

Somatic embryogenesis and polyploidy in grapevine: morphological shoot and leaf traits variations

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Abstract

Somatic embryogenesis (SE) has been used in a variety of biotechnology applications such as virus elimination, cryopreservation, induced mutagenesis and genetic transformation. The SE induction process may cause DNA alterations and ploidy changes, which may provide a source of genetic variability useful for the improvement of agronomic characteristics of plants. This research aims at investigating the spontaneous alterations of the genome in grapevine plants regenerated through SE. Regenerants obtained from different embryogenic events from three different grapevine genotypes (Catarratto, Frappato and Nero d'Avola) were analysed. Three different DNA-based techniques, were used to verify mutations (RAPD, ISSR and SSR markers). We also estimated the ploidy levels of regenerants and differences were observed for 10% of Frappato regenerants that were tetraploid. The different ploidy levels induced several anatomical/morphological changes of the shoots, mature leaves and stomata, which were larger in tetraploid as compared to diploid regenerants. Also, the number of chloroplasts per guard cell pair was higher in tetraploids as compared to diploids; on the contrary, the stomatal index was lower in tetraploids than in diploids. These profound morphological alterations may influence a wide range of physiological processes related to adaptation to environmental stresses.

Keywords: autoploidy, ploidy variability, somatic embryogenesis, stomatal characteristics, grapevine