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Short communication

Response of capsicum to different plant density under polyhouse and open conditions

S. Brahma*, D.B. Phookan, M. Kachari and T.K. Hazarika*****
Department of Horticulture, Assam Agricultural University, Jorhat 785 013

ABSTRACT

A field experiment was conducted using five treatments, *viz.*, T_1= 30 cm × 30 cm, T_2= 40 cm × 30 cm, T_3 = 45 cm × 30 cm, T_4 = 40 cm × 40 cm and T_5 = 45 cm × 45 cm in randomized block design with four replications under polyhouse and open conditions. One-month-old seedlings of California Wonder were transplanted at the above spacings. Treatment comprising spacing of 45 cm × 30 cm was significantly superior than other treatments with regard to plant height, number of branches, plant spread and leaf area under polyhouse and open conditions respectively. There was significantly higher yield gain under low cost naturally ventilated polyhouse as compared to open conditions

Key words: Capsicum, fruit quality, growing condition, planting density, yield.

Capsicum (*Capsicum annum* var. *grossum*) also referred to as sweet or bell pepper is one of the highly priced-nutritious vegetables having great market potential in the domestic as well as export market. As it is a high value vegetable, its cultivation under cost effective greenhouse has tremendous potential. In greenhouse production plant density is very important for optimization of plant spacing per unit area. Plant density can have a pronounced influence on plant development, growth and marketable yield of many vegetable crops (Stoffella and Bryan, 5). Hence, to optimize density of planting for getting highest productivity, the present study was undertaken to 1-see the effects of different plant density on growth, yield (561.16 and 541.67 g/plant) and seed production of capsicum under polyhouse and open conditions.

A field experiment was conducted at the Experimental Farm, Department of Horticulture, Assam Agricultural University, Jorhat during *Rabi* season under both polyhouse and open conditions. The soil of the experimental field is sandy loam in texture and acidic in reaction. Five treatments, *viz.*, T_1= 30 cm × 30 cm, T_2= 40 cm × 30 cm, T_3 = 45 cm × 30 cm, T_4 = 40 cm × 40 cm and T_5 = 45 cm × 45 cm were tested in randomized block design with four replications. One-month-old seedlings of California Wonder were transplanted at the spacing mentioned above inside polyhouse and open conditions.

Observations on different growth, yield and seed characters were tested from five randomly sampled plants from each treatment. In general, the growth and productivity of capsicum grown inside polyhouse were significantly superior over plants grown in open condition. All the vegetative characters generally increased linearly in response to decreasing plant density (Table 1). Among the various spacing levels tried, performance of capsicum crop planted at a spacing of 45 cm × 30 cm was significantly superior than others with regard to plant height, number of branches, plant spread and leaf area under polyhouse and open conditions respectively. Inconsistent findings were also reported by Anon (1). Increase in vegetative characters at 45 cm × 30 cm spacing might be due lesser competition and better absorption of nutrients compared to other plant density.

Days to 50 per cent flowering and fruiting were also significantly influenced by plant density (Table 1). Significantly lowest days to 50 per cent flowering and fruiting were observed in T_3 (45 cm × 30 cm) with a plant density of 7 plants per m^2 under polyhouse and open condition respectively.

Different levels of spacing also significantly influenced the yield attributing parameters (Table 2). As regards productivity, providing a plant spacing of 45 cm × 30 cm was found to be significantly superior with regard to fruits per plant (10.63 and 9.87), average fruit weight (52.79 and 56.02 g) and yield per plant (561.16 and 541.67 g) under polyhouse and open conditions respectively over all other spacing which is closely followed by 45 cm × 45 cm spacing. This can be attributed to better availability of nutrients and sunlight at wider spacing. These results corroborate the earlier findings of Kishore *et al*. (5) in cucumber. Supportive findings were also reported by Singhal *et al.* (7) in broccoli. However, the highest yield per

*Corresponding author's present address: KVK, Assam Agricultural University, Kokrajhar 783360, E-mail: brahma.sanchita@gmail.com
**KVK, Assam Agricultural University, Dhemaji
***Deptt. of Horticulture, Medicinal and Aromatic Plants, Mizoram University, Aizawl

Table 1. Effect of plant spacing on vegetative characters of capsicum under polyhouse and open conditions.

