

Short Communication

## Effect of Parental Row Ratio and Foliar Spray of $GA_3$ and Urea on Seed Yield and Quality of Chilli Hybrid, CH-3

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Chilli (*Capsicum annuum* L.) is among the most common vegetable cum spice crops grown in India for domestic consumption as well as for export. The average yield of chilli still remains low (1.07 t/ha) because majority of farmers grow local varieties from self produced seeds. The development of chilli hybrid, CH-3 by Punjab Agricultural University in 2000 A.D. has broadened the prospects of chilli cultivation as this hybrid is high yielding and tolerant to fungal and viral diseases as well as it has greater export potential due to its low capsaicin content. This hybrid utilizes male sterile line (MS-12) as female parent and S2530 as male parent. As the seed parent is male sterile, the hybrid seed yield is very low. In order to enhance its hybrid seed yield, external manipulation to facilitate cross pollination is must. Therefore, the present study was conducted to figure out the optimum parental row ratio and the dose of  $GA_3$  and urea solution for augmenting hybrid seed production and improve the seed quality of chilli hybrid, CH-3.

The experiment was conducted at Vegetable Teaching Farm, Punjab Agricultural University, Ludhiana, during 2003-04. The experiment comprised of 15 treatments i.e. combination of three planting ratios, viz; female:male row ratio PR-I, PR-II and PR-III at 1:1, 2:1 and 3:1 respectively and five different treatments viz;  $T_0$  = control,  $T_1$  =  $GA_3$  10 ppm,  $T_2$  =  $GA_3$  20 ppm,  $T_3$  = urea 1 per cent and  $T_4$  = urea 1.5 per cent. The experiment

was laid out in Split Plot Design with parental row ratio as main plot treatments and foliar spray as sub plot treatments. These treatments were tested in three replications. The seedlings of both the parents in each treatment were transplanted on a rectangular plot of size 7.2 x 2.25 m<sup>2</sup> each. The seed parent (MS-12) was transplanted at the spacing of 22.5 cm and male parent (S-2530) at 45 cm within the row. The experimental field was isolated by the distance of 400 m from the field of other varieties of chilli as well as sweet pepper. The foliar spray as per the treatment of  $GA_3$  and urea was done in the morning on both the parents at 30 days after transplanting and followed by second spray after 10 days. The control plots were sprayed with the equal volume of water. The observation were recorded on days taken for 50 per cent flowering, fruit setting, fruit yield per plant, seed yield per plant, 1000 seed weight, germination per cent, speed of germination and the vigour index.

The days taken for 50 per cent flowering was not significantly influenced by the row ratio in both the parents. However, the foliar treatment has significant influence on this attribute (Table 1). Similarly, both the concentrations of  $GA_3$  were ineffective in altering the days taken for 50 per cent flowering in male as well as female parent. This might be due to the ineffectiveness of  $GA_3$  to induce endogenous gibberellin level at this low dose. Earlier flowering with the foliar spray of

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GA<sub>3</sub> have been reported in okra [1]. Flowering was significantly delayed (2-5 days) with the application of urea in both, seed parent and male parent. Similar effect of urea was reported in cauliflower [2]. The delayed flowering with urea spray might be due to induced vegetative growth, which prolonged vegetative phase. Further, the data suggested that the flowering in male parent was almost two weeks earlier than the female parent, which indicates that the female flowers were not wasted. The planting of male parent can be delayed by two weeks to synchronize flowering.

The fruit set per cent was significantly affected by parental row ratio as well as treatments during July whereas, during August the effect was not significant (Table 1). This might be due to environmental conditions especially high rainfall in August which has adverse effect on pollination

and non-persistent effect of GA<sub>3</sub> and urea. During the early fruiting period, maximum fruit setting (27.3%) was obtained with the row ratio of 1:1 and minimum (18.0%) was recorded with 3:1 ratio, which was at par with the 2:1 row ratio (18.6%). The significant improvement in fruit setting with the narrow row ratio might be due to adequate pollen availability for pollination. Bath [3] reported that in the alternate row, the male and female flowers were in close proximity and bees had more chance of visiting flowers thereby, resulting in better pollination which gives higher fruit set per plant in muskmelon. Among the treatments, GA<sub>3</sub> 10 ppm recorded maximum fruit setting (28.9 %) followed by urea 1 per cent (23.3 %). The significant reduction in fruit setting with the higher dose of GA<sub>3</sub> might be due to low pollen viability [4]. The overall mean fruit set per cent for various treatments (row ratio x foliar spray interaction)

Table 1. Effect of parental row ratio and foliar spray on hybrid seed yield (CH-3), its attributes and quality in chilli

