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First Record of Cytoplasmic-Genic Male Sterility System in Pigeonpea (*Cajanus cajan* (L.) Millsp.) Through Wide Hybridization

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Pigeonpea (*Cajanus Cajan* (L.) Millsp.) is an important pulse crop of Indian sub-continent. Genetic improvement of this crop upto eighties was largerly confined to pure line selection from land reces/germplasm and subsequently through hybridization followed by pedigree selection from inter-varietal crosses. Discovery of genetic male sterility (Reddy *et al.* 1997: Reddy *et al.* 1978 : Wallis *et al.* 1981; Dundas *et al.* 1981; Dundas *et al.* 1982; Saxena *et al.* 1983 a, b) coupled with high degree of outcrossing (Howard *et al.* 1919; Williams 1977; Onim 1981; Bhatia *et al.* 1983; Brar *et al.* 1992) and availability of high degree of heterosis for seed yield (Soloman *et al.* 1957; Patel *et al.* 1991; Patel *et al.* 1992; Malik *et al.* 1995) opened vistas for exploiting heterosis through developing hybrids. In the recent years a number of pigeonpea hybrids (ICPH-8, PPH-4, COH-1, COH-5) have been released in India. However, commercialization of these hybrids is constraint because of labour intensiveness of seed production and seed purity concerns arising from incomplete roguing of fertile plants from the population which are used as female parent. Pure breeding cytoplasmic-genic male sterile lines would effectively circumvent these constraints and revolutionize hybrid seed production.

This paper reports the development of first stable cytoplasmic genetic sterility system in pigeonpea through wide hybridization.

The work was initiated in 1993 by crossing pigeonpea with its wild relatives (*Cajanus scarabaeoides*) as female parent. The F_1 plant was partially fertile, errect, dwarf, small podded with 2-3 small seeds per pod. The F_2 population raised in isolation (monsoon 1994) arising from this cross comprised 95 plants. Fourteen plants in F_2 were found to be completely sterile. The F_2^s were further advanced in the following manner.

1. Completely male sterile F_2 plants were crossed to four pigeonpea genotypes viz., QMS-2 (Fertile), MS 288 (Fertile), ICPL-87 and GT-100.

2. The sterile plants were also sibmated to phenotypically similar F_2 fertile/partially fertile plants.

3. Selected fertile F_2 plants were advanced to F_3 generation by selfing.

4. Selected sterile F_2 plants were allowed to open pollinate and advanced to F_3 generation.

In all the crosses plant to plant mating was followed with the fertile counterparts maintained by selfing. Fortytwo BC_1F_2 progenies arising from 12 F_2^s and four pollinators raised during monsoon 1995 were examined for the extent of pollen sterility and other quantitative characters. All the 299 plants in 12 BC_1F_2 progenies, resulting from MS 288 (fertile) were found to be 100% sterile, while out of 11 BC_1F_2 progenies, arising from QMS-2 (fertile), four progenies comprising 30 plants were completely sterile. This ruled out the possibility of MS_1 and MS_2 genes to be responsible for the pollen sterility in the present material. Similarly, in ICPL-87 out of nine progenies, three were found to possess completely sterile plants, while in GT-100 out of ten progenies, four possessed completely sterile plants.

In BC_2F_2 (Summer 1996), 17 progenies of 288 at Sardar Krushinagar and 16 progenies at Navsari comprising 401 plants showed complete pollen sterility. In BC_3F_2 (Monsoon 1996) in 207 progenies comprising 2033 plants raised in isolation at Sardar Krushinagar alongwith ICPL-288 as pollinator, all the plants showed complele pollen sterility. The crosses attempted in BC_1F_2 with F_3 (fully fertile) plants from the derived lines confirmed the restoration of fertility.

Earlier attempts at ICRISAT, Hyderabad (Reddy and Paris, 1981) using *Cajanus cajan* x *Atylosia* spp. (now merged with *Cajanus*) resulted in male sterility associated with varying degree of female sterility. Recently Ariyanayagam *et al.* (1993) and Ariyanayagam *et al.* (1995) reported high degree of male sterility at genome transfer stage IV in interspecific crosses of *Cajanus sericeus x Cajanus cajan.*

The results of the present study confirmed the existance of a stable cytoplasmic-genic male sterility system in pigeonpea with S-rr as A-line (GT-288A) and its maintainer with F-rr as B-line (GT-288B) alongwith restoration mechanism available in stable fertile lines derived from interspecific hybridization (*Cajanus scarabaeoides x Cajanus cajan*).

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