Treatment	Plant height (cm)		No. of branches		Plant spread (cm)		Leaf area (cm^2)		50% flowering (days)		50% fruiting (days)	
	Polyhouse	Open	Polyhouse	Open	Polyhouse	Open	Polyhouse	Open	Polyhouse	Open	Polyhouse	Open
T_1-30 cm × 30 cm	55.53	51.61	6.10	4.80	29.61	31.13	36.00	33.71	58.87	57.53	68.47	65.00
T_2-40 cm × 30 cm	62.60	53.11	6.27	5.47	31.58	34.40	41.20	37.94	57.90	58.27	68.40	65.13
T_3-45 cm × 30 cm	79.60	56.66	7.53	6.43	45.65	39.34	60.44	56.81	51.44	52.40	63.53	61.33
T_4-40 cm × 40 cm	73.58	53.27	6.97	5.80	35.42	33.40	50.16	43.46	56.60	57.00	66.00	64.60
T_5-45 cm × 45 cm	76.20	56.05	7.30	6.10	41.43	34.58	53.45	48.22	54.17	55.40	65.40	65.67
CD at 0.05%	1.78	1.35	0.23	0.28	2.39	1.09	1.33	0.88	1.48	0.81	0.88	2.30

Table 2. Effect of plant spacing on yield attributing and seed characters of capsicum under polyhouse and open conditions.

Treatment	Fruits/plant		Av. fruit wt. (g)		Fruit yield (g/plant)		Seed yield (g/plant)		Fruit yield (kg/m^2)		1000-seed weight (g)	
	Polyhouse	Open	Polyhouse	Open	Polyhouse	Open	Polyhouse	Open	Polyhouse	Open	Polyhouse	Open
T_1-30 cm × 30 cm	8.07	5.87	44.34	44.02	397.66	258.43	3.50	2.35	4.36	3.79	5.90	5.80
T_2-40 cm × 30 cm	9.33	7.20	46.96	51.02	437.65	367.24	6.51	4.76	3.50	2.94	5.97	5.91
T_3-45 cm × 30 cm	10.63	9.87	52.79	54.88	561.16	541.67	12.16	10.89	3.93	2.89	6.00	5.93
T_4-40 cm × 40 cm	9.57	8.50	50.42	50.38	482.09	428.21	8.15	6.75	2.89	2.65	6.20	5.99
T_5-45 cm × 45 cm	10.40	9.47	52.41	54.02	544.99	530.47	13.81	11.52	2.73	2.57	6.30	6.00
CD at 0.05%	0.47	0.38	0.80	0.83	16.93	23.17	0.60	0.36	0.15	0.15	0.25	0.20

m^2 (4.36 and 3.79 kg) were recorded by the highest density planting with a spacing of 30 cm × 30 cm, which is significantly superior over all other spacing level. Spectacular increase in total yield per m^2 under closer spacing of 30 cm × 30 cm is ascribed to higher number of plants producing several fruits, thereby substantially enhancing the yield. Increase in total yield per m^2 with increase in plant density in capsicum was also reported by Dasgan and Abak (3). Increase in per plant yield but decrease in production per unit area in peppers with wide within-row plant spacing were also reported in greenhouse by Cebula (2) and in open field condition by Gaye *et al*. (4). Similar observations on increased yield with closer row spacing have also been reported by Singhal *et al.* (7) in broccoli, and Sharma (6) in strawberry. Significant variations were observed in respect of seed yield per plant and thousand seed weight. Among the various levels of spacing tried, widest spacing (45 cm × 45 cm) recorded the highest seed yield per plant and thousand seed weight under polyhouse and open conditions respectively, which is closely followed by planting density of 45 cm × 30 cm but significantly superior than 30 cm × 30 cm spacing.

Thus, it can be concluded that maintaining a plant density of 7 plants per m^2 by providing a plant spacing of 30 cm × 30 cm is ideal for getting higher fruit and seed yield but 45 cm × 30 cm was best for mean fruit weight under low cost naturally ventilated polyhouse as compared to open condition for under the agro-climatic conditions of Jorhat, Assam.

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