



RESULTS OF THE STUDY OF PHYSICAL AND MECHANICAL PROPERTIES OF SOILS OF COTTON ACREAGE

^{1,2}Toshtemirov Sanjar Jumaniyazovich

Doctor of Philosophy in Technical Sciences, docent,

²Temirova Sarvinoz Sunnatullo qizi

master's student,

²Sattorov Bobur Orif o'g'li- master's student

¹Karshi Engineering Economic Institute, Karshi, Uzbekistan

²Karshi institute of irrigation and Agrotechnologies, Karshi, Uzbekistan

sanjar_toshtemirov@mail.ru.

<https://www.doi.org/10.5281/zenodo.7778154>

ARTICLE INFO

Received: 19th March 2023

Accepted: 27th March 2023

Online: 28th March 2023

KEY WORDS

Soil, humidity, density, arable layer, ridge, agricultural crops.

ABSTRACT

The article presents an analysis of the physico-mechanical properties of the soil, as well as the results of experiments carried out during tillage of the cultivated areas on which agricultural crops are grown, cotton.

The physical and mechanical properties of the soils on which agricultural crops are grown in different zones are diverse. Therefore, the study of their physical and mechanical properties requires a special approach [1].

In our Republic, for growing crops during soil preparation, its density should be within 1.0-1.2 g/cm³, and humidity within 16-18%.

Depending on the type of plants and soil properties, this indicator varies in different ways. In the arable layers of irrigated lands for growing cotton, the most acceptable soil density is 1.2-1.3 g/cm³, but sometimes its density is within 1.35 g/cm³.

If the soil density is higher than the permissible limit, the yield of cotton and other agricultural crops decreases sharply. At the same time, the heterogeneity of soil density has a particularly negative effect, since as a result, there are backwardness in the germination of cotton roots over time [1, 2].

According to the results of the experiments, it can be seen that at a soil density of 1.4-1.5 g/cm³, the root system of plants cannot germinate through a solid layer of soil, i.e. through the sole of the plow, but will only be stratified along the sides of the upper layer. In the soils on which agricultural crops are grown, due to annual tillage in the same depth, the sole of the plow is formed in the lower layer of the soil.

To prevent this undesirable phenomenon, i.e. to avoid the formation of the sole of the plow in the lower arable layer of the soil, it is necessary to cultivate the soil to a depth of one meter every 2-3 years, as a result of this, the sole of the plow is destroyed.

It is known that, without studying the physical and mechanical properties of the arable and lower soil layer, it is impossible to create new energy-saving technologies and technical means that ensure high-quality tillage with minimal energy consumption.

In the cultivated areas of row crops, i.e. cotton and corn, in some row spacing there are artificially created field furrows and ridges. They are characterized not only by uneven relief,

but also by different values of the physical and mechanical properties of the soil lying in the aisles [1, 2, 3].

The main task of soil treatment is to improve the aeration and filtration process, as well as the collection (creation) and preservation of soil moisture.

In the fields of farms in November-December 2022, we studied the impact of traditional technologies on the above main indicators.

It is known that humidity and density are the main indicators of the physical and mechanical properties of the soil. To determine the density and humidity of the arable and sub-arable soil layer, samples were obtained from the so-called soil of a cotton field sown between rows of 60 cm [1, 2].

When choosing a place to obtain soil samples during the growing season of cotton, it was taken into account that, on the one hand, fields that fell under the repeated influence of the tractor running system, and on the other hand, fields that did not fall under its action. Therefore, in the field, the soil density was determined at the upper point of the ridge (in the zone of the cotton root system) and in the middle of the row (field furrow). At the same time, the height of the ridges averaged 10.4 cm.

The results of the studies showed (Fig.1) that the density of the soil in the middle of the ridge and row spacing slightly differ from each other. In the upper horizon of the ridge (0-10 cm), the soil is soft, and its density was 1.22 g/cm³. Field furrows are processed during cultivation. In addition, after the last irrigation, cracks form in this horizon. All these phenomena occurring in this horizon lead to a decrease in soil density [3, 4, 5].

In the 10-20 cm ridge horizon, the soil density was 1.36 g/cm³. During the growing season of plants, this layer of soil is not treated, since it is a protective zone.

