



## RESEARCH PAPER

# Effect of plant density on yield and quality of different cultivars of sweet pepper

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**Abstract :** An experiment was conducted on effect of plant density on yield and quality of different cultivars of sweet pepper at Department of Horticulture, Sam Higginbottom Institute of Agriculture, Technology and Sciences, Allahabad during the year 2009-2010. The experiment was laid out in 3×5 Factorial Randomized Block Design having 15 treatments and 3 replications. The treatment T<sub>8</sub> (variety Lucky star-165 with spacing 60×45cm) was found to be superior and statically significant over other treatment combinations, which recorded highest plant height (34.50cm), plant spread (60.66cm), number of leaves/plant (137.00), number branches/plant (9.57), time of flower bud initiation (52.41 day after transplanting), number of flower buds/plant (74.66), number of flowers/plant (51.20), number of fruits/plant (4.25), fruit length (4.91 cm), fruit yield (916.33g/plant), fruit yield (33.93t/ha), vitamin-C (130mg/100g) and T.S.S (17.26 %).

**Key Words :** Sweet pepper, Plant density, Yield, Quality

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## INTRODUCTION

Sweet pepper is one of the highly remunerative vegetables cultivated in most parts of the world especially in temperate regions of Central and South America and European countries. Capsicum (*Capsicum annum* var. *grossum*) is native of tropical South America. It is also growing in tropical and subtropical regions of Asian continent. The total area under pepper cultivation in India is 1,73,426 hectare with production of 48,982 tonnes and productivity of 0.30 MT (NHB, 2008). In India it is cultivated commercially in Tamil Nadu, Karnataka, Himachal Pradesh and some part of Uttar Pradesh. In northern India it is commonly known as 'Simla Mirch'. The sweet pepper is a high value crop and rich in vitamins, particularly provitamin A, vitamin B, vitamin C and minerals such as Ca, P, K and Fe (Malik *et al.*, 2011).

The present trend of expansion in vegetable in India for export and processing will result in a growth in capsicum production, but an improvement of cultural practices to boost production for domestic consumption, processing and export is needed. The plant density significantly influence the period of emergence of fruit buds. Earlier emergence and opening occur in close planting. The length of fruits and size of fruits also varies with the change in planting density of different cultivars. The yield of any crop is primarily a function of leaf area, the leaf area in turn is a function of nutrients status of plant. Leaf area can be increased by increasing the number of plant or increasing the leaf area per plant. It has been argued that the wider spacing in fertile land is to be preferred, since each individual plant is likely to get more nourishment and hence, abundant and better growth is achieved. Hence, the present study was proposed with the objective of finding the

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optimum spacing and suitable varieties for capsicum under Allahabad conditions.

## MATERIAL AND METHODS

The details of the materials used and experimental methods followed during the course of the present investigation are narrated briefly in this chapter. The present investigation was carried out at Experimental Research Farm, Department of Horticulture, Sam Higginbottom Institute of Agriculture, Technology and Sciences Allahabad, during the year 2009-2010 to study the effect of plant density on growth, yield and quality of different cultivars of sweet pepper under Allahabad conditions. Five cultivars (Doctor, Ganga, Lucky star 165, Karan and PS-22) of sweet pepper were planted at the three spacing (45×30 cm, 60×45 cm, 75×60 cm). The experiment was laid out in 3×5 Factorial Randomized Block Design with 15 treatments and 3 replications. The fifteen treatments consisted of T<sub>1</sub>:V<sub>1</sub>S<sub>1</sub> (Doctor + 45×30 cm), T<sub>2</sub>:V<sub>2</sub>S<sub>1</sub> (Ganga + 45×30 cm), T<sub>3</sub>:V<sub>3</sub>S<sub>1</sub> (Lucky star 165 + 45×30 cm), T<sub>4</sub>:V<sub>4</sub>S<sub>1</sub> (PS-22 + 45×30 cm), T<sub>5</sub>:V<sub>5</sub>S<sub>1</sub> (Karan-25 + 45×30 cm), T<sub>6</sub>:V<sub>1</sub>S<sub>2</sub> (Doctor + 60×45 cm), T<sub>7</sub>:V<sub>2</sub>S<sub>2</sub> (Ganga + 60×45 cm), T<sub>8</sub>:V<sub>3</sub>S<sub>2</sub> (Lucky star 165 + 60×45 cm), T<sub>9</sub>:V<sub>4</sub>S<sub>2</sub> (PS-22 + 60×45 cm), T<sub>10</sub>:V<sub>5</sub>S<sub>2</sub> (Karan-25 + 60×45 cm), T<sub>11</sub>:V<sub>1</sub>S<sub>3</sub> (Doctor + 75×60 cm), T<sub>12</sub>:V<sub>2</sub>S<sub>3</sub> (Ganga + 75×60 cm), T<sub>13</sub>:V<sub>3</sub>S<sub>3</sub> (Lucky star 165 + 75×60 cm), T<sub>14</sub>:V<sub>4</sub>S<sub>3</sub> (PS-22 + 75×60 cm) and T<sub>15</sub>:V<sub>5</sub>S<sub>3</sub> (Karan-25 + 75×60 cm). In order to prevent the occurrence of pathological disease two sprayings with diathane M-45 @ 2.5 kg/ha were done and for protecting against insect pest metasystox-25EC @ 1.0-1.5 per cent was sprayed. Observation were recorded on plant height (cm), plant spread (cm), number of leaves/plant, number branches/plant, time of flower bud

