



# PlantGen2021

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Plant genetics, genomics,  
bioinformatics, and biotechnology

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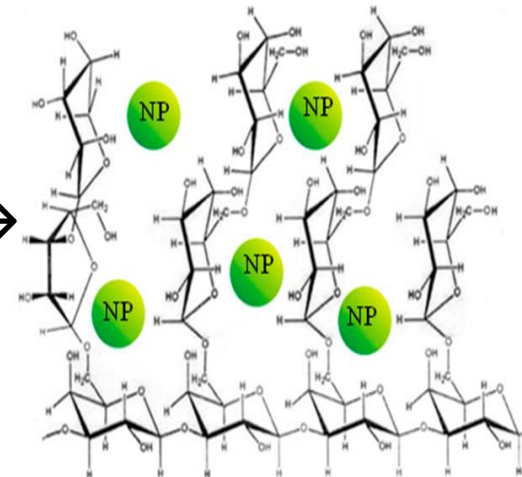
## MANGANESE-CONTAINING BIONANOCOMPOSITES ON THE BASIS OF NATURAL POLYSACCHARIDES AS NOVEL UNIVERSAL MICRONUTRIENTS FOR *SOLANUM TUBEROSUM* L.

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**The aim** - Investigation of the effect of manganese nanocomposites on the viability of phytopatogens and plants in order to develop drugs for the improvement of cultivated plants

**Materials.** Magnesium nanocomposites (Mn NCs)

1. Nanocomposite (AG-Mn) based on arabinogalactan isolated from Siberian larch *Larix sibirica*. The content of Mn 5.2%.
  2. Nanocomposite (AGS-Mn) based on sulfated arabinogalactan . The content of Mn 4.8%.
  3. Nanocomposite based on carrageenan (CG-Mn) The content of Mn 20.2%.
- NC - fine powders, brown or light brown in color. In the mass of the biopolymer, electron-dense round-shaped nanoparticles with an average size of 4-6 nm are formed, the nanoparticles do not form a group of clusters, they are dispersed in the mass of the polymer.

**Objects:**

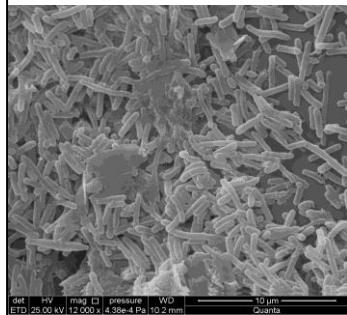
Potato plants *in vitro*  
variety Lukyanovsky

*Clavibacter sepedonicus*  
(Cms) bacterial that causes circular potato rot disease

Soil bacterial:  
*Acinetobacter guillouiae*;  
*Rhodococcus erythropolis*;  
*Pseudomonas oryzae*

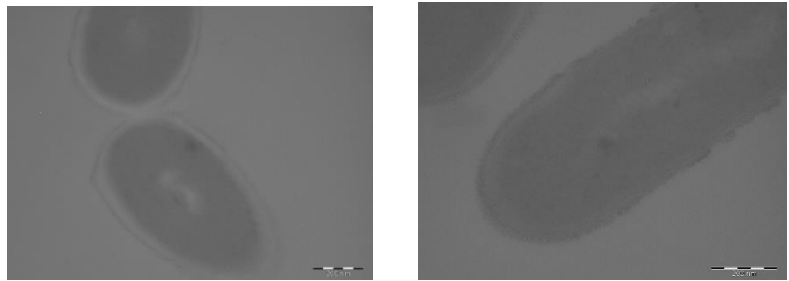
**Methods:**

1. Synthesis of magnesium nanocomposites;
2. Energy dispersive X-ray microanalysis of Mn NCs and seven elements including Mn in potato plant samples;
3. Transmission electron microscopy of Mn NCs;
4. Electron paramagnetic resonance;
5. Cultivation of plants and microorganisms;
6. The optical density of the bacterial suspension;
7. Bacterial biofilm formation

