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Fertility restoration of four sources of cytoplasmic male sterility in rice (*Oryza sativa* L.)

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SUMMARY

The cross combination involving five new male sterile lines of four different cytosterile sources *viz.*, IR 58025 A and RTN 4 A (WA), RTN 11 A (ARC), RTN 13 A (Gambiaca), and RTN 17A (Dissi), when crossed with four effective restorers *viz.*, Ratnagiri 3, Swarna, IR 5 and IR 46 showed more than 80 per cent spike let fertilit) restoration in all the Combinations. The F_2 and BC_1 populations classified based on pollen as well as spike let fertility in the 20 cross combinations, indicated the presence of two independent dominant fertility-restoring genes. The mode of action of the two genes varied in different crosses revealing three types of interaction *viz.*, epistasis with dominance, epistasis with incomplete dominance and epistasis with recessive. Change in fertility restoration by same restorer with CMS line of same source and of different source could be either due to the influence of female parent genotype or fertility restoring genes has different penetrance and is affected by modifier.

Key words : Rice, Inheritance, Cytoplasmic male sterility source.

In recent times, much interest has been shown by the breeders in hybrid rice development. A knowledge on the nature and mode of gene action for fertility restoration in a CMS system facilitates breeding and selection of restorers used in hybrid programme. Such information helps in tailoring the genotypes into effective restorers to be used in hybrid breeding programme. In rice, several sources of cytoplasmic male sterility (CMS) have been reported (Virmani and Wan, 1988). However, intensive research work on inheritance of fertility restoration has been done mostly on the WA (Wild abortive) cytoplasmic source but very meager in other sources but very meagre in other sources.

Therefore, the present investigation was undertaken to determine the genetic control of fertility restoration of four different cytosterile sources *viz.*, Wild abortive, ARC, Gambiaca and Dissi.

MATERIALS AND METHODS

The sources of cytoplasmic male sterility *viz.*, WA, ARC, Mutant of IR 62829 B line, Dissi and Gambiaca were authentically collected from IRRI through Dr. S.S. Virmani in 1995. These cytoplasmic sources are converted into different locally adapted lines through backcross breeding by Dr. D.S. Sawant at Agricultural Research Station, Shirgaon Dist. Ratnagiri (Maharashtra). From these CMS lines, five male sterile lines of four different sources *viz.*, IR 58025A and RTN 4A (WA), RTN 11A (ARC), RTN 13 A (Gambiaca) and RTN 17A (Dissi) and four effective restorers *viz.*, Ratangiri 3, Swarna, IR 5, and IR54 constituted the materials of the present study. The experiment was conducted at Agricultural Research Station, Palghar (Thane) during 2004, *kharif - rabi* and 2005, *kharif* season. Each CMS line was crossed to each restorer to obtain 20 cross combinations. The resulting 20 F_1S were selfed as well as backcrosses to their respective female parent to generate F_2 ands BC_1 population. The size of the population raised in each generation is given in Table 2. Pollen and spikelets fertility of each plant in the F_2 and BC_1 population was studied. From each plant, five anthers from different spikelets were collected and their pollen grains stained in 1 per cent iodine potassium iodide solution. Plants were classified on the basis of pollen fertility into four categories (Govinda Raj and Virmani, 1988). One panicle from each plant was bagged before flowering for spikelet fertility analysis. At maturity, the bagged panicle was examined for seed set and classified on the basis of spikelet fertility percentage into four categories (Govinda Raj and Virmanl, 1988). Chi-square analysis was employed to test the goodness of fit of the genetic hypothesis

RESULTS AND DISCUSSION

Pollen fertility ranged from 85.0 to 98.0 per cent, while spikelet fertility between 82.3 and 92.6 per cent. All cross combinations showed more than 80% pollen and spikelet fertility percentage (Table 1), thereby indicating that fertility restoration in these pollinators is under

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