

植物遗传学

### 水稻低温发芽势的遗传及数量性状基因座分析

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#### 摘要

利用籼粳交“密阳23/吉冷1号”的F2: 3代200个家系作为作图群体, 在14℃条件下鉴定萌发7 d、11 d、14 d和17 d时低温发芽势, 并利用由SSR标记构建的分子连锁图谱为基础, 对不同萌发阶段的低温发芽势进行了数量性状基因座(QTLs)检测, 同时进行了低温发芽势与其他耐冷性状间的相关分析。结果表明, 萌发7 d时低温发芽势及其低温反应指数呈现向低发芽势和低的低温反应指数的偏态分布, 而萌发11 d、14 d和17 d时低温发芽势及其低温反应指数均呈现接近正态的单峰连续分布。萌发14 d时低温发芽势与其他耐冷性的相关性较萌发7 d、11 d和17 d时低温发芽势更为密切, 与芽期耐冷性、幼苗期耐冷性、低温下幼苗生长能力和孕穗期耐冷性表现为显著或极显著的正相关。位于第2染色体RM29-RM262区间的qLVG2和第7染色体RM336-RM118区间的qLVG7-2、qCIVG7-2在萌发11 d、14 d和17 d时均检测到; 位于RM29-RM262区间的qCIVG2在萌发11 d和14 d时均检测到, 并对表型变异的贡献率随着萌发进程而逐渐增加。与低温发芽势相关的qLVG2贡献率从6.9%增加到14.2%, qLVG7-2贡献率从9.9%增加到11.2%, 而与发芽势的低温反应指数相关的qCIVG2贡献率从6.3%增加到9.0%, qCIVG7-2贡献率从8.3%增加12.9%。这些QTL的增效等位基因均来自强耐冷亲本吉冷1号, 基因作用方式主要为部分显性。

关键词 [水稻; 低温发芽势; 低温反应指数; 遗传; 相关性; 数量性状基因座](#)

分类号

### Genetic and QTL Analysis for Low-Temperature Vigor of Germination in Rice

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Abstract

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The quantitative trait loci (QTLs) for low-temperature vigor of germination (LVG) with a germination period of 7 d, 11 d, 14 d, and 17 d at 14 °C was identified using F2:3 population, which included 200 individuals and lines derived from a cross of indica and japonica "Milyang 23/Jileng 1" with microsatellite markers. The correlation coefficient between LVG and other cold tolerance traits was analyzed. LVG and the cold response index for vigor of germination (CIVG) detected when the germination period was 7 d showed a continuous distribution, which was partial to lower LVG and lower CIVG in F3 lines. LVG and CIVG detected when the germination periods were 11 d, 14 d, and 17 d showed a continuous distribution near normal, which were quantitative traits controlled by multiple genes. LVG detected when the germination period was 14 d was more correlated with other cold tolerance traits than LVG detected when the germination periods were 7 d, 11 d, and 17 d, which was significantly associated with cold tolerance during the bud bursting period, the seedling stage, the booting stage, and the growing ability under cold conditions. qLVG2 located in RM29-RM262 on chromosome 2, qLVG7-2 and qCIVG7-2 located in RM336-RM118 on chromosome 7 were detected when the germination periods were 11 d, 14 d, and 17 d. qCIVG2 located in RM29-RM262 on chromosome 2 was detected when the germination periods were 11 d and 14 d. The variation is due to the observed phenotypic variation by the above QTLs, which was increased following the germination. The variation of qLVG2 related to LVG was increased from 6.9% to 14.2%. The variation of qLVG7-2 associated with LVG was increased from 9.9% to 11.2%. The variation of qCIVG2 correlated with CIVG was increased from 6.3% to 9.0%. The variation of qCIVG7-2 associated with CIVG was increased from 8.3% to 12.9%. These QTL alleles were obtained from the tolerant parent Jileng 1, and the gene action was most likely to be partially dominant.

**Key words** [rice](#); [low-temperature vigor of germination](#); [cold response index](#); [genetic](#); [correlativity](#); [quantitative trait loci \(QTLs\)](#)

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