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PROCUREMENT OF WASTE-FREE COMPLEX LIQUID FERTILIZERS AND THEIR METHODS

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Аннотация

The benefits of liquid complex fertilizers for agricultural crops are many, they are well assimilated; secondly, both the anion of the acid (in the form of a nitrogenous compound) used in the decomposition of phosphates, as well as the microelements contained in phosphates, are included in the composition of the fertilizer, therefore, in the mentioned method, so to speak, no waste is produced.

Key words

yellow phosphorus, phosphorus sulfide, phosphorite ores, hypophosphate, clay cement, bauxite, coke, nitrogen, potassium, trace elements.

Decomposing natural phosphates with sulfuric acid or thermally processing them to obtain high-concentrated fertilizers from phosphoric acid produces a lot of waste, consumes a lot of electricity, and sulfuric acid turns into waste without recovery.

First of all, we should not weaken the measures of comprehensive chemicalization of agriculture, but on the contrary, we should strengthen it. The experience of our country and abroad proves without a doubt that at least equal half of the yield of agricultural crops is usually grown by the use of fertilizers. Thus, chemicalization is the most important basis for increasing agricultural productivity," said one of the statesmen.

To describe how much our country pays attention to increasing the productivity of agricultural crops, it is enough to cite the following two numbers: pre-revolutionary Russia produced only 89,000 tons of fertilizer in 1913. XXI By the beginning of the century, Uzbekistan produced 200 million tons of mineral fertilizers. Currently, one of the main issues is the search for ways of more effective use of phosphate in the agriculture of our republic and its wide implementation. It is known that compounds containing many elements of D.I. Mendeleev's periodic system of elements are necessary for the growth and development of plants. Each

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element performs a specific function in plant nutrition, but no other element can replace it. D. I. Mendeleev, while thinking in this regard, said that "one type of fertilizer can never do the work that is done by the combination of fertilizers. Fertilizers, including complex fertilizers, are very important in agriculture. "The main task of agriculture," said the famous former Soviet scientist D. N. Pryanishnikov, — is the large-scale use of solar energy for the purpose of growing organic matter, by the way, the hardware used in this is not mechanisms, but consists of organisms, first of all, chlorophyll plants (an animal organism does not create new organic substances, but only organic substances produced by plants are used)» . The plant produces carbonic acid and organic matter in water from mineral compounds, mainly in the presence of sunlight.

The main components of the protoplasm and the nucleus are proteins and their derivatives. In addition to carbon, oxygen, and hydrogen, nitrogen, sulfur, and phosphorus are needed for their creation, and potassium, calcium, magnesium, iron, sodium, manganese, and boron are needed for the proper functioning of the entire photosynthesis mechanism. copper, molybdenum, iodine, etc. are also needed. Thus, as we said above, for the uniform development of plants, there is no doubt that compounds with many elements of the Mendeleev system are necessary, at the same time, each element has its own function. Photosynthesis of green plants occurs due to carbonic acid in the air and mineral substances obtained from solution in the soil. Among the mineral nutrient elements of plants, nitrogen occupies a special place. It is the main component of protein substances that form the basis of the protoplasm of plant cells and are part of all enzymes. Protein without nitrogen, and life without protein, therefore, life without nitrogen is impossible. Protein is a high molecular organic substance, its complex molecule is composed of amino acids. By the way, it is not for nothing that it is said that "Life is the lifestyle of protein bodies". Indeed, the most important aspect of life is the regular exchange of substances with the external environment. Consequently, when metabolism stops, life stops, and eventually the protein decays.

Nitrogen plays a very important role in the process of metabolism in the body. Nitrogen is present in chlorophyll, phosphotides, alkaloids and many other organic substances of plant cells. If there is not enough nitrogen in the plant food, the plant grows slowly and does not develop properly, the leaves are pale green, and the yield decreases.

Phosphorus is one of the important nutrients without which plants cannot survive. Metabolism and synthetic processes, of course, take place with the participation of phosphorus. Phosphorus participates in the composition of

