Development of agrotechnical methods and application of biomeliorant plants in the lower areas of Amudarya

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Abstract : A little-known sorghum culture, over the past ten years has gained a worthy place among agricultural crops.Sorghum has high drought tolerance, salt tolerance, high productivity, crop stability over the years and a distinctive feature is that it is able to continue the accumulation of dry matter and grow normally at high air temperatures and a limited amount of moisture in the soil, when other crops often die.
Keywords: sorghum, salt tolerance, salinization, vegetation, irrigation rate, crop rotation, agriculture

INTRODUCTION

Salinization of cultivated soils is one of the most common degradation processes that reduce the fertility of agricultural lands, leading to their desertification and exclusion from use. According to the International Institute for Environment and Development, about 10% of the continent's surface suffers from salinization

To prevent salinization, as well as to combat existing salinization, it is necessary to properly organize the operation of the irrigated area. The optimal irrigation regime and, first of all, irrigation norms that do not allow waterlogging, the fight against water losses in canals and planned water use are the most important measures to prevent soil salinization. Of great importance are measures to reduce moisture evaporation by the soil: creating a soil structure, thickened and re-sowing, correct and timely tillage, and planning the surface of the field[7, 8].

The land resources of general economic importance include not only fertile soils that are actively used in agriculture, but also soils containing readily soluble mineral salts harmful to plants and therefore unsuitable for growing useful crops[9, 10]. Saline soils make up about 20% of all developed land in the world. The process of accumulation of salts in soils can occur both naturally (weathering of minerals or the intake of substances from the atmosphere), and artificial (land reclamation associated with irrigation or drainage of the land).

Aim. The aim of the research is to substantiate and develop the technology of cultivating biomeliorant plants as a cultivator-cultivator of saline irrigated lands in the semi-desert zone, providing a reclamation effect and increasing soil fertility.

The task of dissertation research. The analysis of the impact of complex land reclamation on increasing the fertility of the saline arid lands of the arid territories, the role of phytomeliorants in improving the agrochemical and agrophysical properties of soils is carried out; selection of cultivators of saline irrigated lands; studied the effect of salinization on productivity and studied the water consumption of biomeliorant plants in development phases with and without groundwater recharge.

By analyzing the phytomeliorative potential of different plants, cultivated plants can be ranked according to soil restoration efficiency in a row: perennial grasses - biennial leguminous grasses - annual grasses - winter crops - legumes - spring grains - row crops.

Cultivated crops have a significant impact on the structure of the arable soil layer. For example, with constant steaming and under corn, the content of aggregates larger than 0.25 mm was about 20%, after 6 years of cultivation of wheat -18%, under alfalfa - 25%. This once again confirms the well-known position on the structure-forming role of perennial herbs. The frequent action of tillage tools also contributes to a decrease in the content of microaggregates in the arable soil layer [1].

According to P.V. Vershinin, the more grass leaves in the soil of plant root residues, the higher their structure-forming role, and the root residue in the soil after grass will be greater where the grass yield was higher. The work of A.A. Plotnikov also shows that an increase in water-resistant aggregates is in accordance with an increase in the yield of herbs. Moreover, according to I.B. Revuta occurs a sharp (2.5 times) increase in soil structure. P.V. Vershinin noted a decrease in the effect of perennial grasses on the restoration of the soil structure to the southeast, that is, to arid regions [2]

It is known that the root system of plants acts as a powerful agent for structure formation, penetrating the soil in all directions with a dense network of small roots. Roots can penetrate the soil through cracks, traces of decayed roots and rhizomes of plants, along the paths of animals. The roots also populate those deep layers of the soil where the soil is not very dry, and the frost penetration is relatively weak or little manifested. An important role is played by small roots and root hairs, which can settle in the undivided part of the soil or subsoil.Even a dense soil in the wet state does not show significant resistance to the passage of the root hair, often having a few microns in diameter. The disintegrating activity of small roots extends to several millimeters and even fractions of millimeters. In accordance with this, the sizes of structural lumps formed as a result of the activity of plant roots can be insignificant [3].

