migrate to the surrounding area. In unaltered and burned rocks, toxic elements were found, the content of which many times exceeds the MPC for soils.

The composition of substances and compounds in the surface layer of the rock dump is practically uniform and contains: manganese, copper, zinc, lead, nickel, cobalt, etc. The composition and content of elements may vary depending on the 11 geological features of the mining region. Water filtration washes out mineral compounds from the surface of dumps, gets into ground and surface waters, changing their chemical composition. At the same time, the concentration of chemical components increases relative to the background values due to their constant accumulation.

Mountain rocks have a large supply of elements of mineral nutrition of plants. This is evidenced by the gross chemical composition of coal mine waste rock: potassium 1.0–5.5%, phosphorus – 0.1–0.5%, nitrogen – 0.3–0.6%. Not all of these elements are available to plants. Available forms are formed in the process of weathering of rocks.

The soils of the adjacent territories are ordinary chernozems with medium humus on loess-like loam. The amount of absorbed bases in the rock of coal mine dumps varies between 2.75 – 13.8 mg-equiv/100 g, of dissection dumps – 4.3–18.0 mg-equiv/100 g. In all rocks, the absorbing complex is dominated by Ca^2+ cations , less Mg^2+ and a very small amount of monovalent cations (Na+ , K+, H+).

The absorption capacity of soil is almost twice as high as that of coal mine rock. The ratio of absorbed bases in the soil also differs from their ratio in the man-made substrates studied. Calcium cations in the soil exceed magnesium cations by 7 times and monovalent cations by 34 times. In coal mine dumps, this ratio varies widely. In the substrate of all investigated industrial dumps, Ca^2+ cations predominate in the absorbing complex (53–86%). Nutrient content: NO_3 – 0.2–1.1 mg/100 g of rock; P_2O_5 – 1.3 – 32.8 mg/100 g of rock; K_2O – 8.1 – 22.7 mg/100 g of rock, which indicates the passage of weathering processes.

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FORMS OF POTASSIUM IN A TYPICAL MEDIUM-HUMUS BLACK SOIL

All chernozem soils of Ukraine contain a sufficiently large total potassium reserve of 2.1–2.9%, but the main part of it is in the potential reserve, which is inaccessible to plants, but can be removed from the soil under certain conditions.

Potassium in the soil is represented by various minerals and salts. The content of total potassium in the soil depends on its mineralogical composition. Thanks to biological and chemical processes, the process of decay of primary and formation of secondary minerals takes place in the soil. With the weathering of these minerals, potassium enters the solution. But this process takes place very slowly. Therefore, in order to sufficiently provide plants with this element, it is necessary to create conditions for accelerating the release of potassium from non-exchangeable forms. Such conditions provide soil protection technologies, changing the acidity of the soil solution.

Exchangeable and non-exchangeable forms of potassium are in a certain mobile equilibrium in the soil. During the use of readily available exchangeable forms of potassium by plants, a part of non-exchangeable potassium is mobilized into exchangeable forms during weathering, as well as under the action of root secretions, which are acidic in nature.

Solving the problem of stabilizing and increasing fertility requires the development and improvement of rational systems of soil use. The latter are based on modern methodological principles of fertility management and provide, first of all, the creation of optimal parameters of soil properties and regimes.

Providing plants with potassium nutrition can be achieved by optimizing soil moisture, regulating the reaction of the soil solution, and the content of organic matter in the soil. These and other factors of availability of potassium for plants are achieved by the use of rational agricultural techniques and the optimal amount of organic and mineral fertilizers. One of the agrotechnical measures aimed at mobilizing potential soil fertility is tillage.

The study of the effect of an acid solution on the mobility of potassium in a typical medium-humus chernozem shows that H^+ (H_3O^+) are able to displace potassium cations (K^+) from the absorbing complex. In a typical chernozem with an acidity of the soil solution of 7.1, the content of exchangeable potassium is 36 mg/kg, and with the same acidification it increases by 0.07 mg/kg.

