Germplasm improvement

Genetic resources

A new CMS line with a wide compatibility gene

P. Jayamani, K.N. Ganesan, K. Thiyagarajan, M. Rangaswamy, and P. Rangasamy, School of Genetics, Tamil Nadu Agricultural University, Coimbatore 641003, India

In the three-line system (A/B/R) of heterosis breeding in rice, genetic diversity of the A line is very important. The F_1 hybrids of indica/japonica crosses show semisterility. Some wide compatibility varieties do produce fertile F_1 hybrids when crossed with indica as well as with japonica varieties. A cytoplasmic male sterile (CMS) line with a wide compatibility gene will be useful in developing indica/japonica hybrids that can overcome sterility problems.

Variety Dular, with a wide compatibility gene, was crossed with different CMS lines during the 1990 dry season. The F_1s of V20A/Dular showed 100% pollen sterility and substitution backcrosses were then made. In each backcross generation, 36 plants were raised along with the parental lines. The completely male sterile plants were identified based on pollen sterility and used for subsequent backcrossing up to the BC_6 generation. Finally, the genome of Dular was transferred into a V20A cytoplasmic background.

In the BC_7 generation, a completely male sterile population was built up. This new male sterile line (COMS8A) has many advantages over the existing male sterile lines, although it has an open plant type. COMS8A has the wide compatibility allele, which can be used to exploit indica/japonica heterosis. The line also possesses a high percentage of panicle exsertion, which minimizes the requirement of applying GA_3 in seed production. ■

New cytoplasmic male sterile (CMS) lines with diversified CMS sources and better outcrossing traits in rice

M.S. Ramesha, M.I. Ahmed, B.C. Viraktamath, C.H.M. Vijayakumar, and S. Singh, Directorate of Rice Research, Rajendranagar, Hyderabad 500030, India

About 95% of the commercial hybrids in China and elsewhere are based on a wild abortive (WA) cytosterility system. This excessive reliance on a single source of sterility may give hybrids genetic vulnerability to a sudden outbreak of diseases and insect pests. Another drawback of the WA system is poor panicle exsertion and undesirable flowering behavior, which lead to low seed yield in seed production plots.

To overcome these disadvantages, three new and diversified CMS sources have been identified and many CMS lines possessing these sources have been developed. One CMS line from *Oryza nivara* possessed a sporophytic type of male sterility with a very high frequency of typically abortive pollen grains. The other two sources, from *O. rufipogon* and *O. nivara*, possessed a gametophytic type of male sterility as evidenced by a very high frequency of round, sterile-type pollen grains.

The new CMS lines were compared with other CMS lines belonging to WA, *O. perennis*, and MS577A CMS sources during 1994-96 for pollen sterility characteristics and outcrossing traits. Besides stable sterility, the new CMS lines were found to have very high panicle exsertion (92-96%), good stigma exsertion (48-65%), and high outcrossing ability (38-52%) compared with other CMS sources. The search for restorers for the new CMS sources is in progress. The use of good hybrid combinations involving new CMS lines can pave the way for maximizing hybrid seed yield without the use of GA_3, a costly input in hybrid rice seed production. A reduction in the cost of hybrid seed will help in large-scale adoption. ■

Diversifying cytoplasmic sources in rice

M. Rangaswamy and P. Jayamani, School of Genetics, Tamil Nadu Agricultural University, Coimbatore 641003, India

Most commercial hybrids of indica rice are based on a wild abortive (WA) source of cytoplasmic male sterility (CMS). This cytoplasmic uniformity could lead to genetic vulnerability to disease and insect pests. There is thus an urgent need for cytoplasmic diversification of the male sterility source for hybrid rice breeding.

Direct and reciprocal crosses were made between AA genome species *Oryza nivara* (Accessions 105879, 101508, 102464, 105343, 101871, and 106046), *O. spontanea* (106137), *O. rufipogon* (105616), *O. barthii* (100934), *O. glaberrima* (100139), and *O. sativa* cultivars Co 43, IR50, Co 45, ASD16, White Ponni, and IR64. These cultivars are restorers/weak restorers of WA cytoplasm.

The F_1 was evaluated and based on pollen or spikelet fertility. Progenies with >99% pollen or spikelet sterility—*O. nivara* (105343)/Co 45, *O. barthii* (100934)/ASD16, *O. barthii* (100934)/IR50, and *O. nivara* (101508)/IR64—were identified by their reciprocal difference. These sterile hybrids were backcrossed with the respective recurrent parents. Pollen sterility was determined in the BC_1, BC_2, BC_3, and BC_4 generations and these lines were found to be stable for complete male sterility. Subsequent backcrosses are in progress to transfer the character of the recurrent parents. ■