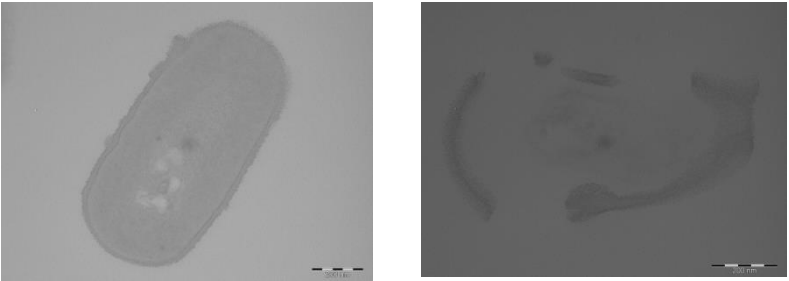


# Results. Effect of Mn NCs on *Clavibacter sepedonicus* bacteria

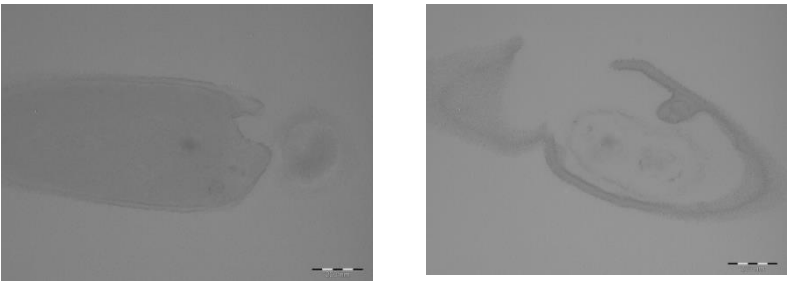
## TEM *Cms* in present with Mn NCs



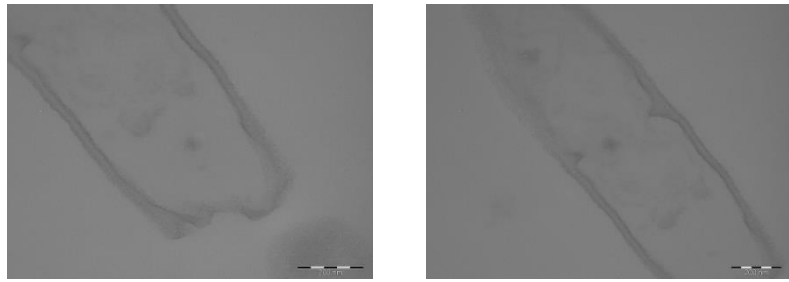
Check Sample



AG-Mn

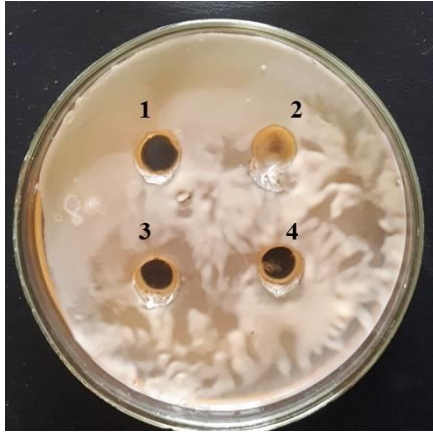
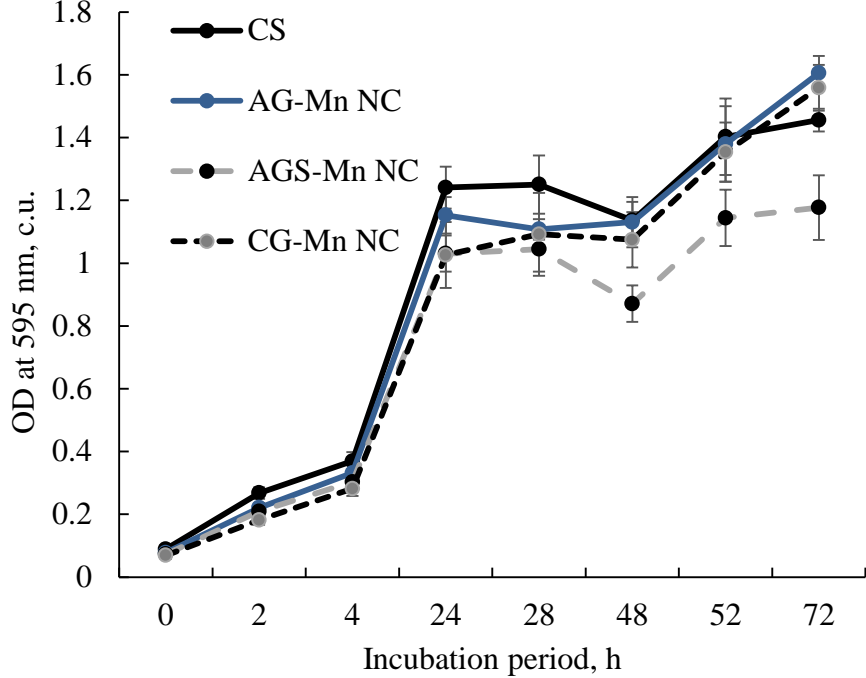


