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Influence of integrated nutrient management on growth of coloured capsicum (*Capsicum annuum* L.) cv. OROBELLE under naturally ventilated greenhouse

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ABSTRACT

A study on influence of integrated nutrient management on the growth of coloured capsicum Cv. Orobelle under naturally ventilated greenhouse was conducted at Division of Horticulture, University of Agricultural Sciences, Bangalore during 2004-2005. The treatments comprised of three organic manures *viz.*, Pongamia cake (220g/m^2, 440g/m^2 and 880g/ m^2), vemicompost (375 g/ m^2, 750g/$m^2$and 1500g/ m^2) and FYM @ 25 t/ ha, recommended dose of fertilizer (RDF) @ 250: 250: 250 kg NPK/ ha (applied at three different levels 50%, 75% and 100%) and *Azotobacter* @ 5g/plant. The results of the experiment have revealed that application of 25 per cent of nitrogen through Pongamia cake + 75 per cent of recommended dose of fertilizer + FYM @ 25t/ha + *Azotobacter* @ 5g/plant has significantly increased the growth parameters like plant height (64.72, 127.34 and 225.93cm), number of branches per plant (12.47, 18.21 and 20.57) and plant spread (448.24, 981.31 and 1250.10 cm^2) when observed on 60, 90 and 120 days after transplanting, respectively. The capsicum plants responded significantly to the integrated nutrient supply.

Key words : Greenhouse, Azotobacter, Pongamia cake, Plant height.

Capsicum (*Capsicum annuum* L.) also called as bell pepper belonging to the family Solanaceae is one of the most popular and highly valued vegetable crops grown in tropical and sub-tropical parts of the world. It is believed to be the native of tropical South America (Shoemaker and Tesky, 1955). Growing of capsicum under green/ polyhouses has been reported to give high productivity of good quality produce in developed countries. Hence, there is a need for evaluating the performance of capsicum under low cost greenhouse conditions for getting higher productivity of excellent quality under Indian conditions. Nutrition plays an important role in growth and development of any crop including capsicum. To overcome the problems of increased cost of cultivation and ecological imbalance due to continuous use of chemical fertilizers, the latest trend of growing crops mainly horticultural crops using organic manure is in vogue. Hence, use of organic manures and bio-fertilizers along with chemical fertilizers in an integrated manner on a long run helps in reducing the use of chemical fertilizers thereby improving the soil health.

Hence, the present study on Integrated Nutrient Management in cultivation of coloured capsicum cultivar Orobelle under naturally ventilated greenhouse was taken up.

MATERIALS AND METHODS

The study was carried out under naturally ventilated cost effective greenhouse at Precision Farming Development Center, Division of Horticulture, UAS, GKVK, Bangalore. Yellow coloured capsicum hybrid Orobelle developed by Syngenta seed company was used for this study. The raised nursery beds of one meter width, three meter length and 0.4 meter height were prepared after mixing with the recommended dosage of farm yard manure (2 kg/sq.m). Seeds of hybrid capsicum (Orobelle) were sown one cm deep at a spacing of 10 cm x 5 cm. for raising the seedlings. One month old healthy and vigorous seedlings were planted at a spacing of 45 cm x 30 cm under naturally ventilated greenhouse. In each treatment 24 plants were planted. There were 12 treatments and three replications under each growing conditions.

Manures, fertilizers and bio-fertilizer application:

Farm yard manure, vermicompost and Pogamia cake were applied to soil media as per the treatments at 15 days prior to planting. The water soluble chemical fertilizers (obtained from Kemira OY International, Finland) were used for the study as per the treatments and applied to the soil in three split doses at monthly intervals over a period of three months starting from 15th day after transplanting. The biofertilizer (*Azotobacter* obtained from Department of Microbiology, GKVK, Bangalore) was applied as soil application at 25days after transplanting as per the treatment.

Details of nutrients:

1. Organic manures : a. Pongamia cake
   b. Vermicompost
   c. FYM

2. Bio-fertilizer : a. *Azotobacter*
3. Chemical fertilizers: a. 50% of RDF
b.75% of RDF
c.100% RDF (250: 250: 250 kg NPK/ha)

RESULTS AND DISCUSSION

Nutrient content of organic manures and inorganic fertilizer used

Manures or fertilizer	N	P_2O_5	K_2O
Pongamia cake	2.84	1.80	1.90
Vermicompost	1.60	1.00	1.50
FYM	0.75	0.20	0.50
18 all	18.0	18.0	18.0

Coloured capsicum variety orobelle responded significantly to the different combinations of nutrient elements

Significantly higher plant height (34.5, 64.72, 127.34 and 225.93 cm at 30, 60, 90 and 120 DAT, respectively) was recorded in treatment T_7 which was at par with T_9 (33.65, and 210.64 cm at 30 and 120 DAT, respectively) and T_6 (32.86 at 30 days). The increased plant height may be due to higher availability of more nitrogen which improved the plant height due to the fact that nitrogen after being taken up by the plants is converted into amino acids which are building blocks of proteins which might have led to increase the rate of meristematic activity resulting in better plant height. Similarly biofertilizer used might have helped in production of growth regulating substances leading to increased plant height supplemented by the favorable micro climate prevailing in the greenhouse. This is in confirmation with studies conducted by Natarajan (1990), Shrivastava *et.al.* (1993) and Nagalakshmi *et.al.*(2001) in capsicum and Gajbhiye *et. al.* (2003) in tomato (Table 1).