According to P.V. Vershinin, the process of loosening the soil under grasses proceeds as follows: the first year after an annual grain crop into which grasses are sown, the field begins to compact; due to the cessation of cultivation, loosening the soil, and under the influence of the root systems of developing grass mixtures, the density of the soil under the herbs continues to increase. Depending on the composition of the grass mixture, fertilizer background and general soil conditions, the bulk of the roots of the grass is created either in the first year or in the second. Spaces after the death of roots and roots in the autumn-winter time are filled with water, which freezes, expands these passages, thereby realizing the aggregate structure of the soil created by the root mixtures of the grass mixture. In the third year of grass life in the arable horizon, the soil density begins to decrease, the sealing effect of the grass goes into the loosening. I.B. Revut, referring to the experiments conducted at the Agricultural Academy. K.A. Timiryazeva also emphasizes the importance of annuals and perennials.[4].

Field experiments in 2019-2020 carried out in the lower reaches of the Amu Darya. The comparative biomeliorative effects of annual legumes, perennial grasses, and straw plowing to prevent soil degradation were studied.

The intensity of the passage of phenological phases, the duration of interphase periods are largely associated with abiotic factors and, above all, with weather conditions. Growth conditions also have a significant impact. Sorghum sowing is usually carried out when the soil at a depth of seed placement warms up to 12 - 15 ° C, in 2019 this became possible on May 21, and in 2020 on June 1. In 2019, seedlings appeared 13-14 days after sowing. From germination to tillering, it took 13 days. Differences between the options began to appear in the exit phase of the tube. The effect of fertilizers was noted (the duration of the interphase periods is increased by 1-2 days).

In the period of emergence and exit into the tube, the ground mass develops poorly, and from the moment it enters the tube, intensive linear growth and build-up of the aboveground mass begin, this continues until the sweeping phase. Intensive growth of aboveground mass continues until the flowering phase. Over the next 45 to 50 days, the formation and maturation of sorghum grain occurs.[5, 6].

Table 1. - The onset of phenological phases of grain sorghum depending on the seeding rate, 2019

Experienceoption		**Developmentphases**						
Sort	**Seedingrate**	**crop**	**Seedlings**	**Tillering**	**Accessto thetube**	**Sweeping**	**Bloom**	**Fullripeness**
Slavyanka	**0,4**	**1.06**	**19.06**	**2.07**	**20.07**	**29.07**	**4.08**	**27.09**
	0,6	**1.06**	**19.06**	**2.07**	**20.07**	**29.07**	**4.08**	**27.09**
	0,8	**1.06**	**19.06**	**2.07**	**20.07**	**29.07**	**4.08**	**27.09**
	1,0	**1.06**	**19.06**	**2.07**	**20.07**	**29.07**	**4.08**	**27.09**
	1,2	**1.06**	**19.06**	**2.07**	**20.07**	**29.07**	**4.08**	**27.09**

Table 2 - The onset of phenological phases of grain sorghum depending on the seeding rate, 2020

Experienceoption		Developmentphases						
Sort	Seedingrate	Sort	Seedingrate	Sort	Seedingrate	Sort	Seedingrate	Полная спелость
Slavyanka	0,4	15.06	3.06	17.06	4.07	13.07	20.07	8.09
	0,6	15.06	3.06	17.06	4.07	13.07	20.07	8.09
	0,8	15.06	3.06	17.06	4.07	13.07	20.07	8.09
	1,0	15.06	3.06	17.06	4.07	13.07	20.07	8.09
	1,2	15.06	3.06	17.06	4.07	13.07	20.07	8.09

Meteorological conditions of the growing season 2020 were favorable for the growth and development of sorghum. The period of seed germination was warm, and after sowing, 8 mm of precipitation fell, which in the complex responded rather favorably to seed germination. The first seedlings began to appear on the fifth day, full seedlings were observed on the 8th-9th day, the application of mineral fertilizers stimulates the seeds to faster and more friendly germination - seedlings are marked on the 8th day, without fertilizing on the 9th day. June and July can be characterized as dry months (high temperatures, moisture deficit), which affected the passage of the interphase periods - they were slightly reduced. On the 14-18 day from the appearance of the seedlings, tillering began, for getting into the tube it took 15-17 days from the date of the full tillering. Panicles appeared on 42 - 46 days from the full germination phase, another seven days later the flowering phase began. Flowering proceeded at optimal temperatures and in the presence of atmospheric moisture.

