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Abstract. The problem of using saponite containing tailings obtained as a by-product in the territory of the M. V. Lomonosov diamond Deposit ("Severalmaz") not only for technical purposes, but also as an ameliorant and mineral fertilizer in agricultural production is considered. The results of vegetation field experiments on row crops and in the closed ground when growing arugula and lettuce are shown. The experience of 2017 was laid in atypical weather conditions, but the data show a positive impact of different doses of saponite on soil, crop and potato quality. The experience of 2018 in the conditions of hothouse facilities with leaf vegetables also confirms the influence of introduction of saponite in the soil on the content of nitrates in production.

Introduction.

At the Lomonosov diamond deposit, one of the world's biggest diamond deposits, located in the Primorsky district of the Arkhangelsk region, in the course of diamond mining more than 3 million tons of ore are extracted to the surface of the earth per year, which is processed at the "Severalmaz" concentrating factory. The main distinction of the Lomonosov deposit consists in the high saponification of rocks. The research carried out in 2003-2005 by the Russian Academy of Sciences Institute of Geoecology on the Arkhangelsk tube showed that the saponite content in the vent facies rocks of the tube practically does not change with the depth and makes about 90 %. At the process of diamond mining the rock is diluted with water and the diamonds are extracted from the slurry by various technological operations. The slurry consisting of saponite and water is moved for storage to a tailings pond located at a distance of about 1 km from the concentrator factory. In the consequence of the considerable saponite reserves there is a need for its disposal.

Saponite is a high-magnesium clay mineral, the high physical and chemical activity of which leads to its forming a fine-dispersed suspension in the aqueous medium, which has a very low sedimentation rate and density of the precipitate formed under natural conditions. [1]. After the rocks processing and diamonds extraction the saponite-containing materials are transferred to the tailings in liquid form.

There are studies on various methods of processing of this mineral from tailings by evaporation, deposition, various mechanical and chemical methods by recultivation. However, these methods are not profitable.

The existing research shows the use of saponite in various industries. For example, in Ukraine it is used in pharmaceutical industry (medicines used in human beings). There are also studies on treatment of broiler chickens from aflatoxicosis [2] as well as on detoxification of technogenic and radiation contaminated soils, aqueous solutions [3]. There is also a positive experience of using of saponite from

other deposits as an ameliorant and (or) mineral fertilizer [4]. In connection with the above the PJSC "Severalmaz" management appealed to the "Arkhangelsk" Agrochemical service station, Federal state budgetary institution for carrying-out of research work to determine the possibility of using the saponite mineral extracted from the Lomonosov Deposit in agricultural areas.

Methods and results

In 2017-18, the experience was laid on the use of saponite as a mineral fertilizer for row crops, in 2018 - on the study of the effect of saponite on soil acidity, on the yield and quality of vegetable and annual crops, as well as on the possible reduction in the nitrates number in green crops in hothouse facilities. Experiments on the use of saponite as mineral fertilizer for tilled crops showed that in a year with excessive moistening (2017), its introduction gives an increase in the mobile phosphorus content in the soil by 4.3% at the maximum dose (12 t/ha), in the content of potassium (12.2%) and organic matter (17.4%) - at the minimum dose (3.6 t/ha). The most noticeable yield increase in a year with non-traditional weather conditions (lack of heat and excess moisture during the growing season) was observed at the minimum dose of saponite-containing materials (3.6 t/ha). In addition to soil research, the production quality was investigated. On application of the 12T/ha dose of saponite-containing materials in the soil a significant reduction of nitrate concentration in potatoes was recorded.

A reduction of nitrate concentration in production was also obtained in the experiments of 2018 in protected ground (leaf vegetables). Thus, the use of saponite as an additive to the main substrate (peat soil) showed the maximum reduction of nitrate concentration in arugula and lettuce by 60 and 76%, respectively. However, it was observed that the use of saponite leads to a decrease in the size and yield of products. Given the unique sorption properties of saponite (sorption of water and nutrients), it is advisable to conduct further research to select the technology of growing products on different backgrounds of moistening (watering) and fertilizing with mineral fertilizers, which will allow finding the best option to reduce nitrates and complete the output of finished products.

Conclusions

If this mineral (saponite-containing materials of diamond procurement by-products) will be included in the list of agrochemicals allowed for use in the territory of the Russian Federation, it will significantly reduce the environmental load on the territory adjacent to the concentrator and will increase the profitability of the deposit. At the same time, the agricultural producers will reduce the costs of purchasing ameliorants and mineral fertilizers, which will have an impact on the cost of the final product.

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