The Asian Journal of Horticulture, **Vol. 3 No. 2 : 213-216 (December-2008)**

Influence of pruning and growth regulators on flowering, fruit set and yield of coloured capsicum (*Capsicum annuum* L.) cv. OROBELLE under naturally ventilated greenhouse

G. RAVIRAJA SHETTY AND R. KRISHNA MANOHAR

Accepted : *July, 2008*

See end of the article for authors' affiliations

Correspondence to :

G. RAVIRAJA SHETTY
Division of Horticulture, University of Agricultural Sciences, G.K.V.K., BANGALORE (KARNATAKA) INDIA

ABSTRACT

An experiment was conducted during 2005-06 to study the influence of pruning and growth regulators on the yield and quality of coloured capsicum (*Capsicum annuum* L.) cv. OROBELLE under greenhouse, Division of Horticulture, UAS, GKVK, Bangalore. In this experiment two pruning levels (2 branches per plant and 4 branches per plant) and growth regulators (NAA10 ppm and 25ppm, GA_3 10 ppm and 25ppm) at different combinations were used as treatments. Both during summer and winter, the number of days taken was least for 50 per cent flowering (34.18 and 32.63 days, respectively) and fruit set (7.12 and 5.54 days, respectively) with the treatment T_5 which was the combination of pruning to four branches per plant + NAA 10 ppm. This treatment had also significantly increased number of flowers per plant (34.34 and 39.41, respectively) and per cent fruit set (52.37 and 63.51%, respectively) fruit yield per plant (1.97 and 2.39 kg) and per hectare (118.20 and 143.40 t) in both summer and winter, respectively. Capsicum plants responded significantly to the pruning and application of growth regulators.

Key words : Greenhouse, Capsicum, Pruning, Growth regulator, Flowering and Fruit set.

Capsicum (*Capsicum annuum* L.) also known as sweet pepper or bell pepper is one of the most popular vegetable crops grown in India as well as in several other parts of the world. It is believed to be the native of tropical South America (Shoemaker and Tesky, 1995). In India, capsicum occupies an area of 4,780 hectare with an estimated production of 42,230 tones. (Anon., 1997). The productivity of capsicum is very low (10 to 42 t/ha) in India. Capsicum under open field cultivation yields between 20-40 t/ha, where as in a greenhouse the yield ranges from 100 to 120 t/ha

Greenhouse production technology of vegetables emphasizes the need for having appropriate plant densities, plant structure and use of optimum levels of growth regulators in order to boost up the production per unit area by utilizing the available space and nutrients applied. Since not much information is available on greenhouse cultivation of sweet pepper with respect to varying levels of pruning and growth regulators, there is an imminent need to assess the optimum levels of pruning and growth regulators for its cultivation in greenhouse. Therefore, this experiment was carried out to study the influence of pruning and growth regulators on the growth of capsicum plants

MATERIALS AND METHODS

The study was carried out at Precision Farming Development Center, Division of Horticulture, University of Agricultural Sciences, GKVK, Bangalore. Yellow coloured capsicum hybrid Orobelle developed by Syngenta seed company was used for this study. In both summer and winter seasons 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). Seedlings of hybrid capsicum (Bombi) were raised by sowing centimeter deep at spacing of 10 cm x 5 cm. One month old 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 fifteen treatments and three replications under each growing conditions.

Pruning:

Capsicum plants were pruned to retain two stems and four stems according to the treatment. In two branch pruning, secondary two branches, first flower and shoots under first flower were pinched out. In four branch pruning, the first flower and the shoots under first flower

Preparation of growth regulators

Growth regulator	Concentration (ppm)	Quantity of growth substance dissolved
NAA	10	10 mg
	25	25 mg
GA_3	10	10 mg
	25	25 mg

were removed. Pruning was done at weekly interval from 20 to 30 days after transplanting.

The above treatments with combinations were superimposed at 30, 45 and 60 days after transplanting.

RESULTS AND DISCUSSION

Application of growth regulators and pruning in different treatments had significantly influenced the flowering, fruit set and yield both during summer and winter seasons.(Table 1, 2 and 3)

Both in summer and winter, the number of days taken was least for first flowering (27.81 and 25.25 days, respectively), 50 per cent flowering (34.18 and 32.63 days, respectively) and fruit set (7.12 and 5.54 days, respectively) with the treatment T_5 followed by T_6. Both during summer and winter maximum number of flowers per plant (34.34 and 39.41, respectively) and per cent fruit set (52.37 and 63.51%, respectively) was recorded with the treatment T_5 followed by T_6. The treatment T_5 was the combination of pruning to 4 branches per plant + NAA 10 ppm.

