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ИЗУЧЕНИЕ ВОПРОСА О ЗАКУПКЕ КРАСЯЩИХ КОМПОЗИЦИОННЫХ МАТЕРИАЛОВ НА ОСНОВЕ НЕОРГАНИЧЕСКОГО И ОРГАНИЧЕСКОГО СЫРЬЯ

***Аннотация**: в статье речь идёт о том, что одной из самых больших проблем современного сельского хозяйства является предотвращение необратимой потери плодородных земель на земле и обеспечение сельского хозяйства новыми землями. В связи с этим актуальной стала проблема рационального использования природных ресурсов и восстановления нарушенных земель различными средствами и методами. В исследованиях, проведенных для решения данной проблемы, изучен процесс получения композиционных материалов с удобрительно-амелиорирующими свойствами, что имеет особое значение в повышении продуктивности почвы и высоты растений, с использованием неорганического и органического сырья. Установлено, что только внесение удобрений в экологически поврежденные почвы не дает положительных результатов, так как нарушается структура и физико-химические свойства почв, и для их восстановления необходимо проводить комплексные мероприятия. Более интенсивное питание растений фосфором при участии элемента магния приводит к образованию водостойких агрегатов, в результате чего уменьшается перколяция и инфильтрация, а количество доступного фосфора в почве увеличивается.*

***Ключевые слова**: органическое сырье, неорганическое сырье, гумус, композиционные материалы, высотообразующий компонент.*

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STUDY OF THE PURCHASE OF DYE COMPOSITE MATERIALS BASED ON INORGANIC AND ORGANIC RAW MATERIALS

Abstract*: the article states that one of the biggest problems of modern agriculture is to prevent the irreversible loss of fertile land on earth and to provide agriculture with new land. In this regard, it has become an urgent problem to use natural resources efficiently and restore damaged lands with various means and methods. In the studies conducted to solve the problem, the process of obtaining composite materials with fertilizer-ameliorant properties, which is of particular importance in increasing soil productivity and plant height, using inorganic and organic raw materials, was studied. It has been established that only applying fertilizers to ecologically damaged soils does not give positive results, because the structure and physical-chemical properties of the soils are damaged, and complex measures must be taken to restore them. The more intensive feeding of the plant with phosphorus with the participation of the magnesium element leads to the formation of water-resistant aggregates, which, as a result, percolation and infiltration decrease, and the amount of available phosphorus in the soil increases.*

Keywords*: organic raw materials, inorganic raw materials, humus, composite materials, height-increasing component.*

Ingredients

The 20th century brought new global ecological problems to mankind, such as the loss of land and the decrease in its fertility. The land is an independent private natural entity like plants, animals, water, and air. Sometimes he is subjected to terrible diseases – destruction and infertility. The most important part on which soil fertility depends is humus – organic matter. The most productive soils are soils with a humus content of 10–12%. One of the urgent questions of modern agrochemistry is the organization of the correct use of soil for humus preservation [1]. Humus in the soil, which has a total reserve of about 1.5 1018 g on the planet, is a reservoir of solar energy on the earth's surface. Without humus, the soil dies. If the soil is deprived of annual decaying plant residues, microorganisms will immediately switch to feeding on humus

and quickly destroy it. This is one of the biggest problems of modern agriculture. Because the irreversible loss of fertile land on earth has reached 6–7 million hectares every year. To compensate for this loss, the same amount of new land should be brought into agriculture [2].

In this regard, the problem of effective use of natural resources is of great importance. Over the past 10 years, the idea of using various production wastes of industry and agriculture as raw materials for the purchase of valuable products has been developed, which is related to their low cost and solving environmental problems by efficient use of waste [3].It is considered more promising to carry out research mainly based on special environmentally friendly animal husbandry and various wastes of agriculture, resulting in the improvement of the physical and chemical properties of soils and vegetation [4].In the studies conducted for this purpose, the study of the process of obtaining composite materials with fertilizer-ameliorant properties, which is of particular importance in increasing soil productivity and plant height by using inorganic and organic raw materials, is one of the urgent problems.

Recently, in most developed countries, there is a tradition of increasing the variety and production of various multifunctional fertilizer-sorbent complexes. Processing of planting layers with fertilizer ameliorant complexes leads to the improvement of the physicochemical, and water-physical properties of the soil, as well as the nutritional conditions of the plants and the increase in productivity [5].

The main criterion for the evaluation of agricultural lands is their productivity. According to agrochemical data, up to 80% of the lands of our Republic are salinized and unusable. They are mainly distributed in the Kura-Araz Plain, Absheron, Ordubad Plain, and Aran zone. In the territory of our republic, there are more than 1.3 million hectares of moderately and severely saline soils, the area of these areas is increasing every year, and the alarm should be sounded [6–7].

An abundant supply of oxygen is also necessary for the intensive development of the second stage of decomposition of organic matter in the soil; At this stage, the components obtained through mineralization are transformed into more complex organic compounds suitable for plant nutrition. For example, ammonia is first

converted to nitric acid and nitrite, and then to nitric acid and nitrate by certain nitrifying bacteria. A special form of conversion of organic matter in soil is humus, resulting in humus or humus mulch, a complex group of compounds containing valuable, slowly decomposing plant nutrients. Humus does not emit a bad smell, it is cleaned of living pathogens [8–10].

