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ANALYSIS OF PATENT RESEARCH ON IMPROVING THE RECLAMATION STATE OF SALINE SOILS

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Abstract
The article analyzes the scientific research results obtained in the field of reducing various salts in saline soils and improving the reclamation state of soils using biomelioration and melioration methods.

Introduction
By applying phytomelioration and biomelioration methods, the content of various salts in the soil decreases, soil fertility increases, and its agrotechnical condition improves.

Research Methodology and Object
The study focuses on sweet sorghum (Sorghum saccharatum) samples collected from saline soils in the Parkent and Bekabad districts of Tashkent region. It examines the results of patented methods aimed at improving the reclamation state of soils through phytomelioration, biomelioration, and salt-leaching techniques.

Obtained Results and Their Scientific Analysis
The biomelioration properties of sweet sorghum (Sorghum saccharatum) were studied on soil samples taken from moderately and strongly saline soils in Bekabad and Parkent districts of Tashkent region. Experiments were conducted in both large and small plots at the experimental laboratory of the Tashkent “Botanical Garden” named after F.N. Rusanov. Soil samples from moderately and strongly saline lands were placed in the plots, and 3–4-year-old sweet sorghum root cuttings were planted to study the biomeliorative properties of the soils.
The results showed that among the salts present in the studied soils, CaSO4 had the most significant effect on sweet sorghum growth (51%). The effects of other salts were distributed as follows: NaCl (41.5%), MgCl2 (40%), Na2SO4 (36%), MgSO4 (35.2%). It was confirmed that biomeliorative crops can also be cultivated in soils containing chloride ions.
A limitation of this experiment was that the collected root cuttings needed to be planted into the plots quickly, and to prevent the roots from drying out before planting, each root was coated with clay. Consequently, experimental results began to show effect only from the second year. Since our experiments were planned for two years, they were conducted in small plots under laboratory conditions.
The practical application of these results is expected to yield positive outcomes in the field of biomelioration and improve the reclamation state of soils. Sweet sorghum not only reduces soil salinity but also improves soil structure. Its roots are suitable for export, making the crop highly profitable.

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The Volgograd State Agricultural University developed and patented a method to extend the planting time of sweet sorghum root cuttings for improving the reclamation state of reclaimed and degraded lands (RU Patent №2 251 241 C1, IPC7 A01C 1/00, A01N 59/00). The method aims to use mineral kieserite to maintain the natural state of roots and prevent drying. The clay mixture contains 80–90% mass of kieserite at a density of 1.2–1.3 t/m³, with the remaining part being water. Four- to five-year-old sweet sorghum roots are dipped into the suspension before planting, where the suspension acts on the roots at 30–45ºC for 4–6 hours, coating them with macro- and microelements of mineral kieserite, preventing root desiccation.

Planted sweet sorghum roots form large plantations. Using the phytomelioration method, the reclamation state of soils improves. A limitation of the method is that the roots must be planted within a short period (12–16 days).

Another invention of Volgograd State Agricultural University, "Method for establishing sweet sorghum plantations on reclaimed lands" (RU Patent №2 261 572 C1, IPC7 A01B 79/02, A01B 49/06), allows planting roots using agricultural machinery on reclaimed lands. Roots from clay soils of 3–5 years are harvested, prepared, and planted vertically in 0.7 m diameter circular openings at 0.20–0.25 m depth, with 2–3 roots per opening. This method enables the establishment of large plantations, improves soil agrotechnical condition, reduces salinity, enhances soil fertility, and increases rotational planting efficiency. Advantages include material cost savings, conservation of natural eco-forms, rapid expansion of plantation areas, and labor saving. Limitations include imperfect planting technology, risk of soil structure damage, time consumption, and short-term applicability.

The Secondary Saline Land Phytomelioration Method (RU Patent №2 415 557 C2, IPC7 A01G 7/00, A01B 79/02, A01C 7/00) developed by the Russian Academy of Agricultural Sciences allows preparation of reclaimed lands for planting within one year. In early May, sweet sorghum roots (4–5 per 1 m²) and topinambur (6–8 per 1 m²) are planted. The established plantations reduce secondary salinization and improve soil reclamation. However, the method is time-consuming, and plant residues left after harvest may lead to partial salinization of the soil surface.

The Dagestan State Agricultural Academy invention "Method for phytomelioration of saline soils" (RU Patent №2 265 978 C1, IPC7 A01B 79/02) focuses on planting salt-tolerant crops to improve soil reclamation. After harvesting, phytomeliorant roots are cultivated with spring or spike tools and ploughed into the soil. Advantages include improved agrotechnical condition, reduced salinity, increased soil porosity, and enhanced biohumus content. Disadvantages are high material costs, long duration, and temporary inefficiency for subsequent planting, as residues may still contribute to salinity.

Conclusions

1. Based on the analysis of the patents presented above regarding the improvement of saline soil reclamation, it can be stated that applying these methods in many saline areas of Uzbekistan—such as Bekabad district of Tashkent region, Syrdarya region, Khorezm region, and the Republic of Karakalpakstan—can yield positive results.
2. In the Republic of Karakalpakstan and Khorezm region, it is advisable to establish large plantations using biomeliorants to improve the reclamation state of soils and prevent soil erosion.

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3. When mineral kieserite is used for melioration, the phytomeliorant roots remain stable for 12–16 days until the completion of soil preparation. Application of mineral kieserite improves root quality and increases plantation productivity.

4. The method of melioration using biomeliorants, when implemented with the help of agricultural machinery, not only saves labor but also reduces the time required to reclaim large areas, thereby enhancing their agrotechnical condition.

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