

Agarose-resolvable InDel markers based on whole genome re-sequencing in cucumber

ABSTRACT

Insertion and Deletion (InDel) are common features in genomes and are associated with genetic variation. The whole-genome re-sequencing data from two parents (X1 and X2) of the elite cucumber (*Cucumis sativus*) hybrid variety Lvmei No.1 was used for genome-wide InDel polymorphisms analysis. Obtained sequence reads were mapped to the genome reference sequence of Chinese fresh market type inbred line '9930' and gaps conforming to InDel were pinpointed. Further, the level of cross-parents polymorphism among five pairs of cucumber breeding parents and their corresponding hybrid varieties were used for evaluating hybrid seeds purity test efficiency of InDel markers. A panel of 48 cucumber breeding lines was utilized for PCR amplification versatility and phylogenetic analysis of these markers. In total, 10,470 candidate InDel markers were identified for X1 and X2. Among these, 385 markers with more than 30 nucleotide difference were arbitrary chosen. These markers were selected for experimental resolvability through electrophoresis on an Agarose gel. Two hundred and eleven (211) accounting for 54.81% of markers could be validated as single and clear polymorphic pattern while 174 (45.19%) showed unclear or monomorphic genetic bands between X1 and X2. Cross-parents polymorphism evaluation recorded 68 (32.23%) of these markers, which were designated as cross-parents transferable (CPT) InDel markers. Interestingly, the marker InDel114 presented experimental transferability between cucumber and melon. A panel of 48 cucumber breeding lines including parents of Lvmei No. 1 subjected to PCR amplification versatility using CPT InDel markers successfully clustered them into fruit and common cucumber varieties based on phylogenetic analysis. It is worth noting that 16 of these markers were predominately associated to enzymatic activities in cucumber. These agarose-based InDel markers could constitute a valuable resource for hybrid seeds purity testing, germplasm classification and marker-assisted breeding in cucumber.