The upper genetic horizon H contained 2.30% of gross potassium, which is related to the content of dusty fractions, the composition of which is dominated by algae. The underlying carbonate loess, typical chernozem, has a slightly smaller amount of it in its composition – 1.97%.

The most active part of the soil, which depends on its agrophysical and physicochemical properties and, ultimately, its fertility, is the earthworm fraction. It should be noted that mineralogical analyzes of the soil, to a certain extent, can be replaced by chemical and mechanical ones. Clay minerals make up the fraction less than 0.001 mm, so it is important to determine the amount of this fraction.

The content of gross potassium in the sludge fraction is also quite important, bearing in mind that hydromics contain 6% K_2O. In typical chernozem, the silt content increases to the lower transitional horizon (Phk) and amounts to 24.3% and 28.0%, respectively. Its quantity decreases from the lower transitional horizon to the rock. The content of gross potassium in the mud also increases towards the lower horizon and decreases towards the rock. Such changes can be explained by a change in the mineralogical composition of the silt fraction in the genetic horizons.

In chernozem, the typical composition of the silty fraction varies little along the profile: hydromica minerals predominate, mixed layer mica-smectite formations, kaolinite, chlorite, and one-and-a-half oxides in the upper part of the profile. Also, the worm fraction of chernozems contains highly dispersed quartz. There is some increase down the profile of montmorillonite group minerals and a decrease in hydromica. This is explained by illitization of swelling minerals as a result of potassium fixation, as well as mica hydration.

The content of hydromica in typical chernozem ranges from 42.8 to 36.3%. The entire supply of ash elements according to M.M. According to Gorbunov (1974), we call it the general reserve. It includes direct, near and potential, which is determined by gross soil analysis.

With the help of agrochemical extractions (ammonium acetic acid), we determine the immediate reserve, and it is this that is the source of nutrients for plants. We call the number of elements that are in the silty fraction of the soil near. The allocation of this reserve is explained by the fact that plants will consume ash elements from the muddy part of the soil when they are not in the immediate reserve. Ash elements contained in the fraction less than 0.001 mm are called a potential reserve.

The potential reserve is calculated from the general, immediate and near-term reserve. It should be noted that the content of the fraction less than 0.001 mm is approximately equal to the content of clay minerals.

Potential reserve potassium is slow-moving and is removed over a long period of time, gradually moving into near and immediate reserves. The potential reserve down the profile increases in the upper transitional horizon and decreases in the lower one.

The close reserve with an increase in the number of fractions less than 0.001 mm increases down the profile.

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THE ROLE OF CROP ROTATION IN ORGANIC AGRICULTURE

Crop rotation is a key feature of the entire system of organic farming, because thanks to it there are mechanisms for the formation of healthy soils, it is the main way to fight pests and weeds, as well as a way to preserve the organic matter of the soil.

In organic farming, the role of crop rotation is extremely important. Crop rotation is a systematic change of crops on one plot of land for several years. This practice helps to improve soil fertility, preserve biodiversity and increase crop yields.

Organic agriculture develops on the principles of sustainable use of land resources and preservation of ecological balance. In this context, crop rotation plays a key role in maintaining soil and plant health.

First of all, crop rotation helps improve soil fertility. Each crop has its own nutrient requirements. By planning a proper crop rotation, a farmer can use crops that add nutrients to the soil or reduce its loss. For example, some crops may have deep roots that facilitate soil water supply and improve soil structure.

In addition, crop rotation helps reduce the risk of diseases and pests. Multiple crop rotations on the same plot of land prevent the accumulation of pathogens and harmful organisms that can damage crops. Each crop contributes to the ecosystem and changes the conditions for other pests and diseases, reducing the risk of their spread.

Conservation of biodiversity is also an important component of crop rotation. The variety of crops on one piece of land contributes to the diversity of organisms that live in the soil and on the plants. This includes beneficial insects, microorganisms that facilitate the decomposition of organic residues and improve soil structure.