initiation (day after transplanting), number of flower buds/plant, number of flowers/plant, number of fruits/plant, fruit length (cm), fruit yield (g/plant), fruit yield (t/ha), vitamin-C (mg/100g) and T.S.S (°Brix).

## RESULTS AND DISCUSSION

The findings of the present study as well as relevant discussion have been presented under following heads :

### Yield parameters :

#### Number of fruits per plant :

Distinctive divergences with respect to number of fruit/plant were observed with different treatment at 165 DAT at successive vegetative stage. The data presented in the Table 1 indicated that there was significant alteration in the number of fruit per plant at all successive stage of reproduction. The maximum number of fruit per plant (4.25) was observed with T<sub>8</sub> (Lucky star-165 with 60×45cm) followed by 4.08 in T<sub>13</sub> (Lucky star-165 with 75×60cm). However, minimum number of fruits per plant (0.06) were recorded with T<sub>1</sub> (Doctor+45×30). Similar findings were also reported by Ahmed (1984), Shrivastava (1996) and Gare *et al.* (2009).

#### Average fruit yield per plant (g) :

Data on the fruit yield as influenced by different spacing and varieties are presented in Table 1. It is evident from the table that maximum fruit yield per plant (920.0 g) was observed with T<sub>13</sub> (variety Lucky star-165 with spacing 75×60 cm) which was followed by 916.33g in T<sub>8</sub> (variety Lucky star-165 with spacing 60×45cm) and it was minimum (114.0 g) in T<sub>1</sub> (Doctor+45×30). Similar results were also reported by

**Table 1 : Effect of different spacing and cultivars on yield parameters of sweet pepper**

Treatment combinations	Number of fruits per plant	Average fruit yield per plant (g)	Average fruit yield per hectare (tonnes)	Average fresh fruit weight (g)
T <sub>1</sub> (Doctor+45×30)	0.06	114.0	8.63	20.00
T <sub>2</sub> (Ganga+45×30)	2.16	377.20	27.93	37.66
T <sub>3</sub> (Lucky star 165+45×30)	2.75	442.56	32.78	42.66
T <sub>4</sub> (PS-22+45×30)	0.50	150.20	11.12	23.00
T <sub>5</sub> (Karan-25+45×30)	0.50	159.13	11.78	25.33
T <sub>6</sub> (Doctor+60×45)	0.25	237.00	8.77	22.00
T <sub>7</sub> (Ganga+60×45)	3.75	801.16	29.66	41.33
T <sub>8</sub> (Lucky star 165+60×45)	4.25	916.33	33.93	48.00
T <sub>9</sub> (PS-22+60×45)	0.75	304.66	11.28	26.33
T <sub>10</sub> (Karan-25+60×45)	0.75	344.66	12.76	27.33
T <sub>11</sub> (Doctor+75×60)	0.25	234.60	5.21	23.00
T <sub>12</sub> (Ganga+75×60)	3.25	809.33	17.97	44.00
T <sub>13</sub> (Lucky star 165+75×60)	4.08	920.00	20.44	52.33
T <sub>14</sub> (PS-22+75×60)	0.58	314.25	6.97	31.00
T <sub>15</sub> (Karan-25+75×60)	0.50	343.16	7.62	33.33
C.D. (P=0.05)	0.38	5.42	0.17	0.30

Shrivastava (1996), Maya *et al.* (1999) and Dobromilska (2000).

#### Average fruit yield per ha (tonnes) :

Data on the fruit yield as influenced by different spacing and varieties are presented in Table 1. It is evident from the Table 1 that maximum fruit yield per ha (33.93 tonnes) was observed with T<sub>8</sub> (variety Lucky star-165 with spacing 60×45cm) and was followed by 32.78 tonnes in T<sub>13</sub> (variety Lucky star-165 with spacing 45×30cm). However, minimum fruit yield per ha (8.63 tonnes) was recorded with T<sub>1</sub> (Doctor+45×30). Similar findings were also reported by Shrivastava (1996), Maya *et al.* (1999) and Dobromilska (2000).