The earliness in flower initiation, 50 per cent plants to flower and fruits set in the treatment T_5 and T_6 may be due to the fact that, the growth regulator (NAA 10 ppm and 25 ppm) treated plants were able to synthesize more C:N ratio required for early initiation of reproductive phase. This might be also due to rapid growth and higher accumulation of net photosynthates, besides stimulation of early flowering by auxins. Such reduced number of days taken to flowering and 50 per cent of plants to flower due to NAA was observed by Chandramony and George (1976) in chilli.

On the other hand, pruning to 4 branches per plant restricted the side branches and stimulated the plants to flower early and set the fruit. Increase in flowering and per cent fruit set might be due to the production of more number of branches in such plants and optimum vegetative growth besides effective pollination and fertilization and less incidence of abscission of flowers due to application of NAA. This was coupled with pruning to 4 branches per plant which has stimulated the plants to produce more number of flowers and per cent fruit set by enhancing the content of assimilation pigments, intensity of photosynthesis and resources of assimilates in plants and

Table 1 : Days taken for first flowering and 50 per cent flowering as influenced by pruning and growth regulators in coloured capsicum cv. OROBELLE under greenhouse

Treatments	Days taken for first flowering (DAT)		Days taken for 50 per cent plants to flower (DAT)	
	Summer	Winter	Summer	Winter
T_1	36.68	32.30	41.78	39.36
T_2	37.73	33.46	42.19	40.11
T_3	38.03	34.49	42.80	40.81
T_4	38.53	35.57	44.36	41.23
T_5	27.81	25.25	34.18	32.63
T_6	29.12	27.34	37.13	35.11
T_7	29.80	27.52	37.83	35.86
T_8	30.53	28.71	38.43	36.34
T_9	32.55	29.38	39.15	37.12
T_{10}	33.20	30.27	39.85	37.91
T_{11}	34.87	30.81	40.56	38.34
T_{12}	36.35	31.54	41.00	39.51
T_{13}	39.79	37.65	46.14	43.62
T_{14}	39.17	36.41	45.31	42.34
T_{15}	40.31	38.28	48.83	44.40
S.E. $\pm$	0.69	0.45	0.39	0.31
C.D. (P=0.05)	2.00	1.31	1.15	0.90
CV%	3.42	2.45	1.66	1.38

DAT – Days after transplanting

T_1- Pruning to 2 branches per plant + NAA 10 ppm, T_2- Pruning to 2 branches per plant + NAA 25 ppm, T_3- Pruning to 2 branches per plant + GA 10 ppm, T_4 - Pruning to 2 branches per plant + GA 25 ppm, T_5 - Pruning to 4 branches per plant + NAA 10 ppm, T_6 - Pruning to 4 branches per plant + NAA 25 ppm, T_7 - Pruning to 4 branches per plant + GA 10 ppm, T_8 - Pruning to 4 branches per plant + GA 25 ppm, T_9 - Pruning control + NAA 10 ppm, T_{10} - Pruning control + NAA 25 ppm, T_{11} - Pruning control + GA 10 ppm, T_{12} - Pruning control + GA 25 ppm, T_{13} - Growth regulator control + Pruning to 2 branches per plant, T_{14} - Growth regulator control + Pruning to 4 branches per plant, T_{15} - Control

Table 2 : Number of flowers per plant, days taken for fruit set and per cent of fruit set as influenced by pruning and growth regulators in coloured capsicum cv. OROBELLE under greenhouse

