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Development of male sterility system through wide hybridization in sesamum

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SUMMARY

Sesamum (*Sesamum indicum* L.) is one of the world's important oilseed crop with high quality oil. Several studies have reported high level of heterosis for yield and its component traits. The exploitation of heterosis mainly depends on the availability of economic male sterility system of producing hybrid seeds. The wild species of sesamum have been recognized as source of many novel traits like pest and disease resistance and male sterility. The present investigation was taken up with an objective to develop male sterility system in sesamum by crossing four wild species with cultivated species. The sterile interspecific hybrids between *S. malabaricum* and *S. indicum* were confirmed by morphological observations like leaf shape and flower color supplemented with cytological and molecular studies. The pollen sterility in hybrids was due to incompatible interaction between wild cytoplasm and cultivated genome as normal tetrad formation was observed, which was further confirmed in backcross generations with cultivated and wild species.

Key words : Cytology, Heterosis, Pollen sterility, Sesamum, Wild species, Component.

Sesamum (*Sesamum indicum* L.) is one of the world's most important oil seed crops, having an oil content generally over 50 per cent (Yermanos *et al.*, 1972) and a balanced fatty acid composition with more or less equal percentage of oleic and linoleic acids. It is cultivated for its high quality oil which is the present need and good shelf life. India is the largest producer of sesame covering 42 per cent of the world's sesame area and 27 per cent of the production (Anon., 2005). The yield improvement achieved through conventional hybridization followed by selection has been only marginal. However, sesame being a self pollinated crop, high levels of heterosis has been reported for yield and its components (Brar and Ahuja, 1979; Singh, *et al.*, 1986; Patel, *et al.*, 2005,). The utilization of this heterosis would need the male sterility system. There are some sporadic efforts to develop male sterile lines in sesamum but no reports of stable male sterile lines which makes hybrid seed production economically feasible.

Interspecific crossing is frequently used in plant breeding, especially for transferring resistant genes as well as for finding new sources of CMS and restorer genes Many of the present day commercially utilized male sterile lines of different crops were isolated either in species crosses or induced through mutagenesis (Honson and Conde, 1985). The presence of cytoplasmic male sterility in oil seed crops and its importance in developing F1 hybrids has lead to a plethora of research in cytoplasmic genome manipulations. The back cross substitution of the nucleus of one species into the cytoplasmic background of alien species has been utilized extensively in many crops. A number of different CMS systems are now available in oilseed *Brassica* which were created by alloplasmic substitution of the cytoplasm from other *Brassica* species or related wild species. Successful transfer of cytoplasm from *H. petiolaris* into cultivated species of sunflower has been achieved (Leclercq, 1969). The genus sesamum consists of cultivated species, *S. indicum* and 37 wild species some of which are reported to be sources of desirable genes including male sterility (Prabhakaran, 1996). The transfer of the male sterility from wild species would require the wide crossing and confirm the hybrids through suitable approaches *viz.*, cytogenetic and marker studies. Efforts were made to identify source of male sterility and to develop male sterile line in sesame through wide hybridization.

MATERIALS AND METHODS

Four wild species of sesamum belonging to three chromosomal groups, *viz.*, 2n=26 (*S. malabaricum*), 2n=32 (*S. prostratatum*) and 2n=64 (*S. radiatum* and *S. occidentale*) collected from different parts of India and two cultivars (DS-1 and E-8) of *S. indicum* (2n= 26) were crossed by taking wild species as female parent. The flower buds of the female parent were hand emasculated one day before anthesis and pistils bagged using butter paper bags to avoid contamination from foreign pollen. Next day morning, fresh pollen was collected from male parent (five accessions of E-8 *viz.*, E8-2, E8-3, E8-4, E8-

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