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研究论文

水稻显性早熟基因Ef-cd的基因效应分析及育种应用潜力的初步评价

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摘要 利用近等基因系，比较系统地分析了水稻Ef-cd基因的感光效应、早熟效应以及对其他主要农艺性状的影响，并对该基因的育种应用潜力进行了初步评价。结果表明Ef-cd基因是一个非感光的显性早熟基因，它能使水稻提早抽穗13~21 d，并能显著降低水稻的株高，但对有效穗、穗长、每穗总粒数、结实率和千粒重等主要农艺性状无显著影响。同时，该基因可使迟熟杂交稻的抽穗期提早13~17 d，并且通过导入该基因育成的早熟杂交稻新组合比同熟期对照显著增产，因而该基因在早熟杂交稻育种中具有较大的应用潜力。

关键词 水稻 早熟性 近等基因系 基因效应

分类号

Gene Effect Analysis and Evaluation of Application Potential of Rice Dominant Earliness Gene *Ef-cd*

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Abstract Ef-cd gene is a dominant earliness gene located on the short arm of rice chromosome 3. In order to promote application of Ef-cd gene in rice improvement, we studied the photosensitivity and effect of Ef-cd gene on main agronomic traits by using near isogenic lines harboring the gene and their recurrent receptor parents Minghui 63 (MH63), Shuhui 881 (SH881) and Shuhui 527 (SH527). At the same time, application potential of Ef-cd gene in developing early-maturing hybrid rice was evaluated through analysis of main agronomic traits and yield of F1 combinations from the cross between the near isogenic lines of Ef-cd gene and CMS lines. The results showed that there was no significant difference of reduction of dates to heading in the same early-maturing lines between long-day and short-day conditions. Under natural long-day condition, there were significant differences in dates to heading and plant height between the early-maturing lines and their receptor parents, with 13 – 21 d earlier and 2.4 – 10.9 cm shorter in the early-maturing lines than in their receptor parents, respectively. However, there were no significant differences in panicles per plant, spike length, grain number per panicle, seed setting rate, and 1000-grain weight between the early-maturing lines and their receptor parents. It is assumd that Ef-cd gene is a photoperiod-insensitive dominant earliness gene and can significantly accelerate heading, markedly reduce plant height, but does not have significant effects on panicles per plant, spike length, grain number per panicle, seed setting rate, and 1000-grain weight of rice. Days to heading of the hybrid combinations of early-maturing line E527-5-5 with CMS lines G46A, G201A, and G203A were 13 – 17 d earlier than those of its receptor parent SH527 with the same CMS lines, however, yield of the early-maturing hybrid combinations was 5.8% – 7.1% higher as compared with the control cultivar Shanyou 77 with the same mature period. It is also suggested that Ef-cd gene can advance late-maturing hybrid rice to head significantly earlier, and increase the yield of early-maturing hybrid rice with Ef-cd gene. Therefore, Ef-cd gene may have promising application potential in developing early-maturing and high-yielding hybrid rice.

Key words Rice Earliness Near isogenic line Gene effect

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