

JUSTIFICATION OF MIXTURE COMPOSITION FOR RECLAMATION OF THE LANDS DISTURBED AS A RESULT OF UNDERGROUND COAL MINING

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Underground coal development is accompanied by significant deformations of the earth's surface, changes in the hydrological mode of groundwater and surface water, as well as other negative consequences. Subsidence of the earth's surface leads to the flooding of its settlements, industrial objects, communications, agricultural and forest lands. As a result, there are areas with low productivity, reduced agricultural and aesthetic value. Thus, there is a need to develop the system of reclamation of disturbed lands for their further effective use.

In most cases, rocks after coal processing are used for dips backfilling. Usually, these rocks may contain toxic elements that inhibit plant growth. Therefore, justification the composition of soil mixtures, which can be used for the reclamation of disturbed lands, is a really actual problem.

In the presented work it was proposed to use resources available in the coal mining regions, namely loam and rocks after coal processing (empty rock), with the following ratio:

- Variant 1 (control): 100% loam (L) and 0% of the empty rock (ER);
- Variant 2: 80% L and 20% ER;
- Variant 3: 50% L and 50% ER;
- Variant 4: 40% L and 60% ER;
- Variant 5: 30% L and 70% ER;
- Variant 6: 0% L and 100% ER.

The empty rock and loam were dried, ground, then weighted in appropriate proportions (variants 1–6), mixed and used for the experiment.

A growth test was conducted to determine the overall toxicity of the test mixtures. The essence of the growth test was to take into account changes in the growth rates of germs of indicator cultivated plants grown on the investigated samples of mixtures. For testing the toxic properties of the experimental mixtures the crop species *Triticum aestivum* L. was used.

For the study of the toxicity of soil samples, in a vessel, 100 g of substrate hydrated up to 70% by boiled drinking water were added, and then 20 germinated seeds of test culture were sowed into each vessel. After 2 weeks, the plants were carefully released from the soil, washed and dried on a filter paper. Then, the length of the roots and stems was measured.

It has been established that the growth processes of plants grown on pure loam and on the empty rock (variants 1 and 6) are significantly different that indicates the presence of toxic properties of the rocks after coal processing. After adding a mixture of loams in different ratios, the toxic properties of the empty rocks are reduced. It should be noted that at ratio of 80% and 30% of loam (variants 2 and 5) there is a significant deviation of below-ground growth processes from the control mixture. It indicates the inefficiency of adding loams in such proportions to reduce the toxicity of the ER. According to the ratio of 40% and 50% of loam, this mixture does not show a significant deviation from the control sample. Addition of the loam into the mixture in such proportion reduces the toxicity of the empty rocks and makes it suitable for the creation of reclamation mixtures.

The growth index of the above-ground part of the plants has shown similar tendency to the values of the root lengths. The results obtained on two bioindicative measures confirm the effective addition of 40% of loam in the reclamation mixture.

Thus, the most optimal is the addition of 40–50% of loam to the rocks after coal processing. However, from the economic and technological point of view, the most optimal will be the addition of 40% loam, which is sufficient enough to reduce the toxic properties of the empty rocks and confirms the possibility to use this mixture for the reclamation purposes.

Key words: Underground Coal Mining, Reclamation, Bioindication, Loam, Empty Rock