

## Effectiveness of self-incompatibility and cytoplasmic male sterility systems in developing $F_1$ hybrids of cabbage

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### SUMMARY

Four self-incompatible (SI) lines and three cytoplasmic male sterile (CMS) lines of cabbage (*Brassica oleracea* L var. *capitata*) were crossed with a set of four male parents. The resulting 28  $F_1$  hybrids were evaluated along with a standard variety, 'Golden Acre' at the IARI, Regional Station, Katrain during the winter season of 2004. Significantly higher net head weight, harvest index (%) and head size index were observed in the hybrids involving SI lines than the CMS lines. Heterosis over the standard check for marketable head weight ranged from 22.80% to 60.36% in case of hybrids developed by SI lines whereas in the hybrids produced by utilizing the CMS lines it ranged between -9.09% to 40.54%. Therefore, for the production of  $F_1$  hybrids in cabbage, SI system was found superior over the available Ogura CMS system.

**Key words :** *Brassica oleracea* L var. *capitata*, Heterosis, Self-incompatibility, Male sterility.

In the cole group of vegetable crops grown in India,  $F_1$  hybrids have become very popular in cabbage (*Brassica oleracea* L var. *capitata*). Development of hybrids in cabbage may be accomplished by the utilization of different genetic systems and self-incompatibility and cytoplasmic male sterility are the important ones. Keeping aside the problems associated with the maintenance and use of the two systems in the production of hybrids, the present study was made to compare their effectiveness in the development of superior  $F_1$  hybrids in cabbage.

### MATERIALS AND METHODS

Three cytoplasmic male sterile (CMS) lines (CMS-1, CMS-3 and CMS-4) along with four self-incompatible (SI) lines (83-1, 83-2, 83-5 and Sel-8) were crossed with a set of four male parents (MR-1, PoA, AC-208 and AC-236) during 2003. The resulting 28 crosses were put under evaluation along with a standard variety, 'Golden Acre' at the IARI, Regional Station, Katrain during winter season of 2004. Each entry was replicated thrice in a randomized block design. Row-to-row and plant-to-plant spacing were maintained at 45 cm each in a 3 m x 3 m plot size. All the recommended cultural practices were adopted to raise a successful crop. Data recorded on 5 randomly selected plants were subjected to statistical analysis as per Sukhatme and Amble (1995).

### RESULTS AND DISCUSSION

Analysis of variance revealed highly significant differences among the hybrids for all the characters. Mean data for 8 quantitative characters are presented in the

Table 1. Significantly higher net head weight was expressed by the hybrids, 83-5 (SI) x AC-236 (1.11 kg) and Sel-8 (SI) x AC-208 (1.05 kg), developed by self-incompatible lines than the CMS lines. Harvest index (%) was also recorded significantly higher in the hybrids developed from SI lines than the CMS lines as 83-5 (SI) x AC-236 recorded maximum harvest index (72.1%) than the check variety 'Golden Acre'. On the same pattern hybrids developed from SI lines have taken lead over the hybrids developed from CMS lines for increased head size index which was maximum for 83-5 (SI) x AC-208 (219.32 cm<sup>2</sup>) followed by 83-2 (SI) x AC-208 (218.42 cm<sup>2</sup>).

Number of non-wrapper leaves was found the least in 83-2 (SI) x PoA (17.46) but it was statistically at par with the check. CMS-1 x AC-236 showed least number of non-wrapper leaves (17.60) in the group of hybrids developed from CMS lines. None of the hybrids exhibited significantly smaller frame size than the check variety. Minimum stalk length and diameter were observed in the hybrids CMS-3 x MR-1 (0.56 cm) and CMS-1 x AC-236 (1.54 cm), respectively but these were statistically at par with the hybrids developed by SI lines showing minimum stalk length (0.66 cm) for Sel-8 (SI) x MR-1 and stalk diameter (1.58 cm) for 83-5 (SI) x PoA in their group and with the standard check.

The range of heterosis over the standard check (Golden Acre) for net head weight ranged between -9.09% to 40.54% in case of hybrids developed by CMS system whereas the hybrids resulted by utilizing SI system exhibited the heterosis between 22.80% to 60.36% (Fig.