum score (6.52) was observed with untreated. In different variety the maximum score (7.44) was observed with Maharaji and minimum score (7.31) was observed with American Apirouge. Among the interaction effect the maximum score (7.95) was observed with Maharaji + mint @ 1% followed by (7.80) Red Delicious + Mint @ 1% and minimum (6.48) was observed with American Apirouge + untreated. Overall maximum score (7.82) was observed in additive of apple as compared to the variety. However, the organoleptic characters showed a gradual increase during the storage period up to 90 days. This finding was in conformity with **Singh *et al.*, (1983)** in guava cheese up to 90 days of storage and decrease therefore **Dube, (1984)** in Bael.

CONCLUSION

From the finding it may be concluded that treatment V_2T_2 (Maharaji+ Mint extract @ 1%) was recorded as best treatment in terms of physic-chemical properties and texture, colour, flavour taste and overall quality of the value added apple cheese.

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Effect of sowing method and nitrogen level on the growth and yield potential of variety Niharika of Isabgol (*Plantago ovata*)

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ABSTRACT

A field experimental was conducted during winter season of 2010-2011 to study the effect of methods of sowing (line sowing and broadcasting) and different levels of nitrogenous fertilizer (0, 10, 20, 30, 40 and 50kg/ha) on the growth yield of Isabgol (Plantago ovata frosk.) at Sam Higginbottom Institute of Agriculture Technology and Sciences. Seed as well as husk yield of Psyllium differed significantly between line sowing and broadcasting methods of planting. Line Sowing method produced significantly higher yield (11.23 q/ha) and husk yield (2.93 q/ha) which was 4.9% and 7.3% higher than in the broadcasting methods of sowing respectively. Application of 50 Kg N/ha produced Significantly higher Psylliium seed yield of 13.30 small q/ha which was 54, 39, 26, 17, 7% higher than the application of 0, 10, 20, 30 and 40 kg N/ha respectively.

Keywords: *Psyllium, Plantago ovata, planting method, N levels, growth and yield attributes.*

INTRODUCTION

Psyllium or Isabgol (*Plantago ovata*) is an important medicinal plant. India holds monopoly both in production and trade of Psyllium in the world. The seeds of Psyllium are used in the treatment of dysentery and disorders of digestive system. Psyllium seed consists of 6.85% ash, 23.5% crude fibers, 8.7% proteins and 50.65% carbohydrates. This crop is well suited to the soil and environmental conditions prevailing in Uttar Pradesh. The crop is getting popularity amongst the farmers of U.P. because of low cost of production and higher net returns. It is commercially cultivated in North Gujarat and in some districts of Rajasthan, where the crop is mostly grown without proper management. It is grown in about 1.0 lakh ha area with a production (seed) of 0.72

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lakh/t **Anonymous (2001)**. Inadequate supply of plant nutrients especially nitrogen in light textured soils of U.P. leads to low productivity. Therefore, the present investigation was undertaken to find out the suitable method of sowing and level of nitrogen application required to increase the productivity of this crop in the state.

MATERIALS AND METHOD

Agriculture Technology and Sciences, Allahabad on sandy loam sol having pH of 7.3 organic carbon 0.28%, EC 0.32 dsm and available N, P and K of 210, 19 and 240 kg /Ha respectively. The treatments comprised a field experiment was carried during winter season of 2010-11 at Sam Higginbottom institute of two methods of sowing (line sowing at 20 cm and broadcasting) and six levels of N application (0, 10, 20, 30, 40 and 50 kg/ha). The experiment was conducted following 2 x 6 factorial RBD with three replications. Psyllium cv. 'Niharika' was sown in the first week of December with seed rate of 8 Kg/ha. Recommended dose of 25kg P_2O_5/ha and half dose of N as per treatment was applied as basal and remaining half dose of N as per treatments was applied at 30 days after sowing. Dry sowing was done and then irrigation were applied during the crop season. The crop was harvested at maturity in second week of April. The data on yield and yield attributes were recorded at the time of harvesting and analyzed as per standard methods. The significance and non significance of the treatments was tested with the help of 'F' variance ratio test and calculated 'F' value at 5% level of significance.

RESULTS AND DISCUSSION

Effect of sowing method

Method of sowing did influence growth and yield attributing characters. Some growth and yield characters like plant height, no. of tillers/plant, spike length and husk yield were more or less at par with each other in both line sowing method at 20 cm and broad cast method in given *(Table. 1)*, where as other growth and yield attributing characters like plant spread, spikes/plant, seeds spike and seed yield was significantly higher under line sowing at 20 cm *(Table. 1)*. Less growth and yield under the broadcast method of sowing in comparison with line sowing at 20 cm due to the overpopulation (closeness in spacing) of the Psullium plants in a restricted area. Our findings in close proximity with those of **Sharma *et al.* (2003)** and **Kumawat and Gaur (2002)**.

Table 1. Effect of method of sowing and different levels of nitrogen on the yield and yield attributing characters of Isabgol cv. 'Niharika'.

Treatment	Plant height (cm)	Plant spread (cm)	No. of tillers/ plant	Spike Length (cm)	Spikes/ plant (cm)	Seeds/ Plant (cm)	Husk yield (q/ha)	Seed yield (q/ha)
Sowing methods								
(M_1) Line sowing	32.07	34.55	5.85	4.84	36.75	65.12	2.93	11.23
(M_2)Broadcasting	31.43	32.58	5.57	4.65	35.53	63.11	2.73	10.71
S.EM(±)	0.06	0.19	0.06	0.04	0.72	0.47	0.01	0.07
C.D.(P=0.05)	0.13	0.39	0.11	0.08	1.49	0.98	0.03	0.14
Nitrogen levels (Kg/ha)								
(N_0)0	28.81	25.57	5.17	4.08	12.74	56.18	1.89	8.60
(N_1)10	30.36	29.66	5.44	4.30	18.88	57.76	2.29	9.58
(N_2)20	31.40	32.74	5.50	4.47	24.83	59.93	2.68	10.55
(N_3)30	32.24	34.07	5.61	4.74	45.12	64.42	3.00	11.39
(N_4)40	33.44	38.15	6.11	5.02	52.66	68.94	3.34	12.40
(N_5)50	34.26	41.12	6.45	5.77	58.62	77.45	3.80	13.30
S.Em(±)	0.11	0.31	0.10	0.06	1.24	0.82	0.02	0.12
CD (P=0.05)	0.23	0.67	0.20	0.14	2.58	1.69	0.05	0.24

Effect of Nitrogen

Application of N influenced all the yield attributing characters significantly, Application of 40 kg N/ha increased significantly plant spread, spikes/plant, seeds/ spike. Spike length was significantly higher upto 40 kg N/ha compared with control but was statistically at par with higher with higher levels of N *[Table. 1]*. Plant height and number of tillers/plant were also found significantly higher up to 50 kg n/ha over loss nitrogen treatments *[Table. 1]*. **Maheshwari *et al.* (2000)** reported that plant height and spike length was maximum with application of 50 kg N/ha.

Application of 30 kg N/ha produced significantly higher seed and husk yield over control but application of n beyond 30 kg/ha did not increase husk yield compared to application of 30kg N/ha. Pooled results indicated that application of 50 kg N/ha increased the seed yield of psyllium by 54, 39, 26, 17 and 7% over application of 0, 10, 20, 30 and 40kg n/ha respectively. **Modi *et al.* (1974)** suggested application of 50 kg N and 25 kg P_2O_5/ha for psyllum in Gujarat. **Singh and Chouhan (1994)** suggested application of 60 kg N and 30 Kg P_2O_5/ha for higher spikes/plant and seed

Table 2. : Effect of Interactions between methods of and different levels of nitrogen on the yield and yield attributing characters of isabgol cv. 'Niharika'.

Treatment	Plant height (cm)	Plant spread (cm)	No. of tillers/ plant	Spike Length (cm)	Spikes/ plant (cm)	Seeds/ Plant (cm)	Husk yield (q/ha)	Seed yield (q/ha)
N0M1	29.06	27.07	5.22	4.11	13.85	57.10	1.97	9.05
N0M2	28.55	24.06	5.11	4.05	11.62	55.45	1.80	8.15
N1M1	30.74	30.67	5.55	4.33	23.34	58.06	2.40	9.86
N1M2	29.97	28.65	5.33	4.27	14.42	57.45	2.18	9.35
N2M1	31.65	33.06	5.78	4.55	25.57	60.29	2.77	10.95
N2M2	31.14	32.41	5.22	4.39	24.08	59.56	2.59	10.15
N3M1	32.78	34.92	5.89	4.82	43.52	64.81	3.08	11.50
N3M2	31.70	33.21	5.33	4.66	42.71	64.03	2.92	11.27
N4M1	33.77	39.18	6.11	5.00	54.28	69.55	3.43	12.55
N4M2	33.10	37.12	6.10	4.99	51.04	68.33	3.25	12.55
N5M1	34.40	42.41	6.511	6.15	59.91	80.88	3.95	13.50
N5M2	34.11	40.00	6.33	5.39	57.32	74.01	365	13.10
S.Em (±)	0.16	0.46	0.14	0.09	1.76	1.15	0.03	0.17
CD(P=0.05)	0.32	0.94	0.28	0.19	3.64	2.40	0.07	0.34

yield at Sumerpur in Rajasthan. **Randhawa *et al.* (1978)** recommended application of 60 kg N/ha in Punjab, **Singh *et al.* (2002)** also suggested that significantly higher seed yield parameters were recorded with 50kg N/ha at Agra in U.P.

Effect of Interaction

Analysis of data *[Table. 2]* clearly shows that the interaction between methods of sowing and different levels of nitrogen significantly increased growth and yield attributing characters like plant spread, spikes/plant, seeds/spike and seed yield except plant height Number of tillers/plant, spike length and husk yield which was approximately at par under treatments with same level of N plus different method sowing *[Table - 2]*.

It was found that the psyllium plants responded better to the gradual increase in Nitrogen levels in both methods of sowing. But Line Sowing at 20 cm interacted with different levels gave better results than the broadcast method of Sowing *[Table - 2]*.

CONCLUSION

It was concluded that psyllium crop may be fertilized with 50 kg N/ha and seeds should be sown in line sowing method for higher seed yield under irrigated coarse textured soil condition of eastern Allahabad.

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Yield attributes and yield of Barley (*Hordeum vulgare* L.) as influenced by biofertilizers with nitrogen levels

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ABSTRACT

Biofertilizers and different levels of Nitrogen effects were studied on growth and yield of Barley in Rabi season of 2010. An experiment was conducted in a factorial randomized block design with three replications. Treatments included 3 levels of nitrogen (40, 60 and 80 kg ha^{-1}) and bio-fertilizers on four levels (Uninoculation, Azotobacter (20 gr/kg), Azospirillum (20 gr/kg) and Azotobacter (10 gr/kg) + Azospirillum (10 gr/kg)). The results revealed that fertilizer treatment T_{12}-N @ 80 kg/ha with both (Azotobacter (10 gr/kg) + Azospirillum (10 gr/kg) inoculations was found to be the most responsive, with significantly increased in the yield parameters via Spikes/hill (5.85), Length of spikes (8.80), Grains/ spike (64.33), Test weight (43.00), Grain yield (45.04), Straw yield (52.12) and Harvest index (0.46) of barley. Azospirillum inoculation, Azotobacter inoculation and uninoculated control significantly differed between each other.

