4035 mg/L in peripheral human blood, alveolar epithelial and liver hepatocyte cells, respectively. Al–ZnO nanoparticles induced upregulation of 1 and down-regulation of 31 genes in peripheral human blood cells, upregulation of 41 and down-regulation of 5 genes in human alveolar epithelial cells and upregulation of 34 and down-regulation of 17 genes in liver hepatocytes cells. This study of gene expression profiles affected by nanotoxicity provides critical information for the clinical and environmental applications of Al–ZnO nanoparticles.

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The influence of colloidal metal nanoparticles on *in vitro* plants of potato

Włodzimierz Przewodowski*, Agnieszka Przewodowska, Dorota Michałowska, Danuta Sekrecka, Katarzyna Salamońska, Wioleta Stochła, Dorota Szarek

Bonin Research Center, Plant Breeding and Acclimatization Institute – National Research Institute, Bonin, Poland

E-mail address: w.przewodowski@ihar.edu.pl (W. Przewodowski).

Potato (*Solanum tuberosum*) as one of the most economically important strategic crops in the world, it is also host to many pathogenic microorganisms causing serious diseases, significantly affecting the yield. One of the most efficient ways of preventing yield loses are application of healthy seed material as well as strict hygiene during the production. Therefore, it is crucial to provide appropriate conditions, at the initial stage of the potato production, especially during *in vitro* plant material microprpoagation process. Currently applied biocides often trigger phytotoxic response and they are not very efficient. As an alternative to the substances the silver, copper, gold and platinum nanoparticles have been used. Therefore, the aim of the proposed research was to develop and identify the influence of the colloidal metal nanoparticles on growth and proliferation of *in vitro* cultures of potato. The research on different varieties of potato were performed by placing the explants of the *in vitro* cultures in sterile Murashige and Skoog type medium impregnated with the examinated nanoparticles. The vigour of growth and the rate of proliferation has been examinated. The preliminary results confirmed high usefulness of the nanocolloids in the safe and effective production of the examinated *in vitro* cultures.

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Nanoemulsion-based delivery systems to improve functionality of oregano essential oil: Molecular characterization and in vitro antifungal activity

Ertan Ermis[1,*], Perihan Kubra Cicek[2], Raciye Meral[3], Azime Yilmaz[4], Enes Dertli[5], Mustafa Tahsin Yilmaz[2]

[1] *Istanbul Sabahattin Zaim University, Faculty of Engineering and Natural Sciences, Food Engineering Department, İstanbul, Turkey*
[2] *Yildiz Technical University, Chemical and Metallurgical Engineering Faculty, Food Engineering Department, İstanbul, Turkey*
[3] *Yuzuncu Yil University, Engineering Faculty, Food Engineering Department, Van, Turkey*
[4] *Yildiz Technical University, Chemical and Metallurgical Engineering Faculty, Bioengineering Department, İstanbul, Turkey*
[5] *Bayburt University, Engineering Faculty, Food Engineering Department, Bayburt, Turkey*

E-mail address: ertan.ermis@gmail.com (E. Ermis).

In this work, nanoemulsion-based delivery system was developed by encapsulation of oregano essential oil (OEO) at different concentrations (0.5%, 0.75% and 1%, v/v) in poly-vinyl alcohol solution. The nanoemulsion systems (NES) were characterized in terms of nanodroplet size distribution, zeta potential, thermal, molecular, micro-structural and antifungal properties. The average droplet diameters were in the range of 70–75 nm while zeta potentials were recorded in the range of 3.13 and 19.90 mV. Increase in the OEO concentration did not affect the size distribution of nanodrops in NES. Change in concentrations showed no visible differences in FTIR spectra; however, for the concentrations of 0.5, 0.75 and 1%, endothermic peak temperatures were recorded as approximately 94, 105 and 117 °C, respectively. The antifungal activity of OEO in NES against mycelial growth of *Aspergillus niger* could be significantly enhanced as compared to that of free OEO. The zone diameter of mycelial growth could be decreased by around 20%, 55% and 65% over 6 days of incubation time for 0.5%, 0.75% and 1%, v/v concentrations, respectively. The results of this study show the increased antifungal efficiency of the encapsulation of OEO in NES as compared to that of free OEO.

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Green synthesis of silver nanoparticles using *Allium cepa* and *Allium sativum* extract: A comparative characterization study

Gamze Tan

Department of Biology, Faculty of Science and Letters, Aksaray University, Aksaray, Turkey

E-mail address: gamzetan2003@yahoo.com.

Silver nanoparticles (AgNPs) are used in many fields, including diagnosis and treatment of diseases, creams, paints, packaging thanks to their unique antibacterial properties. Due to the toxic effect, high cost and production time, the interest in new synthesis approaches that can be an alternative to the physical and chemical methods has increased. There is currently widespread interest in green synthesis methods with rapid, low cost and eco-friendly. In this study, AgNPs were prepared by green synthesis using "*Allium cepa*" (Onion) and "*Allium sativum*" (Garlic) extracts. The NPs were analyzed by UV–vis spectroscopy, transmission electron