In this horizon, the soil, as a result of the convex shape of the relief of the aisles, is compacted under the influence of tractor wheels as a result of the distribution of deformation to the sides. In layers 20-30, 30-40 and 40-50 cm, the soil density increases. In the lower layers of the horizon, the density increases, and in the horizon of 40-50 cm, the density reaches 1.47 g/cm³. The highest density of the soil is formed in the middle of the furrow, at the horizon of 40-50 cm. In this furrow horizon, the density is 1.49 g/cm³, and accordingly 0.02 g/cm³ is greater than the density of the soil located in the ridge. Due to the decrease in row spacing, the density of the field furrow and ridge slightly differs from each other [1, 3, 4].

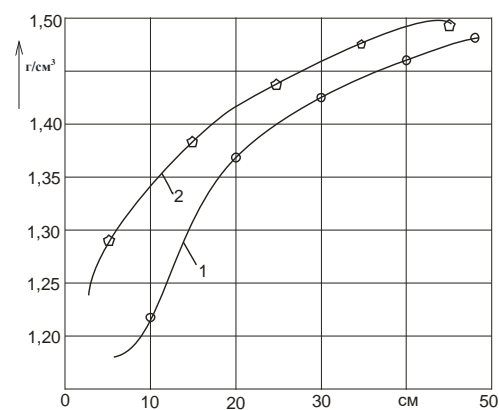
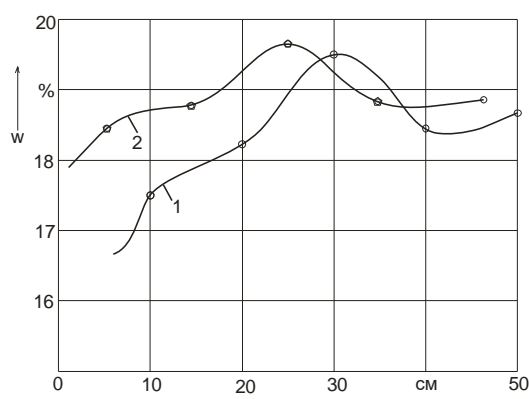




Fig.1. Graph of the dependence of soil moisture (a) and density (b) of such soil on the depth of the horizon. 1-on the ridge; 2-on the furrow

As can be seen from the above materials, when cultivating the soil by the traditional method, it is more compacted, while moisture is not collected and is not preserved. Therefore, the introduction of soil-protecting, water-saving and energy-saving technologies into agricultural production is a promising task.

References:

1. Тоштемиров С.Ж., Раззаков Т.Х., Эргашов Г.Х. Новая технология и агрегат для подготовки почвы к посеву «Вестник науки и образования». Научный журнал. Россия - 2021. № 6 (109). Часть 1
2. Toshtemirov S.J, Mamatov F.M., Batirov Z.L., Chuyanov D.Sh., Ergashov G'.Kh., Badalov S.M. Energy-resource-saving technologies and machine for preparing soil for sowing // European science revive. – Austria, 2018. – № 3-4. – p. 284-286. (05.00.00; № 2).
3. Mamatov F.M., Toshtemirov S.J., Xoliyarov Y.B., Batirov Z.L. Energy-resource-saving technology and a machine for preparing soil for planting cotton on the ridges // European
4. Раззаков Т.Х., Тоштемиров С.Ж., Эргашов Г.Х. Анализ процесса взаимодействия рабочего органа загрузчика с массой вороха трав.«Наука, техника и образование». Научный журнал. Россия -2021. № 2 (77). Часть 1.
5. Раззаков Т.Х.,Тоштемиров С.Ж., Эргашов Г.Х. Обоснование конструктивных параметров пальцевых элементов рабочего органа загрузчика конвейерных сушилок.«Academy».Научный журнал. Россия - 2020 - № 5 (56).
6. Раззаков Т.Х., Эргашев Г.Х., Раззаков С.Т. Теоретический анализ процесса подачи вороха клевера на конвейер сушильной установки рабочим органом загрузчика. //Academy. Научный журнал. № 3 (42). Россия - 2019.- С.23-24
7. Mamatov F, Mirzayev B, Toshtemirov S, Hamroyev O, Razzoqov T, Avazov I.Study on the development of a machine to prepare the soil for cotton sowing on ridges. IOP Conference Series: Earth and Environmental Science, 939(2021) 012064. Science revive. – Austria, 2018. – № 3-4. – p. 261-263. (05.00.00; № 2).