Treatments	Days taken for 50% flowering		Fruit set (%)		Fruit yield/plant(g)	Seed yield (kg ha <sup>-1</sup> )	1000-seed weight(g)	Germination (%)	Speed of Germination	Vigour index
	Male (S-2530)	Female (MS-12)	July 2004	August 2004						
Row ratios (female:male)										
PR-I = 1:1	41.0	53.9	27.3 (31.1)	13.3 (21.1)	48.8	50.8	4.6	76.8 (61.5)	2.5 (9.0)	486.8
PR-II = 2:1	41.4	54.5	18.6 (25.2)	11.3 (17.6)	46.2	60.4	4.9	77.0 (61.6)	2.4 (8.9)	479.9
PR-III = 3:1	41.2	54.5	18.0 (24.4)	12.6 (14.0)	36.9	51.6	4.7	76.6 (61.2)	2.3 (8.7)	473.5
CD (P = 00.05)	NS	NS	3.4	NS	0.7	2.1	NS	NS	NS	NS
Foliar sprays										
T <sub>0</sub> =Control	40.2	52.6	15.5 (22.6)	8.8 (14.0)	38.8	54.6	5.1	71.6 (57.8)	2.0 (8.1)	385.2
T <sub>1</sub> =GA <sub>3</sub> (10ppm)	39.8	53.1	28.8 (32.3)	12.2 (19.0)	43.8	55.6	4.7	78.5 (63.0)	2.2 (8.6)	533.0
T <sub>2</sub> =GA <sub>3</sub> (20ppm)	40.1	52.2	16.6 (23.8)	12.2 (19.0)	49.2	45.0	4.75	80.3 (63.8)	2.7 (9.6)	551.6
T <sub>3</sub> =urea (1%)	43.8	56.5	23.3 (28.3)	11.1 (18.1)	45.9	70.1	4.9	84.6 (66.9)	3.3 (10.5)	605.6
T <sub>4</sub> =urea (1.5%)	42.1	57.1	22.2 (27.6)	8.8 (16.3)	42.4	49.6	4.3	68.1 (55.6)	1.7 (7.2)	324.9
CD (P = 0.05)	1.0	1.0	3.7	NS	0.8	1.42	NS	1.22	0.4	10.7

Figures in parenthesis are the values are sine transformation.

was found to be significant in July (Table 2). The combination of 1:1 row ratio with GA<sub>3</sub> 10 ppm, row ratio of 3:1 with GA<sub>3</sub> 10 ppm and 1:1 row ratio with urea 1 per cent recorded maximum fruit setting (33.3 %) which were at par with the combination of 1:1 row ratio with urea 1.5 per cent (30.0 %).

The parental row ratio and foliar treatment significantly influenced fruit yield per plant as well as seed yield per unit area (Table 1). The maximum fruit yield (48.8 g) per plant was recorded with the row ratio of 1:1, which significantly reduced to 46.2 g and 36.9 g at the row ratio of 2:1 and 3:1 respectively. The increase in fruit yield with the narrow row ratio was due to the increase in fruit setting during the early fruiting period. Singh [5] reported that row ratio of 2:1 recorded maximum seed yield of 60.40 kg ha<sup>-1</sup> in muskmelon.

The increase in seed yield despite less fruit yield per plant with 2:1 row ratio over 1:1 ratio was due to the increase in female plant population per hectare in the former. The maximum seed yield with 2:1 row ratio of female:male parent was previously reported in bell pepper [6]. All the foliar treatments significantly increased fruit yield per plant whereas, only application of urea 1 per cent was effective in increasing seed yield over control. The decrease in pollen viability with the application of GA<sub>3</sub> 20 ppm has been reported in chilli [4] and this could be the probable cause for the reduction in seed yield over control. The reduced seed yield with 1.5 per cent urea might be due to the phytotoxic effect of higher dose of urea [7]. Riley [8] obtained partially or entirely seedless fruits with GA<sub>3</sub> 10-200 ppm in tomato. However, this dose of GA<sub>3</sub> increased total yield of the crop with respect to fruit set and fruit growth. The interaction between row ratio and treatment was significant for fruit yield per plant as well as seed yield (Table 2). The interaction between 1:1 row ratio and GA<sub>3</sub> 20 ppm recorded maximum fruit yield (61.8 g) per plant. While, the maximum seed yield (89.3 kg ha<sup>-1</sup>) was recorded with the planting done at 2:1 female:male row ratio followed by foliar spray of 1 per cent urea.

Seed quality parameters in terms of 1000 seed weight, germination per cent, speed of germination and vigour index revealed interesting results. There

was no significant effect of row ratio on all the above seed quality attributes. However, the foliar treatment of GA<sub>3</sub> and urea has significant influence on all the attributes except 1000 seed weight. The application of both the concentrations of GA<sub>3</sub> as well as urea 1 per cent significantly increased germination per cent, speed of germination and vigour index over control. The enhanced germination and vigour with GA<sub>3</sub> was due to the accelerated growth primarily because of modification of embryonic axis growth and subsequent enhanced seedling development and other quality attributes [9]. The foliar application of urea 1 per cent was the most effective in improving germination as well as vigour. Sharma [10] has obtained significant increase in seed germination per cent with the foliar spray of urea in tomato.