Treatments	Number of flowers per plant		Number of days to fruit set		Per cent fruit set	
	Summer	Winter	Summer	Winter	Summer	Winter
T_1	27.76	32.88	9.88	7.87	38.31	43.77
T_2	27.24	32.18	10.25	8.16	36.67	43.02
T_3	26.82	31.87	10.53	8.46	36.21	42.44
T_4	26.37	31.01	10.78	8.78	35.59	41.51
T_5	34.34	39.41	7.12	5.54	52.37	63.51
T_6	33.34	37.53	7.82	5.84	48.43	58.53
T_7	32.75	36.81	8.25	6.16	46.41	57.18
T_8	32.10	35.52	8.52	6.43	45.22	53.41
T_9	31.34	36.81	8.86	6.86	44.43	52.71
T_{10}	30.44	34.76	9.10	7.08	42.52	48.40
T_{11}	28.86	34.13	9.34	7.36	41.61	46.47
T_{12}	28.23	33.49	9.63	7.64	40.67	45.42
T_{13}	25.81	30.65	10.23	9.41	33.32	37.39
T_{14}	26.22	30.01	10.90	8.95	34.64	38.66
T_{15}	25.41	29.36	11.55	9.76	32.39	36.71
S.E.±	0.55	0.42	0.50	0.40	1.05	1.32
C.D. (P=0.05)	1.61	1.24	1.46	1.17	3.06	3.82
CV%	3.31	2.20	9.21	9.22	4.52	4.83

DAT – Days after transplanting

T_1- Pruning to 2 branches per plant + NAA 10 ppm, T_2- Pruning to 2 branches per plant + NAA 25 ppm, T_3- Pruning to 2 branches per plant + GA 10 ppm, T_4 - Pruning to 2 branches per plant + GA 25 ppm, T_5 - Pruning to 4 branches per plant + NAA 10 ppm, T_6 - Pruning to 4 branches per plant + NAA 25 ppm, T_7 - Pruning to 4 branches per plant + GA 10 ppm, T_8 - Pruning to 4 branches per plant + GA 25 ppm, T_9 - Pruning control + NAA 10 ppm, T_{10} - Pruning control + NAA 25 ppm, T_{11} - Pruning control + GA 10 ppm, T_{12} - Pruning control + GA 25 ppm, T_{13} - Growth regulator control + Pruning to 2 branches per plant, T_{14}- Growth regulator control + Pruning to 4 branches per plant, T_{15} - Control

effectiveness in fruit setting. Similarly increased number of flowers per plant and more per cent fruit set was obtained by Chandra *et al.* (1976) in chilli.

Pruned to four branches per plant along with application of NAA 10 ppm had significantly increased the fruit yield per plant (1.97 and 2.39 kg) per plot (19.70 and 23.90 kg) per square meter (11.82 and 14.34 kg) and per hectare (118.20 and 143.40 t) in both summer and winter seasons, respectively.

The higher yield in the treatment of pruning to 4 branches per plant and NAA application is due to increased number of flowers and fruits per plant. This is because of highest per cent fruit set, maximum fruit length, breadth, volume and weight of the fruits which directly accounted for higher yield per plant, per plot, per square meter and per hectare. Similar results were observed by many workers. Sharma *et al.* (1980) obtained maximum fruit weight and high yield in chilli (54.91 q/ha) when sprayed with 10 ppm NAA 25 days after transplanting. Yamgar and Desai (1987) recommended spraying of NAA (20 ppm) at 30 days after planting to get early flowering (30.33 days) increased number of flowers (288.95), fruit set (61.27%) and reduced flower drop (39.09%) and fruit drop (9.24%). Nimje *et al.* (1990) sprayed growth regulators *viz.* NAA, IAA and GA (50 ppm) at 25 and 50 days after planting of Bell pepper under greenhouse conditions, and found that NAA treatments produced higher yield of 419.3 q/ha, over control. Onis *et al.* (2001) reported that, in the production of bell peppers in non heated greenhouse, the highest yield, fruit number and flower abscission was obtained when the plants were pruned to 4 branches.

Considering lower yield in the plants treated with pruning to 2 branches per plant was due to severe pruning where removal of main shoots which would have flowered and fruited has decreased the chances of fruits per plant and yield per unit area. Reduced canopy cover might have resulted in increased damage to fruit. The lowest yields in the treatment T_{15} was due to non application of growth regulators and non-pruning of plant

Combination of pruning and growth regulator application had significant influence on the flowering, fruit set and yield of coloured capsicum. Pruning to four branches per plant along with application of NAA 10 ppm

Table 3 : Yield per plant, yield per plot, yield per square meter and yield per hectare as influenced by pruning and growth regulators in coloured capsicum cv. OROBELLE under greenhouse