Key words: *Azotobacter, Azospirillum, Inoculations, Biofertilizers.*

INTRODUCTION

Barley (*Hordeum vulgare* L.) is the world's fourth most important cereal after wheat, rice and maize. The major use of barley is in brewing industries for manufacturing malt. Both barley grains and straw are highly digestible compared to wheat because they do not contain gluten. Barley ranks next to wheat both in acreage and production among Rabi cereals in India. Barley ranks next to wheat both in acreage and production among Rabi cereals in India. In India, barley is cultivated on an area of 7.8.00 lakh hectares with an annual production of 15.0 lakh tonnes of grain with average productivity of 1920 kg ha^{-1}. It is mainly cultivated in U.P., Rajasthan, M.P., Bihar, Haryana and Punjab. With regards to its acreage and production, Rajasthan is

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the second largest state. Despite this, its productivity scenario is quite different, Punjab ranks first followed by Delhi, Haryana, U.P., Rajasthan and M.P. In order to find out some alternative for fertilizer nitrogen economy, the use of diazotrophic bacteria has been evaluated. Azotobacter is a well known free-living heterotrophic bacterium which plays a beneficial role in cereal crop production viz Rice, Maize, Wheat etc. Studies on biological nitrogen fixation have mainly emphasized the role of Rhizobium and Azotobacter. However, with the discovery of free-living N2-fixing bacterium Spirillum lipoferum (now *Azospirillum brasilense*) form associative symbiosis with wheat. It has been suggested that the plant growth response may be attributed to the hormone production by these bacteria or to an increased nutrient uptake by inoculated roots. The growing imbalance of nutrients in soils is posing a threat to sustain soil health and productivity. Inorganic fertilizers are very costly and their agronomic efficiency is poor under field conditions. Thus, biofertilizers are potential source of plant nutrients which not only fix atmospheric nitrogen and increase availability of phosphorus but also supply many micro-nutrients, antibiotics, growth promoting and anti-fugal substances **Sardana, (1997)**. Generally the yield increases in different crops have been obtained in soils rich in organic matter. However, the increased cost of organic matter and fertilizer nitrogen prevents its use at higher levels by small and marginal farmers in India. It was, therefore, felt essential to find out the correct and compatible level of fertilizer nitrogen with these inoculations in barley production.

MATERIALS AND METHODS

Field experiment was conducted during Rabi season of 2010 at central research farm, SHIATS, Allahabad. The soil of the experimental site was sandy loam with pH (7.7) and medium in organic carbon (0.4%). The initial status of available N, P_2O_5 and K_2O of the experimental site was 220.0, 18.8 and 250.0 kg ha^{-1}, respectively. The experiment was laid out in a factorial randomized block design with twelve treatments replicated thrice. The treatments included 3 levels of nitrogen (N_1-40, N_2-60 and N_3-80 kg/ha) and bio-fertilizers on four levels (B_0-no inoculation, B_1-Azotobacter-20gr/kg, B_2-Azospirillum-20gr/kg and B_3-Azotobacter-10gr/kg + Azospirillum-10gr/kg). Observations were recorded for various growth and yield attributes.

RESULTS AND DISCUSSION

Yield attributes: The different yield indices like Spikes/plant, Length of spikes, Grains/spike, Test weight, Grain yield, Straw yield and Harvest index of barley was significantly influenced by various treatments *(Table 1)*. Significantly most number

Table 1. Effect of different biofertilizers and nitrogen levels on Plant height and number of tillers of barley.

Treatment	Spikes/ plant (No.)	Length of spike (cm)	Grains/ spike (No.)	Test weight (g)
Biofertilizer (B)				
B_0 -Uninoculated	3.87	7.99	55.07	38.83
B_1 -Azotobacter	4.70	8.32	59.84	41.62
B_2 -Azosprillium	4.45	8.16	58.49	41.39
B_3 -Azotobacter + Azosprillium	4.94	8.42	60.82	41.89
SEd (±)	0.04	0.03	0.17	0.14
CD at 5 %	0.08	0.06	0.35	0.29
Nitrogen (N)				
N_1 -40 kg / ha	3.98	8.00	55.20	39.63
N_2 -60 kg / ha	4.42	8.19	58.83	40.96
N_3 -80 kg / ha	5.09	8.47	61.63	42.21
SEd (±)	0.03	0.03	0.15	0.12
CD at 5 %	0.07	0.05	0.30	0.25
Interaction (B*N)				
T_1- Uninoculated + 40 kg N	3.34	7.93	52.80	37.67
T_2- Uninoculated + 60 kg N	3.78	7.93	54.40	37.83
T_3- Uninoculated + 80 kg N	4.49	8.10	58.00	41.00
T_4- Azotobacter (20 gr) + 40 kg N	4.25	8.07	56.07	40.17
T_5- Azotobacter (20 gr) + 60 kg N	4.63	8.27	60.60	42.00
T_6- Azotobacter (20 gr) + 80 kg N	5.20	8.61	62.87	42.67
T_7- Azosprillium (20 gr) + 40 kg N	3.99	7.93	54.93	40.00
T_8- Azosprillium (20 gr) + 60 kg N	4.56	8.20	59.20	42.00
T_9- Azosprillium(20 gr) + 80 kg N	4.79	8.35	61.33	42.17
T_{10}- Azotobacter (10 gr) + Azosprillium (10 gr) + 40 kg N	4.3.1	8.08	57.00	40.67
T_{11}- Azotobacter (10 gr) + Azosprillium (10 gr) + 60 kg N	4.73	8.35	61.13	42.00
T_{12}- Azotobacter (10 gr) + Azosprillium (10 gr) + 80 kg N	5.85	8.80	64.33	43.00
S. Ed. (±)	0.06	0.05	0.29	0.24
C. D. at 5%	0.13	0.11	0.60	0.50

of spikes/plant (5.85) was recorded with the treatment inoculation with azotobacter (10 gr/kg) + azospirillium (10 gr/kg) + 80 kg nitrogen (T_{12}). It was followed by the treatments azotobacter (10 gr/kg) + 80 kg nitrogen- T_6 (5.20). Minimum number of spikes/plant (3.34) was recorded without seed inoculation + 40 kg N (T1). Increase in number of spikes realized due to Nitrogen and inoculation with azotobacter + azospirillium might be due to increased transportation of photosythates from source due to Nitrogen application. Similar findings were reported by **Singh, (2000)** in guinea grass. Highest length of spike (8.80) was recorded with the treatment inoculation with azotobacter (10 gr/kg) + azospirillium (10 gr/kg) + 80 kg nitrogen (T_{12}). It was closely followed by (8.61) the treatments azotobacter (20 gr/kg) + 80 kg nitrogen (T_6). Increase length of spike realized with Nitrogen and inoculation with azotobacter + azospirillium due to the fact that it plays a vital role in photosynthesis and nitrogen metabolism. It helps in regulating auxin concentration and in carbohydrate transformation processes in plants. Similar findings were reported by **Bhakher *et al.* (2000)** in sorghum. Highest number of grains/spike (64.33) was recorded with the treatment inoculation with azotobacter (10 gr/kg) + azospirillium (10 gr/kg) + 80 kg nitrogen (T_{12}). It was closely followed by (62.87) the treatments azotobacter (20 gr/kg) + 80 kg nitrogen (T_6). Minimum number of grains/spike (52.80) was recorded without seed inoculation + 40 kg N (T_1). The higher number of grains/spike Nitrogen and inoculation with azotobacter + azospirillium might be due to the better partitioning of carbohydrates from leaf to reproductive parts resulting in increased number of grains/spike, **Bhakher *et al.* (2000)** also reported similar results. Maximum test weight (43.00) was recorded with the treatment inoculation with azotobacter (10 gr/kg) + azospirillium (10 gr/kg) + 80 kg nitrogen (T_{12}), was found statistically at par (42.67) with the treatment inoculation with azotobacter (20 gr/kg) + 80 kg nitrogen (T_6). Minimum number of test weight (37.67) was recorded without seed inoculation + 40 kg N (T_1). Increase in test weight due to Nitrogen and inoculation with azotobacter + azospirillium application may be attributed to its role in various enzymatic reactions and its action as catalyst in various growth processes and in hormone production and protein synthesis, **Singh, (2000)** in rainfed guinea grass. Grain yield *(Table 2)* among the biofertilizers, maximum grain yield was recorded in the treatment in which the seed was inoculated with azotobacter as well as azospirillium. It was found to be statistically significant as compare to these culture applied alone as well as uninoculated treatment. Maximum grain yield (45.04) was recorded with the treatment inoculation with azotobacter (10 gr/kg) + azospirillium (10 gr/kg) + 80 kg nitrogen (T_{12}). It was closely

Table 2. Effect of different biofertilizers and nitrogen levels on Grain yield, Straw yield and Harvest index of barley.

Treatment	Grain yield (Q/ha)	Straw yield (q/ha)	Harvest index (%)
Biofertilizer (B)			
B_0 -Uninoculated	33.43	41.3	0.43
B_1 -Azotobacter	39.25	46.79	0.45
B_2 -Azosprillium	37.35	45.50	0.45
B_3 -Azotobacter + Azosprillium	39.89	47.47	0.46
SEd (±)	0.08	0.08	0.01
CD at 5 %	0.17	0.17	0.01
Nitrogen (N)			
N_1 -40 kg / ha	34.32	40.38	0.43
N_2 -60 kg / ha	37.06	45.50	0.45
N_3 -80 kg / ha	41.06	49.95	0.46
SEd (±)	0.07	0.07	0.02
CD at 5 %	0.14	0.15	0.10
Interaction (B*N)			
T_1- Uninoculated + 40 kg N	32.13	38.96	0.43
T_2- Uninoculated + 60 kg N	32.71	39.00	0.45
T_3- Uninoculated + 80 kg N	35.46	46.04	0.43
T_4- Azotobacter (20 gr) + 40 kg N	35.00	41.00	0.45
T_5- Azotobacter (20 gr) + 60 kg N	39.21	47.71	0.45
T_6- Azotobacter (20 gr) + 80 kg N	43.54	51.67	0.45
T_7- Azosprillium (20 gr) + 40 kg N	34.96	39.33	0.45
T_8- Azosprillium (20 gr) + 60 kg N	36.88	47.21	0.43
T_9- Azosprillium(20 gr) + 80 kg N	40.21	49.96	0.44
T_{10}- Azotobacter (10 gr) + Azosprillium (10 gr) + 40 kg N	35.17	42.21	0.45
T_{11}- Azotobacter (10 gr) + Azosprillium (10 gr) + 60 kg N	39.46	48.08	0.45
T_{12}- Azotobacter (10 gr) + Azosprillium (10 gr) + 80 kg N	45.04	52.12	0.46
S. Ed. (±)	0.14	0.14	0.24
C. D. at 5%	0.29	0.30	0.50

followed by (43.54) the treatments azotobacter (20 gr/kg) + 80 kg nitrogen (T_6). Minimum number of grain yield (32.13) was recorded without seed inoculation + 40 kg N (T_1). Increase in the grain yield due to Nitrogen and inoculation with azotobacter + azospirillium application on the yield of barley may be attributed to its role in various enzymatic reactions, growth processes hormone production and protein synthesis. The results are in accordance with those of **Zahir *et al.* (1996)** in wheat. Maximum straw yield (52.12) was recorded with the treatment inoculation with azotobacter (10 gr/ kg) + azospirillium (10 gr/kg) + 80 kg nitrogen (T_{12}). It was closely followed by (51.67) the treatments azotobacter (20 gr/kg) + 80 kg nitrogen (T_6). Minimum straw yield (38.96) was recorded without seed inoculation + 40 kg N (T_1). The increasing level of residual available Nitrogen and inoculation with azotobacter + azospirillium in a soil significantly increased the concentration of Nitrogen in the crops, which was largely responsible for the higher straw yield of wheat, **Verma *et al.* (1999)**. Harvest index among the biofertilizers, maximum harvest index was recorded in the treatment in which the seed was inoculated with azotobacter as well as azospirillium. It was found to be statistically not significant as compare to these culture applied alone as well as uninoculated treatment. Maximum harvest index (0.46) was recorded with the treatment inoculation with azotobacter (10 gr/kg) + azospirillium (10 gr/kg) + 80 kg nitrogen (T_{12}). Minimum Harvest index (0.43) was recorded without seed inoculation + 40 kg N (T_1).

CONCLUSION

On the basis of above findings, it may be concluded that combined inoculation of Azotobacter & Azospirillium with nitrogen at 80 along with recommended doses of Phosphorus and Potash (both were at 30 kg /ha) recorded maximum Spikes/plant, Length of spikes, Grains/spike, Test weight, Grain yield, Straw yield and Harvest index of barley.

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Groundnut Varieties as Influenced by Plant Density on Growth and Yield

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ABSTRACT

The experiment was laid out in Factorial Randomized Black Design (FRBD) with eight treatments with three replication. The treatments consisted of 30X15, 20X15, 35X15 & 35X20 cm plants spacing and two varieties of groundnut Kaushal (Bunch type), Chitra (Spreading type). The results showed that plant spacing of 30x20 cm gave higher plant height, No. of branches / plant, No. of pegs /plant, higher pod yield and haulm yield. Lowest yield was recorded in plant spacing of 20x15cm. The growth and yield attributes of groundnut were significantly reduced when the crop is provided with less spacing. Groundnut required wider plant spacing (30 x 20 cm) to express its maximum yield potentiality.

