The influence of sowing norms on the green mass and yield of sorghum variety “Nayman” in salt soil conditions of Karakalpakstan

Esbolova Miyrigul Bazarbaevna Candidate of agricultural sciences, associate professor of the department of Plant growing · **Baltabaeva Guljamal Quwanishbayevna** Independent Researcher in the Field of Plant Science · **Yusupov Beknazar Orazbaevich** assistant professor of the department of Plant growing

Karakalpakstan Institute of Agriculture and Agrotechnology

DOI 10.66073/ReFocus-Conf/1610051

For citation: Esbolova Miyrigul Bazarbaevna, Baltabaeva Guljamal Quwanishbayevna, Yusupov Beknazar Orazbaevich. The influence of sowing norms on the green mass and yield of sorghum variety “Nayman” in salt soil conditions of Karakalpakstan. In: Development of innovative climate-resilient technologies for monitoring and controlling water use efficiency and the impact of salinization on crop productivity and livelihoods in the Aral Sea region: Proceedings of the International Scientific and Practical Conference. Nukus, 2026. P. 209–213. DOI: 10.66073/ReFocus-Conf/1610051

Abstract. The number of sprouted plants increased from 91.3% to 93.1%, and the number of plants preserved at the end of the growing season was also found to be more by 1.9% when the seed consumption was increased from 110,000 to 140,000 seeds when the “Nayman” variety of sorghum planted in saline soil conditions was planted for green mass. The number of seeds in the panicle, which is the main indicator of the harvest, was determined to be 1398.4 seeds weighing 27.0 grams when 110,000 seeds/ha were used, and 1322.0 seeds weighing 27.8 grams when 100,000 seeds/ha were planted. The number of seeds in the panicle was less in the variants with a low sowing rate.
Keywords: salination, salt, sowing norm, yield, germination, green mass

Introduction

Soils in hot and dry regions of the world are often saline, so the potential for agriculture in such areas has been very low. Most of the crops in these areas are grown using irrigation, and the secondary salinity caused by inadequate irrigation management is exacerbating the problem, affecting 20 percent of irrigated land worldwide.

Salinity is the accumulation of sodium, magnesium, and calcium soluble salts in the soil to the extent that it drastically reduces soil fertility. Salinity is one of the most serious environmental factors that limit the productivity of agricultural crops. Most agricultural crops are sensitive to salinity caused by high concentrations of salts in the soil. The size of the affected areas is increasing day by day. The area of irrigated saline land in Uzbekistan is 2 mln 270.7 thousand hectares, including 1 million 267.7 thousand hectares of low salinity lands, moderately saline land is 711.2 thousand hectares, and highly saline land is 291.8 thousand hectares (Ministry of Finance of the Republic of Uzbekistan, 2018). The highest level of soil salinity is observed in Karakalpakstan (90-95%), Bukhara (96%) and the Khorezm oasis (95-100%) (FAO, 2021 source).

Soil salinity is one of the extreme factors spread over large areas in our country and throughout the world. Starting with a salt concentration of 0.9%, it significantly reduces the viability of seeds. A NaCl concentration of 1.1% had a strong inhibitory effect on seed viability, while 1.5% practically stopped seed germination.

Salt tolerance is the ability of a plant to maintain its growth, development and reproductive characteristics under salinity conditions.

Food production should be carried out mainly at the expense of intensification of agriculture, in which it is necessary to choose the correct selection of food crops that ensure continuous abundant harvest in any soil-climatic conditions. Sorghum is one of them. It is a heat-tolerant and drought-tolerant crop. Sizot waters grow well in close proximity and improve the mechanical composition. Sorghum produces more greens than corn. It is the most drought-resistant crop among field crops. Sorghum is a crop that has the ability to re-green after being harvested.

Research results. The transition of agriculture to the market economy and the deterioration of the ecological environment in our country, and the Aral Sea problem require the development of technology for the production of high-yield grain and green crops, using less water, mineral fertilizers and other material resources.

Starch, pure fructose, glucose, fructose mixture, cellulose, concentrate feed, and ethanol (ethyl alcohol) are obtained from the juice contained in the stalk of sorghum. And ethanol is a renewable, ecologically clean, cheap source of energy. A promising use of sweet sorghum is ethanol production. The stem of this crop contains 17% to 21% sugar content. High productivity and low cost of cultivation make this crop the only crop in sugar production.

