

PHYTORECOLTIVATION OF ROCK MASS DUMPS WITH APPLICATION OF PRODUCT OF UTILIZATION OF INDUSTRIAL WASTES AS A FERTILIZER

Alona Pasenko and Oksana Maznytskaya

Kremenchug Mykhaylo Ostrogradskyi National University, Kremenchug, Ukraine; pasenko2000@ukr.net

One of the types of man-made landscapes are dumps of spent rock mass, which, occupying significant areas of the earth's surface, change the terrain, are sources of secondary pollution of atmospheric air by dust and subsequent infiltration of weathering products into soil and groundwater. Among the existing ways of solving this problem is phytorecultivation of the surface of dumps as ecologically expedient. When the realization of this technology it is necessary to take into account the deficiency of nitrogen and sulfur compounds in the rock mass, which are necessary for the growth of plants. Therefore, it is recommended to use fertilizers or substances, which are available to them by composition to create primary conditions for the growth of plants.

The aim of the work was to investigate the possibility of using the product of neutralization of spent mother liquors from caprolactam production by the sludge of water treatment of a thermal power plant in the technology of phytorecultivation of dumps of a mining and concentrating enterprise as a fertilizer. To achieve this goal, the following tasks were set: obtaining fertilizer as a product of joint utilization waste of chemical and energy industries, determining the effect of fertilizer on the growth of weed plants in phytorecultivation technology.

The spent mother liquors of caprolactam production contain ammonium sulfate (acidic pH), and the chemical treatment water treatment waste of the thermal power plants is identified as limestone (alkaline pH). To obtain fertilizer in the utilization of waste, a neutralization method was used with the yield of a product with a neutral reaction of the medium. The obtained fertilizer contains calcium sulfate, ammonium sulfate, microelement impurities, which enrich the substrate for phytorecultivation with biogenic plant nutrients.

To investigate the effect of the fertilizer application on the growth processes of plants, experiments were conducted with test cultures of *Digitaria ischaemum* Schreb., *Setaria glauca* L. and *Calamagrostis epigeios* (L.) Roth. In laboratory conditions, the fertilized rock mass was seeded in the tanks with seeds of said species and cultivated under optimal conditions of temperature, illumination, and irrigation. As a control, a sample with a rock mass without applying fertilizer was used.

After two weeks of growing on a substrate of rock mass with fertilizer (a product of neutralization of industrial waste), plants were recovered from the substrate and the lengths of their aboveground and underground parts were measured. The lengths of the aboveground parts of plants considerably exceed in the samples with the addition of fertilizer to the substrate in comparison with the control experiment. In this case, the dosage of applying fertilizer to the rock mass is important, since phytotoxic effect was manifested in overestimated doses - inhibition of growth processes occurred. The most positive result was obtained in experiments with *Calamagrostis epigeios* culture, which proved to be the most sensitive to fertilizer application and more resistant to its high doses. The obtained results were confirmed by indices of the wet mass of plants.

Proceeding from the experimental data, the following conclusions were drawn: introduction of fertilizer into the rock mass of dumps (the product of neutralization of spent mother liquors of caprolactam production by the sludge of water treatment of the thermal power plant) in concentrations optimal for reaction of the medium of the soil substrate, leads to strengthening of growth processes in plants in phytorecultivation technology; the phytotoxic effect of applying high doses of fertilizer was recorded in different plant cultures; the most sensitive to the positive effect of fertilizer and simultaneously resistant to its overestimated concentrations was the cultivation of *Calamagrostis epigeios*; the fertilizer obtained during the utilization of waste can be recommended for increasing the efficiency of the implementation of the technology of phytorecultivation of spent rock mass dumps.

Key words: Phytorecultivation, Fertilizer from Industrial Wastes, *Calamagrostis epigeios*