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Genome wide QTL mapping for resistance to *Verticillium* wilt, and the related traits in cotton chromosome segment substitution lines

The development of chromosome segment substitution lines (CSSLs) from *Gossypium barbadense* in *G. hirsutum* background provided ideal materials for further genome research and crop improvement through MAS. We had developed BC₅F_{3,5} populations with the donor parent *Hail* and the recurrent parent CCRI36. In this study, 300 CSSLs and their two parents were planted in a randomized complete block design with two replications in two ecological locations (Anyang and Xinjiang) in 2015 and 2016, respectively. *Verticillium* wilt resistance was collected at the time of July and August in the field. A total of 597 pairs SSR markers screened from 2292 pairs of markers in the high density map from a BC2F1 population of *G. hirsutum* × *G. barbadense* were used to identify the polymorphisms among the BC5F3:5 lines. A total of 56 QTLs for *Verticillium* wilt resistance were detected, 30 of them are stable, and 38 QTLs (68%) had negative additive effects, which indicate that the *G. barbadense* alleles increased *Verticillium* wilt resistance and decreased DI by about 2.64 to 13.23. By meta-analysis, 30 QTL hotspot regions for VW resistance were identified and 13 of them were new hotspot regions. One hundred ninety-one (191) QTLs were detected for fiber yield and fiber quality, 98 for the fiber quality traits and 93 for the yield related traits, 54 of them are stable. Three chromosomes of Chr05, Chr10 and Chr20 contained more QTLs. Thirty (30) clusters with disease index and fiber related traits were identified on 16 chromosomes. Most of the fiber traits were clustered with the disease index stable QTLs. We found six clusters namely, C01-cluster-1, C05-cluster-4, C07-cluster-1, C19-cluster-2, C22-cluster-1 and C22-cluster-2, which had positive correlation between VW resistance and fiber quality traits. Two clusters, C10-cluster-1 and C25-cluster-1 had also positive correlation between VW resistance and yield related traits (boll weight and lint percentage). One cluster, C20-cluster-1 is important for VW resistance, fiber quality and fiber yield. So, these clusters and related QTLs are very important for breeding improvement of fiber quality and yield, VW disease resistance.

Biography

Youlu Yuan has completed his PhD from Nanjing Agricultural University, China. He is the Director of Biotechnology Research Department of Institute of CAAS. His studies are related to cotton hybrid vigor and molecular marker assisted selection about fiber quality, and his focus on Cotton Variety Molecular Design.

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