

## Research Note

# Hybrid Seed Production Through Natural Open Pollination in Chilli (*Capsicum annuum* L.).

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### ABSTRACT

In chillies (*Capsicum annuum* L.), the development of stable, male sterile (MS) lines and exploitation of natural out pollination could render commercial hybrid seed production technology economically viable and practically feasible. The efficiency of hand pollination and natural out pollination were compared on a MS line (MS-12), grown in a row ratio of 3:1 with a pollinator line Ludhiana Local Selection (LLS) for hybrid seed production. Higher temperature (36°C and above), lower humidity (35% RH or less) and the presence of preferential crops for pollinating agents such as cucurbits, restricted fruit setting in the summer season. Maximum number of fruits and seed yield were recorded in hand pollinated plants. However, under natural open pollination, the values declined by 50 and 72% respectively in the first row, while in the second row of the seed parent, the fruit number remained the same but seed yield declined further by 40%. The results suggested that natural out pollination could conveniently be relied upon for hybrid seed production of chillies, though the technology requires standardization.

*Additional index words:* male sterile lines, out pollination, fruit setting, seed yield.

### EXPERIMENTAL AND DISCUSSION

As for other self pollinated crops, heterosis breeding in chilli has also been rewarding (Pearson, 1983). A highly heterotic and stable combination was identified (Singh, 1987) which yielded 82 and 100% higher than the standard checks, namely Punjab Lal and Pusa Jawala. However, the commercial exploitation of such hybrids would only be possible if economically viable and practically feasible production technology is developed for hybrid seeds. At present, hand emasculation and hand pollination is the most common method employed for hybrid seed production of varietal hybrids promoted mostly by private sector companies (Pearson, 1983; Phal, 1990). However some reports suggest geographic differences in the degree of outcrossing in chilli, which has been reported to be as high as 35-38% (Singh and Singh, 1978) and 46-67% (Daskaloff, 1976). Shifriess and Guri (1977) observed that hybrid seed production was most promising when the cytoplasmic male sterile plants were intermingled with the pollinator plants. Therefore, in the present study, an effort was made to explore the possibilities of natural out pollination for hybrid seed production in chilli.

The experimental material comprised parental lines of Chilli Hybrid-1 (CH-1) namely MS-12 (a line reconstituted after incorporating male sterility from an exotic source) and LLS (a local selection used as the pollinator) planted in a 3:1 row ratio. At least four randomly selected plants of MS 12 from each of the rows grown immediately beside the pollinator line (1st line) were pollinated by hand (the flowers were not

bagged before and after pollination). Observations were recorded on percent fruit set, number of fruits per plant, seed yield per plant and seed yield per fruit.

Almost negligible fruit set was observed during the months of May and June because of very high temperature (36-42°C) and low humidity (35% RH or even lower) which might have proved detrimental to pollen viability and restricted the number of pollinating agents which included *Musca domestica* L., *Apis florea* and *Pollenia* sp. and the duration of their activities. The problem was further confounded by the preference of pollinators for crops such as muskmelon and other cucurbits growing in the adjoining fields. However, with the onset of the monsoon and decline in temperature fruit setting improved.

Maximum number of fruits (219) and seed yield per plant (16.98 g) were recorded on plants which were hand pollinated (Table 1). For natural open pollination, the average number of fruits per plant and seed yield per plant were 107 and 4.83 g respectively on the first row, and the values further declined to 90.5 and 2.8 g for the second row (Table 1). It was interesting to note that while there was a 50% reduction in the number of fruits/plant under natural open pollination conditions as compared to hand pollination, the corresponding decline in seed yield was 72% in the first row. Similarly, for the second row there was a marginal decline in the number of fruits per plant over the first row but the seed yield was reduced by 40%.

**Table 1. Percent fruit set, and fruit and seed yield under different methods of pollination and in different rows**

Method of pollination	Fruit set (%)	Av. no. of fruits per plant	Av. seed yield per plant (g)	Av. seed yield per fruit (mg)
Hand Pollination	81	218.5 ±31.4 <sup>1</sup>	16.98 ±4.78	88.65 ±9.15
Open Pollination	47	107.7 (50) <sup>2</sup>	4.83 (71)	50.74 (75)
(i) First Row		±28.5	±1.79	±7.12
(ii) Second Row	44	90.5 (15) ±24.8	2.88 (40) ±1.02	31.51 (38) ±6.70

<sup>1</sup> Standard error<sup>2</sup> Figures in parentheses indicate per cent decline for various characters.

Apparently, the activities of pollinating agents on the first and second rows were similar (as reflected through the same number of fruits per plant) but the marked reduction in seed set (i.e. number of seeds per fruit) of the second row suggested the contrary. It might be possible that the pollen laden carriers visited the flowers of plants grown in close proximity to the pollinator plants more frequently. However this requires further investigation.

Though hand pollination produced the highest number of fruits and seed set (seed yield/fruit) this method is not economically viable, as labour is extremely costly in this part of India. Moreover, natural open-pollination resulted in a reasonable number of fruits and good seed yield per plant. Therefore, hybrid seed production technology based on natural open pollination is practically feasible and also cheaper. This technology can probably be further improved to maximize hybrid seed production per unit area e.g. through an increased number and activity of pollinating agents, decreasing row to row distance and increasing plant to plant spacing.

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