An experiment was conducted to determine the optimal planting rate that ensures good growth and high-quality harvest of sorghum in saline soil conditions. To study the effect of sowing standards on the good growth and development of sorghum plants; to study the effect of planting standards on the productivity of sorghum; to study the influence of the studied factors on the grain productivity of sorghum.

In our experiment, the influence of the Nayman variety of sorghum included in the State Register on planting standards was studied in the conditions of irrigated meadow alluvial soils. As a result of the experiment, optimal planting standards were determined, which ensure the production of abundant and high-quality crops from sorghum. Laws of abundant and high-quality harvest of sorghum variety, field germination of seeds, growth, development and productivity of plants were determined.

When setting up field experiments, the size of the plots was 50 m2, 4 replicates. The ratio of the width to the length of the strips was kept in the ratio of 1:5-1:10.

In the experiments, soil moisture was maintained at not less than 70% of the limited moisture capacity.

Our experiment was conducted at the KKNIIZ experimental station. The terrain of the experimental site is uneven. The soil of the experimental plot belongs to previously irrigated meadow alluvial soils, and the amount of phosphorus, potassium, nitrogen and organic matter was determined in the soil of the experimental plot. It has a soil environment. Type is saline sulfate.

Table 1. The amount of mineral fertilizers and organic matter in the soil of the experimental area

No	Ground type	depth, cm	P2O5 mg/kg	K mg/kg	N %	Humus, %	pH	Type of salination
1	soil	0-10	171	142,74	0,15	2,17	9,0	sulfated

The level of soil nutrient supply is very low.

All technological methods, except those studied in the experiment, were carried out on the basis of general agrotechnics adopted by the region.

Observations and biometric measurements were carried out on model plants in odd replicates.

DOI 10.66073/ReFocus-Conf/1610051

Table 2. Seed germination rate and actual seedling thickness of Nayman variety

Options	Sowing norms	Number of germinated plants, thousand pieces / ha	%	The number of plants preserved at the end of the growing season, 1,000 pieces/ha	%
For grain					
1	80 thousand pieces	73,6	91,4	73,1	91,0
2	90 thousand pieces	82,6	91,5	82,2	91,0
3	100 thousand pieces	91,5	91,7	91,0	91,3
4	110 thousand pieces	100,6	92,0	100,1	91,4

The following studies were conducted to study plant growth, development and productivity of sorghum:

- the field germination of seeds and plant stem thickness were calculated in 0.5 m2 areas where constant observation was carried out before harvesting, in 10 places located diagonally across the plot;

-biometric indicators of sorghum were conducted every 8-10 days in 20 plants selected from 0.5 m2 plots in 4 repetitions;

- in order to study the properties of sorghum, viability and productivity during the growing season, 20 plants were taken from each plot after full germination and the order of formation of the head and side stems was determined. A productive cluster was found in the phase of wax ripening.

The variety “Nayman” was studied in the experiment.

The “Nayman” variety of sorghum was planted in 4 different standards for grain and plant thickness. Sorghum seeds were heated for a day in the sun before sowing because of low germination.

Germinated grasses were identified in the full grassing phase. Of the 80,000 seeds planted for grain, 73,600 seeds germinated and formed grass, or 91.4% of the seeds became grass. At the end of the growing season, the actual number of seedlings was counted, and 73,100 plants were preserved, or the plant preservation rate was 91.0%. Out of 90,000 spent seeds, 82,600 seeds from the second option germinated and formed grass, or 91.5% of the seeds became grass.

At the end of the growing season, the actual number of seedlings was calculated, and 82,200 plants were preserved, or the plant preservation rate was 91.0%. In the first and second options, it was found that the percentage of plants that remained at the end of the growing season was the same. Out of 100,000 spent seeds, in the third option, 91,500 seeds germinated and formed grass, or 91.7% of the seeds became grass. At the end of the growing season, the actual number of seedlings was calculated, and 91,000 plants were preserved, or the plant preservation rate was 91.3%. Out of 110,000 spent seeds, in the third option, 100,600 seeds germinated and formed grass, or 92.0% of the seeds became grass. At the end of the growing season, the actual number of seedlings was calculated, and 100,100 plants were saved, or the degree of plant preservation was 91.4%. It was found that in the variants with an increased amount of seeds, the germination of seeds is 0.3-0.6% higher.

