

植物遗传学

# 水稻籼粳亚种间杂种低温花粉不育的QTL分析

杨 杰<sup>1</sup>, 翟虎渠<sup>2</sup>, 王才林<sup>3</sup>, 仲维功<sup>3</sup>, 邹江石<sup>3</sup>, 池桥宏<sup>4</sup>, 万建民<sup>1</sup>, ①

1.南京农业大学作物遗传与种质创新国家重点实验室;江苏省植物基因工程技术研究中心;南京 210095;2. 中国农业科学院;北京 100081;3.江苏省农业科学院粮食作物研究所;南京 210014;4.日本大学生物资源科学学院;神奈川县 1866;日本

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**摘要** 为探明籼粳杂种低温花粉不育的遗传基础,以籼稻品种3037和粳型广亲和品种02428的F2分离群体进行了低温花粉不育的遗传分析。推迟播种后, F2群体各单株孕穗期的日平均温度为21~23℃, 调查了F2群体各单株的花粉育性。利用108对SSR引物构建了包含157个F2单株, 覆盖12条染色体的分子标记连锁图谱。该连锁图的总长度为1857.8 cM, 标记间平均距离为16.26 cM, 标记较均匀地分布在12条染色体上。采用区间作图法对F2群体花粉不育进行QTL分析, 共检测到2个低温花粉不育QTLs, 即qLTSPS2和qLTSPS5, 分别位于第2、5染色体, 其加性效应分别为0.021、0.045, 显性效应分别为-0.246、-0.251, 显性度分别为11.7和4.8, 具有超显性效应, 超显性是QTL作用的主要方式, 这2个位点杂合基因型在低温环境下具有降低花粉育性的作用, 分别解释表型变异的15.6%、11.9%。另外, 两因素的方差分析表明这两个QTL之间不存在互作。

**关键词** [水稻](#) [籼粳杂种](#) [低温](#) [花粉不育](#) [QTL定位](#)

分类号

## QTL Analysis of Low-temperature-sensitive Pollen Sterility in Indica-japonica Hybrid Rice (*Oryza sativa* L.)

YANG Jie<sup>1</sup>, ZHAI Hu-Qu<sup>2</sup>, WANG Cai-Lin<sup>3</sup>, ZHONG Wei-Gong<sup>1</sup>, ZOU Jiang-Shi<sup>3</sup>, Ikehashi H. 4, WAN Jian-Min<sup>1</sup> ,①

1.State Key Laboratory of Crop Genetics and Germplasm Enhancement; Rice Research Institute; Research Center of Jiangsu Plant Gene Engineering; Nanjing Agricultural University; Nanjing; 210095; China; 2.Chinese Academy of Agricultural Sciences; Beijing; 100081; China; 3.Institute of Food Crops; Jiangsu Academy of Agricultural Sciences; Nanjing; 210014;4.College of Bioresources Sciences; Nihon University; 1866 Kameino; Fujisawa; Kanagawa; Japan

### Abstract

There existed a number of biological constraints in exploiting the heterosis between indica and japonica hybrid rice. The low-temperature-sensitive sterility (LTSS) of indica-japonica hybrid has become one of the major problems in indica-japonica hybrid rice breeding after the solution to the problem of poor fertility of the hybrids with the finding of wide-compatibility gene. The previous studies revealed that the LTSS might be caused by low-temperature-sensitive pollen sterility (LTSPS). However, the genetic basis of LTSPS remained unclear. To explore the genetic basis of LTSPS in indica-japonica hybrid rice, an F2 genetic population derived from 3037 (indica) and 02428 (japonica) was developed. At the booting stage, pollen fertility of F2 population together with parents were surveyed after the treatment with low temperature daily average 21~23℃. The linkage map was constructed containing 108 SSR markers distributed throughout the whole 12 chromosome with average marker interval 16.26 cM. Using software MapMaker/QTL, two putative QTLs, namely qLTSPS2 and qLTSPS5 on chromosomes 2 and 5 were detected by interval mapping, which can explain the phenotypic variation 15.6% and 11.9% respectively. The additive effects were 0.021 and 0.045, dominant effects were -0.246 and -0.215, and the degrees of dominance were 11.7 and 4.8, respectively for the two QTLs, therefore the mode of gene action in response to low-temperature stress was overdominance and LTSPS is mainly the result of interaction between the indica and japonica alleles within each locus. In addition, two-way ANOVA showed that the two QTLs acted essentially independent of each other in conditioning LTSPS. <br>

**Key words** [Oryza sativa L.](#) [Indica-japonica hybrid rice](#) [Low temperature](#) [Pollen sterility](#) [QTL](#)

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