

## A SHORT THEORY OF SOME SCIENTISTS ON THE FORMATION OF GYPSUM SOILS

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**Abstract.** *In this article, the improvement of land reclamation of common gypsum soils, which affects the physical and chemical properties of soils, microbiological and enzymatic activity, as well as soil composition and specific characteristics, and increasing their productivity, at least for their existing the researches of scientists conducted to maintain productivity are presented.*

**Keywords:** *saline sierozem, meadow-sierozem, sierozem-meadow, meadow, meadow-marsh, solonchak, soil, gypsum, salinity, chemical and physical properties, microbiology, enzyme, fertility.*

Gypsum soils — soils with gypsum in their composition and horizons. Gypsum soils are found in dry steppe, semi-desert and desert soils, as well as in saline soils at a depth of up to 10 cm (gypsum loam soils) and deeper than 50 cm (gypsum soils). It exists as hemihydrate ( $\text{CaSO}_4 \cdot 0.5\text{H}_2\text{O}$ ), hydrate ( $\text{CaSO}_4 \cdot \text{H}_2\text{O}$ ) and dihydrate ( $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ ). The amount of Gypsum soils in the soil can be 30% or more. The solubility of Gypsum soils increases in the presence of chlorides (often found together with layers of Gypsum soils). Therefore, the amount of Gypsum soils in the soil exceeds 20%, and the withering coefficient of crops also increases. During the oxidation-reduction process, Gypsum soils produce sulfur (P)-oxide and hydrogen sulfide, which are toxic to cultivated plants. Soils with overlying Gypsum soil horizons may cause subsidence and deformation of riverbeds when irrigated. Therefore, when developing such soils, it is necessary to take into account the depth and thickness of the gypsum soil horizon. Gypsum is added to the soil to improve the physico-chemical properties of saline soils and as a fertilizer.

In the Action Strategy for the Development of the Republic of Uzbekistan for 2017-2021, "...continuous development of agricultural production, further strengthening of the country's food security, further improvement of the reclamation of irrigated lands, expansion of the development of environmentally friendly products, significantly increasing the export potential of the agricultural sector" are defined as important strategic tasks [1].

It is known that in subarid and arid regions, the direction and intensity of the processes occurring in the water-soil-vegetation system, their quantitative indicators change over time, subject to horizontal laws. That is why some soils are classified as difficult to develop. Hardly digestible soils include highly saline gray meadow soils distributed in the southeastern part of Mirzachol. These soils are layer-by-layer according to their mechanical composition and have a strongly compacted gypsum layer at a certain depth. Empirical analyzes conducted in Syrdarya and Jizzakh region showed that the agro-ameliorative measures used in the development of alluvial and loess plains cannot be applied to gypsum soils [2]. Gypsum soils take time to master. Gypsum soils have poor water-physical properties, strong salinity prevents absorption. A lack of nutrients leads to low soil fertility.

The study of gypsum derivatives in the soil was first conducted by K. D. Glinka (1894). While studying the soils of Bessarabia, he paid attention to gypsum crystals of various shapes.

For the first time in Uzbekistan, gypsum soils were produced in 1900 by V.V. It was found and studied by Dokuchayev in the Karakum deserts. After that, importance was given to gypsum soils in Central and South Asia, several countries of North Africa, Central America and Australia. The main areas of these soils correspond to regions with arid climate. Study of gypsum soils of Central Asia was studied by several scientists after Dokuchayev. Despite the fact that it has been studied by several scientists, there is still no single detailed opinion about the formation of gypsum in soils, its effect on physical and chemical properties of soil and cultivated plants [3].

Until recently, it seemed easier to explain the origin of hydromorphic gypsum soils than that of automorphic soils. There was an opinion that the process of accumulation of gypsum is formed by the accumulation of calcium sulfate in the silt waters. Looking at the evidence and facts that have been gathered so far, it can be seen that this process is somewhat complicated. First of all, it is clear that gypsum soils belong to ancient soil surfaces, and moreover, they are formed in different periods of deposition, that is, they can belong to different stages of weathering of the silicate part of the soil.

The ancient soil surface is located below the current relief, and the neogene layers below it are located higher than the environment (50-200 m). Some young alluvial - proluvial layers cover the Neogene deposits in a considerable thickness. Due to the thickness of the Middle and Upper Quaternary deposits, the accumulation of sediments in this area is very intensive. In modern times, on surfaces with strong gypsum soils, the accumulation of sediments occurred very slowly. In some areas, the accumulative surfaces are covered with proluvial - deluvial or eolian - proluvial loess deposits. These loess are saturated with seepage waters saturated with small crystals of gypsum. In some soil sections, large crystalline gypsum can be seen alternating with small crystals. Such alternations mean that soil formation processes alternate with dry and wet conditions [4].

The source of gypsum in soils is soil-forming rocks containing gypsum and pyrite, sulfate-calcium seeps, and at the same time eolian deposits with gypsum. Dry climate and geochemical characteristics of the region have a great influence on the accumulation of gypsum in desert and barren soils. Because such soils are usually dominated by a non-washable water regime. In semi-hydromorphic and hydromorphic soils, the perspiring water regime has favorable conditions for the accumulation of gypsum compounds.

Gypsum soils can belong to different relief and geomorphological structures - foothills, elevations, slopes and lowlands. The foothills can be not only gypsum, but also saline with water-soluble salts [4]. The appearance and morphology of gypsum crystals depends on the hydrothermal regime of the morphology of gypsum soils. Accumulation of gypsum in heavy soils causes an increase in soil density and hardness. The shape of the gypsum layer is an important genetic, diagnostic and remedial factor. The appearance and morphology of gypsum crystals depends on the hydrothermal regime of gypsum soils. Accumulation of gypsum in heavy soils causes an increase in soil density and hardness. The shape of the gypsum layer is an important genetic, diagnostic and remedial factor. If the gypsum form consists of large crystals, when the soil has a heavy mechanical composition, a layer with weak water permeability properties is formed. Washing such soils for many years will be ineffective. Such a situation was observed in large gypsum soils of Mirzachol. On the other hand, karst phenomena can occur not only in irrigated fields, but also on the sides of ditches in soils with less mechanical structure. These processes lead to the formation of suffocated funnels and the wastage of irrigation water. At the same time, the presence of gypsum in the soil leads to deterioration of not only water permeability, but also other

physical properties [4].

Gypsum soils are characterized by high salinity, high compaction, poor water permeability, and weak biological properties of the soil, which have a negative effect on the root growth and development of plants in such soils. Gypsum is well formed in saline and salinity-prone soils, and the accumulation and amount of gypsum in the soil profile should be taken into account when growing agricultural crops and irrigating the soil [3].

Thus, there are 4 theories regarding the formation of gypsum in the soil, excluding supporters of the exchange reaction, and one of them is the theory of formation and accumulation of gypsum due to the salinization process. According to this theory, the formation and accumulation of gypsum is formed in the process of formation of saline soil, which is the main factor in the presence of saline mineral waters and their evaporation. The effect of seepage water on the formation of gypsum in the soil was studied by V.V. Dokuchayev said it for the first time. The next proponents of this theory were V.A. Kovda, M.A. Pankov, D.M. Kuguchkov, A.P. Biryukova and others are many scientists.

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