BIBLIOGRAPHY

LASUNA, JONALYN C. APRIL 2006. Growth and Yield Response of Spoon Cabbage (*Brassica chinensis* L.) to Planting Distance. Benguet State University, La Trinidad, Benguet.

Adviser: Pepe E. Toledo, PhD

ABSTRACT

This study was conducted at Lamut, Tawang, La Trinidad, Benguet from November to December 2005 to determine the effect of planting distance on the growth and yield and establish the best planting distance for spoon cabbage production.

Results revealed that during the first week after transplanting, leaf length was not significantly affected by the various spacings evaluated. However, from the second to the fourth week, wider spacings significantly increased leaf length.

Concerning average weight per bunch, planting distance of 20 cm x 20 cm and 30 cm x 30 cm considerably increased it over 10 cm x 10 cm, 15 cm x 15 cm and 25 cm x 25 cm. The non-marketable yield were not significantly affected by the different plant spacings use but spacings of 10 cm x 10 cm and 15cm x 15 cm markedly increased marketable yield.

In terms of the total and computed yields and their benefit:cost ratio (BCR) obtained from the various spacing treatments used, it was apparent that spacings at 10 cm x 10 cm and 15cm x 15cm significantly increased total and computed yields than wider spacings but had lower BCRs. The highest BCR computed was at 20 cm x 20 cm with 4.23.

TABLE OF CONTENTS

INTRODUCTION

Spoon cabbage (*Brassica chinensis* L.) is a vegetable crop typically grown in Benguet. It is considered as a vegetable that can provide nutrition to human, sometimes preceded by other names such as Pak Choi, Bok-Choi, Taisai, and celery mustard. As compared to Chinese cabbage, the leaves are shorter, more loose and spoon-like and named after it but this crop is not widely known in Benguet and Mountain Province, although it is one of the most nutritious green leafy vegetables (Kinoshita, 1972). It contains fiber and essential nutrients such as calcium, phosphorus and vitamin C. Besides its nutritional value, this crop is also profitable due to its rapid growth and early maturity. Spoon cabbage is succulent and mild in flavor, and maybe eaten either cooked or raw. This crop grows best at cool temperature of 15-20^{0}C (McDonald, 1993).

It is believed that high yield and normal growth can be obtained from spoon cabbage if proper cultural practices such as proper planting and proper spacings are observed. Plant spacing affects plant growth and development due to competition for light, nutrient elements, soil moisture, air, and space (Bautista and Mabesa, 1977).

Determining the distance of planting in every crop minimizes waste of expensive seeds per unit area increasing the yield with higher profit (Compay, 1995). Determining the appropriate spacing requirement to ensure an effective vigorous plant growth and good yield is important. Spacing is a practical way of preventing crops from competing with each other in the absorption of nutrients and utilization of light, which also provides the crop for full development of head. In addition, proper spacing prevents rotting and avoid overcrowding of the plant (Bilango, 1996).

This study was conducted at Lamut, Tawang, La Trinidad, Benguet from November to

December 2005 to determine the effect of planting distance on the growth and yield and establish the best planting distance for spoon cabbage production.

REVIEW OF LITERATURE

The Crop as a Vegetable

Spoon cabbage is a leafy vegetable grown in all parts of the world and has been used as food since antiquity although it is not well popular in the Philippines (Tamayo, 1975).

Lomiwes (2004) said that this crop is also used to flavor other dishes due to its good strong taste. Nutritionally, it is a good source of vitamins and minerals.

Importance and Effect of Spacing

Spacing is important especially on the growth of the plant. Bautista and Mabesa (1977) mentioned that as the plant population per unit increases, the yield per unit area also increases until the spacing is so close that excessive competition between adjacent plants reduced the yield. Plants with wider spacing can get more light, minerals and nutrients but closer spacings led to great competition for these growth factors (Cortez, 1978).