Treatments	Yield per plant (kg)		Yield per plot(kg)		Yield per m^2 (kg)		Yield per hectare (t)	
	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
T_1	1.18	1.41	11.80	14.10	7.08	8.46	70.80	84.60
T_2	1.11	1.37	11.10	13.70	6.48	8.22	64.80	82.20
T_3	1.06	1.28	10.60	12.80	6.36	7.92	63.60	79.20
T_4	0.99	1.29	9.90	12.90	5.98	7.74	59.80	77.40
T_5	1.97	2.39	19.70	23.90	11.82	14.34	118.20	143.40
T_6	1.83	2.18	18.30	21.80	10.95	13.08	109.80	130.80
T_7	1.69	1.94	16.90	19.40	10.14	11.64	101.40	116.40
T_8	1.61	1.80	16.10	18.00	9.66	10.80	96.60	108.00
T_9	1.51	1.74	15.10	17.40	9.06	10.44	90.60	104.40
T_{10}	1.38	1.67	13.80	16.70	8.34	10.02	83.40	100.20
T_{11}	1.30	1.52	13.00	15.20	7.80	9.12	78.00	91.20
T_{12}	1.25	1.46	12.50	14.60	7.56	8.76	75.60	87.60
T_{13}	0.874	1.17	8.70	11.70	5.24	7.20	52.40	70.20
T_{14}	0.925	1.25	9.20	12.50	5.55	7.50	55.50	75.00
T_{15}	0.731	1.07	7.30	10.70	4.38	6.06	43.80	60.60
S.E.±	0.10	0.14	0.23	0.35	0.39	0.19	1.20	1.02
C.D. (P=0.05)	0.31	0.40	0.67	1.02	1.15	1.44	3.50	2.97
CV%	14.62	15.56	3.13	3.90	8.87	9.17	2.69	1.88

DAT – Days after transplanting

T_1- Pruning to 2 branches per plant + NAA 10 ppm, T_2- Pruning to 2 branches per plant + NAA 25 ppm, T_3- Pruning to 2 branches per plant + GA 10 ppm, T_4 - Pruning to 2 branches per plant + GA 25 ppm, T_5 - Pruning to 4 branches per plant + NAA 10 ppm, T_6 - Pruning to 4 branches per plant + NAA 25 ppm, T_7 - Pruning to 4 branches per plant + GA 10 ppm, T_8 - Pruning to 4 branches per plant + GA 25 ppm, T_9 - Pruning control + NAA 10 ppm, T_{10} - Pruning control + NAA 25 ppm, T_{11} - Pruning control + GA 10 ppm, T_{12} - Pruning control + GA 25 ppm, T_{13} - Growth regulator control + Pruning to 2 branches per plant, T_{14}- Growth regulator control + Pruning to 4 branches per plant, T_{15} - Control

is best to attain early flowering, fruit set and maximum yield in coloured capsicum cv. OROBELLE.

Authors' affiliations

R. KRISHNA MANOHAR, Division of Horticulture, University of Agricultural Sciences, G.K.V.K., BANGALORE (KARNATAKA) INDIA

REFERENCES

Anonymous (1997). Statistical data on Horticultural Crops in Karnataka. Government of Karnataka, Department of Horticulture, Lalbaugh, Bangalore, pp: 8-13

Chandra, R., Murthym, P.S.S. and Murthy, M.S. (1976). Effect of NAA (Planofix) on yield of chilies (*Capsicum annuum* L.). *Cur. Res.,* **5** (11): 196-197.

Chandramony, D. and George, M.M. (1976). Effect of planofix foliar spraying on some varieties of Capsicum. *Agri. Res. J., Kerala,* **14** (2): 196-197.

Nimje, P.M., Wajnan, O.D. and Shyran, M. (1990). Greenhouse technology for vegetable production. *Proceedings of XI Internationals Congress on the use of Plastic in Agriculture,* pp: 83-90.

Onis, A., Lopez, A. and Gomez, P. (2001). Effect of pruning to two and four branches on bell peppers production in a non-heated greenhouse. *Revista de-la. Facultad-de-Agronomia-Universidad-de-Buenos-Aries,* **21** (1) : 5-11.

Sharma, J.P., Thikekar, D.G. and Singh, I.J. (1980). Response of chilli to planofix sprays. *J. Agric. Sci., Res., Balwant Vidyapeeth,* **19** (1): 36-41

Shoemaker, J.S. and Tesky, B.K.E. (1995). *Practical Horticulture*, John Wiley and Ions. Inc., New York.

Yamgar, V.G. and Desai, U.T. (1987). Effect of NAA on flowering, flower and fruit drop and fruit set in chilli. *J. Maharastra Agric. Univ.,* **12** (1): 34-38.

****