A REVIEW

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Sterility genes in interspecific hybrids of *Oryza glaberrima* and *Oryza sativa*

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The African rice *O. glaberrima* is first choice of useful gene mining in AA genome species because of its resistance to biotic and abiotic stress. The introduction of these characters to *O. sativa* is difficult due to reproductive barriers leading to spikelet sterility. However, fertility can be restored by backcrossing which has resulted in improvement of rice due to transfer of many agronomical traits.

Key words : Gene sterility, Interspecific crosses, Reproductive isolation, Barriers

It is an accepted concept that biological species are groups of interbreeding populations that are reproductively isolated (Mayr, 1942). To understand the origin of species, the genetics of the reproductive barriers between closely related species have been studied extensively (Dobzhansky, 1951; Stebbins, 1958; Coyne, 1992; Coyne and Orr, 1998). Reproductive isolation is the main mechanism acting at various stages in the life history of an organism that is through differential fitness of the gametophyte or zygote via different genes (Dobzhansky, 1951).

O. glaberrima is endemic in inland delta of Niger river in West Africa (Carpenter, 1978) whereas *O. sativa* is of Tropical Asian origin. *O. glaberrima* is supposed to be the first choice of useful gene mining in AA genome species of genus *Oryza* and is a valuable source of genes for *O. sativa* improvement (Jones *et al.*, 1997b). However, experiments dealing with interspecific hybrids between *O. sativa* and *O. glaberrima* suggest that the reproductive barrier is the main obstruction (Morinaga and Kuriyama, 1957; Morishima *et al.,* 1962; Morishima *et al.,* 1963; Chu *et al.,* 1969; Jones *et al*., 1997a; Sano *et al*., 1979; Sano, 1983; Tao *et al.,* 1997) causing 100% spikelet sterility in F1 plants (Sano, 1990). Numerous barriers like segregation distortion, gametophytic abortion and sterility loci located on all chromosomes hinders these interspecific crosses. Since some embryo sacs are fertile, fertility can be restored by back crossing (BC) to the recurrent parent and subsequent selection of fertile progenies in successive selfing generations (Jones *et al*., 1997a; Heuer *et al*., 2003). A list of sterility genes is presented in Table 1.

Tao *et al.* (2002) found that a near-isogenic line WAB450-6, derived from interspecific hybrid of *O. sativa* and *O. glaberrima*, induced frequent abortion of pollen grains but gave completely fertile spikelets when hybridized with its recurrent parent. Similarly Heuer and Miezan (2003) studied that the hybrids between *Oryza glaberrima* with *Oryza sativa* cultivars are partially female fertile and the fertility can be restored by back crossing to a recurrent male parent. They selected a segregating BC_2F_3 population of semi-sterile *O. glaberrima* x *O. sativa indica* hybrid progenies and analyzed it with PCR markers located on the rice chromosome 6. The analyses revealed that semi-sterile plants were heterozygous for a marker (OSR25) located in the waxy promoter (on chromosome 6S), whereas fertile progenies were homozygous for the *O. glaberrima* allele. Though the adjacent markers showed no linkage to spikelet sterility but the semi-sterility of hybrid progenies was maintained upto F_4 progeny, suggesting the existence of a pollen killer in this plant material. Further monitoring of reproductive plant development showed that spikelet sterility was due to an arrest of pollen development at the microspore stage. Hu *et al.*(2004) backcrossed these semi-sterile individuals and showed a clear-cut bimodal distribution for pollen fertility indicating a single gene controlling sterility. This sterility gene was linked with the SSR marker RM7033 on chromosome 2. Since there was no sterility gene previously reported from *O. glaberrima* on chromosome 2, suggested that this gene was a new pollen killer and was tentatively designated as S29(t).

A strong heterosis expressed in hybrids between *Oryza sativa* spp. *indica* and *O. sativa* ssp *japonica* was observed by Song *et al.* (2005). He studied that the wide-compatibility varieties are able to produce fertile hybrids due to spikelet fertility but the extent to which male and female gamete abortions influence hybrid