Key words: *Groundnut, Spacing, varieties, Spreading, Bunch, yield.*

INTRODUCTION

Groundnut is one of the world's most popular crops cultivated throughout the tropical and sub-tropical areas where annual precipitation is between 1000-1200 mm for optimum growth of the crop. Leading world producers of the crop are China, India, Nigeria, USA and Senegal. Among the vegetable sources, groundnut can play an important role as it contains the highest amount of oil (48% in seed) with the highest yield compared to other oil seed crops. **Khaleque, (1986)**. Being a leguminous crop groundnut helps in maintenance of soil fertility. And being rich in protein they supply major share of the protein requirement of country. Exhaustive cultivation without legumes in rotation, has transformed many regions in to barn wastelands thus the inclusion of legume crop in high intensity cropping programme has shown very encouraging effect in improving physical and to certain extent the chemical properties

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of soil. It is also efficient cover crop for lands exposed to soil erosion. Several research reports established the fact that the proper row and plant spacing determined the yield of a particular variety in a specific agro-ecological environment **Patel *et. al.*, (1985)**. Plant density is highly associated with yield potential and optimum plant density per unit area is an important non monetary input to decide the maximum groundnut productivity. Yield is a function of inter and intra plant competition and there is a considerable scope for increasing the in yield by adjusting plant population to an optimum level. Considering all these facts, the present study was undertaken to find out the influence of plant spacing on the growth and yield of different groundnut varieties.

MATERIALS AND METHODS

Field experiment was conducted during kharif season of 2010 at central research farm, SHIATS, Allahabad. The soil of the experimental site was sandy loam with pH (7.7) and medium in organic carbon (0.4%). The initial status of available N, P_2O_5 and K_2O of the experimental site was 220.0, 18.8 and 250.0 kg ha^{-1}, respectively. The experiment was laid out in a Factorial Randomized Black Design (FRBD) with eight treatments with three replication. The treatments consisted of S_1-30X15, S_2-20X15, S_3-35X15 & S_4-35X20 cm plants spacing and two varieties of groundnut V_1-Kaushal (Bunch type), V_2-Chitra (Spreading type). The treatments were Kaushal + 30 x 15 cm (T1), Kaushal + 20 x 15 cm (T2), Kaushal + 35 x 15 cm (T3), Kaushal + 35 x 20 cm (T4), Chitra + 30 x 15 cm (T5), Chitra + 20 x 15 cm (T6), Chitra + 35 x 15 cm (T7), Chitra + 35 x 20 cm (T8). Observations were recorded for various growth attributes like plant height, No. of branches /plant and yield attributes like No. of pegs /plant, pod yield, haulm yield and shelling percentage.

RESULTS AND DISCUSSION

Growth attributes: The growth attributes like plant height, No. of branches / plant, No. of pegs / plant are significantly influenced by various treatments *(Table 1)*. The maximum plant height was recorded with treatment (T_8-35 x 20 cm) as (89.01 cm), and minimum plant height was recorded as (42.19 cm) with treatment (T_2-30 x 15cm). It revealed that by increasing the spacing between the row to row and plant to plant, it had a significant effect on plant height. The plant height associated with S4 treatment (35 x 20cm) was 30.45% more than that of recommended spacing S_1 (30 x 15cm). The spacing between plants increases the plant height due to effective absorption of sunlight and nutrients. **Deshmukh, G.N. and Bhoi, P. G (2000)**. The maximum plant

Table 1. Plant height, No. of branches / plant, No. of pegs / plant as influenced by spacing and variety.

Factors	Plant height (cm)	No of Branches/plant	No of pegs / plant
SPACING			
S_1-30X15	44.45	6.43	25.47
S_2-20X15	50.72	6.27	22.17
S_3-35X15	75.61	6.37	22.87
S_4-35X20	88.96	7.77	26.90
S.Em (+)	1.31	0.10	0.317
C.D.at 5%	3.83	0.31	0.980
VARIETIES			
V_1-Kaushal	64.38	6.750	24.45
V_2-Chitra	65.49	6.667	24.25
S.Em (+)	0.528	0.040	0.127
C.D.at 5%	1.132	0.087	0.272
Interaction (S x V)			
T1	46.70	6.20	25.27
T2	42.19	6.67	25.67
T3	51.41	6.53	23.00
T4	50.03	6.40	21.33
T5	70.48	6.33	22.33
T6	80.73	6.00	23.40
T7	88.92	7.60	27.20
T8	89.01	7.93	26.60
S.Em (+)	2.62	0.20	2.24
C.D at 5%	7.91	0.63	6.82

height (89.01 cm) was recorded with treatment T_8 -Kaushal 35 x 20cm and the minimum height (42.19 cm) was recorded with T_2- Chitra 30 x 15cm. The bunch type variety shows increase in plant height in more spacing due to less competition between plant to plant and high due observation of sunlight. **Bell, *et al.,* (1991)**. The above results point out the fact that groundnut is highly responsive to spacing and gives good results. It draws the clear picture of necessity to use more spacing for optimum growth. The maximum no of branches were recorded with treatment (T_8-35 x 20 cm) as (7.93) followed by (6.00) with treatment (T_6-20 x 15cm) was recorded as minimum number of branches / plant in *(Table 1)*. It revealed that by increasing spacing between the row to row and plant to plant, it had a significant effect on number of branches. The number of branches associated with (T_8-35 x 20cm) was more than that of recommended spacing (35 x 15cm), Spreading type has the character of more height and less branches. Number of branches in spreading type will be less compared to bunch due more creeping **Tarimo, *et al.,* (1999)**.

The maximum no of pegs (26.90) were recorded in the treatment (T_7-30 X 20cm). Minimum no of pegs / plant were recorded as (21.33) in the treatment (T_4-20 x 15cm). It revealed that by increasing spacing between the row to row and plant to plant, it had a significant effect on no of pegs /plant. The no of pegs associated with (30 X 20cm) was (14.13) more than that of recommended spacing (30 x 10cm) and it was (26.90) in (30 X 20cm). Increasing plant density slowed the flowering rate and shortened the blooming period. This allowed a better synchronization of pod maturity, **Meena, *et.al.,* (2011)**.

Yield : The Pod yield (q/ha), Haulm yield (q/ha) and Shelling (%). significantly influenced by various treatments *(Table 2)*. Higher pod yield (25.00 q/ha) was recorded with treatment (T_8-Chitra + 35x20 cm). Lowest pod yield (18.70 q/ha) was recorded with treatment (T_4-Kaushal + 35x20 cm). Closer spacing of 30 x 10 cm recorded significantly higher pod yield of 2576, 2530 and 2192 kg/ha with a BCR of 1.80, 2.50, and 1.60, respectively during Rabi seasons of all the three years. **Chandrasekaran. *et.al* (2007)**. Yield was highest with 30 x 15 or 30 x 20 cm spacing, depending on cultivar. Increasing plant density tended to decrease crop growth rate per plant, pod growth rate per plant and to increase leaf area index and crop growth rate per unit area. Increasing plant density decreased harvest index, Plant density also affected the proportion of yield on main stems and different branches. **Mishra, *et al.* (1998)**. Higher haulm yield (16.87 q/ha) was recorded with treatment (T_3-Kaushal + 35x15). Lowest haulm yield (13.18 q/ha) was recorded with treatment (T_4-Kaushal + 35x20

Table 2. Effect of Spacing and Varieties on pod yield (q/ha), Haulm Yield (q/ha) and Shelling (%)

Factors	Pod Yield (q/ha)	Haulm yield (q/ha)	Shelling (%)
SPACING			
S_1-30X15	22.21	12.67	42.27
S_2-20X15	21.32	12.67	40.27
S_3-35X15	22.14	12.50	44.40
S_4-35X20	23.80	12.67	46.21
S.Em (+)	0.719	1.848	1.376
C.D.at 5%	1.543	3.963	2.952
VARIETIES			
V_1-Kaushal	22.79	12.50	44.13
V_2-Chitra	21.94	12.25	42.44
S.Em (+)	0.288	0.739	0.550
C.D.at 5%	0.617	1.585	1.181
Interaction (S x V)			
T1	20.26	14.07	43.18
T2	24.15	16.75	41.36
T3	23.94	16.87	41.91
T4	18.70	13.18	38.62
T5	24.37	16.68	44.03
T6	19.92	13.89	44.77
T7	22.60	15.56	47.41
T8	25.00	16.49	45.01
S.Em (+)	1.43	3.69	2.75
C.D at 5%	3.88	9.92	7.30

cm). The haulm yield and biological yield were recorded maximum under 22.5 cm x 8 cm planting geometry, application of 40 kg N/ha significantly improved the studied growth characters, yield attributes and yield. **Meena, *et al.* (2011)**. Increasing plant density tended to decrease crop growth rate per plant, pod growth rate per plant and to increase leaf area index and crop growth rate per unit area. Increasing plant density decreased harvest index, Plant density also affected the proportion of yield on main stems and different branches. **Mishra, *et al.* (1998)**. Highest shelling % (47.41) was recorded with T_7-treatment (Chitra + 35x15cm). Lowest shelling % (38.62) was recorded with T_4-treatment (Kaushal + 35x20cm). Increasing plant density tended to decrease crop growth rate per plant, pod growth rate per plant and to increase leaf area index and crop growth rate per unit area. Increasing plant density decreased harvest index, Plant density also affected the proportion of yield on main stems and different branches. **Mishra, *et al.* (1998)**.

CONCLUSION

On the basis of above findings, it may be concluded that groundnut crop with 35x20 cm spacing was found significantly better than other spacing, which increased the plant height, number of branches/ plant, number of pegs/plant, pod yield, haulm yield and shelling percentage. The growth and yield attributes of groundnut were significantly reduced when the crop is provided with less spacing. Groundnut required wider plant spacing (35 x 20 cm) to express its maximum yield potentiality.

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Response of Integrated nutrient to improve soil health and yield attributs of Rice (*Oryza Sativa* L.)

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ABSTRACT

A Field experiment was conducted on Response of Integrated Nutrient to Improve Soil Health and Yield Attributes of Rice (*Oryza sativa* L.) during Kharif 20 July -20 Nov. 2011 at the Research Farm of Department of Soil Science, Allahabad School of Agriculture, Sam Higginbottom Institute of Agriculture, Technology & Sciences (Deemed-to-be-University) Allahabad. The experiment was laid out in Randomized Block Design with three replications. The treatment consisted of for combination of $T_1 = I_0O_0$ Control, $T_2 = I_0O_1$ @ 5t ha^{-1} rice straw., $T_3 = I_0O_2$ @ 5t ha^{-1} rice straw burn, $T_4 = I_1O_1$ @ $N_{30}P_{15}K_{15}$ Kg ha^{-1} + @5 t ha^{-1} rice straw, $T_5 = I_2O_1$ @ $N_{60}P_{30}K_{30}$ Kg ha^{-1} + @ 5t ha^{-1} rice straw, $T_6 = I_3O_1$ @ $N_{120}P_{60}K_{60}$ Kg ha^{-1} + @ 5t ha^{-1} rice straw, $T_7 = G_1O_1$ @ 5t ha^{-1} rice straw + @ 5t ha^{-1} green manure, $T_8 = F_1O_4$ @ 5t ha^{-1} rice straw + @ 5t ha^{-1} FYM, $T_9 = I_2O_1B_1$ @ $N_{60}P_{30}K_{30}$ + @ 5t ha^{-1} rice straw + Azotobacter 25Kg ha^{-1} Treatment $T_9 = I_2O_1B_1$ also recorded highest seed yield where as the variation in Treatment T_9 due to 100% of RDF where found to be statistically more over the nine treatment. The maximum cost benefit ratio 1:2:47.

