

**THE EFFECT OF NANOPARTICLES, MULTICOMPONENT TRACE
ELEMENT PREPERATION “AVATAR-2 PROTECTION”, AND MICROBIAL
PREPARATION “AZOGRAN” ON THE PRODUCTIVITY POTATO
CULTIVAR SUVENIR CHERNIHIVSKYI IN POLESIA REGION
CONDITIONS**

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Improvement of conventional methods of potato growing is an important task of modern agriculture. Nowadays nanoparticles (NPs) gain increasing attention of scientists as promising tools for increasing productivity of crop cultures. NPs of such elements as Fe, Zn, B, Si, Cu, Co, Se and Ag can significantly increase potato productivity. Ag NPs show synergic effect with some microbial preparations. However, the influence of such elements as Zn and Se on the productivity of potato and joint application of NPs with microbial preparations for pre-sowing treatment are not studied sufficiently. The influence of Ti and I NPs on potato productivity, the influence of NPs on Ukrainian potato cultivars, the influence of NPs on the potato productivity in Polesia region conditions are not studied yet. The aim of the study was to investigate the influence of pre-sowing treatment of seed potatoes with Zn nanoparticles (NPs), Ti NPs, composition of Se + I NPs, composition of Zn + Ti + Se + I NPs NPs, “Avatar-2 protection” multicomponent trace element preparation, “Azogran” microbial preparation and the combination of “Azogran” preparation with the composition of Se + I NPs on the productivity of potato cultivar Suvenir chernihivskyi in the Polesia region conditions. Two small plot studies were

planted for three years in order to conduct the study. Each small plot study had been performed on different soil types: soddy podzolic soil and alkaline chernozem. Studies were situated on the lands of the Institute of Agricultural Microbiology and Agro-industrial Production of National Academy of Agrarian Sciences of Ukraine.

As a result of our study it has been found that the influence of NPs, “Avatar-2 protection”, multicomponent trace element preparation and “Azogran” microbial preparation on the potato yield vary, depending on chemical composition of NPs and soil type. Most of the treatment variants had increased potato cultivar Suvenir chernihivskyi tubers yield on the soddy podzolic soil. However, in last two years a tendency of yield decrease under the influence of under the influence of Zn and Ti NPs was noticed.

A tendency of tuber yield increase had been noticed in the treatment with the composition of Se + I NPs. In the first year the yield in this variant had increased significantly by 49,22 %, in the second it decreased by 8,85 %, in the third – increased by 8,85 %. According to average data of three years the yield in this treatment significantly increased by 33,13 %.

A tendency of tuber yield increase had been noticed in the treatment with “Azogran” preparation. In the first year the yield in this variant had increased significantly by 23,39 %, in the second it decreased by 6,44 %, in the third – increased by 6,09 %. According to average data of three years the yield in this treatment significantly increased by 38,34 %.

The best result was obtained in the joint treatment with the composition of Se + I NPs and “Azogran” microbial preparation. The yield in this variant was consistently higher throughout the whole term of observation. In the first year it was higher than in control by 37,09 %, in the second and third years – by 27,43 and 36,57 % respectively. According to average data of three years the yield in this treatment significantly increased by 45,35 %.

In the treatments with the composition of Zn + Ti + Se + I NPs and “Avatar-2 protection” preparation there was a tendency of the yield increase, but the results were not significant.

On the alkaline chernozem there was a more consistent tendency of the yield increase in all variants with higher statistical significance. Unlike the soddy podzolic soil, there was a consistent tendency of yield increase in the treatment with Zn NPs.

In the treatment with Ti NPs there was a tendency of yield decrease.

In the treatment with the composition of Se + I NPs there was a consistent tendency of yield increase. Thus, in the first, the second and the third years the yield in this variant had increased by 47,04; 5,83 and 8,82 % respectively. According to average data of three years the yield in this treatment variant had significantly increased by 6,21 %.

In treatments with the composition of Zn + Ti + Se + I NPs and “Avatar-2 protection” preparation there was also a tendency of yield increase. According to the average data of three years the yield in this treatments had increased by 12,21 and 9,71 % respectively.

In the treatment with “Azogran” microbial preparation there was a consistent tendency of the yield increase. In the first and second years the yield in this variant was significantly higher than in control by 48,52 and 27,86 % respectively, in the third year – by 10,96 %. According to the average data of three years the yield in this treatment variant was significantly higher than in control by 17,98 %.

As in the case with soddy podzolic soil, the best result on alkaline chernozem was in the joint treatment with the composition of Se + I NPs and “Azogran” microbial preparation. The yield in this treatment was significantly higher three years in a row by 70,41; 21,06 and 29,14 % respectively. According to the average data of three years the yield in this treatment variant was significantly higher than in control by 32,27 %.

The combination of “Azogran” microbial preparation and the composition of Se + I NPs had the strongest influence on the yield, consistently increasing it in both field trials throughout the whole term of observation. The data suggest synergic effect between the composition of Se + I NPs and “Azogran” microbial preparation. It had been found previously that the composition of Se + I NPs significantly increases the titer of bioagent of “Azogran” preparation, bacteria strain *Bacillus subtilis* IMV V-7023, which can explain

the synergic effect. The results of the study suggest high efficiency of the use of NPs in potato growing.

Keywords: potato, yield, nanotechnology, nanoparticles, microbial preparation, trace element preparation.