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Fruit and Seed Quality as Influenced by Differential Emasculation Time and Crossing Period in Hybrid Brinjal (*Solanum melongena* L.)

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ABSTRACT The parents of two hybrids Brinjal Hybrid-1 (BH-1) and Brinjal Hybrid-2 (BH-2) of brinjal (*Solanum melongena* L.) i.e. Jamuni Gola (female parent of BH-1), Punjab Neelam (female parent of BH-2) and Punjab Barsati (male parent of both), were subjected to two emasculation times i.e. emasculation time-1 (9.00-11.00 A.M.) and emasculation time-2 (3.00-5.00 P.M.) and six crossing periods in the month of September and October, 2003. Duration of each crossing period was of 10 days. Significant differences were observed between emasculation times and crossing periods in both the crosses. Significantly higher fruit set, fruit weight, quantity of seed per unit weight of fruit, 1000-seed weight, germination per cent and seed vigour were registered in the plants emasculated in the afternoon (3.00-5.00 P.M.) than those emasculated in the morning hours. Maximum fruit setting was observed in crossing period-5 (October, 11-20). For all other characters crossing period-3 (September 21-30) was the best in both the crosses.

Key words: *Solanum melongena*, emasculation time, crossing period, seed quality, hybrid seed

Brinjal (*Solanum melongena* L.), is an important vegetable crop in India. An increasing demand of its varieties/hybrids for different culinary purposes impress upon the need to develop high yielding varieties and hybrids. Though there are hybrids available in brinjal yet there is still a large scope of strengthening the hybrid breeding programme by manipulating emasculations and crossing techniques in view of the expression of large amount of heterosis in some inter-varietal crosses. Also the seed production of these hybrids has not been properly standardized, so the present investigation was conducted to study the effect of emasculation time and crossing period on fruit and seed quality of hybrid brinjal.

MATERIAL AND METHODS

The present study was conducted in Vegetable Research Farm of the Punjab Agricultural University, Ludhiana, during the year 2002-2003. The experimental material consisted of Jamuni Gola (female parent of Brinjal Hybrid-1) and Punjab Neelam (female parent of Brinjal Hybrid-2) and Punjab Barsati (male parent of both hybrids). The crop was raised using recommended agronomic practices. The means of agrometereological data during the months of September and October w.r.t. temperature was (28.7°C, 24.2° C), relative humidity (78, 62) and sunshine hours (8.3, 9), respectively.

Emasculation of flowers from female parent plants of both the hybrids was done twice a day i.e. in morning (ET-1, 9:00-11:00 A.M.) and afternoon (ET-2, 3:00-5:00 P.M.). Healthy, medium to long styled, well developed buds of the female plants were selected for emasculations one day prior to pollination. Punjab Barsati was used as a pollen parent and freshly dehisced anthers were collected for pollination and during different crossing periods, pollen dust was applied on the stigma of the emasculated flower buds during 9:00-

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11:00 A.M. Each Crossing period was of 10 day duration i.e. Crossing period-1, (September, 1-10); Crossing period-2, (September, 11-20); Crossing period-3, (September, 21-30); Crossing period-4, (October 1-10); Crossing period-5, (October, 11-20) and Crossing period-6, (October, 21-30). Thus, twelve treatments were carried out on each female parent of hybrids BH-1 and BH-2 and each treatment was performed on 10 plants of each variety. Before starting emasculation and crossing, rogueing was done by removing all the previously set fruits from all the plants. Crossed fruits were allowed to mature beyond the edible stage when fruit gets harder and change to straw color. Observations with respect to fruit set (%), fruit weight (g), quantity of seed per unit weight of fruit (g), thousand seed weight (g) were recorded. Seed quality was tested in terms of germination (%), seedling length (cm) and seedling dry weight (g) as per ISTA [1].

RESULTS AND DISCUSSION

Differential emasculation times and crossing periods showed significant differences with respect to seed and fruit quality in present investigations. Maximum fruit setting i.e. 93.25 per cent and 93.50 per cent was obtained is emasculation time-2 and crossing period-5 in both the crosses i.e. Jamuni Gola x Punjab Barsati and Punjab Neelam x Punjab Barsati (Table 1). Cross Punjab Neelam x Punjab Barsati (80.07%) had significantly higher fruit set as compared to cross Jamuni Gola x Punjab Barsati (71.30%). The best period was crossing period-5 followed by crossing period-6 in both the crosses. Minimum fruit setting was observed in emasculation time-1 and crossing period-1 in both the crosses. Fruit setting showed increasing trend up to crossing period-5 after that it decreased in both the crosses. Chattopadhyay [2] reported maximum fruit setting in the month of February in emasculation time-1 in these studies. As in the present studies Pathore *et al.* [3] also observed the effect of pollination intervals on fruit set. Crossing periods also differed significantly in both the crosses and emasculation time-2 was significantly better than emasculation time-1. It can be due to effective stigma receptivity during afternoon times [4]. The emasculation times and crossing periods had significant effect on fruit weight of both the crosses. The maximum fruit weight (303 g) was

