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The progression of perennial rice breeding and genetics research in China

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Abstract

Soil erosion is a worldwide problem of increasing concern, and perennial grain crops could be an important part of the solution. In Southeast Asia, upland rice (*O. sativa*) contributes to regional soil erosion problems because it is an annual crop grown on hilly lands. The perennial cultivars of upland rice could reduce soil erosion and meet the needs of subsistence farmers. From the viewpoint of breeding, *O. longistaminata*, with the same genome, AA, as *O. sativa*, would be the most logical donor of genes for rhizome expression. For perennial rice cultivar development, several donor traits, such as rhizome and stolon have been employed for perenniability. Up to now, there are some results as follows: 1. Based on the fine mapping of the rhizome genes (*Rhz*), *Rhz2*, *Rhz3*, via genomic library (BAC, Fosmid, rhizome cDNA library) construction and analysis, *de novo* sequence, confirming the genetic regularity that the rhizome was controlled by two pairs of dominant complementary genes, *Rhz2*, *Rhz3* and obtaining 15 rhizome locus and candidate functional genes, and *Rhz2-1* and *Rhz3-1* potentially originate rhizome via the transgenic means and would be confirmed; 2 the perennial rice breeding is on the way and some breeding lines that hold the rhizome genes was made. There are 5 perennial rice (PR) lines, namely PR23, PR57, PR129, PR137 and PR139 that have been bred. 3 the potential perennial materials were screened at different sites, such as Lao, Africa and China for perennial ability investigation. Thus development of perennial rice cultivars from *O. longistaminata* face two large challenges: 1) the need to pyramid in an *O. sativa* background multiple rhizome QTL in order to get strong rhizome expression, and 2) the need to get rid of QTLs for low pollen fertility without losing linked QTLs for rhizomes.

Key words: Perennial rice, breeding, genetic research