In addition, Gardner (1951) said that another method of adjustment to a limited water supply is through wider spacing. The principal factor of course in determining how far apart to seed or set plants is the size that they normally attain under the conditions in question. Relatively wider spacings may be necessitated either by the limited supply of an infertile soil or by rank growth where the soil is rich. Second importance only to natural habit of growth, however, is moisture supply. Roots of most crop plants will reach wide and deep for moisture and consequently under conditions of limited water supply they can be widely spaced with the assurance that with such spacing they will obtain what is available and use it to better advantage that if planted closely.

However, Watts (1972) reported that close planting is conducive to small heads which are preferred by consumers. If sold by the head, and if the heads are large enough to meet market requirements, a maximum number to the acre will of course secure largest returns. Close planting, however prohibits cultivation late in the season, which is very important in dry weather. It may also prevent the use of power sprayer and of carts when harvesting the crop. Yield by weights are larger when spacing or distance are medium rather than close. The larger when spacing or distance are medium rather than close. The most approved plan is to plant rather close in the row and allow a liberal space between rows. Some of the most successful growers prefer planting in check rows because of advantages in cultivating land because less hoeing is required than in the usual method.

Furthermore, the idea of McDonald (1993) also said that plant spacing in planting design that allow enough space between plants so that they have room to develop to their full size, if planted too closely, they may soon used to be thinned to avoid becoming over crowded. There may be occasions, however, when close planting can be employed to provide a particular design feature, such as a knat garden. Planting distance and spacing also depend upon the soil climatic conditions, and the time that the species or cultivar takes to mature while the flower bed is developing. Young plants are less costly than more mature specimens, but their impact is less immediate, and there maybe a delay of several years before the planting begins to look mature. The decision or whether to use young or mature plants will depend on the budget. As a general rule, close planting and the use of fast maturing plants creates a good short-term impact, but more thinning, maintenance and renewal is required in the longer term.

Moreover, Uichanco (1959) as cited by Alos (1996), mentioned that plant spacing affects root formation and root crops should be planted closer. In contrast, Mendoza (1966) wrote that beans planted tend to grow tall at closer spacing and produce more leaves at wider spacing. As reported by Bonner and Galston (1959), plants in wide spacing are smaller due to mutual shading, exhaustion of water supply and depletion of mineral nutrients. Sawat (1976) also said that when plant population markedly increased per unit area, a point is reached at which plant begins to compete for certain essential factors such as light, nutrients and water.

The idea of Compay (1995) stated that the distance between the plants depends upon the size of the plant and the time they are to remain in the new location before setting. However, a minimum of 20 cm x 20 cm had been found satisfactory for tomato and pepper. It is preferable to give the plant 25% more space in the plot when the condition do not favor field setting, especially when the plants may have to be held three or more weeks longer than usual as may happen during wet season.

MATERIALS AND METHODS

Materials

The important materials used were spoon cabbage seeds ('Pak Choi Green'), chicken manure, complete fertilizer, garden tools, knife and identifying tags.

Methods

Experimental design and treatment. This experiment was laid in a randomized complete block design (RCBD) with four replications. The treatments were as follows:

Code	Plant Spacing
S_1	10 cm x 10 cm
S_2	15 cm x 15 cm
S_3	20 cm x 20 cm
S_4	25 cm x 25 cm
S_5	30 cm x 30 cm (Farmer's practice)

Raising of seedlings. A plot measuring 1 m x 10 m was thoroughly prepared. Furrows across the plot were made for seed sowing and covered thinly with soil followed by watering.

Land preparation and fertilizer application. An area of 100 m^2 was thoroughly prepared and divided into four blocks and each block was further subdivided into five experimental plots with a dimension of 1 m x 5 m. These plots were leveled and holes were made in accordance with the specified treatments. Chicken manure (one handful) and complete fertilizer (100-100-100 kg $N\text{-}P_20_5\text{-}K_20$/ha) were applied in the prepared holes and mixed thoroughly with the soil.

Transplanting. The 3-week old seedlings were transplanted in the holes followed immediately by watering. Any dead seedling was immediately replaced one week after transplanting.

