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The Effects of Zinc Oxide Nanoparticles Loaded with Indole-3-Acetic Acid and Indole-3-Butyric Acid on in vitro Rooting of Apple Microcuttings

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Abstract : Plant tissue culture is a substantial plant propagation technique for mass clonal production throughout the year, regardless of time in fruit species. However, the rooting achievement must be enhanced in the difficult-to-root genotypes. Classical auxin applications in clonal propagation of these genotypes are inadequate to solve the rooting problem. Nanoparticles having different physical and chemical properties from bulk material could enhance the rooting success of controlled release of these substances when loaded with auxin due to their ability to reach the active substance up to the target cells as a carrier system.The purpose of this study is to investigate the effects of zinc oxide nanoparticles loaded with indole-3-acetic acid (IAA-nZnO) and indole-3-butyric acid (IBA-nZnO) on in vitro rooting of microcuttings in a difficult-to-root apple genotype (Malus domestica Borkh.). Rooting treatments consisted of IBA or IAA at concentrations of 0.5, 1.0, 2.0, 3.0 mg/L; nZnO, IAA-nZnO and IBA-nZnO at doses of 0.0, 1.0, 2.0, 3.0, 4.0, 5.0, 6.0 mg/L were used. All components were added to the Murashige and Skoog (MS) basal medium at strength ½ with 2% sucrose and 0.7% agar before autoclaving. In the study, no rooting occurred in control and nZnO applications. Especially, 1.0 mg/L and 2.0 mg/L IBA-nZnO nanoparticle applications (containing 0.5 mg/L and 0.9 mg/L IBA), respectively with rooting rates of 40.3% and 70.4%, rooting levels of 2.0±0.4 and 2.3±0.4, 2.6±0.7 and 2.5±0.6 average root numbers and 20.4±1.6 mm and 20.2±3.4 mm average root lengths put forward as effective applications.

Keywords : Auxin, Malus, nanotechnology, zinc oxide nanoparticles
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