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Use of Nanoparticles for Molecular-level Manipulation of *in Vitro* Cultures in Obtaining New Varieties of Crop Plants

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Extended Abstract

The field of nanotechnology opens up the potential novel applications in agriculture and biotechnology. Understanding the nature of the interactions between nanoparticles and plants is critical in realizing the influence of nanotechnology on the environment and agriculture systems. Nanoparticles affect the plants on molecular level and these changes appear in variable ontogenesis stages. Plants with improved features could be produced by using nanoparticles.

The present study was aimed to provide some insight into the nature of nanoparticles influence on crop plants in molecular level. As model systems, we have used three plant cultures of Latvian origin alfalfa (*Medicago sativa* subsp. *varia*) variety 'Skriveri', flax (*Linum usitatissimum* L.) accession 'Blue di Riga' and red clover (*Trifolium pratense* L.) variety 'Stendes agrais'. The influence of Ag, Au, C and Ni nanoparticles on calli tissue were studied.

Quantitative and qualitative characteristics of calli were analyzed after each subculture. The penetration and location of nanoparticles in calli and in plant regenerants, frequency of callusogenesis, type and capacity of regeneration, cell ploidy, DNA methylation and DNA sequencing were detected. Somaclonal variation was investigated in nuDNA regions of pectin methylesterase (pme3) and Mlo-like protein genes. Sequences were obtained by Sanger method. Methylation analyses were carried out in genes rich with CpG sites: 26S ribosomal RNA gene, 26S-18S ribosomal RNA intergenic spacer, 18S ribosomal RNA gene, internal transcribed spacer 1, 5.8 S ribosomal RNA gene, and internal transcribed spacer 2. Ploidy level were determined by flow cytometry. At least 10000 nuclei were analysed per sample.

To study the molecular mechanisms of interactions between nanoparticles and calli was done extensive research to determinate the differences among calli culture and the influence of nanomaterials on living plant cells. A significant effect of nanoparticles on the calli was detected.