Highest number of branches per plant was produced in treatment T_7 (7.00, 12.47, 18.21 and 20.57 at 30, 90, 60 and 120 DAT, respectively). This could be attributed to the increase in number of nodes with shorter internodes favored by application of phosphatic fertilizer and biofertilizer and also may be as a result of the greenhouse micro climate. Similar observations have been made by Deka *et al.* (1986) in chilli, Renuka and Ravishankar

Table 1 : Plant height, Number of branches per plant and Plant Spread (cm^2) of coloured capsicum cv. OROBELLE as influenced by integrated nutrient management under greenhouse

Treatments	Plant height (cm)				Number of branches per plant				Plant Spread (cm^2)			
	Days after transplanting				Days after transplanting				Days after transplanting			
	30	60	90	120	30	60	90	120	30	60	90	120
T_1	29.24	53.33	97.68	170.07	4.40	8.46	11.47	14.25	94.36	316.4	828.43	1122.08
T_2	27.76	52.23	86.54	154.65	4.25	8.23	11.46	13.10	92.70	302.73	783.00	1019.83
T_3	31.51	55.14	99.32	190.32	4.53	8.75	13.29	14.84	99.18	326.33	899.78	1130.41
T_4	26.20	51.24	83.97	151.47	4.22	8.13	11.14	12.72	87.55	296.75	773.27	1014.55
T_5	31.00	54.02	98.79	184.57	4.46	8.71	12.99	14.37	96.00	318.28	895.19	1125.64
T_6	32.86	59.50	108.63	198.00	5.58	9.26	14.80	16.25	149.68	345.12	955.41	1194.34
T_7	34.50	64.72	127.34	225.93	7.00	12.47	18.21	20.57	169.43	448.24	981.31	1250.10
T_8	32.05	55.72	103.18	196.19	5.50	9.23	14.40	15.97	145.73	375.00	940.31	1189.23
T_9	33.65	62.33	112.83	210.64	6.45	10.64	16.53	17.60	161.6	432.80	965.4	1223.75
T_{10}	25.91	49.33	83.69	148.32	4.13	8.02	10.30	12.22	85.35	291.48	769.73	1004.60
T_{11}	24.21	48.00	80.23	144.67	4.00	7.87	10.07	12.18	84.78	287.63	745.00	1002.19
T_{12}	24.88	48.67	81.25	147.98	4.12	8.00	10.15	12.20	85.15	290.95	764.88	1003.62
F-test	*	*	*	*	*	*	*	*	*	*	*	*
S.E.±	0.70	0.577	4.175	7.95	0.163	0.0381	0.807	1.183	4.1410	8.340	13.828	43.093
C.D. (P=0.05)	2.05	1.693	12.24	23.31	0.477	1.116	2.663	3.469	12.147	24.462	40.55	126.39

* indicatse significance of value at P=0.05

Treatment details : T_1 : 100 per cent recommended dose of fertilizers +FYM 25t/ha, T_2 : 50 per cent N through Pongamia cake + 50% RDF+FYM 25t/ha, T_3 : 25 per cent N through Pongamia cake + 75% RDF+FYM 25t/ha, T_4 : 50 per cent N through vermicompost + 50% RDF+FYM 25t/ha, T_5 : 25 per cent N through vermicompost+ 75% RDF+FYM 25t/ha, T_6 : 50 per cent N through Pongamia cake + 50% RDF+FYM 25t/ha + *Azotobacter* (5g/plant), T_7 : 25 per cent N through Pongamia cake + 75% RDF+FYM 25t/ha + *Azotobacter* (5g/plant), T_8 : 50 per cent N through vermicompost+ 50% RDF+FYM 25t/ha +*Azotobacter* (5g/plant), T_9 : 25 per cent N through vermicompost + 75% RDF+FYM 25t/ha + *Azotobacter* (5g/plant), T_{10}: 100 per cent N through Pongamia cake +FYM 25t/ha, T_{11}: 100 per cent N through vermicompost +FYM 25t/ha, T_{12} : 50per cent N through Pongamia cake + 50% N through vermicompost + FYM 25t/ha

(2001) in tomato (Table 1).

Significantly higher plant spread was observed in treatment T_7 (169.43, 448.24, 981.31 and 1250.1 m^2) at various stage of crop growth (30, 60, 90 and 120 DAT). The production of more number of branches per plant was due to optimum NPK fertilization, biofertilizer and organic manure application resulting in increased availability nutrients and uptake by the plants which was easily assimilated by plants. The additive ameliorative effect of organic manures at all the stages of growth contributed to the maximum plant spread under greenhouse. Similar results were reported by Chougale and Mahajan (1979) in capsicum (Table 1).

Application of 25 per cent of nitrogen through Pongamia cake + 75 per cent of recommended dose of fertilizer + FYM @ 25t/ha + *Azotobacter* @ 5g/plant is ideal for better growth of the coloured capsicum.

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