Care and management. Other cultural management practices such as pests control, weeding, hilling-up, and irrigation were done uniformly to ensure optimum growth and development of the plants.

Harvesting. All plants were hand harvested using a sharp knife at the marketable stage.

Data gathered. The data gathered were subjected to variance of analysis and mean separation test by Duncan's multiple range test (DMRT) were as follows:

1. Leaf length (cm/leaf). This was obtained from 10 sample plants by measuring from the base of the petiole to the tip of the longest leaf at weekly intervals until harvest.

2. Yield. The yield were assessed as follows:

a. Average weight (g/bunch). This was computed using the formula:

Weight (g/bunch) = Total yield (kg/plot)) Total number of harvested plants/plot

b. Marketable bunch (kg/plot). All bunches without defects were weighed at harvest.

c. Non-marketable bunch (kg/plot). All bunches with defects were weighed at harvest.

d. Total yield (kg/plot). This was the weights of marketable and non-marketable bunches per plot.

e. Computed yield (t/ha). The marketable yield per plot was converted to tons/hectare using the formula:

Yield (t/ha) = Yield (kg/5m^2) x 2

where: 2 was a factor used to convert kg/5m^2 to t/ha.

3. Benefit:cost ratio (BCR). This was obtained by recording the man-days/ha in transplanting and seedling costs and BCR was computed by using the formula:

BCR = Benefit-Cost) Cost + 1

4. Others. Documentation of the study in pictures.

RESULTS AND DISCUSSION

Leaf Length

Table 1 shows the weekly leaf length after transplanting. During the first week, statistical analysis showed no significant differences observed among the various spacing treatments evaluated. However, the second to the fourth week, wider spacings significantly increased leaf length compared to the 10 cm x 10 cm spacing. Nonetheless, the other spacings were comparable with each other.

Average Weight, Non-marketable and Marketable Yield

The average weight, non-marketable and marketable yield harvested are shown in Table 2. Concerning average weight per bunch, 20 x 20 and 30 cm x 30 cm considerably increased it over 10 x 10, 15 x 15 and 25 x 25 cm. The non-marketable yield were not

Table 1. Weekly leaf length (cm)

PLANTING DISTANCE (cm)	WEEK 1	2	3	4
10 x 10	10.14a	17.74b	21.94b	23.99b
15 x 15	11.99a	19.89a	23.73a	25.91a
20 x 20	11.57a	19.32a		

			23.63a	26.27a
25 x 25	10.55a	19.87a	23.09a	25.76a
30 x 30 (Farmer's pactice)	10.96a	19.17a	23.56a	25.40a

In a column, means with a common letter are not significantly different at 5% level by DMRT

Table 2. Average weight, non-marketable and marketable yield

PLANTING DISTANCE (cm)	AVERAGE (g/bunch)	WEIGHT (kg/plot) Non-marketable	Marketable
10 x 10	59.66d	2.68a	7.14a
15 x 15	120.24c	2.60a	7.45a
20 x 20	158.85a	1.10a	5.30b
25 x 25	139.09b	1.99a	4.64bc
30 x 30 (Farmer's practice)	149.69a	1.88a	4.12c

4444444444444444444444444444444444444444444444444444444444444
In a column, means with a common letter are not significantly different at 5% level by DMRT

significantly affected by the spacings tested but spacings of 10 x 10 and 15 x 15 cm markedly increased marketable yield, though, comparable with each other.

Total and Computed Yield
and Benefit:Cost Ratio

Table 3 shows the total and computed yield and the benefit:cost ratio (BCR) obtained from the various spacing treatments used. It is apparent that spacings at 10 x 10 and 15 cm x 15 cm significantly increased total and computed yield than wider spacings but had lower BCRs. The highest BCR computed was at 20 cm x 20 cm.

Plate 1 shows the overview of experiment while Plate shows the harvested bunches from the various planting distance.

