

Effect of organic and inorganic sources of nitrogen and biofertilizers on growth and yield of cabbage (*Brassica oleracea* var. capitata)

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ABSTRACT

A field experiment was conducted to find out the effect of organic and inorganic sources of nitrogen and biofertilizers on growth and yield of cabbage Cv. Golden Acre. Twenty treatment combinations comprised of four levels of sources of nitrogen and five levels of biofertilizers were laid out in factorial randomized block design with two replications. The fertilizer combination 75% RDN through inorganic fertilizer + 25 % N through FYM along -with biofertilizer combination *Azotobacter* + PSB + VAM were found superior than other treatments for growth characters (height of plant, number of leaves, diameter of stem, plant spread) and yield of cabbage.

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Key words : Biofertilizers, Organic nitrogen sources, Cabbage growth, Yield

INTRODUCTION

Vegetables are protective food, providing vitamins, minerals, proteins, carbohydrates and fibre in the diet besides having medicinal value. Being second largest country in vegetable production. India is still unable to meet the per capita requirement of vegetables. Plant nutrients are essential for the production of crop and healthy food for expanding population. Consistent and indiscriminate use of organic fertilizers have caused serious damage to the soil and ecology and the population of beneficial micro-organisms present in the soil reduced due to excessive use of chemical fertilizers. Many researchers showed that organic manures in combination with inorganic form of nitrogen increased the quality of fruits and vegetables. Currently use of microbial inoculants in supplements with nitrogen, potassium, phosphorus and other micronutrients has attained immense importance. Hence, keeping in view these facts, the present investigation was undertaken to assess the effect of organic and inorganic nitrogen sources and biofertilizers on growth and yield of cabbage.

MATERIALS AND METHODS

The field experiment was conducted at the experimental farm of Department of Horticulture, Marathwada Agricultural University, Parbhani with cabbage cv. GOLDEN ACRE. The soil of the experimental field was black cotton soil with pH 8.17. The experiment was laid out in factorial randomized block design replicated twice. Treatments consisted of four levels of sources of

nitrogen, viz., F₁, (100 % RDN through inorganic fertilizer), F₂ (100 % RDN through FYM), F₃ (75 % RDN through inorganic fertilizer + 25 % N through FYM) and F₄ (50 % RDN through inorganic fertilizer + 50 % N through FYM) and five levels of biofertilizers i.e. B₀ (No biofertilizers), B₁ (*Azotobacter*), B₂ (*Azotobacter* + PSB), B₃ (*Azotobacter* + PSB + VAM) and B₄ (*Azotobacter* + PSB + VAM + EM). Seeds were sown on raised beds in a row at 10 cm apart on 25th September, 2009. Spraying of insecticide, weeding and watering were done on raised beds. Also ploughing, harrowing and manuring were done on experimental field. FYM was applied before 8 days of transplanting to only FYM treatments plots. The inorganic fertilizers was applied in two split doses, first dose (1/2 N and full P, K) was applied at the time of transplanting and remaining N was applied 30 days after transplanting. Ridges and furrow were opened at spacing of 45 cm. For biofertilizer treatments seedlings were dipped in slurry of biofertilizers for 10-15 minutes before transplanting. The observations on growth and yield parameters were recorded on five randomly selected plants from each plot.

RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been presented under following heads :

Effect on growth:

The data on growth characters as influenced by various sources of nitrogen adopted are presented in Table

1. Maximum plant height (26.01 cm), number of leaves/plant (30.20), diameter of stem (1.78 cm) and plant spread (2650.6 cm²) were found with treatment F₃ (75% RDN through inorganic fertilizer + 25% N through FYM). It is well known fact that inorganic nitrogen in combination with organic nitrogen plays an important role in increasing

vegetative growth. Robert and Stephan (1953) reported that organic manures when applied in combination with inorganic fertilizers effectiveness of inorganic fertilizers are high. Growth characters showed a significant response to biofertilizers. Maximum plant height (26.47 cm), number of leaves/plant (29.86), diameter of stem (1.97 cm) and