Key words: *Integrated nutrient, Rice, Soil health, Yield attributes.*

INTRODUCTION

Rice (*Oryza Sativa* L.) is a cereal of the Family Gramineaes. Its seeds are high in carbohydrate despite being widely considered a foods, is in fact one of the earliest cultivated fruits; Rice is the most cereals crops of India, Which has IInd ranked world production. In rice calories percentage 11, Carbohydrates 15%, Dietary Fibre 14%, Sugars 0.7g, Protein10%, Vitamin K1%, Thiamin 12%, Riboflavin 3%, Niacin 15%, Vitamin B6 14%, Folate 2%, Pantothenic Acid 6%. **(USDA SR-21, 2011)**. A part form this, its cultivation play's a major role in improving soil fertility. Soil is recognized as the most complex soil parameter and has significant interrelationship with the

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important physical and chemical properties of soil. To point out that productivity of soil affected by increased mechanical impedance, reduced aeration altered soil moisture availability and heat flux which followed from increased soil density and reduced pore space. At any one time, one or more of these factors may become critical for the growth of the plant, which factors actually does become critical will deepened upon soil type the climate condition and the plant species. That relation between soil density and plant yield to be parabolic whether a given density increments will hamper or improve plant growth depends upon whether the soil is looser than at or more compact than the optimal density for the given crop and sol. The source of integrated nutrient use for experiment in different treatment Nitrogen Urea 46 % N Phosphorus SSP 16% P_2O_5 Potassium MOP 60% K_2O.

MATERIALS AND METHODS

The experiment was conducted during kharif season 2011-12 on crop Research Farm of Department of Soil Science at Sam Higginbottom Institute of Agriculture, Technology and Sciences, Deemed-to-be-University Allahabad, the area is situated on the south of Allahabad on the right side of the river Yamuna on the South of Rewa Road at a distance of about 6 km from Allahabad city. It is situated at 25.57^0 N latitude, $81\square50^0$ E longitude and at the altitude of 98 meter above mean sea level.

The soil was natural in reaction, Soil texture Sandy loam, low in available N, medium in available P_2O_5 and high in available K_2O content. The experiment was laid out in randomized block design with three replications. The treatment consiststed of nine combination of organic and inorganic and control of with fertilizer T_1 Control, T_2 - 5 t ha^{-1} rice straw. T_3- 5 t ha^{-1} rice straw burn. T_4 - @ $N_{30}P_{15}K_{15}$ kg ha^{-1} + @ 5 t ha^{-1} rice straw. T_5 - @ $N_{60}P_{30}K_{30}$ kg ha^{-1} + @ 5 t ha^{-1} rice straw. T_6 - @ $N_{120}P_{60}K_{60}$ kg ha^{-1} + @ 5 t ha^{-1} rice straw. T_7 - @ 5 t ha^{-1} rice straw + @ 5 t ha^{-1} green manure. T_8 - @ 5 t ha^{-1} rice straw + @ 5 t ha^{-1} FYM. T_9 - @ $N_{60}P_{30}K_{30}$ kg ha^{-1} + @ 5 t ha^{-1} rice straw + Azotobacter 25 kg ha^{-1}. The treatments were given to each crop every year. The experiment was laid out in a randomized block design with three replication having plot size of 3x2 m for crop. Seeds of rice 25 kg ha^{-1} (*Oryza sativa* L.) var. Pusa Basmati-1. Green manure grow in April month and milking stage burying in soil and farm yard manure incorporated as per treatment at time of field preparation and mixed thoroughly. One third nitrogen and full doses of phosphorus and potassium were applied at the time of sowing of the crop and remaining dose of nitrogen was applied in two equal splits at tillering and flower initiation stages through urea, single super

Table 1. Pre-Sowing soil properties of the experimental field

Properties	Value
Bulk density (g cc^{-1})	1.54
Soil Texture (Sand, Silt & Clay %)	Sandy loamy
Particle density (g cc^{-1})	2.67
Moisture content (%)	5.20%
pH	7.42
EC (dS m^{-1})	0.17
Particle density (g cm^{-3})	0.42
Bulk density (g cm^{-3})	216.19
Organic carbon (g kg^{-1})	0.18
Nitrogen (kg ha^{-1})	233.42
Phosphorous (kg ha^{-1})	10.34
Potassium (kg ha^{-1})	260.39

phosphate and muriate of potash, respectively. Soil sample were air-dried and pulverized to pass through 2 mm sieve, Soils were analysed by using standard procedures as described for pH **Jackson (1958)**, **EC Wilcox (1950)**, Organic carbon **Walkely and Black (1947)**, available nitrogen **Subbiah and Asija (1956)**, available phosphors **Olsen's (1954)** and available potassium **Toth and price (1949)**.

RESULTS AND DISCUSSION

Growth and yield response of Rice

The statistical analysis of plant height, weight 1000 grains (g), and weight grains yield rainfed under different treatment, RDF combination and FYM with levels fertilizers showed significant at 5% probability level. However, statically results for these treatments were significant $T_9 = I_2O_1B_1$ @ $N_{60}P_{30}K_{30}$ + @ 5t ha_{-1} rice straw + Azotobacter 25Kg ha^{-1}. Combination of inorganic fertilizer and Organic fertilizer levels increased the plant height, weight car (g $plot^{-1}$) weight grain (g $plot^{-1}$), weight Stover yield (q ha^{-1}) , weight 1000 grains (g) and weight grains yield (q ha^{-1}). The data clearly revealed that the plant height, 90.30 (cm) weight grain yield (34.5 q ha^{-1}) and No of

Table 2 : Effect of different levels of integrated nutrient on plant height (cm) no. of tillers no. of leaves no. of spikelet's per panicle and yield (q ha^{-1}) of rice

Treatment	Plant Height	No of tillers	No of Leaves	No of spikelet's per panicle	Yield (q ha^{-1})
$T_1=I_0O_0$	65.63	17.20	70.06	92.73	20.8
$T_2=I_0O$	65.76	15.34	50.63	110.40	26.5
$T_3=I_0O$	74.10	12.30	59.73	116.67	26.4
$T_4=I_1O$	83.73	18.83	75.72	126.86	28.2
$T_5=I_2O_1$	85.63	18.40	71.43	136.60	30.6
$T_6=I_3O_1$	87.63	19.63	75.66	152.58	31.5
$T_7=G_0O_1$	76.83	20.86	86.53	120.32	27.5
$T_8=F_1O_4$	73.06	21.19	81.52	137.82	27.8
$T_9=I_2O_1B_1$	90.30	22.20	101.40	155.77	34.5
Mean	78.07	18.43	74.74	127.75	28.2
F- test	S	S	S	NS	S
S. Em (±)	3.974	3.92	-	-	0.036
C.D. at 5%	12.50	1.12	6.5	-	0.076

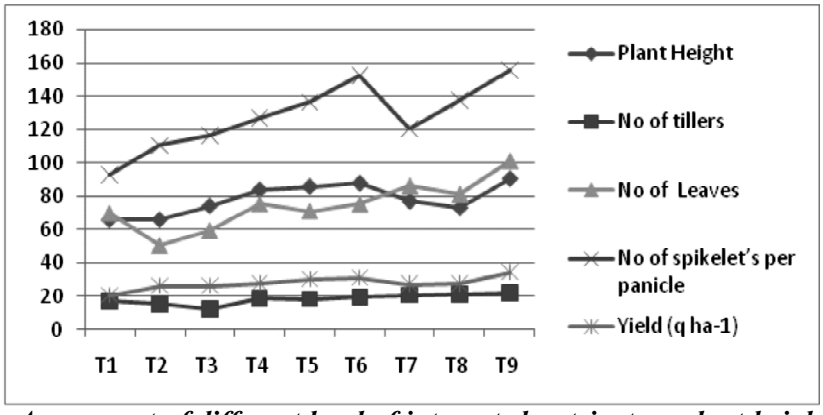

Fig 1 :- Assessment of different level of integrated nutrient on plant height (cm), no. of leaves, no. of tiller, no. of spikelet's per panicle, yield (q ha^{-1}) of rice

spikelet's per panicle(155.77) (g) per plot were affected significantly by nitrogen and organic rates. The maximum plant height 78.07 cm was recorded compared with other treatments. This improvement plant growth by addition of RDF and organic combination with different rate mineral compared with control may be attributed to improved mineral nutrition of soil and plant.

Economics

The cost of cultivation was marginally increased when the nutrient were applied through the combination of different sources, but due to higher grain and straw yields, the net income and benefit : cost ratio were also higher under the integrated use of organic and inorganic source of nutrient. The highest net income (Rs. 61685.00 ha^{-1} and benefit : cost ratio 1: 2.47) was obtained with application of 50 % RDF along with 5 t ha^{-1} rice straw + Azotobacter 25 kg ha^{-1}. The second best treatment (100 % RDF and @5 t ha^{-1} rice straw) gave net income (Rs 42385.00. ha^{-1} and B : C ratio of.1:2.27.).

CONCLUSION

As it is the result of only one year study, further experimentation is required for its recommendation which will help in enhancing yield of rice per unit area for sustaining productivity and fertility of the soil.

Result revealed that it is possible to sustain upland rice grain yield of .34.5.q ha^{-1} with 50 % RDF and 5 t rice straw + 25 kg biofertilizer ha^{-1} recommended dose of NP and k fertilizer against the existing farmer's practices in improved in Allahabad district in Uttar- Pradesh. The fertility status of N, P, K and organic carbon increased in after harvest of under the INM treatment. There is a considerable improvement in uptake of N, P and K under integrated nutrient management practices.

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Effect of different levels of NPK and FYM soil health and yield attributes of fenugreek (*Trigonella Fenum-greacum* L.)

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ABSTRACT

The field experiment was conducted during Rabi season 2011 the "Effect of different levels of NPK and FYM on soil health and yield attributes of fenugreek (*Trigonella fenumgreacum* L.)" was conduct at the experiment field of Department of Soil Science, Sam Higginbottom Institute of Agriculture, Technology & Sciences, Allahabad (U.P.). The experiment was laid out in Randomized Bock Design with nine treatment and three replication the observation recorded for the standard parameter analyzing the uptake of nutrient in percentage NPK and FYM in plant and yield of fenugreek (*Trigonella fenumgreacum* L.) observation were recorded as main value of the data showed that there were non significant in % N, P, K in treatment combination (T_8 N_{100} + P_{100} + K_{100} + FYM 10 t ha^{-1}) fenugreek yield was 46 q ha^{-1} followed by treatment combination (T_7 N_{100} + P_{100} + K_{100} + FYM 5 t ha^{-1}) fenugreek yield over then control (T_0 $N_0P_0K_0$ + FYM 0 t ha^{-1}) Higest fenugreek Biomass yield was (T_8 N_{100} + P_{100} + K_{100} + FYM 10 t ha-1) Followed.

Keywords: *Chemical properties, Fenugreek, Nutrient available soil, Physical properties & Yield.*

INTRODUCTION

Fenugreek (*Trigonella foenum-graecum* L.) is an annual, self-pollinated plant from Leguminosae family with small seeds, erect annual herbaceous plant that grows up to 10-50 cm height and since ancient times has always been known as a medicinal herb. Fenugreek seeds have anti-diabetes and cholesterol-reducing properties. Moreover, the plant is known for treating gastric ulcers and its antibacterial,

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anthelminitic, contraceptive, and anodyne properties as well **Petropoulos, (2002)**. Its leaves broadly are consumed as leafy green vegetables in India and are rich in calcium, iron, carotene B and other vitamins **Sharma, (1986)**. Fenugreek seeds are rich in protein, fixed oils and minerals; thus, it is quite nutritious.

Fenugreek is used as a spice, vegetable and a medicinal plant. Since antioxidant properties have been linked to health benefits of natural products, such properties were studied in germinated fenugreek seeds which are considered to be more beneficial than dried seeds **Dixit, (2005)**. Extract from fenugreek is usually added to fodder in order to improve animal's palatability **Smith, (1982)**. Generally nitrogen fertilizers have a major effect on stem formation, foliation and germination of plants and as a whole; it accelerates their vegetative growth.

Using nitrogen in fenugreek leads to growth increase, delayed maturation, producing desired leaves, developed stem and the plant's dark-green color which indicates a desired growth. Also, plant density on the rows affects the yield and is controlled by the amount of seeds. The appropriate spacing on the row and within the rows depend mainly upon on soil texture, depth of sowing, fertility, available moisture, temperature and the type of cultivar **Petropoulos, (2002)**. Higher levels of FYM slightly decreased the dry matter yield in comparison to soil un-amended with FYM.

MATERIALS AND METHODS

The experiment was carried out during Rabi season 2011 at Research Farm, Department of Soil Science, Sam Higginbottom Institute of Agriculture, Technology & Sciences, Allahabad, Uttar Pradesh, India. The farm is situated at 25.57^0 North latitude and 81.5^0 East longitudes at an altitude of 98m above sea level.

