

植物诱变育种 · 农业生物技术

玉米叶夹角和叶向值的QTL定位

刘鹏飞^{1,2}, 蒋锋¹, 王汉宁¹, 王晓明^{1,2}

1. 仲恺农业工程学院农学院, 广东 广州 510225;
2. 甘肃农业大学农学院, 甘肃 兰州 730070

摘要:

叶夹角和叶向值是评价玉米株型的重要指标。本研究以甜玉米自交系组合T14×T4的F₂为作图群体,构建了包含192个SSR标记位点的遗传连锁图谱,覆盖玉米基因组1260cM,平均图距6.56cM。通过测定F₂、F_{2:3}家系的叶夹角和叶向值,应用复合区间作图法在两个世代中共检测到26个QTL,其中14个与叶夹角相关的QTL,分别位于第2、5、6、7和8染色体上,单个QTL可解释的表型变异为3.3%~26.2%;12个与叶向值相关的QTL,分布于第1、2、3、7和10染色体上,单个QTL可解释的表型变异为3.1%~20.7%。在第2、3、5染色体上分别检测到1、1、2个同时在F₂、F_{2:3}家系都稳定表达的QTL,分别落在区间bnlg1329~bnlg1613、umc1148~umc2275和umc1097~umc1692,可作为相关数量性状基因的候选基因。发现1个同时控制叶夹角和叶向值性状的QTL,位于第2染色体上的bnlg1017-umc2129区间,对两性状的表型贡献率分别为10.8%和10.6%。本研究的结果有望为玉米耐密型育种及分子辅助选择育种提供一定的理论依据。

关键词: 玉米 复合区间作图 叶夹角 叶向值 QTL定位

QTL MAPPING FOR LEAF ANGLE AND LEAF ORIENTATION IN CORN

LIU Peng-fei^{1,2}, JIANG Feng¹, WANG Han-ning¹, WANG Xiao-ming^{1,2}

1. College of Agronomy, Gansu Agricultural University, Lanzhou, Gansu 730070;
2. College of Agronomy, Zhongkai University of Agriculture and Engineering, Guangzhou, Guangdong 510225

Abstract:

Leaf angle and leaf orientation are very important traits affecting maize plant type (compactness). A genetic linkage map of 1260cM length was constructed with 192 SSR markers based on a sweet corn population consisting of 330 F₂ individuals from the cross T14 × T4, with an average interval length of 6.56cM. The leaf angle and leaf orientation from the population of F₂ and F_{2:3} families were evaluated for QTL analysis. With the method of composite interval mapping (CIM), 14 QTL out of 26 total QTL were identified for leaf angle on chromosomes 2, 5, 6, 7 and 8, and the phenotypic variance explained by each QTL ranged from 3.3% to 26.2%. The other 12 QTL were identified association with leaf orientation on chromosomes 1, 2, 3, 7 and 10 accounting for 3.1% to 20.7% of the phenotypic variance. One QTL was detected between bnlg1329 and bnlg1613 on chromosomes 2, one QTL was found between umc1148 and umc2275 on chromosomes 3, there were two QTL in the marker interval umc1097~umc1692 on chromosomes 5. These QTLs were detected in both F₂ and F_{2:3}, suggesting that these QTLs might be the stable QTLs and could be used as candidate gene of the quantitative traits. One QTL was found on chromosome 2 between bnlg1017 and umc2129, controlling the leaf angle and leaf orientation, which could explain 10.8% and 10.6% of the phenotypic variance, respectively. The result of this study may provide useful information for compact breeding and marker-assisted selection for maize.

Keywords: corn composite interval mapping leaf angle leaf orientation QTL

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通讯作者: 王汉宁(1956-),男,甘肃平凉人,博士,教授,博士生导师,主要从事玉米遗传育种研究。

Tel: 0931-7631145; E-mail: wanghn@gsau.edu.cn

作者简介:

作者Email: wanghn@gsau.edu.cn; wxm1724@sina.com

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