Methods

On the other hand, although the soils of Azerbaijan are in great need of phosphorus, due to the lack of natural phosphorus raw materials in the area, the purchase of phosphorus fertilizer, soil restoration, and increasing the productivity of plants require the investigation of a new local source of phosphorus. Thus, phosphorus is the main nutrient element for plants, it improves the physical-chemical and biological properties of soils and increases productivity. Plant nutrition with phosphorus is more intensive mainly with the presence of magnesium element. This leads to the formation of water-resistant aggregates, which ultimately reduce seepage and permeability. It has been proven by researchers that [11] adding magnesium-enriched phosphorus fertilizers to the soil leads to the formation of diphosphate or silicon, which is easily absorbed by the plant. Also, giving magnesium causes an increase in the amount of available phosphorus in the soil. Therefore, in our research, we used dolomite mineral, which is the main source of magnesium and has large deposits in the territory of our Republic. The content of the mineral is 19,5–20,5% MgO; 28,5–29,6% CaO; 0,5–1,7% Fe_2O_3; 0,91 -1,12% R_2O; 2,14–2,99% SiO_2; It consists of 46,73% SO_3

By improving the physicochemical properties of degraded soils, it is convenient to use microelement boron to increase fertility and to achieve the height and productivity of vegetation.

Boron plays the role of an important trace element in the development of crops in agriculture and is also added to fertilizers as a trace element. Due to the displacement of calcium, boron is of great importance in improving the structure of the cell wall, in the proper distribution of cells at the ends of plant roots, in the rapid transport of sugar due to photosynthesis in the root part, in regulating the level of hormones that affect

color and reproduction in plants, and in ensuring flowering and fruiting. It has been determined that as soil pH increases, it becomes more difficult for plants to absorb water. In boron-deficient soils, it is difficult to increase the height and productivity of plants. Planting and drought conditions should also be taken into account to assess the impact of boron.

In our research, to use the boron component, oil well water was used as a source of boron, as well as Dari-dough (Nakhchivan) thermal water, which contained a certain amount of boric acid due to the presence of 0.15–0.24% boron in the final product.

Table 1.

The content of boric water according to the amount of main components mg/dm3

№	Ca^{2+}	Mg^{2+}	Cu^{2+}	NO_3^-	B_2O_3	SO_4^{2-}	F^-
I	75,00	30,20	30,8	30,8	1,43	249,0	0,48
II	74,35	29,89	29,8	29,8	2,35	248,30	0,47
III	74,14	31,61	31,0	31,0	2,30	250,20	0,50
IV	74,00	30,90	31,3	31,3	2,34	247,90	0,52

The maximum permissible concentration for boron is 0.5 mg/l boron for different waters depending on the nature of economic use. In this regard, we first studied the composition of the main components of water. We used organic ion exchangers – hazelnut shell – which have better sorption capacity for cleaning the transition of boron from boron water to the composition of the composite material. Hazelnut shell consists of lignin (30.2%), cellulose (28.9%), hemicellulose (11.3%), tannin (18.2%), and proteins (6.7%). Hazelnut shell has been proven to be an effective biological absorbent through research. Hazelnut shells are characterized by ash content, extractives (in acetone, dichloromethane, and boiling water), proteins, tannins, cellulose, lignin, and hemicelluloses.

Ground dolomite and hazelnut shells taken in a certain ratio (1:0.5) are treated with waste phosphoric acid. The absorbed phosphoric acid is diluted to 20–25% with boric water. The obtained mixture is stirred at 60–70 ºC for 25–30 minutes. In case of thickening of the slurry, some boron solution is added to the system. At the end of the

experiment, the solution is filtered, the solid phase is dried at 95–100ºC, the pH of the liquid phase is checked and the liquid is used as a meliorate.

In general, when unburnt rocks are used during the decomposition of carbonate compounds with phosphoric acid, it takes a certain amount of time for the formation of a large amount of stable foam and its extinction, which slows down the rate of the decomposition reaction (30–120 minutes). When taking roasted raw materials, the resulting foam stays for 5–10 minutes. Therefore, dolomite is used as a carbonated raw material, in which stable foam formation is almost absent and the speed of the neutralization reaction increases. Decomposition (neutralization) of dolomite with phosphoric acid is carried out by evaporating the solution obtained both with phosphoric acid alone and with the presence of 1.5% ammonium sulfate and drying the furnace. The results are given in the table below.

Table 2.

Composition of the slag and dried solid product obtained from the decomposition of dolomite-hazelnut shells with phosphoric acid

Indicators, %	In Horra		In the dried product	
	-	$(NH_4)_2SO_4$ with the participation of	-	$(NH_4)_2SO_4$ with the participation of
$P_2O_{5\ appro.}$	12,79	12,01	21,60	22,00
$P_2O_{5\ s.i.w}$	11,6	11,2	20,04	21,03
CaO	5,09	4,07	12,30	12,51
MgO	3,08	2,72	5,46	8,00
SO_3	1,04	1,01	2,7	2,75
F	0,98	0,96	1,7	1,55
N	-	0,32	-	1,07

As a result of drying the received slag, a calcium-magnesium-boron-phosphorus composite material was obtained, the composition of which is shown in the above table [Table 2].

Result

Taking into account the climatic conditions of the republic, types of soil, agrochemical effect, accordingly, physicochemical, water-physical properties, and

productivity, the purchase of fertilizer-ameliorative composite materials containing several nutrients were studied.

An experimental justification of the possibility of obtaining a new type of mineral fertilizer and chemical ameliorant from natural compounds and waste containing phosphorus, boron, and magnesium has been given.

Conditions for obtaining fertilizer-ameliorant composites were studied in conditions of varying proportions of phosphorus, boron-containing water, and dolomite. The effect of the purchased fertilizer-ameliorant composites on improving the physical-chemical and water-physical properties of the soil, increasing its fertility, and increasing the height and productivity of the plants was studied.

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