

Development of a new molecular marker for the resistance to tomato yellow leaf curl virus

ABSTRACT

Tomato yellow leaf curl virus (TYLCV) responsible for tomato yellow leaf curl disease (TYLCD) causes a substantial decrease in tomato (*Solanum lycopersicum* L.) yield worldwide. The use of resistant variety as a sustainable management strategy has been advocated. Tremendous progress has been made in genetically characterizing the resistance genes (R gene) in tomato. Breeding tomato for TYLCV resistance has been based mostly on Ty-3 as a race-specific resistance gene by introgression originating from wild tomato species relatives. Improvement or development of a cultivar is achievable through the use of marker-assisted selection (MAS). Therefore, precise and easy use of gene-targeted markers would be of significant importance for selection in breeding programs. The present study was undertaken to develop a new marker based on Ty-3 gene sequence that can be used for MAS in TYLCV resistant tomato breeding program. The new developed marker was named ACY. The reliability and accuracy of ACY were evaluated against those of Ty-3 linked marker P6-25 through screening of commercial resistant and susceptible tomato hybrids, and genetic segregation using F₂ population derived from a commercial resistant hybrid AG208. With the use of bioinformatics and DNA sequencing analysis tools, deletion of 10 nucleotides was observed in Ty-3 gene sequence for susceptible tomato variety. ACY is a co-dominant indel-based marker that produced clear and strong polymorphic band patterns for resistant plant distinguishing it from its susceptible counterpart. The obtained result correlates with 3:1 segregation ratio of single resistant dominant gene inheritance, which depicted ACY as gene-tag functional marker. This marker is currently in use for screening 968 hybrids varieties and one thousand breeding lines of tomato varieties stocked in Jiangsu Green Port Modern Agriculture Development Company (Green Port). So far, ACY has been used to identify 56 hybrids and 51 breeding lines. These newly detected breeding lines were regarded as potential source of resistance for tomato breeding. This work exploited the sequence of Ty-3 and subsequently contributed to the development of molecular marker ACY to aid phenotypic selection. We thus recommend this marker to breeders, which is suitable for marker-assisted selection in tomato.