

研究论文

野生稻 (*Oryza rufipogon*) 新质源雄性不育恢复系的研究

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摘要 发掘野生稻 (*O. rufipogon*) 新型雄性不育细胞质源, 育成新质源优质米不育系的基础上进一步研究新质源雄性不育恢复系的育种技术—FA型细胞质雄性不育恢复系定向育种。用野生稻 (非轮回亲本) 与籼稻品种明恢63 (轮回亲本) 杂交和多次回交, 后代再经过自交, 将野生稻中的可育基因分离、转移、重组、整合到明恢63遗传背景中, 获得农艺性状似明恢63, 花粉和小穗全可育不分离的野生稻新质源恢复系金恢1号。用新质源不育系与金恢1号组配两个组合, 其花粉和小穗育性都恢复到正常可育水平, 产量高, 米质优, 实现了新质源不育系三系配套应用和大幅度提高杂交稻稻米外观品质的目的。这项育种新技术可以将水稻可育基因 (恢复基因) 转移到任一水稻品种中育成细胞质雄性不育恢复系, 突破了新质源恢复系育种的技术瓶颈, 极大地提高了恢复系利用稻种资源的育种潜力, 为FA型新质源优质米不育系的杂交稻育种开辟了一条崭新的途径。新型 (FA) 细胞质源杂交稻可能对丰富杂交稻细胞质遗传多样性、提高杂交稻亲本对稻种资源的利用潜力、以及实质性提高杂交稻的稻米品质和产量水平都将产生积极和深远的影响。

关键词 [杂交稻](#) [FA型细胞质雄性不育](#) [优质米不育系](#) [恢复系](#)

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Breeding of Male Sterile Restorer Lines Matching with *cms*-FA Lines of New Male Sterile Cytoplasm Genes from *Oryza rufipogon*

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Abstract It is an important approach to discover new resources of male sterile cytoplasm and to develop good quality CMS lines so as to reduce hybrid rice chalkiness, lower amylose content and substantially increase hybrid rice quality. A new male sterile cytoplasm named FA cytoplasm, which is different from WA and HL in the relationship between the maintainer line and the correspondent restorer line, has been obtained through nuclear substitution of Common Wild Rice (*O. rufipogon*) with the nuclear of cultivated rice by backcrosses. And the relevant CMS lines with fine rice quality, Jinnong 1A and Jinnong 2A were developed, which laid a good foundation for substantially improving the quality of hybrid rice. The subsequent breeding of the restorer line is therefore a key matching technique for the application of FA male sterile lines. In this study, the directional breeding method for male sterile restorer lines matching with FA cytoplasm was designed. Hybridization and backcrosses were conducted by using the wild rice as non-recurrent parent and Minghui 63 as recurrent parent. The fertile genes from the wild rice were segregated, transferred, recombined and integrated into the genetic background of Minghui 63 by self-crosses of descendants to obtain a new male sterile restorer line Jinhui 1 with new male sterile cytoplasm.

The restorer line resembled Minghui 63 in agro-chaits with its spikelets completely fertile. Two hybrid rice combinations of Jinnong 1A/ Jinhui 1 and Jinnong 2A/Jinhui 1 were superior in yield compared with CK combination. All the twelve rice quality indexes approached those of fine quality rice, and the goal of greatly improving hybrid rice quality was realized. Backcrosses could be used to input genes of recurrent parents time after time, expand genetic proportion of recurrent parents generation after generation, reduce the proportion of non-target genes from non-recurrent parents generation after generation and enlarge the genetic distance between a restorer line and a sterile line to reach the aim of improving heterosis. By using this method, fertile genes can be transferred so that any rice variety can be lead to be a male sterile restorer line, which breaks the technical bottle-neck in breeding restorer lines matching with sterile lines of the new sterile cytoplasm, greatly increases the breeding potential in the searching of restorer lines and therefore cuts a new way for the development of FA male sterile lines and fine quality hybrid rice.

Key words [Hybrid rice](#) [cms-FA](#) [Fine quality rice male sterile line](#) [Male sterile restorer line](#)

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