Table 1 :Effect of organic and inorganic sources of nitrogen and biofertilizers on growth and yield of cabbage

Characters treatments	Plant height (cm)	Number of leaves/plant	Diameter of stem (cm)	Plant spread (cm ²)	Net weigh of head (g)	Head yield (q/ha)
Nitrogen sources						
F ₁	25.01	28.48	1.70	2507.7	1034.2	510.6
F ₂	23.16	26.59	1.31	2136.4	858.4	423.8
F ₃	26.01	30.20	1.78	2650.6	1286.8	645.2
F ₄	24.59	27.21	1.54	2523.8	1099.6	542.9
'F' test	Sig	Sig	Sig	Sig	Sig	Sig
S.E.±	0.43	0.53	0.04	77.45	11.25	5.56
C.D. (P=0.05)	1.27	1.58	0.12	228.9	33.25	16.43
Biofertilizer levels						
B ₀	23.05	26.13	1.31	2256.3	918.2	453.4
B ₁	24.38	27.92	1.61	2442.1	1072.5	540.0
B ₂	24.11	27.05	1.58	2393.3	1054.8	509.9
B ₃	26.47	29.86	1.97	2615.5	1182.2	583.7
B ₄	26.21	29.62	1.67	2566.0	1146.0	565.84
'F' test	Sig	Sig	Sig	Sig	Sig	Sig
S.E.±	0.48	0.59	0.046	86.59	12.58	6.21
C.D. (P=0.05)	1.42	1.77	0.137	255.92	37.18	18.37
Interaction						
F ₁ B ₀	23.13	26.60	1.44	2237.5	833.50	411.5
F ₁ B ₁	24.61	28.35	1.74	2430.5	1053.00	520.0
F ₁ B ₂	24.30	27.25	1.72	2576.2	1008.50	497.9
F ₁ B ₃	26.65	30.15	2.00	2718.2	1159.00	572.3
F ₁ B ₄	26.37	30.05	1.85	2656.9	1117.00	551.6
F ₂ B ₀	21.48	24.75	1.07	1982.0	755.50	372.9
F ₂ B ₁	22.60	26.55	1.37	2149.2	839.50	414.4
F ₂ B ₂	22.42	25.20	1.33	2036.5	810.00	399.9
F ₂ B ₃	24.73	28.30	1.41	2279.0	917.00	479.5
F ₂ B ₄	24.59	28.15	1.40	2235.5	916.00	452.1
F ₃ B ₀	24.35	27.50	1.50	2448.6	1090.00	538.2
F ₃ B ₁	25.67	29.40	1.80	2661.9	1297.50	683.6
F ₃ B ₂	22.64	29.20	1.77	2528.2	1284.50	640.6
F ₃ B ₃	28.84	32.65	2.19	2847.8	1393.50	688.0
F ₃ B ₄	28.57	32.25	1.90	2766.5	1368.50	675.7
F ₄ B ₀	23.25	25.70	1.23	2237.5	994.00	490.8
F ₄ B ₁	24.66	27.40	1.56	2430.5	1100.00	543.2
F ₄ B ₂	23.11	26.55	1.52	2576.2	1016.00	501.5
F ₄ B ₃	25.66	28.35	1.82	2718.2	1205.50	595.2
F ₄ B ₄	25.31	28.05	1.59	2656.9	1182.50	583.8
'F' test	Sig	Sig	Sig	Sig	Sig	Sig
S.E.±	0.96	1.19	0.092	173.19	25.16	12.43
C.D. (P=0.05)	2.84	3.54	0.274	511.83	74.36	36.75

