# Effect of metal nanoparticles on morphological parameters of the plants *in vitro*

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The regulation of metabolism and productivity of the agricultural crops can be possible by means of vegetative plants' treatment. Very relevant research direction of plants' physiology and phytobiotechnology is to use metal nanoparticles instead of ionic form. Grape culture has a high genetic potential. But completeness of the implementation depends on the improvement of technological methods of cultivation adapted to specific agro-climatic conditions, taking into account the biological characteristics of varieties. Zinc (Zn) plays an important role in the plants metabolism: it effects the enzymes' activity and as well can increase the latter of carbonic anhydrase and dehydrogenase, which are involved in stabilization of ribosomal fractions and cytochrome synthesis. Plants' enzymes, which are activated by nano zinc, are involved in carbohydrate metabolism ensuring the integrity of cell membranes, protein synthesis, and maintenance of the phytohormonal balance.

The nanoscale zinc used in this study was produced at the material science department of National University of Life and Environmental Sciences of the Ukraine. Characteristics of the particles were as follows. Average particle size of 40-50 nm., purity – 99,9%. In the experiment, Sultana virgin variety was cultivated in the sterile solutions on agar Murashige and Skoog medium of the Murasega-Skuga in quantities of 5 stalks in each Petri dish. Our plants were processed by stock solutions of different concentrations. The treatment of plants was carried out on the tenth day by application of 15 ml of nanozinc solution to a piece of leaf. For screening and selection of the most effective values of concentration, dilution of bittern nanozinc solution (by 10, 50, 75, 100, 200 times) was used, produced by electric spark synthesis. Plants treated with distilled water were used as control samples. Plants were grown under controlled conditions at 24°C, maintaining the constant level of relative humidity of 70% and a 16-hours photoperiod at value of quanta density of luminous flux about 120 mkmol·m-2·s-1. Assessment of biomass growth of the underground and aboveground parts was performed in 30 days after the treatment.

During the investigation of the effect of influence of different nanozinc concentrations on growth of biomass of the underground and aboveground parts, it was found that all the studied concentrations of nanospecimen statistically significantly ($r \leq 0,05$) activated the processes of growth and accumulation of biomass of vine cuttings in comparison to the control sample. The most effective concentration appeared to be the bittern nanozinc solution diluted by 100 times – it increased the biomass of roots eightfold compared to the control level. With that, 200-times diluted solution caused an increase in growth of roots' biomass only by 1.5 times compared to the constitutive level. In case of nanozinc diluted by 100 times, there was a 10-fold increase of mass of the aboveground part compared to the control sample.

In summary, the effect of colloidal zinc solution on the growth processes of grapes were analyzed, and the optimal concentration of the solution was determined for stimulation of plant growth processes. The best effect of stimulation of the roots and sprouts' biomass growth was observed in case of application of 100-times diluted nanozinc colloidal solution.