The insignificant result obtained on leaf length (Table 1) one week after transplanting might be attributed to slow root establishment of the newly transplanted seedlings resulting to the lesser absorption of the applied fertilizer. However, two weeks after transplanting and Table 3. Total and computed yield and benefit:cost ratio (BCR)

4444444444444444444444444444444444444444444444444444444444444
PLANTING

TOTAL
YIELD
COMPUTED
YIELDBCR

DISTANCE (cm)
(kg/plot)
(t/ha)
))
10 x 10

9.81a
19.63a
1.62

15 x 15

10.10a
20.20a
3.41

20 x 20

7.40b
14.80b
4.23

25 x 25

6.09c
12.17c
4.09

30 x 30 (Farmer’s practice)

5.99c
11.98c
4.03

4444444444444444444444444444444444444444444444444444444444

In a column, means with a common letter are not significantly different at 5% level by DMRT

on-wards, the roots were already well established and that competition for nutrients and shading effect had set-in for the closest spacing resulting to slower growth with shorter leaf length. This finding support with the statement of Bonner and Galston (1954) as cited by Bacdayan (1996) that plants grown in crowded condition are smaller than plants with wider spacings but contradicted the finding of Mendoza (1966) that closer spacing enhance growth resulting to taller plants. In terms of average weight per bunch (Table 2), the lower weight at closer spacings (10 x 10 and 15 cm x 15 cm) could be attributed to the higher populationof the plants. However, this high population resulted to higher marketable, total and computed yields (Table 3). This findings supports the statement of Bautista and Mabesa (1975) that as plant population per unit area also increases until the spacing is so close that excessive competition between adjacent plants reduce the yield per plant. It is also the same with the idea of Burton (1966) as cited by

Dampilag (1998) that if spacing is too wide, the yield/ha may also be less despite the increases in weight of individual plants. Concerning benefit:cost ratio, the lower return could be attributed to higher labor and seedling costs than at wider spacings.

These results obtained in this study confirmed the findings of Candido (2004) that plants spaced at 20 cm x 20 cm and 25 cm x 25 cm of mint significantly produced higher marketable, total and computed sprig yields due to higher population compared to plants grown with wider spacing while it is the same with the findings of Degala (2003) that 20 cm x 20 cm markedly increased marketable and computed yield *vis-a-vis* to 30 cm x 30 cm and 40 cm x 40 cm planting distance in sweet basil. While Falolo (2003) also found that plants spaced 20 cm x 20 cm and 25 cm x 25 cm on 'Florence' fennel considerably increased marketable yield. However, for the total and computed yield of 'Florence' fennel spaced at 15 cm x 15 cm and 20 cm x 20 cm are significantly higher as compared to those with wider spacing, although comparable with each other.

SUMMARY, CONCLUSION AND RECOMMENDATION

Summary

This study was conducted at Lamut, Tawang, La Trinidad, Benguet from November to December 2005 to determine the effect of planting distance on the growth and yield and establish the best planting distance for spoon cabbage production.

Results revealed that during the first week after transplanting, leaf length was not significant on the various spacing treatments evaluated. However, the second to the fourth week, wider spacings significantly increased leaf length compared to the 10 cm x 10 cm spacing. Nonetheless, the other spacings were comparable with each other.

Concerning average weight per bunch, 20 x 20 and 30 cm x 30 cm considerably increased it over 10 x 10, 15 x 15 and 25 x 25 cm. The non-marketable yield were not significantly affected by the spacings tested but spacings of 10 x 10 and 15 x 15 cm markedly increased marketable yield, though, comparable with each other.

In terms of the total and computed yield and the benefit:cost ratio (BCR) obtained from the various spacing treatments used, it was apparent that spacings at 10 x 10 and 15 cm x 15 cm significantly increased total and computed yield than wider spacings but had lower BCRs. The highest BCR computed was at 20 cm x 20 cm.

Conclusion

Based on the results obtained, 10 x 10 and 15 x 15 cm spacings increased yield but had lower benefit:cost ratio. The highest BCR computed was at 20 cm x 20 cm.