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complex oxyls, several enzymes and other important compounds. The plant is regularly supplied with phosphorus during its growth. In the initial period of plant growth, phosphorus accelerates the development of plants, strengthens the root system. The plant receives phosphorus in the form of mineral compounds, which then turn into complex organic compounds. Phosphorus is part of nucleic acids involved in the synthesis of proteins, the formation of vegetative organs and seeds, and the transmission of hereditary characteristics. In addition, mineral compounds of phosphorus later form an important component of living plasmas, such as carbohydrate compounds, nucleoproteins, phosphatides. Potassium is important for plant growth and development. The functions of potassium in plant life are diverse. It increases the movement of carbohydrates from the leaf to other parts of the plant, allowing the process of photosynthesis to take place in a rhythm. Potassium activates the work of many enzymes, including riboflavin, thiamine, kinase, pyruvic acid and other enzymes, and also increases the hydrophilicity of protoplasmic colloids. Due to the increased ability of the plant to retain water under the influence of potassium, potassium-rich plants better tolerate short-term dehydration than potassium-deficient plants. It should be said that the supply of potassium is uniform, and when carbohydrates are accumulated in the plant more intensively, the amount of sugar in fruits and vegetables, and the amount of starch in potatoes increases, the fiber of flax and other lube crops becomes thinner and tougher, the osmotic pressure of the cell juice, as a result, the cold resistance of crops increases. In the case of potassium deficiency, the yield decreases and the quality decreases, as well as the resistance to fungal diseases decreases during the growth and storage of the product. In the case of potassium deficiency, the development of crops and the ripening of their crops are delayed. According to calculations, to grow one ton of cotton, cotton per hectare must be fertilized with 30...70 kilograms of nitrogen, 10...20 kilograms of phosphorus, and 30 to 80 kilograms of potassium. Disclosure of the need for microelements in the physiological, biochemical, and enzymatic processes of organisms leads to the emergence of new concepts about plant nutrition. For example, it is not enough to provide plants with only nitrogen, phosphorus and potassium fertilizers. It became necessary to apply microfertilizers. If microelements (boron, manganese, calcium, copper, zinc, molybdenum, etc.) in the form that can be assimilated by plants are lacking in the soil, agricultural crops produce low and poor quality. A deficiency of trace elements in the soil causes plant diseases. Microfertilizers can be effective only when plants are properly supplied with essential nutrients. When microfertilizers are used, the useful work coefficient of phosphorus, potassium and nitrogen

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increases. It should also be said that microfertilizers are not a universal tool like nitrogen and phosphorus fertilizers, but they should be applied individually depending on the amount of these elements in the form that plants can absorb in the soil of certain regions. Nutrients used for the crop, of course, do not return to the soil, but mostly go with the crop. This applies to nitrogen, phosphorus, potassium and trace elements, which are well absorbed by plants. Due to this feature, nutrients are reduced, the soil becomes thin, so the productivity decreases sharply.

Due to the biological assimilation of atmospheric nitrogen (up to 50 kilograms of nitrogen per one hectare of soil) and atmospheric nitrogen precipitation (from 4 to 15 kilograms of nitrogen per hectare of soil per year) that occur in places where electrical discharges occur in the air, the accumulated nitrogen in the soil can be partially filled. Currently, along with the expansion of cultivated areas, it is extremely important to achieve an increase in the cultivation of agricultural crops due to the increase in productivity. Consequently, the lack of nutrients necessary for regular high yields can be compensated primarily by applying fertilizers.

Consistent agrochemical research shows that if all the factors that increase the yield of agricultural crops are taken as 100%, 50% of it is fertilizer..

Suffice it to say that each kilogram of nitrogen added together with phosphorus makes it possible to obtain an additional 12...15 kilograms of cotton per hectare, and up to 20 kilograms in advanced farms. .30 pounds gain.

By the way, it should not be forgotten that these indicators were obtained in conditions where the efficiency of fertilizers is extremely low. Undoubtedly, due to further improvement of fertilizer efficiency, these figures can be increased more and more through the production of new types of fertilizers and the development of advanced agrochemical activities. It is necessary to further increase the amount of fertilizer production, which is one of the important means of increasing the productivity of agricultural crops. Therefore, the production of fertilizers is constantly increasing worldwide. In our country, the mineral fertilizer production industry is developing at a very high pace. It is envisaged to rapidly develop the production of highly concentrated and complex mineral fertilizers. The goal is to achieve that by the end of the next year, about 80% of the total produced fertilizers will be concentrated and complex mineral fertilizers. In this case, the development trend of this network corresponds to the world level. It is desirable to develop the production of complex complex fertilizers based on the method of decomposition of phosphates using nitric acid. Natural phosphates are usually found as a mixture of various minerals in varying proportions, containing iron, aluminum,

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magnesium, silicon, and trace elements. In our opinion, this method is the cheapest and most convenient way to produce fertilizer, and it will be further developed in the future 45...55% nitric acid undergoes a chemical reaction with phosphorite (enriched) or apatites, forming phosphoric acid and calcium nitrate.

