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RESEARCH PAPER

Influence of plant spacing, training and fertigation on growth, yield and quality of capsicum under naturally ventilated polyhouse

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Abstract : Capsicum hybrid Mekong was grown under naturally ventilated polyhouse during summer season of 2012 at Vegetable Research Farm, Department of Vegetable Science and Floriculture, CSKHPKV Palampur, Himachal Pradesh. Planting was done in two rows on 0.9 m wide bed leaving 60 cm path between two beds following the spacing of 60 cm × 30 cm (S_1) and 45 cm × 30 cm (S_2), with double (T_1), three (T_2) and four (T_3) stems and fertilized (F_1) twice a week and (F_2) thrice a week. The data were analyzed statistically following Factorial Randomized Block Design. The result revealed that the plant height, fruit weight, fruit length, fruit breadth, pericarp thickness were significantly more in $S_1T_1F_2$ treatment. The number of fruits per plant, fruit yield per plant, yield/m^2 and benefit cost ratio was significantly superior in $S_1T_3F_2$ treatment. While there was no significant effect of spacing, training and fertigation levels on days to 50 per cent flowering, days to first harvest, harvest duration and shelf life at room temperature.

Key Words : Spacing, Training, Fertigation, Quality growth

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INTRODUCTION

Basically capsicum is a cool season tropical crop and lacks adaptability to varied environmental conditions (Yoon *et al*., 1989). Despite its economic importance, growers are not in a position to produce good quality capsicum with high productivity due to various biotic (pest and diseases), abiotic (rainfall, temperature, relative humidity and light intensity) and crop factors (flower and fruit drop). Due to erratic behaviour of weather, the crops grown in open field are often exposed to fluctuating levels of temperature, humidity, wind flow etc. which ultimately affect the crop productivity adversely Ochigbo and Harris (1989). Besides this, limited availability of land for cultivation hampers the vegetable production. Hence, to obtain a good quality produce and production during off season, there is a need to cultivate capsicum under protected condition such as green houses or polyhouses. Pruning the plants to two stems, three stem or four stems will not only facilitate easy training operation, but also

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permit closer planting, early ripening of fruits and get higher yields of larger sized fruits. Proper fertigation dose is also very important for long harvest duration and high yields. Hence, the study was initiated to find out suitable spacing, fertigation levels and effect of training in capsicum under polyhouse conditions.

MATERIAL AND METHODS

The experiment was conducted under polyhouse conditions at Vegetable Research Farm, Department of Vegetable Science and Floriculture, CSKHPKV Palampur, Himachal Pradesh during the period 2012. Healthy seedlings of hybrid Mekong were transplanted in Factorial Randomized Block Design with three replications. The plot size was kept 1.9 m × 0.9 m, two plant spacing *i.e.* 60 × 30 cm (S_1) and 45 × 30 cm (S_2), three training systems *i.e.* double stem (T_1), three stem (T_2) and four stem (T_3) and two fertigation levels *i.e.* (F_1) fertigation twice a week NPK (19:19:19) @ 2g/m^2 and (F_2) fertigation thrice a week @ 2g NPK (19:19:19)/ m^2) were tried. Plants were trained along the plastic thread tide to galvanized iron wire stretched over head along the bed. The observations were recorded on various vegetative, quality, yield and yield contributing parameters.

RESULTS AND DISCUSSION

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

Vegetative characters:

Among the vegetative characters (Table 1) data were recorded on plant height, days to 50 per cent flowering, days to first harvest and harvest duration. The plant height was significantly higher (198.4 cm) in $S_1T_1F_2$ (60 cm×30 cm, double stem and fertigation thrice a week). These results are in accordance with the findings of Anez and Tavira (1996); Aliyu and Yusuf (1991) and Shabnam *et al.* (2004). It may be due to the fact that the plants at closer spacing received less space to expand and thereby leading to reduction in height and vice-a-versa in case of wider spacing, while pruning of side branches causing flow of nutrients to the axillary branches might have reduced which in turn leads to flow to the apical tissues leading to elongation of stem and the fertilizers use to be the main driving force behind plant life processes which

Table 1: Effect of training, plant spacing and fertigation levels on vegetative characters of capsicum under polyhouse conditions

	Days to 50 % flowering									Days to first harvest									Plant height (cm)									Harvest duration (days)								
	S_1			S_2			S_1			S_2			S_1			S_2			S_1			S_2			S_1			S_2							
	T_1	T_2	T_3	T_1	T_2	T_3	T_1	T_2	T_3	T_1	T_2	T_3	T_1	T_2	T_3	T_1	T_2	T_3	T_1	T_2	T_3	T_1	T_2	T_3	T_1	T_2	T_3	T_1	T_2	T_3						
F_1	40.3	41.3	40.6	40.6	40.3	41.0	72.6	75.6	72.3	74.0	72.0	71.6	170.0	146.2	124.0	156.6	143.3	121.0	151	152.6	151	154.0	152	151.3												
F_2	40.6	40.0	40.3	42.3	40.3	41.0	71.3	72.6	72.0	71.6	72.5	73.0	198.4	177.0	158.8	188.27	164.4	135.4	151	153.3	151	150.6	151	152.6												
C.D. (P=0.05)			NS						NS						4.56						NS														

