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PROSPECTS FOR THE USE OF BIOMASS OF HIGHER ACUATIC PLANTS AS A BIO FERTILIZER

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ANNOTATION

This article contains materials on the prospects for using biomass of higher aquatic plants (Azolla - A. caroliniana Willd.; Eichornia - E. crassipes Solms.; Pistia - P. stratiotes L.; Ryaska - L. minor L.) as cost-effective, environmentally friendly safe, providing increased soil fertility and additional nutritious bio-fertilizers for plants in agriculture.

Key words: *azolla, duckweed, eucalyptus, pistachio, biofertilizer, biomass, mineral fertilizer, humus, humus, organic fertilizer, high-water plants.*

INTRODUCTION

It is known that a rich and high-quality crop yield of crops depends on providing them with mineral and organic fertilizers. Three types of mineral fertilizers are mainly used in agriculture. These are nitrogen, phosphorus and potash fertilizers. The use of these fertilizers in predetermined proportions, norms and agricultural conditions allows you to get high yields from crops. However, long-term use of mineral fertilizers while maintaining the application rate also leads to a natural decrease in the content of organic substances in the soil.

The high content of humus (humus) in the soil increases the effectiveness of mineral fertilizers. In particular, the constant use of only nitrogen fertilizers without the use of organic fertilizers leads to a violation of the soil structure, its biological, agrochemical, water-physical and physico-chemical properties. For this, nitrogen fertilizers should be used depending on the agrochemical state and climatic conditions of the soil.

MAIN PART

Phosphorus fertilizers, on the other hand, have a much higher efficiency in improving soil structure. These fertilizers do not disappear from the soil, unlike nitrogen fertilizers. The regular use of phosphorus fertilizers leads to an increase and accumulation of its reserves in the soil.

Potash fertilizers strengthen plants, prevent the loss of crop elements and provide saturation of seeds, increase their resistance to various diseases and pests.

The soil contains the necessary nutrients (S, N, R, K), trace elements (V, Mg, Mn), etc., And any plant will grow and develop well only when it reaches the level of absorption of plants. Organic matter in humus is an integral part of soil fertility. With the continuous formation of humus and its decomposition, the plant receives the necessary substances - carbon and other nutrients. With the accumulation of humus, soil fertility increases, since humus contains up to 98% nitrogen for plants, up to 90% sulfur, a certain amount of phosphorus and other nutrients. Humus binds, saturates and binds soil particles together, forming soil granules. As a result, conditions are created for the simultaneous penetration of air and water into the soil, and soil fertility increases.

As a result of many years of research conducted at the Institute of Botany of the Russian Academy of Sciences, agricultural enterprises (cattle-breeding complexes of cattle, poultry farming) and industrial enterprises (hemp processing, mineral fertilizers, biochemical, oil and fat enterprises, silkworm enterprises, textile industry) and housing and communal services. A new effective biotechnology has been created for the biological treatment of agricultural wastewater from organo-minerals, heavy metals, cyanides, oil products and pathogenic microorganisms using higher aquatic plants of azolla, pistia, duckweed and eichornia.

Based on the possibilities of treating the wastewater of these plants with a high water content, i.e. accumulating the properties of various minerals in water, we set ourselves the task of preparing environmentally friendly bio-fertilizers from their biomass using composting, drying and other methods. In our opinion, they do not lag behind mineral fertilizers in their chemical composition, are cost-effective and, most importantly, do not adversely affect soil properties and the environment. On the contrary, it can further enrich the organic content of the soil.

Here is a brief description of the higher water plants selected for the experiment: **Eichhornia crassipes** (Solms., Pontederiaceae) - the leaves are spoon-shaped, smooth, shiny, the edges are flat, symmetrical, the veins are large, the leaves are spherical, filled with air, grows on the surface of the water due to erenchyma. The hair of the puximon root system is branched on two sides, the lateral roots are developed along the base of the stem with 15-20 leaf sheaths, the second-order lateral roots 2.5 cm long are located horizontally in the water.

Pistia (Pistia stratiotes (L.), Araceae) - 20-40 cm tall, with shortened stems, flattened leaves. Leaves emerging from the root collar form a thick bundle covered with thick transparent hairs, the lower part of a light green color floating in the water due to the strong development of aerenchyma tissue. The root system is covered with popuximon (50-60 cm), ciliary hairs.