The area of Allahabad district comes under sub- tropical and arid climate. Due to sub-tropical climate prevailing in the southeast part of (U.P) with extremes in the temperature dropping to 1-2^0C in December and January and very hot in summer with temperature raining between 46-48^0C in the month of the May and June. the average rainfall is around 1013.4 mm with maximum concentration during July to September and occasional frost in winter and hot wind in summer month period of the fenugreek grown in both seasons were recorded at metrological deportment School of forestry and environment.

The soil of the experiment field is sandy loam (13% clay) belong to montmorillonite hyperthermic family of Typic Haplustert. The experiment included 9 Treatment viz. T_0 ($N_0P_0K_0$ + FYM 0 t ha^{-1}) T_2 ($N_0P_0K_0$ + FYM 5 t ha^{-1}) T_3 ($N_0P_0K_0$ + FYM 10 t ha^{-1}) T_3 ($N_0P_0K_0$ + FYM 0 t ha^{-1}) T_4 ($N_{50}P_{50}K_{50}$ + FYM 5 t ha^{-1}) T_5 ($N_{50}P_{50}K_{50}$ + FYM 10 t ha^{-1}) T_6 ($N_{100}P_{100}K_{100}$ + FYM 0 t ha^{-1}) T_7 (N_{100} + P_{100} + K_{100} + FYM 5 tha^{-1}) T_8 (N_{100} + P_{100} + K_{100} + FYM 10 t ha^{-1}) Control each replicated three timees in a randomezed blok design. The Recommended of N, P & K and FYM dose based on initial soil test was 40 $kgha^{-1}$ N, 40 $kgha^{-1}$ & P 20 K_2O $kgha^{-1}$ for fenugreek. The source of N, P and K used were Urea, Diammonium phosphate (DAP) and Muriate of potash. Insulphur free treatment Diammonium phosphate (DAP) was used instead of SSP and source of P. Farmyard manure @10tha^{-1} was applied only to fenugreek crop during *rabi* season was applied only to fenugreek crop during *rabi* season. fenugreek was irgatted crop growth as and when needed. The insect and disease were keeped under following sutable control measures. Fenugreek crop were harvested at yield data were recorded after harvesting. The soil sample were collected after harvest of fenugreek crop from 0-15 cm depth in cropping year 2011-2012 and were analysed for diffrent parameter by following standard procedures for organic carbon **Walkley and Black, (1947)** Available nitrogen **Subbiah and Asija, (1956)** Available P **Olsen *et al.*, (1954)** Available K **Muhr *et al.*, (1965)** All observation recoreded on fenugreek yield and soil properties were analysed Statistically. The polled fenugreek biomass yield have also been repoted.

RESULTS AND DISSCUSSION

The data partaning to the mean fenugreek biomass yield of have beebn presentd in *table-1* and illustrated and *fig.-1* respectively. The data indicated that higest fenugreek biomass yield of fenugreek.

The data perrtaining to be mean biomassyield of fenugreek have been presented in *table-1* and illustread in *fig.-1*. respectively the data indicated the higest yield of fenugreek were obtained in treatment reciving optimal dose of N, P & K with organic manure 100% NPK + FYM 10 tha^{-1} (0.046 tha^{-1}) was recorded in control (0.026 tha^{-1}). The result of 27 plot indicated that application of nalone casued inincrese in the yield over control but the response exhibited decdeclining trend with time due to imbalanced use of nutrients further the supplementation of N with P 100% NP enhanced the yield by 243.57, 175.50 respectively application of K with 100% NPK further increse the yield by 243.57 28.3, 175.50 repctively.

Table 1 : Effect of different level of N, P & K and FYM on Fenugreek yield (q ha^{-1}) of fenugreek

Treatment combination	Yield
T_0 Control	0.026
T_1 $N_0P_0K_0$ + FYM5tha^{-1}	0.047
T_2 $N_0P_0K_0$ + FYM10tha^{-1}	0.046
T_3 $N_0P_0K_0$ + FYM0tha^{-1}	0.037
T_4 $N_{50}P_{50}K_{50}$ + FYM5tha^{-1}	0.036
T_5 $N_{50}P_{50}K_{50}$ + FYM10tha^{-1}	0.043
T_6 N_{100} P_{100} K_{100} + FYM0tha^{-1}	0.036
T_7 N_{100} + P_{100} + K_{100} + FYM5tha^{-1}	0.040
T_8 N_{100} + P_{100} + K_{100} + FYM10tha^{-1}	0.046
F- test	NS
S.Em ($\pm$)	-
C.D. at 5%	-

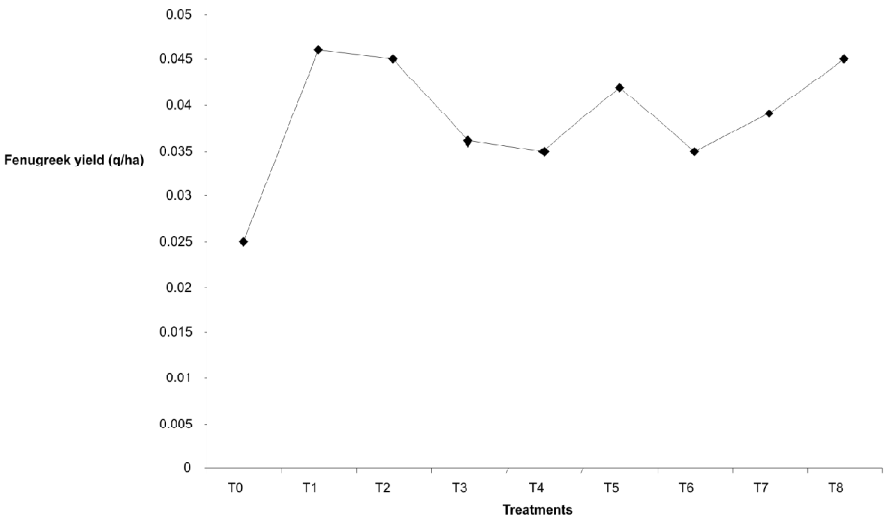

Fig. 1 Effect of different level of NPK & FYM on Fenugreek yield (q/ha^{-1}) of fenugreek

The application of organic manure @10 FYM tha^{-1} along with opmimal dose of fertlizer i.e 100% NPK + FYM $10tha^{-1}$ was bemfical for enchanced productivity and soil fertlity it produced highst yield of 0.046 yield of fenugreek respectively obtained under super optimal dose of fertilizer either alone or in combination with organic manure treatmen is superior to super optimal dose. Thus the balanced use of fetilizer either alone are in combation with organic manure is necessaary for sutatining Soilfertility and productivity and crops. **Mishra *et al.*, (2008)** also reported similar finding.

Available N, P & K in soil

Contintinous use of nitrogenouus fertilizers for available nitorgen status of soil data indicate the available nitrogen status of soil ranged from 204.37 to 243.57 $kgha^{-1}$ and that the highest value of available was found associated with the treatment T_8 were recommend fertilizer with FYM @ 10 tha^{-1} has been applied showed increase of 65.7% over initial value sheeba and ascribe such as increase in Available nitrogen to the mineralization of FYM.

Table 2 : Effect of different level of NPK and FYM on available N, P and K (kg ha^{-1}) of post harvest soil.

Treatment	Available N	Available P	Available K
T_0 Control	204.37	19.4	138.09
T_1 $N_0P_0K_0$ + FYM5tha^{-1}	237.32	21.3	163.57
T_2 $N_0P_0K_0$ + FYM10tha^{-1}	244.96	22.1	166.71
T_3 $N_0P_0K_0$ +FYM0tha^{-1}	237.07	24.3	147.32
T_4 $N_{50}P_{50}K_{50}$ + FYM5tha^{-1}	237.32	22.6	162.29
T_5 $N_{50}P_{50}K_{50}$ + FYM10tha^{-1}	244.74	23.6	177.23
T_6 N_{100} P_{100} K_{100} + FYM0tha^{-1}	194.20	26.6	149.19
T_7 N_{100} + P_{100} + K_{100} + FYM5tha^{-1}	229.49	25.0	163.31
T_8 N_{100} + P_{100} + K_{100} + FYM10tha^{-1}	243.57	28.3	175.50

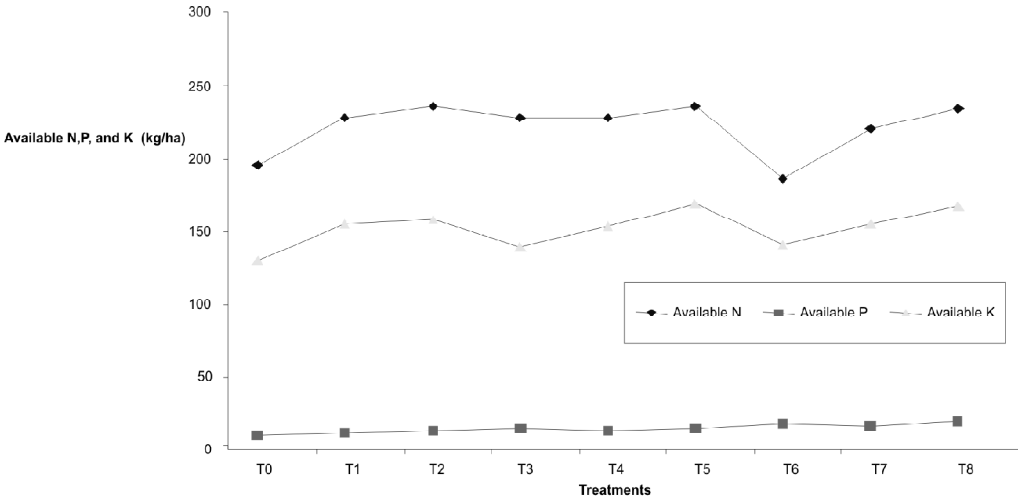

Fig. 2 Effect of different level of NPK and FYM on available N,P, and K (kg/ha) fenugreek

Applied phosphorus get fixed and only a small part (15-20%) of it becomes Available to the plants. The results from this long term experiment indicate that the imbalanced used of fertilizer reduced the available P content in the soil a significant reduction in available P content observed under nitrogen alone (100%) nitrogen and unfertilized treatments occurred due to removal of P supplementation through external source.

The use of recommended dose of fertilizers with organic manure resulted in a increase in the available P status of soil 28.3 $kgha^{-1}$ which was com comparable with that present in 150% N, P & K treatment (22.1 kg ha^{-1}).

The perusal of data indicated declining trend (138.09 to 163.31kg ha^{-1}) form the initial level 175.5 kg ha^{-1} of available K status which indicates considerable mining of available soil maximum decline was observed in case of N, P & K application. K content of the soil which may be due to nutrient imbalance in the soil. Continuous application of N depressive effect on available K content of the soil which may be due to nutrient imbalance in the soil.

Crop nutrition caused meaning of its native pools that caused reduction in the crop yield. **Dwivedi *et al.,* (2007)** However the higest available K status of the found Assoceated with 100% N, P & K + FYM followed by 150% N, P & K treatments. The application of organic manure may have casued reduction in K fixtation and conse quentially increased K content due to intrecation of organic matter with clay besides the dircet addition to the available K pools of soil the higher level of K in 100% NPK treattment due to higher rate of K applicaton in this treatments.

CONCLUSION

It is concluded that one year crop of fenugreek use of organic manurre along with 100% N, P & K was maximum higher yield of fenugreek and also improved in soil fertility. The fiding indicate that balanced use of fertilizer alone or combination with organic manure resulted in significant bulid up of organic carbon and available N, P & K from intial status was noticed as a results K of contineous of cropping which indicated considrable soil meaning of available K. incorporation of fertilzer and manure in sweel shrin K soil improved the buld density and Nutrient balance of soil implied build of phos phorus under fenugreek cropping sequance.wich calls for refinement of P level recommendation.

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Effect of Different Levels Phosphorus and Sulphur on Soil Properties, growth and Yield of Mustard. (*Brassica junciya* L.)