The maximum germination (86.0 %) was observed with the crop grown at 2:1 row ratio followed by foliar spray of 1 per cent urea. Whereas, the combination of 1:1 row ratio and 1.5 per cent urea spray and 2:1 row ratio and 1.5 per cent urea recorded minimum germination (66.0 %). The maximum vigour index (628.3) was observed with the combination of 1:1 row ratio and 1 per cent urea spray, which was at par with the interaction of 2:1 row ratio and 1 per cent urea spray (612.3). The crop planted at 1:1 ratio followed by foliar spray of 1.5 per cent urea recorded minimum vigour index (288.4).

From the study, it can be concluded that maximum hybrid seed of CH-3 with improved quality can be produced by planting at 2:1 row ratio of female : male followed by urea 1 per cent foliar spray at 30 and 40 days after transplanting.

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Table 2. Interaction effect of parental row ratio and foliar spray on hybrid seed yield (CH-3), its attributes and quality in chilli

Treatments	Days taken for 50% flowering		Fruit set (%)		Fruit yield/plant(g)	Seed yield (kg ha <sup>-1</sup> )	1000-seed weight(g)	Germination (%)	Speed of Germi.	Vigour index
	Male (S-2530)	Female (MS-12)	July 2004	August 2004						
PR-I T <sub>0</sub>	40.0	52.0	26.6 (30.9)	16.67 (23.8)	45.1	51.1	5.0	68.0 (55.3)	2.12 (8.3)	374.6
PR-I T <sub>1</sub>	40.0	52.6	33.3 (35.2)	16.6 (23.8)	43.6	53.8	4.4	82.0 (64.8)	2.18 (8.4)	537.1
PR-I T <sub>2</sub>	39.3	52.0	13.3 (35.2)	10.0 (21.1)	61.8	48.3	4.7	84.0 (66.4)	2.8 (9.6)	605.6
PR-I T <sub>3</sub>	43.6	56.6	33.3 (35.2)	13.3 (21.1)	45.2	47.7	5.1	84.0 (66.4)	3.4 (10.7)	628.3
PR-I T <sub>4</sub>	42.3	56.3	30.0 (32.9)	10.0 (18.4)	48.3	53.3	3.6	66.0 (54.3)	1.8 (7.8)	288.4
PR-II T <sub>0</sub>	40.3	53.3	10.0 (18.4)	6.6 (12.2)	40.4	54.3	5.2	72.0 (58.0)	1.9 (8.0)	386.6
PR-II T <sub>1</sub>	40.6	53.0	20.0 (26.5)	6.6 (12.2)	42.6	79.0	4.7	77.3 (61.5)	2.2 (8.6)	501.1
PR-II T <sub>2</sub>	44.6	52.0	16.6 (23.8)	16.6 (23.8)	52.6	42.2	5.2	84.0 (66.4)	2.6 (9.3)	581.2
PR-II T <sub>3</sub>	44.0	56.6	23.3 (28.7)	13.3 (21.1)	53.2	89.3	4.8	86.0 (68.0)	3.4 (10.7)	612.3
PR-II T <sub>4</sub>	41.6	57.6	23.3 (28.7)	10.0 (18.4)	42.4	37.0	4.6	66.0 (54.3)	1.8 (7.7)	318.1
PR-III T <sub>0</sub>	40.3	52.6	10.0 (18.4)	3.3 (6.1)	31.0	58.6	5.0	75.0 (60.0)	1.9 (7.9)	394.5
PR-III T <sub>1</sub>	39.0	53.6	33.3 (35.2)	13.3 (21.1)	45.1	33.8	4.9	79.0 (62.6)	2.4 (8.9)	560.9
PR-III T <sub>2</sub>	40.3	52.6	20.0 (26.5)	10.0 (18.4)	32.3	44.4	4.2	73.0 (58.7)	2.8 (9.7)	467.9
PR-III T <sub>3</sub>	44.0	56.3	13.3 (21.1)	6.6 (12.2)	39.4	73.3	4.7	84.0 (66.4)	3.0 (10.1)	576.2
PR-III T <sub>4</sub>	42.3	57.3	13.3 (21.1)	6.6 (12.2)	36.6	47.7	4.7	72.3 (58.3)	1.5 (6.9)	368.16
CD (P = 0.05)	NS	NS	6.4	NS	1.4	2.4	NS	2.1	NS	18.5

Figures in parenthesis are the values after arc sine transformation.

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