Recommendation

From the preceeding results and discussion, it is therefore recommended that either 15 cm x 15 cm or 20 cm x 20 cm could be used as plant spacing for spoon cabbage production. It is further recommended that the same study and crop be evaluated during rainy season cropping to verify the results obtained in this study.

LITERATURE CITED

ALOS, J.N. 1996. Growth and yield of mustard 'Taiping Po' as affected by plant spacing. BS Thesis. BSU, La Trinidad, Benguet. P. 6.

BILANGO, J.G. 1996. Effect of spacing on the growth and yield of lettuce cv. Great Lakes 54. BS Thesis. BSU, La Trinidad, Benguet. Pp. 1-2.

BACDAYAN, E.D. 1996. Sequence of seed development and seed production of pechay (*Brassica napus* var. *chinensis*) cv. Black Behi as affected by planting distance. BS Thesis. BSU, La Trinidad, Benguet. P. 14.

BAUTISTA, O.K. and R.C. MABESA. 1977. Vegetable Production. UPLB, College, Los Baños, Laguna. P. 63.

BONNER, W. and A.W. GALSTON. 1959. Principles of Plant Physiology. San Francisco: W.H. Freeman Co. Pp. 477-488.

BURTON, W.H. 1966. The Potato. Wageningen, The Netherlands: H. Veeman and Zamen Book Co. Pp. 131-132.

CANDIDO, J.A. 2004. Growth and yield performance of mint (*Mentha spicata*) as influenced by planting distance. BS Thesis. BSU, La Trinidad, Benguet. Pp. 9-12.

COMPAY, D.F. 1995. Effect of planting distance on the growth and yield of tomato. BS Thesis. BSU, La Trinidad, Benguet. Pp. 3-4.

CORTEZ, L.C. 1978. Effect of distance planting on the growth and yield of lettuce. BS Thesis. MSAC, La Trinidad, Benguet. P. 14.

DAMPILAG, H.B. 1998. Influence of spacing on the maturity, some postharvest qualities and profitability of Chinese cabbage. BS Thesis. BSU, La Trinidad, Benguet. Pp.29-30.

DEGALA, J.E. 2003. Growth and yield performance of sweet basil as influenced by planting distance. BS Thesis. BSU, La Trinidad, Benguet. Pp. 10-11.

FALOLO, C.B. 2003. Growth and yield performance of Florence fennel (*Facniculum dulce* Mill.) as influenced by planting distance. BS Thesis. BSU, La Trinidad, Benguet. P. 11.

GARDNER, V.R. 1951. Basic Horticulture. USA: McMillan Co. P. 10.

KINOSHITA, K. 1972. Vegetable Production in the Sub-tropics. Tokyo: Lippincott Co., Inc. Pp. 146-148.

KNOTT, J.E. 1964. Handbook of Vegetable Growers. New York: John Willy and Sons, Inc. P. 14.

LOMIWES, I.T. 2004. Growth and yield performance of spoon cabbage as affected by sources and rates of nitrogen fertilizers. BS Thesis. BSU, La Trinidad, Benguet. Pp. 1-4.

MALINGTA, C.H. 1992. Effect of plant spacing on the growth and yield of cauliflower. BS Thesis. BSU, La Trinidad, Benguet. Pp. 4-5.

MCDONALD, E. 1993. The American Horticultural Society Encyclopedia of Gardening. USA: Dorling Kindersley, Inc. P. 320.

MENDOZA, A.V. 1966. The effect of nitrogen on the yield of snapbeans. BS Thesis. MSAC, La Trinidad, Benguet. Pp. 16-18.

SAWAT, V. 1976. The effect of population density on tree strains of head lettuce. BS Thesis. MSAC, La Trinidad, Benguet. P. 12.

TAMAYO, D.B. 1975. RP's 5 Top Favorite Vegetable. Quezon City Forest and Farms 8:6, 145.

THOMPSON, H.C. 1931. Vegetable Crops. New York: McGraw Hill Books Co., Inc. P. 245.