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ABSTRACT

A study was conducted on the Effect of different levels of Phosphorus @ 0,25 and 50 kg ha^{-1}, and Sulphur @ 0, 20 and 40 kg ha^{-1} on Soil properties and Yield of mustard (*Brassica juncea* L.) Cv. Varuna. The Grain yield (qha^{-1}) was significantly increased by the application of Phosphorus and Sulphur, The maximum yield was obtained by the Phosphorus @ 50 kg ha^{-1} with Sulphur @ 40 kg ha^{-1}, The interaction between Phosphorus @ 50 kg ha^{-1} with Sulphur (40 kg ha^{-1}) was significant and the maximum yield was obtained. The soil samples collected after harvest of Indian mustard showed the significant decreases in pH and EC and inverses in Organic Carbon, available Nitrogen, Phosphorus, Potash and Sulphur was recorded by the application of Phosphorus and Sulphur applied alone or in conjunction with each other.

Key words: *Phosphorus and Sulphur Indian mustard and Soil Health.*

INTRODUCTION

The oilseed form essential part of human diet. Besides it produces basic raw materials for agro based industries and has large acreage covering 20.7 million ha under various oilseeds in different agro-climatic zones of this country. The average Indian consumer uses relatively low quantities of edible oil, no doubt influenced by his modest level of income. This has been primarily due to phenomenal increase in human population and lower rate of productivity of these crops. Rapeseed and mustard are the major Rabi oil seed crops of India and stand next to groundnut in the oilseed economy. Rapeseed and mustard are one of the most important edible oils of northern and eastern parts of India. Various nutrients and micronutrients are required for oilseed

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production, but the nutrient which plays a multiple role in providing nutrition to oilseed crops, particularly those belonging to cruciferae family is sulphur. Each unit of fertilizer sulphur generates 3-5 units of edible oil, a commodity needed by every family. Sulphur can be rightly called as fourth major element of the plant because it is a constituent of three amino acids and helps in the formation of chlorophyll and synthesis of oils. Sulphur application also has marked effect on soil properties and is used as soil amendment to improve the availability of other nutrients in soil as gypsum and pyrite. Sulphur is the cheapest of the four major plant nutrients today. Between the two common sources of sulphur, a relatively large deposit of gypsum are available in India and is a cheap source of sulphur, hence could also be better source of sulphur for oilseed crops. **Khan and Hussain (1999)** showed the highest seed and oil yield in mustard (*Brassica juncea*) Cv. Kranti, Varuna and Rohini was obtained by applying 20 kg sulphur per hectare. Biofertilizer are known to play a number of vital roles in soil fertility, crop productivity and production in agriculture as they are eco-friendly but can not at any cost replace chemical fertilizers that are indispensable for getting maximum crop yields. They supplement chemical fertilizers for meeting the integrated nutrient demand of the crops. Azotobactor inoculants when applied to many non-leguminous crop plants, promote seed germination and initial vigor of plants by producing growth promoting substances. Application of Biofertilizer results in increased mineral and water uptake, root development, vegetative growth and nitrogen fixation. Therefore, present study deals with the combined effect of sulphur and Biofertilizer on yield of mustard crop and soil properties.

MATERIALS AND METHODS

Field experiment was conducted on the soil science research field of SHIATS-DU-Allahabad (U.P) during Rabi season of 2012-013. The surface soil samples (0-15 cm) collected from the experiment site were analyzed for physico-chemical characteristics and results are summarized in *Table. no.1* Indian Mustard (*Brassica juncea* L.) Cv. Varuna was tested for three levels of Sulphur @ 0,20 and 40kg/ha^{-1} by source of Gypsum and Phosphorus @ 0, 25 and 50 kg/ha^{-1}. Irrigation scheduling, fertilizers application and intercultural operation are followed as per normal agronomic practise. The experiment was laid out in 1.5x1.5 m 32 factorial R.B.D with a treatments and three replications. Grain yield was recorded at harvest for all the treatments. At harvest of crops for textural classes, pH, EC as per standard laboratory methods **(Jackson, 1973)**.

Table No.1 : Pre sowing mechanical and chemical analyses of Soil Properties at 0-15 cm depth of soil.

S.No	Soil Properties	Result
1.	Soil Texture	Sandy Loam
2.	Soil pH (1:2)	7.81
3.	Soil EC (dSm^{-1})	0.25
4.	Organic Carbon (%)	0.35
5.	Available Nitrogen (kg/ha^{-1})	258.58
6.	Available Phosphorus (kg/ha^{-1})	24.16
7.	Available Potassium (kg/ha^{-1})	102.70
8.	Available Sulphur (ppm)	7.03

RESULTS AND DISCUSSION

The Grain yield of mustard (qha^{-1})

The Grain yield (qha^{-1}) data presented in *Table no.2* clearly shows. The grain yield (qha^{-1}) of seeds showed a significant increase by the increasing levels of Sulphur, from S_0 - S_0 kg/ha^{-1} < S_1 (S_{20} kg/ha^{-1} < S_2 - S_{40} kg/ha^{-1} and their data 19.25, 22.44, 23.97 qha^{-1}. The grain yield qha^{-1} showed a significant increase by the increasing levels of Phosphorus from P_0 P_0 - P_0 kg/ha^{-1} < P_1 (P_{20} kg/ha^{-1} < P_2 - P_{40} kg/ha^{-1} and their data 19.75, 22.30, 23.61 qha^{-1}. The interaction between the Sulphur, Phosphorus, on an average grain yield qha^{-1} showed a significant Effect. The interaction between Sulphur and Phosphorus on grain yield qha^{-1} was significant. The maximum grain yield qha^{-1} 24.72 was recorded in S_2 P_2 treatment was significantly higher than the grain yield qha^{-1} was 15.93 recorded in S_0P_0 (control).

Table No. 2 : Effect of different levels of phosphorus and sulphur on Grain yield (qha^{-1})

Levels of Sulphur	**Levels of Phosphorus**			**Mean (S)**
	P_0 (0 kg/ha^{-1})	**P_1(25 kg/ha^{-1})**	**P_2 (50 kg/ha^{-1})**	
S_0 (0 kg/ha^{-1})	15.93	19.67	22.14	19.25
S_1 (20 kg/ha^{-1})	20.34	23.01	23.98	22.44
S_2 (40 kg/ha^{-1})	22.98	24.21	24.72	23.97
Mean (P)	**19.75**	**22.30**	**23.61**	
		F-test	**S. Em. (±)**	**C.D. at 5%**
Due Sulphur		S	0.156	0.332
Due to Phosphorus		S	0.156	0.332
Inter (S x P)		S	0.271	0.575

Effect of different treatments on chemical properties of soil : The different treatments of Sulphur and Azotobactor tended to have a marked effect on the health of soil at crop harvest.

1. Soil pH 1:2(w/v)

The data presented in *Table no. 3* clearly shows that pH of the post harvest soil ranges from 7.67 to 8.10, in comparison to the initial pH of 7.80 of the soil. The application of Sulphur resulted in decreases in soil pH with increases in the subsequent does of Sulphur, the interaction between Sulphur, with Phosphorus treatment on soil pH, was significant the lowest pH 8.02 was recorded in S_2P_2 and 8.02 in S_0P_0 treatment at S_1 and S_2 levels of Sulphur and at P_1P_2 levels of Phosphorus the soil pH decreases with increasing levels of Phosphorus, the decreases in pH are due to higher growth of crops as respiration is more, respiration evolves carbon dioxide and reacts with water to form carbonic acid in soil, so resulted in decreases in pH.

Table No. 3.: Effect of different levels of phosphorus(DAP) and sulphur (Gypsum) on Soil pH (1:2) w/v.

Levels of Sulphur	**Levels of Phosphorus**			**Mean (S)**
	P_0 (0 kg/ha^{-1})	**P_1 (25 kg/ha^{-1})**	**P_2(50 kg/ha^{-1})**	
S_0(0 kg/ha^{-1})	7.16	8.15	7.82	7.99
S_1(20 kg/ha^{-1})	7.92	8.25	8.02	8.06
S_2(40 kg/ha^{-1})	7.88	7.88	8.02	7.93
Mean (P)	**7.94**	**8.09**	**7.95**	
		F-test	**S. Em. (±)**	**C.D. at 5%**
Due Sulphur		S	0.043	0.092
Due to Phosphorus		S	0.043	0.092
Inter (S x P)		S	0.075	0.159

2. Electrical conductivity: The EC of post harvest soil ranges from 0.20 to 0.29 dSm^{-1}.

Soil EC (dSm^{-1})

The data with respect to EC of post harvest soil is presented in *Table no.4* clearly shows that the initial EC was 0.30 dSm^{-1}, the EC of post harvest soil ranges from 0.20 to 0.29 dSm^{-1}. The applied Sulphur result was as usual same in EC of post harvest soil with increasing in doses of Sulphur. The effect of EC on available EC of soil was significant, the maximum available EC of soil was 0.26 dSm^{-1} was in S_0 levels of Sulphur combination S_2 levels of Sulphur combination was significantly less than S_0 levels of Sulphur. The application of Phosphorus also showed significant effect on EC availability in soil, the maximum available EC 0.28 dSm^{-1} was recorded in P_0 levels and minimum 0.21 dSm^{-1} was recorded in P_2 levels of Phosphorus. The interaction between Sulphur and Phosphorus on available EC of post harvest was significant, the maximum available EC 0.29 dSm^{-1} S_0P_0 treatment which was significantly greater and is followed by 0.28 dSm^{-1} S_2P_2, minimum 0.20 dSm^{-1} was recorded in S_2P_2 levels of interaction between Sulphur and Phosphorus, however, with increasing the levels of Sulphur and Phosphorus the available EC has significantly decreased thus helping in maintain EC status of soil.

Table No. 4.: Effect of different levels of phosphorus (DAP) and sulphur (Gypsum) on Soil EC (dSm^{-1})

Levels of Sulphur	**Levels of Phosphorus**			**Mean (S)**
	P_0 (0 kg/ha^{-1})	**P_1 (25 kg/ha^{-1})**	**P_2(50 kg/ha^{-1})**	
S_0 (0 kg/ha^{-1})control	0.29	0.27	0.28	0.28
S_1 (20 kg/ha^{-1})	0.25	0.26	0.24	0.25
S_2 (40 kg/ha^{-1})	0.23	0.21	0.20	0.21
Mean (P)	**0.26**	**0.25**	**0.24**	
		F-test	**S. Em. (±)**	**C.D. at 5%**
Due Sulphur		S	0.004	0.008
Due to Phosphorus		S	0.004	0.008
Inter (S x P)		S	0.007	0.014

3. Organic Carbon (%) :

The data presented in *Table no. 5* the available Organic carbon in post harvest soil increases with application of Sulphur, the initial available Organic carbon was 0.18 %. The effect of Organic carbon on available Organic carbon of soil was significant, the maximum available Organic carbon of soil was 0.39% was in S_2 levels of Sulphur combination, S_2 levels of Sulphur combination was significantly greater than S_0 levels of Sulphur. The application of Phosphorus also showed significant effect on Organic carbon availability in soil, the maximum available Organic carbon 0.43% was recorded in P_2 levels and minimum 0.28% was recorded in P_0 levels of Phosphorus. The interaction between Sulphur and Phosphorus on available Organic carbon of post harvest was significant, the maximum available Organic carbon 0.51% S_2P_2 treatment, minimum 0.25% was recorded in S_0P_0 levels of interaction between Sulphur and Phosphorus, however, with increasing the levels of Sulphur and Phosphorus the available Organic carbon has significantly increased thus helping in maintain Organic carbon status of soil.

Table No. 5. :Effect of different levels of phosphorus (DAP) and sulphur (Gypsum) on Soil Organic corban (%)

Levels of Sulphur	**Levels of Phosphorus**			**Mean (S)**
	P_0 (0 kg/ha^{-1})	**P_1(25 kg/ha^{-1})**	**P_2(50 kg/ha^{-1})**	
S_0 (50 kg/ha^{-1}) control	0.25	0.30	0.38	0.31
S_{20} (20 kg/ha^{-1})	0.29	0.35	0.41	0.35
S_{40} (40 kg/ha^{-1})	0.31	0.36	0.51	0.39
Mean (P)	**0.28**	**0.34**	**0.43**	
		F-test	**S. Em. (±)**	**C.D. at 5%**
Due Sulphur		S	0.008	0.017
Due to Phosphorus		S	0.008	0.017
Inter (S x P)		S	0.014	0.029

4. Soil Nitrogen (kg ha^{-1})

The data presented in *Table no.6* the Available Nitrogen in post harvest soil increases with application of Sulphur, the initial Available Nitrogen was 265 kg/ ha^{-1}. The effect of sulphur on Available Nitrogen of soil was significant, the maximum Available Nitrogen of soil was 251.16 kg/ha^{-1} was in S_2 levels of Sulphur. S_2 levels of Sulphur was significantly greater than S_0 levels of Sulphur. The application of Phosphorus also showed significant effect on Nitrogen availability in soil, the maximum available Nitrogen 243.05 kg/ha^{-1} was recorded in P_2 levels, and minimum 239.56 kg/ha^{-1} was recorded in P_2 levels of Phosphorus. The interaction between Sulphur and Phosphorus on available nitrogen of post harvest was significant, the maximum Available Nitrogen 246.53 kg/ha^{-1} S_2P_2 treatment which was significantly greater and is followed by S_0P_0, minimum 224.63 kg/ha^{-1} was recorded in S_0P_0 levels of interaction between Sulphur and Phosphorus, however, with increasing the levels of Sulphur and Phosphorus the Available Nitrogen has significantly increased thus helping in maintain Nitrogen status of soil.

