Nanochemistry and biotechnology

Colloidal nanomolybdenum influence upon the antioxidative reaction of chickpeas plants (*Cicer arietinum* L.)

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Plants contain molybdenum in small quantities (0.001 - 0.1 mg% in terms of dry matter), is present in all organs, it is a part of the 20 enzymes (aldehid oxidases, hydrogenases, nitrate reductase) and catalyzes the transition of nitrates into nitrites, it has an important role in phosphorus and protein metabolism. It should be noted particularly molybdenum role in the metabolism of legumes because its involved in fixing of molecular nitrogen by nodule bacteria of the genus *Rhizobium.* Chickpeas plants are drought tolerant and are able to fix atmospheric nitrogen via forming the symbiotic relationships with nitrogen fixation microorganisms that not only meet the requirements of plants in nitrogen but also bring it into the ground. The use of colloidal solutions of metals as micronutrients enhances plant resistance to unfavourable environmental conditions and ensures high yields of food crops. Taking into account the widespread use of microbiological preparation to improve the nitrogen fixation by plants the aim of the study was the comparative evaluation of pre-sowing treatment with nano molybdenum and microbiological preparation impact upon the development of adaptive responses in chickpeas plants.

Oxidative processes did not develop in all variants of the experiment, but in variants treated with microbial preparation and joint action of microbial and nano preparations even declined, as evidenced by the reduction of thiobarbituric acid reactive substance content in photosynthetic tissues by 15%. The activity of superoxide dismutase increased (by 15%) in variant “nano molybdenum ” and joint action “microbial + nano molybdenum ”, but it decreased by 20% in variant with microbial preparation treatment. The same dependence was observed in changes of catalase activity. Antioxidant status factor, which takes into account the ratio of antioxidant to pro-oxidant, was the highest in variant with joint action of microbial preparation and nano molybdenum (0.7) and the lowest in variant with microbial treatment only (0.1). Thus, the results show that the action of nanoparticles of molybdenum activated antioxidant enzymes and decreased oxidative processes thus promotes plants adaptome .