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Effect of Organic and Inorganic Fertilizers on Growth, Yield and Quality of Cabbage (*Brassica oleracea* L. var. *capitata*)

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ABSTRACT

A field experiment was carried out entitled "Effect of Organic and Inorganic Fertilizers on growth, yield and Quality of Cabbage (Brassica oleracea L. var. capitata)" in Randomized Block Design with three replications. The experiment was conducted at the Horticulture Research Farm of the Department of Applied Plant Science (Horticulture), Babasaheb Bhimrao Ambedkar University, Vidya- Vihar, Rae Bareli Road, Lucknow-226025 (UP), India, during Rabi season of 2015. The experiment comprises of different doses of organic manures i.e. RDF 100%, FYM 100%, Azospirillum 100%, Azotobacter 100%, RDF 50%+ FYM 50% , RDF 50% + Azospirillum 50%, RDF 50%+ Azotobacter 50%, FYM 50%+ Azospirillum 50%, FYM 50% + Azotobacter 50%. The yield attributing characters were recorded maximum plant spread (57.06) per plant, number of leaves (10.90) per plant, length of stalk (3.90 cm), number of non- wrapper leaves (12.13) per plant, leaf area (1778.67), length of leaf (38.32 cm), leaf width (24.77), day maturity (77.25), volume of head (0.88) , head weight (1.27), maximum yield (8.820 kg/plot),TSS (6^0Brix), highest acidity (0.72%) and vitamin-C (19.20 mg/ 100 g) of fruit.

Key words: *Organic manure, bio-fertilizers, cabbage, growth, yield and quality*

INTRODUCTION

India is the second largest producer of vegetables in the world accounting for an about 10 percent of the worlds production. Indian farmers produce a large number of vegetables, however, potatoes, onion, cauliflower and cabbage account for 60 percent of total production. In recent past tremendous progress has been made for increasing vegetable production during 2014-2015. India has produced about 162.89 million tonnes of vegetables from 9.39 million hectare of land accounting the total productivity of 17.3MT/ha in India. Cabbage (*Brassica oleracea* L. var. *capitata*) is popular as a winter season vegetable. In India the word 'Cabbage' is derived from the French word 'Caboche' meaning "Head", cabbage belongs to family Brassicaceae and its origin in probably from Western Europe and Northern shore of the Mediterranean region suggested that cabbage was first domesticated somewhere in Western Europe by Celts during the first millennium B.C. and was later on introduced in the East Europe[8].

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Addition of more vegetable to human diet may be positive alternative for meeting both quantity and quality aspects. The vegetable being short duration crop gives more yields per unit area. They are high nutritious and protective and contain more of vitamins and minerals as compared to other cereal crops. Choudhary[3] reported that presently a majority of vegetarians population consume 58 g cabbage per day per capita only, while for the same figures for Italy, U.S.S.R., Japan, U.S.A., U.K., Canada and Australia are 595,469,449,428 and 346 g respectively. Cabbage is a cold weather crop and generally grown throughout India in winter season. It is mostly employed as culinary, dietic, curries, pickles and also use alone or mixed for vegetable purposes. It is used for salad, boiling, cooking, currying, pickling and dehydration purpose. It neutralizes acidity, improves digestion and appetite[5]. Increase in the yield of chilli, okra, tomato and brinjal by application of organic manure was reported by Gaur. For higher economic yield, balanced nutrient supply is one of the key factors[6] **.** Organic matter is the rich sources of both macro and micro nutrient, which is required in large quantities for the healthy growth and development of the plant.

MATERIALS AND METHODS

The present experiment entitled "Effect of Organic and Inorganic fertilizers on growth, yield and Quality of cabbage (*Brassica oleracea* L. var. *capitata)"* was conducted at Research Farm of Department of Applied Plant Science (Horticulture), Babasaheb Bhimrao Ambedkar University, Lucknow of 2015-2016. The experiment was conducted during Rabi season under Randomized Block Design with three replications. The seeds of the cultivar were collected from Indian Agricultural Research Institute, New Delhi, India. Pusa Mukta was can even set fruit when night temperatures drop to 8^0C. The land of the experimental site was irrigated prior to sowing for optimum moisture level. Seedlings were transplanted at a spacing of 60 x 45 cm and thus in a plot, 16 seedlings were accommodated. All the agronomic package of practices was taken to grow a healthy crop in each replication. In each replication, randomly fine plants were selected for taking observation. The experimental materials included ten treatment combinations *viz.* T_1 (Control), T_2 (RDF 100%), T_3 (FYM 100%), T_4 (*Azospirillum* 100%), T_5 (*Azotobacter* 100%), T_6 (RDF 50%+ FYM 50%), T_7 (RDF 50% + *Azospirillum* 50%), T_8 (RDF 50%+ *Azotobacter* 50%), T_9 (FYM 50%+ *Azospirillum* 50%) and T_{10} (FYM 50%+ *Azotobacter* 50%). The observations were recorded on 4 characters under yield attributing traits in cabbage i.e. Days to maturity, Volume of Head (cm^3), Head weight (kg), Yield (q/ha).