plant spread (2615.5 cm²) was recorded with treatment B₃ (*Azotobacter* + PSB + VAM). The beneficial effect of biofertilizers on growth character may be attributed to growth promoting substances secreted by the microbial inoculants which lead to better root development, transportation of water and uptake and deposition nutrients (Mohandas, 1987). It is revealed from data presented in Table 1 that interaction effects of nitrogen sources and biofertilizers were found significant in respect of growth characters. Maximum plant height (28.84 cm), number of leaves per plant (32.65), diameter of stem (2.19 cm) and plant spread (2847.8 cm²) was found with treatment F₃B₃ (75% RDN through inorganic fertilizer + 25% N through FYM + *Azotobacter* + PSB + VAM). The increase in growth characters could be due to the ability of microbial inoculation to produce some growth promoting substances which might have led to enhanced cell division and cell elongation, resulting in better root development, increased uptake of nutrients and moisture. These results are in close proximity with findings of Bankar (1997) and Khandait (1996) in cabbage.

Effect on yield:

There was a significant response of nitrogen sources on yield characters of cabbage. Application of 75% RDN through inorganic sources along with 25% N through FYM showed maximum net weight of head (1286.8 g) and head yield (645.2 q/ha). This might be due to combination of organic and inorganic nitrogen sources gave prolonged availability of nitrogen which helped to induce more vegetative growth which in turn led to increased head yield. Similar findings were reported by Ghuge *et al.* (2007).

The biofertilizer treatment B₃ (*Azotobacter* + PSB + VAM) showed maximum net weight of head (1182.2 g) and head yield (583.7 q/ha). The increase in yield might be attributed to better root proliferation, better uptake of nutrients, water and more photosynthesis which increased food accumulation in edible parts. These results are in close agreement with the results obtained by Chattoo *et al.* (1997) in Knol-khol. The effect of organic and inorganic nitrogen sources and biofertilizer interactions were found significant for yield characters. The maximum net weight of head (1393.5 g) and head yield per ha. (688 q) was found in treatment combination F₃B₃ (75 % RDN through inorganic fertilizer + 25 % N through FYM +

Azotobacter + PSB + VAM). The yield improvement might be due to vigorous growth in terms of plant growth characters. The FYM apart from improving the soil conditions conducive for plant growth, increased availability of nutrients and biological activities. In addition, biofertilizers might have helped in maintaining continuous availability and supply of nutrients due to nitrogen fixation by *Azotobacter*, phosphate solubilization by PSB and VAM along with release of growth promoting hormones. Similarly findings were reported by Selvi and Thiageshwari (1996) okra.

REFERENCES

- Bankar, P.D. (1997).** Effect of biofertilizers with reduced dose of nitrogen on growth and yield of cabbage (*Brassica oleracea* var. *capitata* L.). M.Sc. (Ag.) Thesis, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola. M.S. (India).
- Chattoo, M.A., Gandroo, M.Y. and Zargar, M.Y. (1997).** Effect of *Azospirillum* and *Azotobacter* on growth, yield and quality of knoll-khol. *Veg. Sci.*, **24**(1):16-19.
- Ghuge, T.D., Jadhav, S.B. and Gore, A.K. (2007).** Effect of organic and inorganic sources of nutrients on uptake and nutrient availability of soil after harvesting of cabbage. *J. Soils & Crops*, **17**(2):294-298.
- Khandait, M.K. (1996).** Effect of *Azotobacter*, *Azospirillum* alone and in combination with reduced doses of nitrogen on growth and yield of cabbage. M.Sc. (Agri.) Thesis, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola. M.S. (India).
- Mohandas, S. (1987).** Field response of tomato cv. PUSA RUBI to inoculation with VAM fungus *Glomus fasciculatum* and with *Azotobacter vinelandii*. *Plant & Soil*, **19**(2): 295-297.
- Robert, A.N. and Stephen, R.E. (1953).** Saw dust and other wood waste and mulch for horticulture crops. *Tech Pap. Orc. Agri. Expt. Stat.*, **27**: 8.
- Selvi, D. and Thiageshwari, S. (1996).** Effect of integrated nutrient management on yield of brinjal and in a mixed black soil (Vertic ustropept.). *Madras Agric. J.*, **89**(7-9): 378-382.

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