WATTS, R.L. 1972. Vegetable Gardening. New York: Orange Judd. P. 271.

UICHANCO, L.G. 1959. Philippine agriculture col. 1. 2nd Ed. College of Agriculture, University of the Philippines Press. P. 329.

APPENDICES

Appendix Table 1. Leaf length on the first week (cm)

TREATMENT	REPLICATION I	II	III	IV	TOTAL	MEAN
T_1	11.52	9.02	10.42	9.58	40.54	10.14
T_2	13.00	11.56	10.86	12.54	47.96	11.99
T_3	12.16	11.80	10.84	11.46	46.26	11.57
T_4	10.10	11.14	9.06	11.90	42.20	10.55
T_5	9.94	13.34	10.22	10.34	43.84	10.96

Analysis of Variance

Source of variation	Degrees of freedom	Sum of squares	Mean square	Computed F	TABULAR F 0.05	0.01
Replication	3	3.978	1.326			
Factor A	4	8.975	2.244	1.73ns	3.26	5.41
Error	12	15.533	1.294			
Total	19	28.486				

ns = Not significant

Coefficient of variation = 10.31%

Appendix Table 2. Leaf length on the second week (cm)

TREATMENT	REPLICATION I	II	III	IV	TOTAL	MEAN
T_1	15.72	17.60	19.14	18.50	70.96	17.74
T_2	18.22	20.34	20.48	20.50	79.54	19.89
T_3	18.22	20.18	19.12	19.74	77.26	19.32
T_4	19.13	20.72	19.42	20.20	79.47	19.87
T_5	18.24	19.76	20.14	18.52	76.66	19.17

Analysis of Variance

Source of variation	Degrees of freedom	Sum of squares	Mean square	Computed F	TABULAR F 0.05	0.01
Replication	3	11.208	3.736			
Factor A	4	12.243	3.061	6.72**	3.26	5.41
Error	12	5.465	0.455			
Total	19	28.915				

** = Highly significant

Coefficient of variation = 3.52%

Appendix Table 3. Leaf length on the third week (cm)

TREATMENT	REPLICATION I	II	III	IV	TOTAL	MEAN
T_1	22.54	21.54	21.82	21.84	87.74	21.94
T_2	23.46	24.38	23.84	23.22	94.90	23.73
T_3	23.28	24.56	22.97	23.72	94.53	23.63
T_4	22.64	22.98	23.34	23.38	92.34	23.09
T_5	24.48	23.52	24.46	21.76	94.22	23.56

Analysis of Variance

Source of variation	Degrees of freedom	Sum of squares	Mean square	Computed F	TABULAR F 0.05	0.01
Replication	3	1.123	0.374			
Factor A	4	8.805	2.201	3.84*	3.26	5.41
Error	12	6.879	0.573			
Total	19	16.807				

* = Significant

Coefficient of variation = 3.27%

Appendix Table 4. Leaf length on the fourth week (cm)

TREATMENT	REPLICATION I	II	III	IV	TOTAL	MEAN
T_1	24.96	23.54	24.72	22.72	95.94	23.99
T_2	26.22	25.00	27.00	25.40	103.62	25.91
T_3	25.20	28.30	26.08	25.50	105.08	26.27
T_4	24.80	25.44	26.82	26.04	103.10	25.78
T_5	25.16	24.82	26.86	24.74	101.58	25.40

Analysis of Variance

Source of variation	Degrees of freedom	Sum of squares	Mean square	Computed F	TABULAR F 0.05	0.01
Replication	3	5.368	1.789			
Factor A	4	12.532	3.133	3.31*	3.26	5.41
Error	12	11.374	0.948			
Total	19	29.274				

* = Significant

Coefficient of variation = 3.82%

Appendix Table 5. Average weight (g/bunch)

TREATMENT	REPLICATION I	II	III	IV	TOTAL	MEAN
T_1	60.74	61.04	58.68	58.18	238.64	9.66
T_2	116.07	118.45	126.79	119.64	480.95	120.24
T_3	152.08	145.83	168.75	168.75	635.41	158.85
T_4	115.91	150.00	145.23	145.23	556.37	139.09
T_5	151.25	165.00	157.50	125.00	598.75	149.69