NS = Non-significant

Table 2: Effect of training, plant spacing and fertigation levels on quality characters of capsicum under polyhouse conditions

	Pericarp thickness (cm)									Shelf-life at room temperature on weight loss basis								
	S_1			S_2			S_1			S_2								
	T_1	T_2	T_3	T_1	T_2	T_3	T_1	T_2	T_3	T_1	T_2	T_3						
F_1	0.79	0.74	0.70	0.77	0.71	0.68	16.00	15.67	14.67	16.00	15.67	15.33						
F_2	0.90	0.79	0.75	0.82	0.78	0.70	15.33	15.00	14.33	13.67	17.00	14.67						
C.D. (P=0.05)				0.02					NS									

NS = Non-significant

lead to enhanced vegetative growth. Interaction between (S×T×F) had non-significant effects on days to 50 per cent flowering, number of days to first harvest and harvest duration.

Quality characters:

Pericarp thickness and shelf-life at room temperature were recorded under quality characters. There was no significant effect of spacing, training and fertigation on shelf-life of capsicum at room temperature, but in case of pericarp thickness significantly higher pericarp thickness (0.9 cm) was recorded in treatment combination (S_1 = 60 cm×30 cm, T_1 = Two stem and F_2 = Fertigation thrice a week @ 2g NPK (19:19:19)/m^2) $S_1T_1F_2$ (Table 2). This may be due to less competition for the nutrients on the two stem as compared to three or four stems. This result is in conformity with the findings of Sanchez *et al.* (1993) and Michelik and Wierzbicka (2001).

Yield and yield contributing characters:

Among these characters data were recorded on fruit weight, fruit length, fruit breadth, number of fruits per plant, yield per plant and yield per meter square (Table 3). All the characters were significantly influenced by spacing, training and fertigation levels. Treatment combination $S_1T_3F_2$ (S_1 = 60 cm×30 cm, T_3 = Four stem and F_2 = Fertigation thrice a week @ 2g NPK (19:19:19)/m^2) resulted into maximum number of fruits per plant (23.6) (AnChulg *et al.*, 2000 and Onis *et al.*, 2001) and yield per plant (1.9 kg.). Similar results were also reported by Onis *et al.* (2001); Lee *et al.* (2006); Mishrinky and Alphonse (1994) and Maya *et al.* (1997), while treatment combination $S_1T_1F_2$ (S_1 = 60 cm×30 cm, T_1 = Two stem and F_2 = Fertigation thrice a week @ 2g NPK (19:19:19)/m^2) produced significantly higher fruit weight (101.1 g) (Lee and Liao, 2007 and Dobromilska, 2000 and Jan *et al.*, 2006) and fruit length (8.1 cm). Similar results in capsicum have also been reported by Maya *et al.* (1997) and Gare *et al.* (2000).

Economics:

Data presented in Table 4 indicated that maximum net return (Rs. 27677.80) and B:C ratio (1.59) were recorded in treatment combination $S_1T_3F_2$ (S_1 = 60 cm × 30 cm, T_3 = Four stems and F_2 = Fertigation thrice a week @ 2g NPK (19:19:19)/m^2).These results corroborate the findings of Ramakrishna and Palled

Table 3 : Effect of training, plant spacing and fertigation levels on yield and yield contributing characters of capsicum under polyhouse conditions

	Number of fruits per plant						Fruit weight (g)						Fruit length (cm)						Yield per plant (kg)					
	S_1			S_2			S_1			S_2			S_1			S_2			S_1			S_2		
	T_1	T_2	T_3	T_1	T_2	T_3	T_1	T_2	T_3	T_1	T_2	T_3	T_1	T_2	T_3	T_1	T_2	T_3	T_1	T_2	T_3	T_1	T_2	T_3
F_1	15.0	15.6	19.3	14.6	15.6	17.3	76.0	70.5	63.9	69.3	74.1	61.5	7.4	7.1	6.9	7.2	6.5	6.6	1.2	1.3	1.4	1.1	1.3	1.3
F_2	18.3	17.3	23.6	15.0	18.0	23.3	101.1	94.2	87.2	95.7	90.0	76.0	8.1	7.5	6.9	7.5	7.2	6.8	1.7	1.5	1.9	1.4	1.5	1.7
C.D. (P=0.05)			0.90						3.13						0.17						0.019			

