

QTL mapping for plant height and stalk sugar content in sorghum [*Sorghum bicolor* (L.) Moench] 31

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Abstract: 【Objective】 The determination of plant height and stalk sugar content is vital when evaluating the yield and quality of sorghum. As a crop with a high biological yield, sorghum is an ideal candidate for use in both livestock feed and biofuel production. Further research focused on the QTL localization of these traits is essential for a better understanding of the intricate molecular genetic mechanisms that are responsible for these complex traits in sorghum. **【Method】** To investigate the phenotypic variation of plant height, sugar content, and other related traits in sorghum, we conducted a six-environment field trial utilizing a RIL population consisting of 252 lines, which derived from the cross between the dwarf non-sweet variety LR625 and tall sweet variety RIO. We employed coefficient of variation, correlation analysis, cluster analysis, principal component analysis, and F-value evaluation of the affiliation function to analyze the correlation and genetic variation levels of plant height and sugar content. QTL mapping for plant height and stalk sugar content was performed using the complete interval mapping method. **【Result】** In this study, plant height and sugar content were measured in twelve environments over a period of six years. The average plant height of RIL populations ranged from 78.50 to 450.00 cm and the average sugar content ranged from 0.30 to 35.10%. Correlation analysis showed that sorghum plant height was significantly and positively correlated with sugar content. A total of 28 QTL loci were detected, located on chromosomes 1, 4, 5, 6, 7, and 8. 17 QTL for plant height were identified, and each QTL could explain 4.89%-29.28% of the phenotypic variation; 11 QTL for stalk sugar content were identified. Each QTL explained 5.94%-10.69% of the phenotypic variation. Where *qPH2.1*, *qPH3.1*, and *qBr2.1* were detected in at least three environments. The main effect QTL controlling plant height (*qPH7.2.1*, *qPH7.3.1*, *qPH7.3.2*, *qPH7.3.3*) overlapped with the main effect QTL controlling sugar content (*qBx7.2.1*) on chromosome 7. **【Conclusion】** A total of 28 QTL related to sorghum plant height and sugar content were detected, 12 of which were dominant QTL, 4 of which were detected repeatedly in multiple environments.

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