The intensity of linear growth and the length of the stem of plants can be attributed to morphological indicators, the parameters of which largely depend on the prevailing weather conditions and are determined by the characteristics of the variety. An analysis of the growth processes of sorghum over the years allows us to conclude that in 2010, characterized by severe drought, the stalk of the sorghum was shorter and in the flowering phase was within the limits of the sorghum Slavyanka 59.3 cm ... 64.3 cm without fertilizer, 64.4 ... 70.0 cm when fertilizing, the variety Premiere 49.9 ... 53.3 cm and 54.0 ... 65.0 cm, respectively. The following years were more favorable, and the length of the stalk of sorghum increased significantly, especially in 2013, where the stalk of sorghum Slavyanka grew to 100 cm

Studies have shown that the size of the leaf surface of sorghum depends on many factors. First of all, the nature of the increase in leaf area varies by year. So in unfavorable 2019, the leaf surface of sorghum in the exit phase into the tube turned out to be maximum, however, its level was low not exceeding 27 thousand m2 / ha and its growth towards extrusion and flowering almost stopped. In 2020, the leaf area increased to the extortion phase

The main indicator of the economic value of annual crops is the size and quality of the crop. Observations in the experiments established that the productivity of sorghum crops depends on the cultivated variety, seeding rate, level of mineral nutrition and weather conditions. Unfavorable weather conditions in 2019 showed that the yield of grain sorghum was reduced. The following trends were identified: despite the drought, an increase in yield is observed against the background of the application of mineral fertilizers, and the Slavyanka variety responds much better to the application of mineral fertilizers. Without fertilizer, it provides a yield of 1.42 ... 1.78 t / ha, and when applied - 1.66 ... 2.08 t / ha. Traced throughout the experience

Studies have shown that in variants with the use of mineral fertilizers, the indicators of standing density and fullness of seedlings increase. The difference in absolute values of the density of standing between ordinary row crops (row spacing 15 cm) and wide row crops (row spacing 45 cm) is associated with sowing coefficients, with row planting 800 thousand all. seeds / ha, with a wide-row - 400 thousand suns. seed / ha.

The main indicator of the economic value of annual crops is the size and quality of the crop. Observations in the experiments established that the productivity of crops depends on the cultivated crop, the method of sowing, the level of mineral nutrition and weather conditions.Despite the drought, there is an increase in crop yields against the background of the introduction of mineral fertilizers. Hot and arid weather conditions in 2019 created unfavorable conditions for the normal growth and development of plants, as a result of which the yield of grain sorghum was at a low level of 0.98 ... 1.83 t / ha this year

It was revealed that the application of the herbicide did not contribute to an increase in productivity, apparently in hot weather its inhibitory effect on sorghum was also manifested. The dependence of yield reduction on wide-row sowing with a row spacing of 45 cm was clearly identified. So, for example, the Slavyanka variety (without the use of a herbicide) when sowing with a row spacing of 15 cm provides a yield of 1.69 ... 1.83 t / ha, and with a row spacing of 45 cm - 0 , 98 ... 1.47 t / ha

The technology of cultivation of sorghum has no special differences from grain crops. The same sowing and harvesting machines are used. The main requirement when choosing a site for sorghum is a field that is clean of weeds (primarily from annual cereals), because after emergence within 20-25 days it grows slowly (since the root system is actively developing during this period) and can be drowned out by weeds.Grain sorghum is unpretentious to soils and grows on all subtypes of chernozem, gray forest, chestnut, and others with favorable physical properties (structurally well aerated). Soil preparation for grain sorghum is standard, as for all grain and row crops.

CONCLUSION

Studies have allowed to identify the main organizational and economic factors for the growth of sorghum grain production and substantiate proposals for improving economic efficiency, which boil down to the following:

1. The agroclimatic resources of the Beruni region, when optimizing the production process, allow obtaining sufficiently high grain yields of grain sorghum of the Slavyanka variety - up to 3.8 t / ha.

2. The results of competitive variety testing showed that the most stable in seed yield is a variety of grain sorghum.

3. The duration of the “sowing-seedlings” period depends on the prevailing temperature conditions and soil moisture at the depth of seed placement. An inverse correlation was established between the duration of the sowing-seedling period and soil temperature.

4.The total biomass of dry matter - 6.5-6.8 g / m day and grain - 2.7-3.1 g / m day in a continuous ordinary method of sowing at a seeding rate of 0.80-1.00 million / ha. The maximum yield with a wide-row method of sowing with 45 cm row-spacing was obtained with an FP - 1144.3-1257.2 m2 / ha day and an SPF - by dry matter biomass - 5.7-6.1 g / m day and grain - 2, 5-2.7 g / m2 day. The maximum yield with a wide-row method of sowing with inter-row spacing of 70 cm was formed by sorghum sowing at AF - 883.0-983.9 m / ha day and NPF - on dry matter biomass - 6.2-6.6 g / m day and grain - 2.9-3.2 g / m day.

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