Table 1. Effect of emasculation time and crossing period on fruit quality attributes in hybrid brinjal

Crossing period	Fruit settinsg (%)						Fruit weight (g)					
	**ET-1		**ET-2		Mean		**ET-1		**ET-2		Mean	
	*A	*B	*A	*B	*A	*B	*A	*B	*A	*B	*A	*B
1.	47.50	54.50	50.25	56.00	48.88	55.25	180	147	238	253	209	200
2.	56.25	72.50	57.50	84.25	56.88	78.38	205	171	249	260	227	216
3.	60.75	78.00	65.75	84.75	63.25	81.88	220	226	303	298	262	262
4.	77.25	86.25	78.50	87.50	77.88	86.88	219	210	271	288	245	249
5.	90.50	89.50	93.25	93.50	91.88	91.50	206	195	264	253	235	224
6.	88.75	84.75	89.25	88.25	89.00	86.50	202	178	217	225	210	202
Mean	70.17	77.58	72.42	82.54	71.30	80.07	205	188	257	263	231	226

CD (5%)	Fruit setting	Fruit weight (g)
Crossing periods	1.72	6.51
Emasculation times	0.99	3.76
Crosses	0.99	3.76
Crossing period x emasculation times	2.43	9.21
Crossing periods x crosses	2.43	N.S.
Emasculation times x crosses	1.41	5.32
Crossing periods x emasculation times x crosses	3.44	13.03

**ET-1 Emasculation time-1; *A: Cross Jamuni Gola x Punjab Barsati;
**ET-2 Emasculation time-2; *B: Cross Punjab Neelam x Punjab Barsati

obtained in emasculation time-2 and crossing period-3 in cross Jamuni Gola x Punjab Barsati. The minimum fruit weight (180 g) was recorded in emasculation time-1 and crossing period-1. Similar results for fruit weight were recorded in cross Punjab Neelam x Punjab Barsati. Significantly higher fruit weight was recorded in both the crosses in emasculation time-2 as compared to emasculation time-1. Similar findings were observed by Jankulovski *et al.* [5] while studying effect of pollination interval on yield and quality of hybrid tomato seed.

In cross Jamuni Gola x Punjab Barsati maximum quantity of seed per unit weight of fruit (0.027 g) was obtained in emasculation time-2 and crossing period-3 (Table 2). The minimum quantity of seed (0.018 g) was recorded in emasculation time-1 and crossing period-1. The cross Punjab Neelam x Punjab Barsati showed similar results. Cross Jamuni Gola x Punjab Barsati (0.022 g) has significantly higher quantity of seed/unit weight of fruit as compared to cross Punjab Neelam x Punjab Barsati (0.019 g). Crossing period-3 and emasculation time-2 was the best in both the crosses with respect to this character. Also emasculation time-2 was significantly better than emasculation time-1 in both the crosses. Thousand seed weight was maximum in crossing period-3 and emasculation time-2 in both the crosses. It showed increasing trend up to crossing period-3, then decreased in both the the crosses (Table 2). Karivaratharaju *et al.* [6] also found differences in seed weight due to influences of fruit weight and explained that the poor filling of seeds or abortion of ovules may be the reasons for lesser seed weight in smaller fruits. Cross Punjab Neelam x Punjab Barsati (4.3 g) had significantly higher 1000 seed weight as compared to cross Jamuni Gola x Punjab Barsati (4.01 g).

Emasculation time-2 was significantly superior to emasculation time-1 in both the crosses with respect to seed germination and seed vigour (Table 3). In both the crosses i.e. Jamuni Gola x Punjab Barsati and Punjab Neelam x Punjab Barsati maximum germination of seed (82.5% and 80.5%, respectively) was recorded in emasculation time-2 and crossing period-3. Similarly, maximum seedling length was obtained in emasculation time-2 and crossing period-3 in both the crosses i.e. 13.92 cm (Jamuni Gola x Punjab Barsati) and 11.71 cm (Punjab Neelam x Punjab Barsati). Cross Jamuni Gola x Punjab Barsati (11.47 cm) had significantly better seedling length as compared to cross Punjab Neelam x Punjab Barsati (9.91 cm).