$$Ca5(PO4)3F+10HNO3=3H3PO4+5Ca(NO3)2+HF.$$

This reaction is complete within 15...30 minutes. Phosphate contains calcium, magnesium, iron, aluminum and other small amounts of trace elements, so it turns into nitrate salts under the action of nitric acid. Phosphoric acid, calcium, aluminum, magnesium, manganese, strontium and other nitrates are formed in the solution obtained in this way. Natural phosphate is processed with sulfuric acid, for example, in the production of double or simple superphosphate, ammophos, sulfuric acid is used to decompose the phosphate raw material, and the calcium sulfate formed as a result of the reaction remains useless. In this case, the consumption of sulfuric acid per unit of phosphate anhydride is 1 for superphosphate, 3 for double superphosphate and 1.5 for ammophos. The thermal processing of phosphate in terms of phosphoric acid production allows for the preparation of highly concentrated types of fertilizers, but it is a method that produces waste in the form of rock, and is also energy-intensive and expensive.

Using sulfuric acid, superphosphate and ammophos are produced, while nitrogen fertilizers are prepared as ammonium nitrate by the reaction of ammonia with nitric acid. When phosphate is treated with nitric acid, the acid does two things at the same time: on the one hand, the active ion of hydrogen is used to decompose phosphates, and on the other hand, the anions of this acid remain in the finished product as a useful nitrogen component. This means that it is possible to obtain nitrogen-phosphorus fertilizers by processing phosphates (without spending sulfuric acid, electricity, coke, and keeping the necessary amount of nitrogen) by nitric acid method.

Combining the production of nitrogen-phosphorus fertilizers in the same technological process of processing phosphates by the nitric acid method is an example of a more complete and complex use of chemical reagents. This makes it possible to dramatically increase the resources of phosphorus fertilizers and significantly reduce the cost of the product.

Academician D. N. Pryanishnikov, and E. V. As early as 1908, British showed the efficiency and prospects of processing phosphates using nitric acid. But consistent research in this area began only after the development of synthetic

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ammonia production in the 1930s made it possible to supply the industry with sufficient quantities of cheap nitric acid. Many chemical, physico-chemical and technological researches have been conducted and are being conducted in this field abroad, as well as in Uzbekistan. Among them, academician S. at scientific research institutes of NIUIF (Scientific Research Institute of Fertilizers and Insectofungicides) and GIAP (State Institute of Nitrogen Industry). I. Professor M. Volfkovich at the Leningrad Institute of Technology. E. Pozin, B. A. Noteworthy is the research led by Kopilev et al.

The staff of the Department of Fertilizer Chemistry and Technology of the Institute of Chemistry of the Academy of Sciences of Uzbekistan (UFA) pay special attention to the production of solid and liquid complex fertilizers based on the processing of phosphates with nitric acid.

It is necessary to dwell on two aspects that make it difficult to introduce the method of obtaining solid fertilizers by recycling phosphates using the nitric acid method. After all, in the study of this problem, all attention is focused on this issue. First, natural phosphates contain large amounts of calcium and magnesium salts. As a result, by decomposing phosphates with nitric acid to obtain solid fertilizers (by neutralizing them), forms of phosphorus that cannot be absorbed by plants are formed. Calcium nitrate or magnesium nitrate residues have a negative effect on the physico-chemical properties of fertilizers.

Secondly, if the concentration of nitric acid is lower than usual, when the phosphate decomposition products are neutralized with ammonia or other neutralizing agents, a soft part - pulp is formed, which makes it difficult for further processing. If the product is not evaporated to obtain a dry product, the heat of the neutralization process alone is not sufficient.

If liquid fertilizers are produced instead of solid fertilizers, such problems will be completely eliminated. In this case, the main advantage of processing phosphates in terms of nitric acid is combined with the advantage of liquid fertilizers in general. The reason that the production process of liquid complex and single fertilizers is not so difficult compared to the production process of solid fertilizers is that some technological steps (evaporation, crystallization, drying, etc.) are lost. In addition, in another method found at the Institute of Chemistry of the Academy of Sciences of Uzbekistan, potassium-phosphate nitrate fertilizers were obtained as a result of splitting phosphates with nitric acid and the effect of released phosphoric acid on potassium chloride. Ways to increase the effectiveness of fertilizers by adding other micronutrients necessary for plants to these were recommended. So, liquid complex fertilizers are very useful for agricultural crops,

they are well absorbed; secondly, both the anion of the acid (in the form of a nitrogen compound) used in the decomposition of phosphates and the microelements contained in phosphates are part of the fertilizer, therefore, in the mentioned method, so to speak, the gard does not come out as waste.

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