#### Average fresh fruit weight (g) :

The data presented in Table 1 indicated significant response of spacing and varieties with respect to fruit weight. Maximum fresh fruit weight (52.33 g) was observed with T<sub>13</sub> (variety Lucky star-165 with spacing 75×60cm) and was followed by (48.00 g) in T<sub>8</sub> (variety Lucky star-165 with spacing 60×45cm). However, minimum fresh fruit weight (20.00 g) was recorded with T<sub>1</sub> (Doctor+45×30). Similar results were also reported by Buckowska and Kossowski (1987) and Saurabh (2009).

#### Fruit diameter (cm) :

Fruit diameter as influenced by different spacing and varieties are presented in Table 2. It is evident from the table that maximum fruit diameter (6.65 cm) was observed with T<sub>13</sub> (variety Lucky star-165 with spacing 75×60cm) and was followed by 4.91 cm in T<sub>8</sub> (variety Lucky star-165 with spacing 60×45cm) and minimum fruit diameter (2.08 cm) was recorded

in T<sub>1</sub> (Doctor+45×30). These results were also reported by Dasgan and Abak (2003) and Saurabh (2009).

#### Quality parameters :

##### Total soluble solid (<sup>o</sup>Brix) :

The total soluble solids (TSS) content of fruit juices was determined with the help of hand refractometer. The relevant data are presented in Table 2. Among the treatments the maximum fresh fruit total soluble solid (17.66 <sup>o</sup>Brix) was observed with T<sub>12</sub> (variety Ganga with spacing 75×60cm) and was followed by (17.46 <sup>o</sup>Brix) in T<sub>13</sub> (variety Lucky star-165 with spacing 75×60cm). However, minimum fresh fruit total soluble solid (16.06 <sup>o</sup>Brix) was observed with T<sub>1</sub> (Doctor+45×30). A similar result was also reported by Buckowska and Kossowski (1987) and Saurabh (2009).

##### Ascorbic acid (mg/100g) :

The relevant data are presented in Table 2. The maximum ascorbic acid (130.25 mg/100g) was observed with T<sub>13</sub> (variety Lucky star-165 with spacing 75×60cm) followed by (130 mg/100g) in T<sub>8</sub> (variety Lucky star-165 with spacing 60×45cm) whereas, minimum amount of ascorbic acid (120.0 mg/100g) was recorded in T<sub>1</sub> (Doctor+45×30). Similar findings were also reported by Buckowska and Kossowski (1987) and Saurabh (2009).

##### Economics of treatments :

The data presented in Table 2 revealed that the highest benefit cost ratio was found in T<sub>8</sub> (1:3.63) and was followed by T<sub>7</sub> (1:3.23), T<sub>13</sub> (1:2.73) whereas minimum benefit cost ratio was found in T<sub>11</sub> (1:0.70). Similar work related to the present work was also done by Cebula (1995); Dasgan and Abak (2003)

**Table 2 : Effect of different spacing and cultivars on yield and quality parameters of sweet pepper**

Treatment combinations	Fruit length (cm)	B : C	Total soluble solids ( <sup>o</sup> Brix)	Ascorbic acid (mg/100g)
T <sub>1</sub> (Doctor+45×30)	2.08	1:1.04	16.06	120.00
T <sub>2</sub> (Ganga+45×30)	3.50	1:2.73	17.06	127.00
T <sub>3</sub> (Lucky star 165+45×30)	4.58	1:3.15	17.13	129.83
T <sub>4</sub> (PS-22+45×30)	2.45	1:1.29	16.33	123.25
T <sub>5</sub> (Karan-25+45×30)	3.01	1:1.36	16.53	123.75
T <sub>6</sub> (Doctor+60×45)	2.36	1:1.12	16.06	120.25
T <sub>7</sub> (Ganga+60×45)	3.58	1:3.23	17.43	127.50
T <sub>8</sub> (Lucky star 165+60×45)	4.91	1:3.63	17.26	130.00
T <sub>9</sub> (PS-22+60×45)	2.71	1:1.40	16.53	123.50
T <sub>10</sub> (Karan-25+60×45)	3.08	1:1.59	16.66	123.75
T <sub>11</sub> (Doctor+75×60)	2.55	1:0.70	16.13	120.25
T <sub>12</sub> (Ganga+75×60)	4.58	1:2.17	17.66	127.50
T <sub>13</sub> (Lucky star 165+75×60)	6.65	1:2.44	17.46	130.25
T <sub>14</sub> (PS-22+75×60)	3.20	1:0.91	16.53	123.50
T <sub>15</sub> (Karan-25+75×60)	3.25	1:1.00	16.80	123.75
C.D. (P=0.05)	0.35	0.49	0.19	0.18

and Jovicich *et al.* (1999).

### Conclusion :

It can be concluded that the treatment T<sub>8</sub> (variety Lucky star 165 with spacing 60×45 cm) was found to be the most suitable for better growth, yield and quality of sweet pepper. Again the treatment T<sub>8</sub> also found economically better with maximum cost benefit ratio (1:3.63) as compared to the other treatments combination.

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