Table 4: Effect of training, plant spacing and fertigation levels on net return and B:C ratio on capsicum under polyhouse conditions

	Net return (Rs.)									B: C ratio					
	S_1			S_2			S_1			S_2					
	T_1	T_2	T_3	T_1	T_2	T_3	T_1	T_2	T_3	T_1	T_2	T_3	T_1	T_2	T_3
F_1	11478.20	14762.60	16976.00	9717.00	13049.00	14564.27	0.68	0.87	1.00	0.57	0.77	0.86			
F_2	23617.52	19474.73	27677.80	15159.00	18974.93	23489.00	1.35	1.12	1.59	0.87	1.09	1.35			

(2005) who recorded higher net returns and B: C ratio with 60 cm row spacing and higher dose of fertilizers.

REFERENCES

Aliyu, L. and Yusuf, Y. (1991). Response of two chilli pepper (*Capsicum fruitscens*) varieties to intra row spacing and nitrogen levels. *Capsicum Newsletter,* **10**: 43-44.

AnChulg, Geon, Kim, Yeong, Bong Jeong and Byong Ryong (2000). Effect of shoot training method on quality and yield of 'Sinsakigake-2' and 'Shishito' peppers. *Korean J. Hort. Sci. & Technol.,* **18** (4) : 503-507.

Anez, B. and Tavira, E. (1996). Growth and yield of capsicum in response to different planting distances and nitrogen rates. *Revise-de-Ca=Facltad-de-Agromomia-Universidad-del-Zulia,* **10** (1):1-21.

Dobromilska, R. (2000). The effect of the planting method and plant spacing on the growth, yield and biological value of sweet peeper cv. MAYATA F1. *Annales Universitatis Mariae Curie Skodowska Sectio EEE, Horticultura,* **8** : 333-339.

Gare, B.N., More, S.M., Japhav, M.G. and Burli, A.V. (2000). Effect of spacing and fertilizer on yield of rainfed chilli in sub montane zone of Maharashtra. *J. Maharashtra Agric. Univ*., **25** (3) : 270-271.

Jan, N.E., Khan, I.A., Khan, N.A. and Sher, A. (2006). Growth and yield of tomato as affected by different doses of nitrogen and phosphorus in light textured soil of Juglote, Northern Areas of Pakistan. *Sarhad J. Agric.,* **22**(1): 93-97.

Lee, Ahchiou and Liao, Fangshin (2007). Effects of organic substrates, training systems and plant density on yield of sweet pepper grown in basket culture under plastic. Acta Horticulturae, **761** : 533-537.

Lee, SuYeon, Sim, SangYeon, Lee, SangWoo, Lee, HaeKil and Lim, Jae Wook (2006). Growth and fruit characteristics as affected by different planting distances among plant types in pepper (*Capsicum annuum* L.) for pickles. *Korean J. Hort.Sci. & Technol.,* **24**: 162-167.

Maya, P., Natarajan, S. and Thamburaj, S. (1997). Flowering, fruit characters and quality as influenced by spacing and N and P in sweet pepper cv. CALIFORNIA WONDER. *South Indian Hort.,* **45**(3&4) : 125-127.

Michelik and Wierzbicka, B. (2001). Effect of plant training way on productivity and quality of sweet paprika grown in a high unheated plastic tunnel. *Sodininkyste ir Darzininkyste.* **20** (3-2): 122-131.

Mishrinky, J.F. and Alphonse, M. (1994). Effect of nitrogen and plant spacing on growth, yield and fruit mineral composition of pepper (*Capsicum annuum* L.). *Bull. Facul. Agric., Univ. Cairo,* **45**(2): 413-431.

Ochigbu, A.A. and Harris, G.P. (1989). Effect of film plastic cover on the growth and yield of bush tomato grown in a bed system. *J. Hort. Sci.,* **64**(1): 300-302.

Onis, A., Lopez, Camelo 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 Facultey de Agrnomia Universidad de Buenos Aires,* **21**(1): 5-11.

Ramakrishna, T. and Palled, Y.B. (2005). Effect of plant geometry and fertilizer levels on growth and yield of chilli. *Karnataka J. Agric. Sci.,* **18**(4): 892-895.

Sanchez, V.M., Sundstroml, F.J. and Lang, N.S. (1993). Plant size influences bell pepper seed quality and yield. *Hort. Sci.,* **28**(8): 809-811.

Shabnam, A., Sher, M. and Hummayun, K. (2004). Effect of row spacings and cultivars on the yield and yield components of chillies. *Sarhad J. Agric.,* **20** (1): 16-20.

Yoon, J.Y., Green, S.K., Tschang, A.T., Tsou, S.C.S. and Changa, L.C. (1989). Pepper improvement for tropicsproblems and the AVRDC approach in tomato and pepper production in the tropics. International Symposium on Integrated Management Practices, 86-98pp.