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Short Communication

Induced pleiotropy for curved stigma and genetic male sterility in tetraploid cotton (*Gossypium hirsutum* L.)

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Cytoplasmic genic male sterility (CGMS) has been developed with the cytoplasm of *Gossypium harkanessii* and the genome of *G. hirsutum* and a single dominant restorer gene from *G. harkanessii* to restore fertility [1-3]. The double recessive genetic male sterility with $ms_5ms_5ms_6ms_6$ alleles is the most promising genetic male sterility [4]. At present, there are 11 genes reported for male sterility in cotton, of which four are dominant ($Ms_4Ms_7Ms_{10}$ *and* Ms_{11}), four double recessive ($ms_5ms_6ms_8ms_9$) and three single recessive (ms_1ms_2 and ms_3). Due to the absence of genetic marker to differentiate between male sterile and fertile plants in cotton GMS system, it is not commercially utilized. So, the present study was aimed to induce male sterility through induced mutations which may also induce mutation in other characters to be linked to male sterility. As physical and chemical mutagen induced male sterility had been considered desirable as it has unique potential for the development of new MS genotypes directly, male sterility has been thus induced in more than 30 crop species including cotton. Irradiation with X-rays induced higher frequency of male sterility in *G. hirsutum* and *G. arboreum* cottons [5, 6]. Several semi and complete sterile plants showing chromosomal aberrations at meiosis have been isolated when interspecific hybrids were gamma irradiated at 250-350 Gy. Ethyl Methane Sulphonate has also been used for induction of male sterility in cotton [7].

In the present study seeds of Abadhita (*G. hirsutum* L.) a bollworm tolerant variety [8] were treated with 100 Gy of gamma rays fallowed by 0.2 per cent EMS for 10 hours and M_1 and M_2 generations were raised at Agricultural Research Station, Dharwad during 1997 and 1998 respectively. Male sterile plants were observed in M_2 and they were sibmated with fertile plants of M_2 population and also fertile Abadhita. Progeny obtained from cross between sterile and Abadhita was fertile where as some progenies obtained from cross between fertile plants of M_2 were completely fertile and some progenies were segregating for sterility and fertility in 1:1 ratio indicating the genetic male sterility. F_2 of cross between sterile mutant and normal fertile Abadhita showed segregation for fertility and sterility in 3:1 ratio indicating single recessiveness for male sterility.

The flowers of male sterile mutant were found smaller with rudimentary anthers than its fertile isoline. Anthers of sterile plants were indehiscent with short filaments. The sterile flowers of this new source showed a characteristic feature of curved stigma, which was apparently seen even 8-10 days before anthesis as compared to fertile counter part of Abadhita and Gregg MS-399, (Fig. 1 and 2). This characteristic feature could be used as a genetic marker to differentiate sterile and fertile plants 8-10 days before anthesis in seed production plots which helps to rouge out the fertile plants in the commercial seed production plot before anthesis and to maintain required male sterile plant population. Hybrid vigour has been commercially exploited in cotton through hand emasculation and pollination method of crossing [9]. Although, genetic male sterility has been identified long back, its

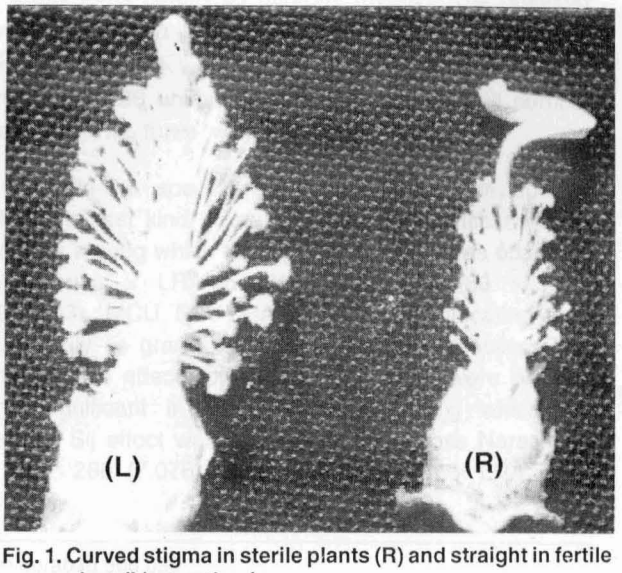

Fig. 1. Curved stigma in sterile plants (R) and straight in fertile plant (L) at anthesis

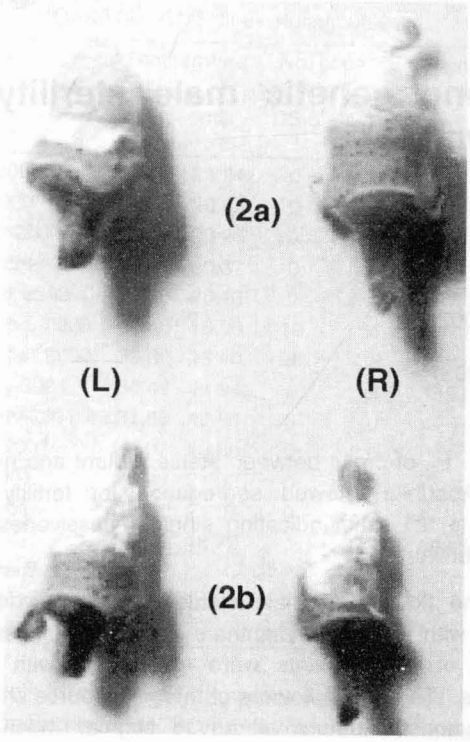

Fig. 2. Curved stigma in sterile flowers (R) and straight in fertile flowers (L) 8 days before anthesis in Abadhita male sterile line (Fig. 2a). Sterile flowers but straight stigma (R), fertile flower with straight stigma (L) in Greg GMS at 8 days before anthesis (Fig. 2b).

commercial application in hybrid seed production Is not yet realized because identification of male sterile and male fertile plants before anthesis in female genotype has not been possible due to absence of genetic marker. But the newly identified genetic male sterility from the present study possessed curved stigma associated with male sterility which helps to identify sterile plants even one week before anthesis. On evaluation for its contribution to positive heterosis for yield and yield contributing characters, it can be used as viable genetic male sterile source in commercial hybrid seed production.

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