Table No. 6. :Effect of different levels of phosphorus (DAP) and sulphur (Gypsum) on Soil Nitrogen (kgha^{-1}).

Levels of Sulphur	**Levels of Phosphorus**			**Mean (S)**
	P_0 (0 kg/ha^{-1})	**P_1 (25kg/ha^{-1})**	**P_2(50 kg/ha^{-1})**	
S_0(0 kg/ha^{-1}) Control)	224.63	227.65	230.45	227.58
S_1 (20 kg/ ha^{-1})	242.42	240.62	252.17	245.07
S_2 (40 kg/ ha^{-1})	251.63	255.32	246.53	251.16
Mean (P)	**239.56**	**241.20**	**243.05**	
		F-test	**S. Em. (±)**	**C.D. at 5%**
Due Sulphur		S	1.113	2.359
Due to Phosphorus		S	1.113	2.359
Inter (S x P)		S	1.927	4.086

5. Soil Phosphorus (kg ha^{-1})

The data presented in *Table no. 7* the available Phosphorus in post harvest soil increases with application of Sulphur, the initial available was 25.33 kg/ha^{-1}. The Effect of sulphur on Available Phosphorus of soil was significant, the maximum Available Phosphorus of soil was 20.69 kg/ha^{-1} was in S_2 levels of Sulphur. S_2 levels of Sulphur was significantly greater than S_0 levels of Sulphur. The application of Phosphorus also showed significant effect on Phosphorus availability in soil, the maximum Available Phosphorus 20.69 kg/ha^{-1} was recorded in P_2 levels, and minimum 18.81 kg/ha^{-1} was recorded in P_2 levels of Phosphorus. The interaction between Phosphorus, Sulphur and Phosphorus on available Phosphorus of post harvest was significant, the maximum available Phosphorus 21.43 kg/ha^{-1} S_2P_2 treatment which was significantly greater and is followed by S_0P_0, minimum 14.23 kg/ha^{-1} was recorded in S0P0 levels of interaction between Sulphur and Phosphorus, however, with increasing the levels of Sulphur and Phosphorus the Available Phosphorus has significantly increased thus helping in maintain Phosphorus status of soil.

Table No. 7. :Effect of different levels of phosphorus (DAP) and sulphur (Gypsum) on Soil Phosphorus (kgha^{-1})

Levels of Sulphur	**Levels of Phosphorus**			**Mean (S)**
	P_0 (0 kg/ha^{-1})	**P_1 (25 kg/ha^{-1})**	**P_2(50 kg/ha^{-1})**	
S_0 (0 kg/ha^{-1}) control	14.23	17.73	18.56	16.84
S_1 (20 kg/ha^{-1})	21.37	15.20	22.07	19.55
S_2 (40kg/ha^{-1})	20.83	22.82	21.43	21.69
Mean (P)	**18.81**	**18.58**	**20.69**	
		F-test	**S. Em. (±)**	**C.D. at 5%**
Due Sulphur		S	0.265	0.562
Due to Phosphorus		S	0.265	0.562
Inter (S x P)		S	0.459	0.973

6. Soil Potash (kg ha^{-1})

The data presented in *Table no.8* the available Potash in post harvest soil increases with application of Sulphur, the initial Available Potash was 25.33 kg/ha^{-1}, the effect of Potash on available Potash of soil was significant, the maximum available Potash of soil was 104.00 kg/ha^{-1} was in S_2 levels of Sulphur, S_2 levels of Sulphur was significantly greater than S_0 levels of Sulphur. The application of Phosphorus also showed significant effect on Potash availability in soil, the maximum available Potash 104.28 kg/ha^{-1} was recorded in P_2 levels and minimum 101.10 kg/ha^{-1} was recorded in P_0 levels of Phosphorus. The interaction between Sulphur and Phosphorus on Available Potash of post harvest was significant, the maximum available Potash 106.23 kg/ha^{-1} S_2P_2 treatment which was significantly greater and is followed by 104.26 kg/ ha^{-1} S_0P_0 , minimum 99.99 kg/ha^{-1} was recorded in S0P0 levels of interaction between Sulphur and Phosphorus. However, with increasing the levels of Sulphur and Phosphorus the Available Potash has significantly increased thus helping in maintain Potash status of soil.

Table No. 8 : Effect of different levels of (phosphorus) and sulphur (Gypsum) on Soil Potassium (kgha^{-1})

Levels of Sulphur	**Levels of Phosphorus**			**Mean (S)**
	P_0 (0 kg/ha^{-1})	**P_1(25 kg/ha^{-1})**	**P_2(50 kg/ha^{-1})**	
S_0 (0 kg/ha^{-1}) control	99.99	101.16	102.36	101.17
S_1 (20 kg/ha^{-1})	101.11	103.46	104.26	102.94
S_2 (40 kg/ha^{-1})	102.21	103.57	106.23	104.00
Mean (P)	**101.10**	**102.73**	**104.28**	
		F-test	**S. Em. (±)**	**C.D. at 5%**
Due Sulphur		S	0.571	1.210
Due to Phosphorus		S	0.571	1.210
Inter (S x P)		S	0.988	2.095

7. Soil Sulphur (ppm)

The data presented in *Table no.9* the available Sulphur in post harvest soil increases with application of Sulphur, the initial Available Sulphur was 6.42 (ppm). The effect of Sulphur on Available Sulphur of soil was significant, the maximum Available Sulphur of soil was 21.32 (ppm) was in S_2 levels of Sulphur, S_2 levels of Sulphur was significantly greater than S_0 levels of Sulphur. The application of Phosphorus also showed significant effect on Sulphur availability in soil, the maximum Available Sulphur 19.78 (ppm) was recorded in P_2 levels, and minimum 19.36 (ppm) was recorded in P_0 levels of Phosphorus. The interaction between Sulphur and Phosphorus on Available Sulphur of post harvest was significant, the maximum Available Sulphur 20.44 (ppm) S_2P_2 treatment which was significantly greater and is followed by 21.06 (ppm) S_2P_2 , minimum 17.60 (ppm) was recorded in S_0P_0 levels of interaction between Sulphur and Phosphorus, however, with increasing the levels of Sulphur and Phosphorus the Available Sulphur has significantly increased thus helping in maintain Sulphur status of Soil.

Table No. 9.: Effect of different levels of phosphorus (DAP) and sulphur (Gypsum) on Soil Sulphur(ppm).

Levels of Sulphur	**Levels of Phosphorus**			**Mean (S)**
	P_0 (0 kg/ha^{-1})	**P_1 (25kg/ha^{-1})**	**P_2(50 kg/ha^{-1})**	
S_0 (0 kg/ha^{-1}) control	17.60	17.80	17.84	17.75
S_1 (20 kg/ha^{-1})	20.40	19.55	21.06	20.34
S_2 (40 kg/ha^{-1})	20.07	23.43	20.44	21.32
Mean (P)	**19.36**	**20.26**	**19.78**	
		F-test	**S. Em. (±)**	**C.D. at 5%**
Due Sulphur		S	0.041	0.087
Due to Phosphorus		S	0.041	0.087
Inter (S x P)		S	0.071	0.150

Conclusion

On the basis of above findings it may be concluded that the treatment combination (Phosphorus 50 and Sulphur 40) shows best result with respect to growth, yield, Nutrient concentration and Fertility status of soil in comparison to other treatment combinations. Though there is , however, need to confirm the results and to work out particularly the extent of increases in grain yield, with added Sulphur and Phosphorus.

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A study on First Aid management pattern of snake bite victims in Saptari District of Nepal

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ABSTRACT

The study was conducted to identify the First Aid management pattern of snake bite victims in Saptari district of Nepal. A descriptive study was conducted in Saptari district of Nepal which was purposely selected, six VDCs & a municipality of Saptari were selected purposely out of 114 VDCs in which Red Cross Society works. The ten per cent of trained respondents were randomly selected from the register and then equal number of untrained was selected on the basis of trained respondents by snow ball technique. The study was conducted among 196 respondents (98 trained & 98 untrained persons). It was observed that majority (88.74%) of lives of victims was saved by trained respondents among treated cases but the less number of lives (73.66%) were saved by untrained respondents because they manage the cases from generation. It was revealed that the mortality rate is drastically less in the cases managed by trained group than the untrained group because they provide proper First aid management to the snake bite victims and referred to the health center where Anti Snake Venum is available as soon as possible.

INTRODUCTION

Snake bite is an injury mainly affecting farmers, plantation workers, herders, fishermen etc. Snake bites are more common in the hot terrai regions of Nepal. Open-style habitation and the practice of sleeping on the floor also expose people to bite from nocturnal snakes. Bites are more frequent in young men, and generally occur on lower limbs. The incidence of snake bites is higher during the rainy season and during periods of intense agricultural activity. Snake bite incidence and mortality also increase sharply during extreme weather events such as floods.

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Snake bite is a fatal condition; it may cause even the death of the victim. There are many species of the venomous snakes in different parts of the world. Snake bites account for approximately 125,000 deaths annually worldwide. South Asia is the most affected region. **Kasturiratne *et al* (2008)** The twenty-one venomous snake species are found in Nepal. The deaths were mainly caused by common Krait Bungarus caeruleus, common Cobra Naja naja. It was estimated by WHO that more than 20,000 people are bitten by snake and one thousand die from snakebite each year in Nepal. The incidence of both of these species are more common in Saptari District and the mortality is very high in comparison to other Terai districts due to lack of First Aid management. **Sutherlands (1992)**.

Most of the trained health workers are urban based where snakebite is rare. The majority of victims first report to traditional healers. Popular traditional treatments include chanting, incisions, attempts to suck venom from the bite site, and the application of herbal medicine or snake stones. The patients who report to traditional healers are referred to hospital when their symptoms deteriorate and often die on the way to hospital. Therefore, faith healers play a major role in the treatment of snakebite. **Sharma *et al* (2002)**

Whenever a person is bitten by a snake, one should be given First Aid treatment immediately, making all the possible attempts to save the life of the victim. pressure immobilization method as an effective alternative first aid method **Sutherland (1979)** Most experts agree that snake bite victims should be transported as quickly as possible to a medical centre where they can be clinically evaluated by qualified medical staff, and where antivenoms are available. In fact, time of transport was shown to be a crucial determinant of snake bite mortality in eastern Nepal **Sharma (2005)**. The present study was carried out with the objective to identify the mortality pattern for the persons treated by both trained and untrained groups in Saptari district, Nepal.

MATERIALS AND METHODS

This study was a descriptive study. Saptari district of Nepal was selected purposely. The respondents were randomly selected from those VDCs in which the Red Cross Society works. The list of trained professionals was prepared and ten per cent from each category of trained members were taken based on random number. The number of untrained community members of First Aid in management of snake bite victims was prepared on the basis of trained persons of the same VDCs & a municipality and then appropriate sample size was selected from both groups based

on snow ball technique for the study. The study was conducted among 196 respondents i.e. (98 trained & 98 untrained persons).

RESULTS AND DISCUSSION

It was clear from the study that majority of cases were managed by untrained respondents because they are older age group and faith by community people. The majority of victims' first report to traditional healers because most of the trained health workers are urban based where snakebite is rare. The patients who report to traditional healers are referred to hospital when their symptoms deteriorate and often die on the way to hospital. A similar study by **Pandey (2007)** reported in the study that incentive should be provided to traditional healers for referral of snakebite victims visited in their homes to treatment centers to reduce the dependency on traditional healing acutely and enhance the rate of timely access to treatment center to save lives.