AGS-Mn



CG-Mn

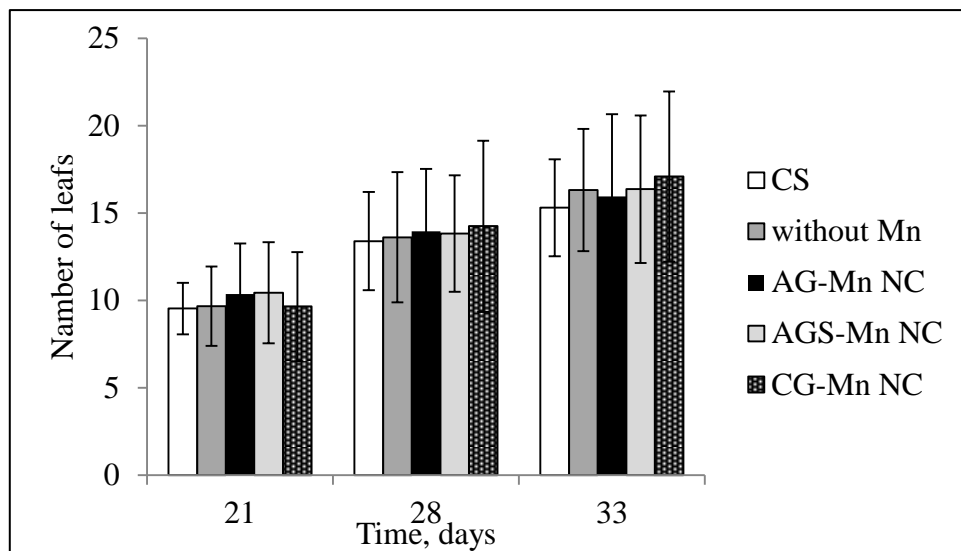
## Effect of Mn NCs on the growth of *Cms*. OD-optical density