RESULT AND DISCUSSION

Data from Table-1 revealed that the differences with respect to the plant height were significant among different treatment combinations at various stages of crop growth. The treatment T_5 was found significantly superior to treatment T_1 control (recommended dose of NPK) was also the minimum plant height. Maximum plant spread (57.06) per plant was observed under treatment T_9 (FYM 50%+ *Azospirillum* 50%) followed by (56.66) treatment T_8 (RDF 50%+ *Azotobacter* 50%) was significantly superior over all other treatments. It is also find out that maximum number of leaves (10.90) per plant was observed under the treatment of T_5 (PSB+50% P) and recommended dose of N & K through chemical fertilizers followed by (10.60) treatment T_4 (*Azotobacter* + 50% P). The T_6 significantly in increased in the (RDF 50%+ FYM 50%) treated than the control. Statistical analysis revealed that maximum length of stalk T_6 (3.90cm) was highly significant. The treatment T_9 and T_{10} also increased length of stalk and showed significant effect over the control. The number of non- wrapper leaves per plant at final stage of growth were finding significant at 75 DAT. It is find out from table-2 maximum number of non- wrapper leaves (12.13) per plant was observed under the treatment of T_9 (FYM 50%+ *Azospirillum*

50%) followed by (11.43) treatment T_{10} (FYM 50%+ *Azotobacter* 50%) was significantly superior over all other treatments. Leaf Area was significantly affected by various bio- fertilizers treatments. The maximum leaf Area (1778.67) was obtained by T_9 (FYM 50% + *Azospirillum* 50%) was significantly superior over all the treatments and control. Minimum leaf area (1549.67) was observed under the control. Minimum length of leaf (38.32 cm) was observed under T_1 Treatment and T_4 treatment (19.59 cm) minimum leaf width (16.34 cm). The maximum leaf width (24.77) was obtained by T_9 was significantly superior over all the treatments and minimum leaf width (17.93) was observed under the control. The maximum day maturity (77.25) was obtained by T_4 (100% *Azospirillum*) was significantly superior over all the treatments and minimum days to maturity (69.49) was observed under the control. The maximum Volume of head (0.88) was obtained by T_7 (RDF 50% + *Azospirillum* 50%) was significantly superior over all the treatments and control. Minimum volume of head (0.81) was observed under the control. The maximum head weight (1.27) was obtained by T_5 (100% *Azotobacter*) was significantly superior over all the treatments and minimum head weight (0.52) was observed under the control. The maximum yield (8.820 kg/plot) was obtained by T_5 (PSB + 50% P and recommended dose N & K through chemical fertilizers) was significantly superior over all the treatments and minimum yield (6.930 kg/plot) was observed under the control. Maximum TSS (6.00) was recorded with the spacing of T_3 (60 x 45cm). Where, as different levels of nitrogen give non-significant effect on TSS concentration. The highest acidity found T_2 (0.72%) followed by T_8 (0.71%) and lowest acidity observed T_1 (0.52%).The data indicate that the treatment T_3 (FYM 100%) showed maximum vitamin-C (19.20mg/100g) of fruit. The plants with organic manure and bio-fertilizer increased the vitamin-C of fruits over the control. Statistical analysis indicates that the treatment T_3 gave highest vitamin-C next T_4 (18.26mg/100g.

Table 1: Effect of Organic and Inorganic Fertilizers on growth, yield and Quality of Cabbage (*Brassica oleracea* L. var. *capitata*)

S. No.	Treatments	Characters														
		Plant height (cm)	Plant spread (cm)	No. of leaves / plant	Length of stalk	No. of non wrapper leaves	Leaf area (mm)	Leaf length	Leaf width	Days to maturity	Volume of head	Head weight	Yield (q/ha)	TSS (° Brix)	Acidity	Vit. C
1.	T_1	30.46	48.06	11.66	0.73	9.76	1549.67	20.82	17.93	69.49	0.81	0.52	270.04	5.03	0.52	15.23
2.	T_2	31.26	47.9	14.23	2.13	10.96	1604.67	21.99	19.11	72.05	0.84	0.78	331.73	5.40	0.72	16.23
3.	T_3	31.63	51.53	14.9	2.13	10.03	1600.67	23.45	19.33	72.44	0.84	0.65	375.38	6.00	0.63	19.20
4.	T_4	32	50.53	15.86	2.63	10.23	1638.67	22.74	19.85	77.25	0.82	0.85	410.43	5.46	0.65	18.26
5.	T_5	36.73	45.83	12.3	4.2	10.73	1711.33	23.20	20.12	72.30	0.86	1.27	270.83	5.40	0.53	15.43
6.	T_6	34.73	50.8	14.36	3.90	10.1	1640.00	22.26	19.42	72.30	0.84	0.87	341.7	5.46	0.62	17.30
7.	T_7	31.76	53.03	15.76	3.13	10.56	1563.67	20.86	20.10	73.31	0.88	0.86	368.22	5.20	0.63	17.93
8.	T_8	34.83	56.66	12.5	3.9	10.26	1593.33	22.52	19.42	72.09	0.84	0.87	390.97	5.33	0.71	17.56
9.	T_9	33.83	57.06	16.70	3.63	12.13	1778.67	26.82	24.77	73.87	0.83	0.90	270.78	5.60	0.53	15.70
10.	T_{10}	34.70	54	16.33	3.63	11.43	1615.00	22.18	20.79	73.44	0.82	0.88	356.40	5.43	0.61	17.76
CD at 5%		0.95	0.986	0.621	0.852	0.825	112.654	3.02	2.93	2.9	0.028	0.18	15.683	0.239	0.02	0.786

CONCLUSION

It can fairly be concluded on the basis of above findings that the application FYM 50% + Azospirillum 50% and Azotobacter 100% at optimum level is quite effective to promote growth, yield and quality of cabbage. It increased height, leaves, head size, spread and yield per hectare, along with better quality of heads in terms of TSS, acidity and ascorbic acid.

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