Seed Research, Vol. 37(1&2): 20-22, 2009

Effect of Barrier Crops and Supplemented Pollen Rows on Natural Out Crossing in Chilli (*Capsicum annuum* L.)

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ABSTRACT Parental lines of Chilli Hybrid-1 (CH 1) *viz.*, male sterile line (MS-12; erect fruiting habit; recessive) and Ludhiana Local Selection (LSS; drooping fruiting habit; dominant) were used to find out the effect of barrier crops and additional pollen rows on the percentage out crossing for hybrid seed production in chilli during 1999-2001. The sterile plants of MS-12 were taken as seed parent and fertile plants as pollen parent wheras, LLS served as contaminator. In the first treatment, a crop barrier (Dhaincha and pearl millet) was provided between the hybrid seed production plot (HSPP) and contaminator plot (CP), whereas, in the second treatment five additional border rows of pollen parent were provided in the HSPP towards the CP. The land was kept fallow between two plots. The percentage out crossing was determined as per the fruiting habit in the next generation. Additional pollen rows and barrier crops plantation significantly reduced the natural out crossing to 1.55 per cent and 1.37 per cent respectively, than those of 14.05 per cent under control.

Key Words: Hybrid seed production, out crossing, crop-barrier, additional pollen, chilli

Genetic purity deteriorates mainly due to mechanical admixtures and out crossing with the undesirable plants. The extent of out crossing in chilli is reported to range from 7-9 per cent [1-5]. Genetic contamination by mechanical admixtures can he minimized by complete sanitation of the cultivar from foreign material during the seed production period and keeping a minimum isolation distance from the contaminants. But in large scale seed multiplication and evaluation of many lines in breeding programmes, keeping a minimum isolation distance is a problem. Similarly, large number of varieties available with the farmers in the production area creates hurdles for a minimum isolation distance. Provision of additional pollen rows in the hybrid seed production plot may enhance the competition to contaminator pollen and result in reduced out crossing. Therefore, present investigation was undertaken to find the effect of barrier crops and additional pollen rows on the natural out crossing in chilli.

MATERIALS AND METHODS

The present investigation was conducted at Experimental Area, Seed Technology Centre, Punjab Agricultural University. Ludhiana, during 1999-2001 to test the applicability of barrier crops and additional pollen rows in reducing the out crossing. The parental lines of Chilli Hybrid-I (CH-1) were chosen *viz.*, male sterile line O (MS-l2; erect fruiting habit; recessive) and Ludhiana Local Selection (LLS; drooping fruiting habit; dominant). The sterile plants of MS-12 were taken as seed parents, and fertile plants as pollen parent whereas, LSS served as contaminator. Under control, a contaminator plot (CP; 4.8 x 3.6 m^2; 60 x 45 cm) of LLS and a hybrid seed production plot (HSPP: 4.8 x 3.6 m^2; 60 x 22.5 cm) of MS-12 were planted at 5 m distance. Five additional border rows of pollen parent were provided in the HSPP towards the CP in first treatment. Whereas, in the second treatment space between the two plots was utilized to grow a physical isolation barrier of crops (Dhaincha and

Received February 2009 Revised October 2009 Accepted December 2009

pearl millet) to obstruct the free movement of contaminator pollen. The physical isolation barrier between the two plots was sown in the last week of April. The experiment was replicated thrice.

Screening was done at flowering stage by examining the characters of flowers, the fertile plants (Swollen anthers and pollen) were rogued from seed parent rows, and sterile (Shriveled anthers and no pollen) from the pollen parent rows. The ratio of seed and pollen parent rows was maintained as 3:1.

The observations were recorded of number of fruits per plant and number of seeds per fruit during the year 1999-2000. For progeny testing, red ripe fruits were harvested from seed parents of each HSPP separately, during the year 2000-2001. The seeds were extracted from these fruits and used to estimate the extent of out crossing by screening the progeny on the basis of fruiting habit. The per cent out crossing was calculated as follows:

$$\text{Out crossing per cent} = \frac{\text{No. of plants with drooping fruits} \times 100}{\text{Total number of plants}}$$

RESULTS AND DISCUSSIONS

The number of fruits per plant ranged from 90.17 to 94.59 in different treatments and 81.20 to 110.57 under different harvests. The average fruit number per plant was recorded to be 90.26, 90.17 and 94.59 under control, barrier crops and additional pollen rows, respectively. The fruit number was significantly higher in second harvest (110.57) and minimum in the fourth harvest (81.20). The significant difference observed in the fruit number per plant under different harvests due to differential climatic conditions and pollinator activities. The significantly less fruit number in first harvest may be due to the detrimental effect of high temperature (39º to 40 ºC) and low relative humidity (44%) prevailed at the time of fruit setting, whereas, reduction in fourth harvesting was the result of decline in plant health as plant has almost completed its life span and significant fall in night temperature. Gill and Gill [3] also reported negligible fruit set during May and June because of high temperature (36º to 42ºC) and low relative humidity (35% or lower), which might have proved detrimental to the pollen viability and restricted the number of pollinating agents and their activity. Kanwar [4] opined that insects played a major role in out crossing under Punjab conditions as the cross pollination was recorded to be high in second harvest (13.95%) than first (11.57%), attributed to the insect population due to prevailing favourable weather conditions. No significant difference with respect to number of seeds per fruit was recorded under different treatments, attributing to its genetic control. The average seed number was recorded to be 17.20, 17.35 and 19.19 under control, barrier crops and additional border rows.

The perusal of data (Table 1) indicate that average out crossing was reduced significantly to 1.37 per cent with the application of barrier crops between HSPP and CP than that of 13.5 per cent under control. It is evident that barrier crops played a significant role in reducing the per cent out crossing in HSPP. This might have resulted due to restriction on crop barrier on the free movement of air and pollinators between two plots. Shekhar and co-workers [6] also reported similarly in pigeon pea, barrier crop proved

Table 1. Effect of barrier crops and supplemented pollen rows on out crossing % in chilli

Harvest	Out crossing (%)		
	Control	Barrier crops	Additional pollen rows
H_1	13.59	1.03	1.80
H_2	16.07	2.90	2.50
H_3	12.50	0.83	0.98
H_4	11.89	0.72	0.92
Mean	13.51	1.37	1.55
CD (P=0.05) Harvest 1.58			
Treatment 1.81			

effective in reducing the amount of out crossing by 54.1 per cent and pollinator activity by 53.7 per cent leading to reduction in amount of out crossing ranging from 7.8 per cent to 10.1 per cent.

A considerable decline was recorded in out crossing, when five border rows of pollen parent were provided in the HSPP towards the CP. The out crossing was reduced to 1.58 per cent (14.05% in the control plot) which could be the result of pollen competition provided to contaminator pollen by additional pollen parent rows. Secondly, it is general behaviour of insects that they prefer to pollinate nears; and the additional border rows served the purpose, thereby resulting in reduced out crossing. Hence, it is concluded that provision of barrier crop and/or additional pollen parent rows between seed plots and contaminator plots may serve as efficient tools in reducing the per cent out crossing in chilli.

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