Analysis of Variance

Source of variation	Degrees of freedom	Sum of squares	Mean square	Computed F	TABULAR F 0.05	0.01
Replication	3	427.049	142.350			
Factor A	4	24979.119	6244.780	44.25**	3.26	5.41
Error	12	1693.563	141.130			
Total	19	27099.730				

** = Highly significant

Coefficient of variation = 9.47%

Appendix Table 6. Non-marketable yield (kg/plot)

TREATMENT	REPLICATION I	II	III	IV	TOTAL	MEAN
T_1	2.65	1.90	3.40	2.75	10.70	2.68
T_2	2.25	1.90	4.05	2.20	10.40	2.60
T_3	2.00	1.85	2.30	2.25	8.40	2.10
T_4	1.55	1.55	2.15	2.69	7.94	1.99
T_5	2.00	1.65	1.95	1.90	7.50	1.88

Analysis of Variance

Source of variation	Degrees of freedom	Sum of squares	Mean square	Computed F	TABULAR F 0.05	0.01
Replication	3	2.690	0.897			
Factor A	4	2.146	0.536	2.65ns	3.26	5.41
Error	12	2.428	0.202			
Total	19	7.263				

** = Highly significant

Coefficient of variation = 20.02%

Appendix Table 7. Marketable yield (kg/plot)

TREATMENT	REPLICATION I	II	III	IV	TOTAL	MEAN
T_1	7.25	8.05	6.40	6.85	28.55	7.14
T_2	7.50	8.05	6.60	7.65	29.80	7.45
T_3	5.30	5.15	4.90	5.85	21.20	5.30
T_4	5.10	5.65	4.10	3.70	18.55	4.64
T_5	4.05	4.95	4.35	3.10	16.45	4.11

Analysis of Variance

Source of variation	Degrees of freedom	Sum of squares	Mean square	Computed F	TABULAR F 0.05	0.01
Replication	3	3.616	1.205			
Factor A	4	35.737	8.934	29.30**	3.26	5.41
Error	12	3.659	0.305			
Total	19	43.012				

** = Highly significant

Coefficient of variation = 9.64%

Appendix Table 8. Total yield (kg/plot)

TREATMENT	REPLICATION I	II	III	IV	TOTAL	MEAN
T_1	9.90	9.95	9.80	9.60	39.25	9.81
T_2	9.75	9.95	10.65	10.05	40.40	10.10
T_3	7.30	7.00	7.20	8.10	29.60	7.40
T_4	5.10	6.60	6.25	6.39	24.34	6.09
T_5	6.05	6.60	6.30	5.00	23.95	5.99

Analysis of Variance

Source of variation	Degrees of freedom	Sum of squares	Mean square	Computed F	TABULAR F 0.05	0.01
Replication	3	0.577	0.192			
Factor A	4	62.788	15.697	54.56**	3.26	5.41
Error	12	3.452	0.288			
Total	19	66.817				

** = Highly significant

Coefficient of variation = 6.81%

Appendix Table 9. Computed yield (/ha)

TREATMENT	REPLICATION I	II	III	IV	TOTAL	MEAN
T_1	19.80	19.90	19.60	19.20	78.50	19.63
T_2	19.50	19.90	21.30	20.10	80.80	20.20
T_3	14.60	14.00	14.40	16.20	59.20	14.80
T_4	10.20	13.20	12.50	12.78	48.68	12.17
T_5	12.10	13.20	12.60	10.00	47.90	11.98

Analysis of Variance

Source of variation	Degrees of freedom	Sum of squares	Mean square	Computed F	TABULAR F 0.05	0.01
Replication	3	2.309	0.770			
Factor A	4	251.150	62.788	54.56**	3.26	5.41
Error	12	13.808	1.151			
Total	19	267.268				

** = Highly significant

Coefficient of variation = 6.81%