Table 2. Effect of emasculation times and crossing periods on quantitative seed attributes in brinjal

Crossing Period	Seed quantity per unit weight						Thousand seed weight (g)					
	ET-1		ET-2		Mean		ET-1		ET-2		Mean	
	A	B	A	B	A	B	A	B	A	B	A	B
1.	0.018	0.017	0.021	0.020	0.020	0.019	3.01	3.65	3.50	3.84	3.26	3.75
2.	0.023	0.019	0.025	0.022	0.025	0.020	3.67	4.43	3.75	5.15	3.71	4.79
3.	0.025	0.020	0.027	0.026	0.026	0.023	4.78	4.74	5.15	5.61	4.97	5.18
4.	0.022	0.018	0.023	0.021	0.022	0.020	4.51	4.68	4.89	5.00	4.70	4.84
5.	0.020	0.016	0.020	0.019	0.020	0.018	4.08	4.18	4.70	4.82	4.39	4.50
6.	0.019	0.013	0.020	0.017	0.020	0.015	2.68	2.87	3.35	3.27	3.02	3.07
Mean	0.021	0.017	0.023	0.021	0.022	0.019	3.80	4.10	4.22	4.62	4.01	4.36

CD 5%	Seed quantity	Thousand seed weight
Crossing periods	0.001	0.008
Emasculation times	0.001	0.004
Crosses	0.001	0.004
Crossing period x emasculation times	NS	0.011
Crossing periods x crosses	0.001	0.011
Emasculation times x crosses	0.001	0.006

Table 3. Influence of emasculation time and crossing period on qualitative seed attributes in hybrid brinjal

Crossing period	Germination (%)						Seedling length (cm)						Seedling dry weight (g)					
	ET-1		ET-2		Mean		ET-1		ET-2		Mean		ET1		ET-2		Mean	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
1.	65.25	68.25	75.25	72.25	70.25	70.25	10.20	9.61	11.22	10.76	10.71	10.19	0.019	0.025	0.024	0.032	0.022	0.029
2.	70.75	73.75	78.75	74.50	74.75	74.13	10.59	10.59	12.29	11.20	11.44	10.89	0.021	0.029	0.027	0.034	0.024	0.032
3.	74.25	78.25	82.50	80.50	78.38	79.38	12.75	11.20	13.92	11.71	13.33	11.45	0.030	0.035	0.031	0.044	0.031	0.040
4.	66.75	71.25	73.50	73.75	70.13	72.50	12.12	9.23	13.01	10.87	12.56	10.05	0.026	0.034	0.028	0.035	0.027	0.035
5.	63.75	62.25	67.75	65.50	65.75	63.88	11.29	8.20	11.52	10.23	11.40	9.21	0.023	0.031	0.024	0.032	0.024	0.032
6.	56.50	55.25	61.75	57.25	59.13	56.25	9.13	7.35	9.68	8.05	9.40	7.70	0.021	0.029	0.022	0.030	0.022	0.030
Mean	66.21	68.17	73.25	70.63	69.73	69.40	11.01	9.36	11.94	10.47	11.47	9.91	0.023	0.031	0.026	0.035	0.025	0.033

CD (5%)	Germination	Seedling length	Seedling dry weight
Crossing periods	1.72	0.16	0.002
Emasculation times	0.99	0.09	0.001
Crosses	NS	0.04	0.001
Crossing period x emasculation times	NS	1.09	NS
Crossing periods x crosses	2.44	1.09	NS
Emasculation times x crosses	1.41	0.55	NS
Crossing periods x emasculation times x crosses	NS	1.97	NS

Maximum seedling dry weight (0.031 g and 0.044g) was observed in crosses Jamuni Gola x Punjab Barsati and Punjab Neelam x Punjab Barsati, respectively during emasculation time-2 and crossing period-3. Minimum seedling dry weight was observed in emasculation time-1 and crossing period-1 in both the crosses. Cross Punjab Neelam x Punjab Barsati had significantly higher seedling dry weight (0.033 g) as compared to cross Jamuni Gola x Punjab Barsati (0.025 g). Similar studies were conducted by Devadas *et al.* [7] in *Cucurbita moschata*.

The studies concluded that crossing period-3 and emasculation time-2 was the best for germination and other vigour parameters whereas fruit setting was maximum in crossing period-5 in both the crosses. Thus for undertaking successful hybrid seed production of brinjal hybrids BH-1 and BH-2, emasculation in female parents may be done in the afternoon hours i.e. 3:00-5:00 P.M. and pollination between 9:00-11:00 A.M. during September and October.

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