

植物遗传学

水稻剑叶部分形态生理特性QTL分析以及它们与产量、产量性状的关系

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摘要

光合产物是水稻产量的主要来源, 因此对水稻后期功能叶片尤其是剑叶形态生理性状的遗传分析对水稻高产育种很重要。利用来源于籼/粳交后代的重组自交系群体为材料对水稻剑叶形态(叶片长、宽、面积)和生理性状(叶绿度、持绿性)进行了 QTL定位, 并对这些性状与产量、产量性状的相关性进行了分析。两年分别定位了17、6和14个与剑叶形态性状、叶绿度和持绿性有关的QTL, 其中10个QTL在两年中共同检测到。相关分析表明, 较大的剑叶可以增加穗粒数并显著增加产量, 然而叶绿度和持绿性与产量、产量性状无关或呈显著负相关。叶绿度与剑叶大小呈显著负相关以及籼/粳交群体后代半不育是叶绿度和持绿性与产量、产量性状无关或呈显著负相关的可能原因。染色体4上的RM255-RM349区域同时控制3个剑叶形态性状并且解释的变异也较大, 该区域可用于遗传改良以提高水稻产量。染色体3上的 RM422-RM565区域重叠了3个与持绿性有关的QTL, 它们对产量的贡献有待于通过构建近等基因系进行深入研究。

关键词

水稻; QTL定位; 剑叶大小; 持绿性; 产量

分类号

QTL Analysis for Flag Leaf Characteristics and Their Relationships with Yield and Yield Traits in Rice

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Abstract

<P>Photosynthesis of carbohydrate is the primary source of grain yield in rice (*Oryza sativa* L.). It is important to genetically analyze the morphological and the physiological characteristics of functional leaves, especially flag leaf, in rice improvement. In this study, a recombinant inbred population derived from a cross between an indica (*O. sativa* L. ssp. indica) cultivar and a japonica (*O. sativa* L. ssp. japonica) cultivar was employed to map quantitative traits loci (QTLs) for the morphological (i.e., leaf length, width, and area) and physiological (i.e., leaf color rating and stay-green) characteristics of flag leaf and their relationships with yield and yield traits in 2003 and 2004. A total of 17 QTLs for morphological traits (flag leaf length, width, and area), 6 QTLs for degree of greenness and 14 QTLs for stay-green-related traits (retention-degrees of greenness, relative retention of greenness, and retention of the green area) were resolved, and 10 QTLs were commonly detected in both the years. Correlation analysis revealed that flag leaf area increased grain yield by increasing spikelet number per panicle. However, the physiological traits including degree of greenness and stay-green traits were not or negatively

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correlated to grain yield and yield traits, which may arise from the negative relation between degree of greenness and flag leaf size and the partial sterility occurred in a fraction of the lines in this population. The region RM255-RM349 on chromosome 4 controlled the three leaf morphological traits simultaneously and explained a large part of variation, which was very useful for genetic improvement of grain yield. The region RM422-RM565 on chromosome 3 was associated with the three stay-green traits simultaneously, and the use of this region in genetic improvement of grain yield needs to be assessed by constructing near-isogenic lines. </P>

Key words

[Oryza sativa L.](#); [QTL mapping](#); [flag leaf size](#); [stage-green](#); [grain yield](#)

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