Carolina azoles (Azolla caroliniana (Willd.), Azollaceae) - 0.7-1.8 cm long, grows in water. At the top of the sporophyte there are 2 rows of small (0.5-1 mm) petals covering the branch, like overlapping coins, at the bottom of which roots of 2.0-2.5 cm are formed. The leaves are developed and consist of two segments. The upper green segment is located on the surface of the water, and the lower segment is located on the bottom of the water and serves to absorb dissolved substances in the water.

Small ryaska (Lemna minor (L.), Lemnaceae) is a small aquatic plant, deciduous, stem length 2-4.5 mm, width 2-3 mm. At the base of each leaf is a thin root 5-7 cm long, the upper part of the leaf is slightly bubbly, green, and the lower part is whiter. The body of the plant consists of 3-6 leaves, which grow in clusters on the surface of the water.

In our experiments, we selected pistachio, azole, eucalyptus and relict plants from the aforementioned introduced higher aquatic plants, but currently grown and expanding duckweed plants as an object of study. Of these, eucalyptus and pistachio are large biomass plants, duckweed and azole are small biomass plants that propagated in greenhouses in winter and in special ponds in summer.

The biomass of the azolla plant propagated in open waters was subjected to chemical analysis in the laboratories of the Institute of General and Inorganic Chemistry of the Russian Academy of Sciences in order to determine the amount of organic and mineral substances in it. Laboratory tests have shown that; The composition of the azolla biomass The chemical composition of the plant during its youth and vegetation differs from each other, the amount of nitrogen in the biomass of the plant after the growing season is 0.93%; organic matter - 5.87%; phosphorus (P_2O_5) - 0.0473%, calcium from trace elements (CaO) - 5.8152%; magnesium (MgO) -1.1175%; iron (Fe_2O_3) - 0.5033%; aluminum (Al_2O_3) - 1.3871%.

When the plant was dried in its youth, the content of nitrogen, phosphorus and organic substances in the biomass increased and reached the following amounts: nitrogen - 4.98%; organic matter - 51.82%; phosphorus (P_2O_5) - 0.7140%, trace elements - calcium (SaO) - 8.6437%, magnesium (MgO) - 2.182%; iron (Fe_2O_3) - 0.7741%; aluminum (Al_2O_3) - 2.3334%.

The results of this analysis show that a sufficient amount of nitrogen in plant biomass indicates that it can be used as biofertilizer.

It is known that for growing cotton on average 30-35 c / ha of cotton, which is an important crop in the agriculture of our country, on average per hectare of land (due to the pure active ingredient) 100-120 kg of nitrogen, 75-90 kg of phosphorus, 45-60 kg of potassium items should be included. If calculated by physical mass, then to add 100-120 kg of pure nitrogen to the soil - 294-353 kg of ammonium nitrate (ammonium nitrate) (NH_4NO_3), 500-600 kg of ammonium sulfate (NH_4) $2SO_4$ or 217-261 kg of urea (urea)) CO (NH_2) $_2$, to add 75-90 kg of pure phosphorus - 187-225 kg of ammophos (mixture of Ca (H_2PO_4)$_2$, (NH_4) $2HPO_4$ and (NH_4) $2HPO_4$), 375-450 kg of simple superphosphate (Ca (For addition of H_2PO_4)$_2$ $2H_2O$ $CaSO_4$ $2H_2O$) or 187-225 kg of double superphosphate (Ca (H_2PO_4)$_2$ $2H_2O$), 45-60 kg of pure potassium - 86-115 kg of potassium chloride (KCl).

If we take into account the fact that plants absorb from 20 to 70 percent of mineral fertilizers, depending on the type, then we must increase the physical mass of fertilizers applied to the soil. This, in turn, leads to a further increase in the amount of toxic chemicals in the soil.

CONCLUSION

When the biomass of the Azolla plant (Azolla caroliniana Willd. Azollaseae) is used as fertilizer, we satisfy the plant's need for nitrogen, as well as a number of other macro- and micronutrients, organic substances and humus in the soil, without harming the micro- and macro-fauna of the soil. Most importantly, biofertilizer prepared in this way is environmentally friendly and cost-effective, it does not require any production capacities and does not negatively affect the environment of the atmosphere, soil, water.

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