Table-I and *Table-II* shows that the majority (88.74 %) of lives of victims were saved by trained group among treated cases, where as less number of lives (73.66 %) were saved by untrained group because the untrained group manage the cases traditionally due to lack of technical knowledge and skill of First Aid training.

Table- I: Number of lives saved by trained respondents

Respondents	Cases treated	Lives saved	Percentage
Health workers	806	764	94.78
Faith healers	595	502	84.36
Teachers	604	531	87.91
Farmers	412	333	80.82
Veterinary paramedics	391	358	91.56
Club members	302	272	90.06
Total	3110	2760	88.74
X^2 =4.24	df = 5		non-significant

Table-II: Number of lives saved by untrained respondents

Respondents	Cases treated	Lives saved	Percentage
Health workers	704	584	82.95
Faith healers	645	432	66.97
Teachers	652	476	73.01
Farmers	594	439	73.9
Veterinary paramedics	356	267	75
Club members	314	207	65.92
Total	3265	2405	73.66
X^2 = 8.57	df = 5		non-significant

Table-III: Prevention of snake bites according to respondents

Activities	Trained	Percentage	Untrained	Percentage
Killing snakes	13	13.29	06	06.12
Run away from snakes	09	09.18	48	48.97
Cover holes & Clean surrounding	24	24.48	08	08.16
Awareness	41	41.83	12	12.27
Others(using Boots, Torch light)	11	11.22	24	24.48
Total	98	100.00	98	100.00

Table-III shows that the snake bite can be prevented by raising public awareness to the general people and using protective measures such clothing, boots, gloves & torch light at the time when there is risk of snake bite.

CONCLUSION

It was concluded that the mortality rate is drastically less in the cases treated by trained group than untrained group but the maximum cases of snake bite were dealt by untrained group is due to the faith by community people in untrained traditional

healers. Whereas the percentage of life saved by the untrained is less than the trained group. Trained group provides proper First Aid treatment and referral services. The successful impact of First Aid training promotes the Red Cross Society to strengthen the training program in large number of different groups. including even the untrained groups and refresher training to update the knowledge of trained group. Therefore, snake bite should be prioritized as national public health problem in Nepal. It can be prevented by raising public awareness of the general people. The best prevention is to use protective clothing, foot-wear, gloves and torch light at the time when there is risk of snake bite.

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Factors leading toward causes of infertility in Kathmandu, Nepal

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ABSTRACT

This study was conducted to find out the present health status of male and female leading towards causes of infertility in Kathmandu valley. Descriptive study had been carried out in Kathmandu metropolitan city, Nepal. 165 married couple (male and female) with infertility problem availing the infertility treatment were selected on first come first serve basic sampling method from infertility treatment center. Couple with high BMI 9% female, 3% men were in pre obese class I. Main causes of infertility in male includes High blood pressure 19%, azoospermia 19%, approximately 16% had history of mumps orchitis and 11.1% had severe oligospermia, 62.5% had history of hydrocele surgery and causes of infertility in female includes Thyroid disease 23.8%, UTI 20.4%, ovarian cyst 43.8%,ovulation disorder 47.2%, vaginal fungal infection 19.6%, TORCH positive 18.1%, history of ectopic pregnancy surgery 26.9%, fibroid surgery 23.1%, miscarriage 32.7%. Result shows Health status of female is weak as compare to men.

Key words: *BMI, azoospermia, oligospermia, mumps orchitis, TORCH, ovarian cyst,*

INTRODUCTION

The problem of infertility has not given its due attention because it is not a life-threatening condition. Infertility is a life crisis with invisible losses, and it consequences are manifold. **Tripathi. N. (2010)** Infertility is defined as the inability of a couple to conceive after 12 months of regular, unprotected intercourse. **Aflatoonian (2011)** There are two types of infertility primary and secondary. Couples with primary infertility have never been able to conceive. While on the other hand secondary infertility is difficulty conceiving after already having conceived and either carried

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the pregnancy to term or had a miscarriage. However infertility is a clinical presentation and not a disease **Dey.S. (2010)**. Thus to be able to offer a new classification, it is necessary to apply a clinical presentation (philosophy) suggested by the University of Calgary in 1991 **Aflatoonian (2011)**. The medicalization of infertiity began in earnest with the development of fertility drugs in the USA in the 1950s but it has proceeded even more rapidly since the development of such assisted reproductive technologies (ART) as in vitro fertilization (IVF) and intra-cytoplasmic sperm injection. According to WHO data, infertility becomes a public health problem when its frequency exceeds 15%, and the organization has developed guidelines for the study of the prevalence and causes of infertility **Philippov *et al* (1998)** Infertility can be a devastating problem for a couple desperate to conceive The study of infertile couple has always been focused on different factors, ovulatory factor, utero-tubal peritoneal factor, semen migration factor and male factor. Around 40% of all infertile couples exhibit a combination of factors and about 15% of couples may not display any objective alteration leading to a definite diagnosis. Infertility is a global health issue affecting approximately 8-10% of couples worldwide. **Dey.S. (2010)** The majority of those who suffer live in the developing world. It is estimated that by the middle of 2002, about 186 million ever-married women age 15 to 49 were infertile.

OBJECTIVE

To find out the present health status of male and female leading towards causes of infertility

MATERIALS AND METHOD

Descriptive study had been carried out in Kathmandu metropolitan city, Nepal. 165 married couple (male and female) with infertility problem availing the infertility treatment were selected on first come first serve basic sampling methods from infertility treatment center. Data were obtained from face to face interview and from medical records.

RESULTS AND DISCUSSION

Obesity is one of the leading causes of infertility a number of reproductive health problems like itching or irritation, and pain or burning while urinating and irregular menstruation problem are seen with obesity and overweight. Reproductive health problems are higher among obese and overweight couple than among women with normal BMI. *Table 1* and *Table 2* shows (9%) wives and (3%) husbands were in obese

Table - 1 : Body mass index (BMI- kg/m^2) of female respondents

Status	Frequency	Percentage
Underweight (<18.50)	12	07.27
Normal (18.50-24.99)	117	70.92
Overweight (?25)	08	04.85
Pre obese (25 - 25.99)	13	07.87
Obese class I (30- 34.99)	15	09.09
Total	**165**	**100.00**

class I. This study is similar to found the probability of a spontaneous pregnancy declined linearly with a body mass index (BMI) over 29 kg/m^2. Women with a high BMI had a 4% lower pregnancy rate per kg/m^2 increase .

Table-2 : Body mass index (BMI- kg/m^2) of male respondents

Status	Frequency	Percentage
Underweight (<18.50)	04	02.42
Normal (18.50-24.99)	132	80.00
Overweight (?25)	06	03.64
Pre obese (25 - 25.99)	18	10.90
Obese class I (30- 34.99)	05	03.04
Total	**165**	**100.00**

Table 3 and *Table 4* shows (19%) men had azoospermia. In addition, approximately (16%) male had history of mumps orchitis, (11.1 %) respondents had severe oligozoospermia. Majority (62.5%) male had history of hydrocele surgery. *Table 5,6,7* and *Table 9* shows majority female respondents had thyroid disease (23.8%), urinary tract infections (20.4%), vaginal fungal infection (29%), majority (43.88%) of female respondents has ovarian cyst problem. Majority (47.2%) had irregular menstrual function. This result shows the more health problem was found in the female as compare with male respondent. Relevant study was done by **Mittal *et al.* (2012)**

Table - 3 : History of disease as diagnosed in male ****N=63***

Types of disease	Frequency	Percentage
Mumps Orchitis	10	15.87
TB	03	04.76
Diabetes	05	07.93
Inflammatory	03	04.76
High Blood Pressure	12	19.04
Severe Oligospermia	07	11.11
Azoospermia	12	19.04
High Grate Fever in Last 6 month	06	09.52
Epididymitis	01	01.58
Testicular Torsion	04	06.34
Total	**63**	**100.00**

Table - 4 : History of surgery in male ****N= 16***

Types	Frequency	Percentage
Hydrocele	10	62.50
Bladder neck	02	12.50
Inguinal hernia repair	02	12.50
Undescended testicle	01	06.25
Spermatocele	01	06.25
Total	**16**	**100.00**

in his study he found that among the infertility cases it is very clear that maximum infertility is due to female factors (30.2%). Infertility in females was due to ovulation problem and most infertility cases were seen in age group of 35 to 40. Male factors also contributed substantially (19.5%) to infertility. Causes of infertility in males is due to absence of sperm in semen (azoospermia), low count of sperm, motility problem

Table - 5 : History of general disease in female respondents **** N= 147***

Diseases	**Frequency**	**Percentage**
Thyroid Disease	35	23.80
Urinary Tract Infections	30	20.40
Migraine Headaches	20	13.60
Anemia	04	02.70
Allergic Skin Reaction	11	07.50
High Blood Pressure	22	15.00
Heart Disease	03	02.00
Frequent Constipation	13	08.80
Tuberculosis (TB)	07	04.70
Diabetes	02	01.30
Total	**147**	**100.00**

Table - 6 : History of reproductive tract infection in female ****N= 55***

Types	**Frequency**	**Percentage**
Vaginal Fungal Infection	16	29.09
Pelvic Inflammation	11	20.00
TORCH Positive	10	18.18
Syphilis	07	12.72
Chlamydia	04	07.27
Gonorrhea	05	09.09
Vaginal Trichomoniasis	01	01.81
Genital Herpes	01	01.81
Total	**55**	**100.00**

Table - 7 : Reproductive health problem in female ***N= 139***

Types of problem	Frequency	Percentage
Ovarian Cyst	61	43.88
Irregular Vaginal Bleeding	26	18.72
Painful Intercourse	31	22.30
Vaginal Discharge	21	15.10
Total	**139**	**100.00**

and most infertility cases were seen in age group of 35 to 40. Another similar study done in france by **Thonneau *et al.* (1991)** found that the main causes of female infertility were ovulation disorders (32%) and tubal damage (26%), and of male infertility oligo-terato-asthenozoospermia (21%), asthenozoospermia (17%), teratozoospermia (10%) and azoospermia (9%). Infertility was also found to be caused by disorders in both the male and female partners together; thus in 39% of cases both the man and woman presented with disorders.

Table - 8 : History of Surgery in female **** N=52***

Types of surgery	Frequency	Percentage
Ectopic pregnancy	14	26.92
Fibriod	12	23.10
Laparoctomy	10	19.23
Breast	01	01.92
Ovarian Cysts	08	15.38
Dilation and curettage	07	13.45
Total	**52**	**100.00**

Table 8 shows (8.4%) wives had ectopic pregnancy and (7.2%) had fibroid surgery, related study was conducted in Tomsk, Western Siberia, **Philippov O.S. *et al.* (1998),** The most frequent causes of female infertility were disturbances to tubal pregnancy (36.5%) and pelvic adhesions (23.6%). Endocrine pathology was found in (32.8%) of cases. The most frequent cause of male infertility was inflammatory disease

Table - 9 : Description of problem during menstrual period

***multiple responses**

Menstruation function	Frequency	Percentage
Tenderness of breast at menstruation	57	34.50
Extreme painful menstruation	73	44.20
Irregular menstruation	78	47.20

of male accessory glands (12.9%). In (8.6%) of cases infection resulted in obstructive azoospermia. Another similar study done by **Pritts *et al.* (2001)** states in his studies the results of studies comparing women with infertility and fibroids versus infertile controls showed widely disparate results. Conversely, women with submucous myomas demonstrated lower pregnancy rates and implantation rates than infertile controls. Results of surgical intervention were similar. The current data suggest that only those fibroids with a submucosal or an intracavitary component are associated with decreased reproductive outcomes, and that hysteroscopic myomectomy may be of benefit.

CONCLUSION

According to health status of the couple high Body mass index is more in female as compare to male respondent. Main causes of infertility in male includes High blood pressure and azoospermia (19%), history of mumps orchitis approximately 16% and 11.1 % severe oligospermia and causes of infertility in female were Thyroid disease, urinary tract infection, ovarian cyst, ovulation disorder, vaginal fungal infection, TORCH positive. miscarriage and tubal pregnancy were high in secondary sterility. This study shows that the health status of wives contribute for infertility in female is more than in males.

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