Nanocomposites and nanomaterials

Effect of metal nanoparticles on the antioxidant activity of *Triticum sp*. plants under drought conditions

M.S. Kovalenko, Ye.O. Konotop, N.B. Svietlova, V.O. Storozhenko, Yu.A. Koval

Educational and Scientific Centre «Institute of Biology and Medicine», Taras Shevchenko National University of Kyiv, Volodymyrska Street, 64/13, Kyiv 01601, Ukraine
E-mail: mariia.s.kovalenko@gmail.com

One of the promising areas of sustainable agriculture that helps to realize the genetic potential of crops in unfavorable environmental conditions is the use of nanotechnology. Biogenic metal nanoparticles (NPs) are considered as adaptogens and can be used to induce protective action of stress reactions of different nature on early ontogenetic stages of plants including drought.

The aim of our research was to study the effect of nanoform biogenic metal colloidal solution on the development of antioxidative reactions of plants under PEG-induced drought stress. 7-day seedlings of two wheat varieties *Triticum aestivum* L. (Trypil`s`ka, Favorytka) and *Triticum dicoccum* Schuebl. (Holikovs`ka) were studied. Experimental seedlings were grown on distilled water with polyethylene glycol 6000 (PEG) with an osmotic potential of -0.3 MPa and / or were treated with NPs (Cu, Fe, Mn, and Zn). Control seedlings were grown without both NPs treatment and PEG.

Analysis of the results shows that NPs treatment caused increased activity of antioxidant enzymes (SOD and CAT) in plants of Trypil`s`ka and Holikovs`ka varieties; the content of TBA-active products in photosynthetic tissues remained at control levels. Upon the conditions of joint action NPs and drought, the development of oxidative processes was observed, that manifested in increasing the content of TBA-active products in all varieties.

Antioxidant status factor, which reflects the ratio of antioxidant / prooxidant, increased upon the drought action in plants of Trypil`s`ka and Holikovs`ka varieties. NPs treatment significantly reduced this rate to nearly the control level. Plants of Favorytka variety were characterized by decreasing of antioxidant status factor relatively to control over the NPs actions by reducing the activity of SOD and CAT. Thus, the use of NPs on early ontogenetic stages alleviates the stress load on the plant organisms under drought conditions.