

# THE USE OF PRETREATMENT OF PLANT SEEDS TO OVERCOME THE PHYTOTOXICITY OF MINE WASTE DUMPS DURING THEIR BIOLOGICAL RECLAMATION

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Donbass is one of the oldest and largest coal mining regions in Ukraine and the world. For today there are more than 1300 dumps in Donetsk and Luhansk regions, the main part of which are located within the cities. To reduce the pollution of the atmosphere and improve the sanitary state of the cities, the dump reclamation is carried out. Biological reclamation provides creation of plant communities for decorative and sanitary protective purposes.

One of the obstacles for biological reclamation is the phytotoxicity of the dumps, which inhibits the growth and development of plants. To overcome the phytotoxicity it is recommended to cover dumps by not phytotoxic soils with a layer not less than 20–30 cm. Application of soil reduces the intensity of rock oxidation and prevents the development of its phytotoxicity, as well as creates favorable conditions for the successful growth of plants. However, at present time it is relevant to search for the required amount of soil for the application as a protective layer, which in the conditions of our region is practically impossible to execute, and requires significant capital costs.

To solve such a problem it is suggested to generate a dragee for the plant seeds (pelleting). Dragee means covering of the seeds with a protective layer consisting of a mixture of peat, humus, mineral fertilizers and sticky substances. Such treatment of the seeds is conducted in a special apparatus. Described pretreatment of the seeds will create favorable conditions for the germinating capacity and plant growth without application of a protective layer of soil.

For the study samples from the dump of the mine “Zakhidna” were selected and their physical and chemical parameters (pH, amount of water-soluble salts, rock density, etc.) were determined. Based on the ecological conditions and qualitative composition of the waste dumps, the composition of the mixture and the technology for seed dragee were selected.

According to the recommendations, a seed mixture of cereals and legumes was used in the ratio 2:1 (*Avena L.* and *Medicago sativa L.*). The seeds of *Avena L.* and *Medicago sativa* were drageed with fertilizers, peat and lake silt, by spraying on seeds for 3 hours. Drageed and intact seeds were planted in the dump samples; as a control, clean soil was used. After the experiment the germination capacity of the seeds, the mass and size of the germs were determined.

It was established that drageed seeds on the dump samples had a better germination and a greater mass of germs in comparison with untreated seeds.

The greatest rate of germination was observed for the seeds of *Avena L.* and *Medicago sativa*, which were treated with fertilizers and peat. *Avena L.* seeds showed rather high percentage of germination when treated by fertilizers only.

The smallest germination was observed for the seeds which were treated by lake silt, which is probably associated with application of the dragee technology. In general, the dragee of seeds improves its germinating by 30–50%.

Thus, selecting the necessary nutrients in accordance with the environmental conditions at the reclaimed dumps and performing the dragee of the seeds, it is possible to carry out the biological remediation step without applying a protective layer of soil. This will not only accelerate the process of reclamation, but also significantly reduce the cost of its reclamation.

The use of seed dragee before planting can be recommended for the reclamation of dumps that are in difficult conditions, where it is impossible to conduct a mining technical stage of reclamation.

**Key words:** Mine Waste Dumps, Phytotoxicity, Dragee of the Seed’s (Pelleting)