1 – Check Sample, 2 – AG-Mn NC, 3 – AGS-Mn и 4 – CG-Mn

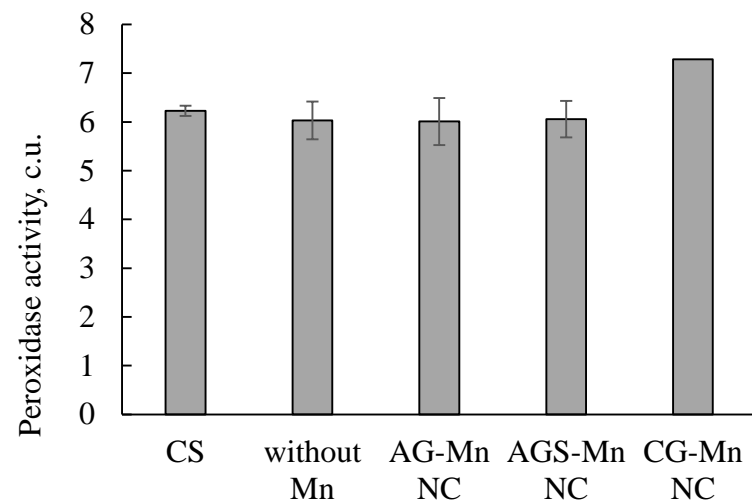
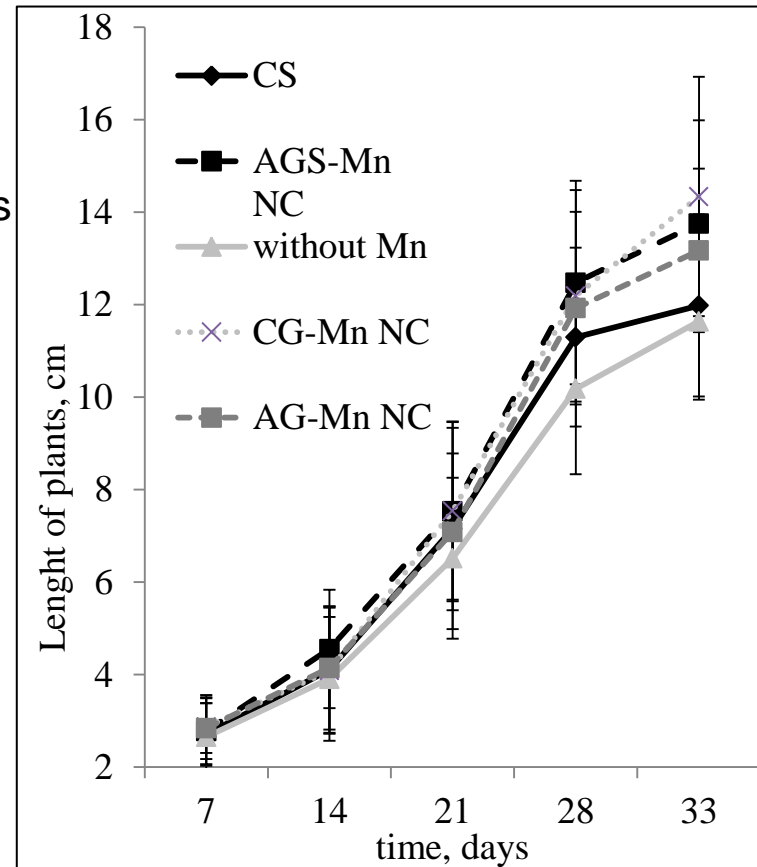
## Results. Effect of Se NCs on potato plants

Effect of treatments by Se/AG and Se/ST NCs on the length (A, y – length of plants, cm) and number of leaves in potato plants *in vitro* (B, y – number of leaves). CS — control samples



The content of manganese (wt.%) in the organs of the plant *Solanum tuberosum* L. grown in the presence of manganese-containing nanocomposites in the nutrient medium in comparison with the check sample

	roots	stems	Leaves
<b>CS</b>	0.17(3)	0.19(4)	0.20(13)
<b>AG-Mn NC</b>	0.28(10)	0.27(1)	0.24(20)
<b>AGS-Mn NC</b>	0.05(4)	0.16(11)	0.17(13)
<b>CG-Mn NC</b>	0.29(12)	0.38(13)	0.24(11)



## Conclusions:

- Mn NCs have antibacterial effect against the phytopathogen *Cms*;
- Mn NCs do not affect the viability of potato plants *in vitro*;
- Mn NCs do not accumulate metal in the tissues of potato after processing plants with them;
- Mn NCs do not have a negative effect on the soil microflora;
- The most effective of all the studied substances is the AGS-Mn composite.

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*Thank you for your attention!*