The varieties planted for grain Nayman were harvested at the end of the wax ripening phase of the grain and in the flowering phase of the pods for green mass, so only the yield of green mass was determined.

In the option planted for grain, the yield of the panicles was determined first. In the first option, where 80,000 seeds were sown, 38.1 centners of panicles was obtained from one hectare of land, while in the second option, where 90,000 seeds were sown, 41.2 centners or 3.1 s/ha more than the first option was obtained. In the third option, where 100,000 seeds were planted, 43.8 centners of panicles were obtained from one hectare of land, and in the fourth option, when 110,000 seeds were sown, 46.3 centners of panicles were obtained from one hectare of land. The highest panicle yield was obtained from the fourth option, which was 8.2 s/ha more than the first option, 5.1

DOI 10.66073/ReFocus-Conf/1610051

s/ha more than the second option, and 2.5 s/ha more than the third option. The reason for this is, of course, the increased number of plants in each option.

The seeds were crushed and the grain yield was determined. The above pattern was repeated in the grain yield, but the difference between the variants was not as great as in the panicle yield due to the difference in the number of seeds in the panicle and their weight.

Table 3. Yield of Nayman variety of sorghum

Options	Sowing norm	Yield, q/ha			
		Panicle	Grain	Green mass	Dry stem
For grain					
1	80 thousand pieces	38,1	29,3	-	225,0
2	90 thousand pieces	41,2	32,0	-	230,4
3	100 thousand pieces	43,8	34,0	-	238,4
4	110 thousand pieces	46,3	35,2	-	246,2
For green mass (first mowing)					
1	110 thousand pieces	-	-	343,0	-
2	120 thousand pieces	-	-	371,0	-
3	130 thousand pieces	-	-	400,0	-
4	140 thousand pieces	-	-	428,6	-
sprouted again					
1	110 thousand pieces	-	-	180,0	-
2	120 thousand pieces	-	-	186,4	-
3	130 thousand pieces	-	-	195,0	-
4	140 thousand pieces	-	-	204,4	-

Also, the highest grain yield was obtained from the fourth option with 110,000 seeds, 35.2 s/ha. The first option, where 80 thousand seeds were sown, yielded 29.3 t/ha, and 5.9 q/ha less than the fourth option. The second option, where 90,000 seeds were sown, yielded 32.0 q/ha of grain, 3.2 q/ha less than the fourth option. The third option, where 100,000 seeds were sown, yielded 34.0 s/ha of grain, and 1.2 s/ha less than the fourth option.

The yield of dry stems was 225.0 q/ha from the first option, where 80,000 seeds were sown. 230.4 q/ha of the second option with 90 thousand seeds, 238.4 q/ha with 100 thousand seeds and 246.2 q/ha of the fourth option with 110 thousand seeds were obtained.

Green mass yield is 343.0 q/ha in the option of 110 thousand pieces/ha of seeds, 371.0 q/ha in the option of 120 thousand pieces/ha of seeds, 400.0 s/ha in the option of 130 thousand pieces/ha of seeds and 140 thousand 428.6 q/ha was obtained in the option where seeds were used per unit/ha. At the same time, in the case of planting more seeds due to the number of plants, the yield of green mass was more.

After harvesting for green mass, nitrogen fertilizer was given and watered immediately. In 3 days, re-greening was observed in the plant and 7-8 stems started to develop in each plant. The replanted stems grew faster and entered the fruiting period in 50 days compared to the main planting, but the plant developed a thinner stem. 180.0 q/ha in the option of 110 thousand pieces/ha of seeds, 186.4 q/ha in the option of 120 thousand pieces/ha of seeds, 195.0 q/ha in the option of 130 thousand pieces/ha of seeds and 140 thousand pieces/ha 204.4 q/ha of green mass yield was obtained in the variant with spent seeds.

Conclusions

1. It was found that when the seed consumption of the “Nayman” variety of sorghum was increased from 80,000 to 110,000 grains, the seed germination rate increased from 91.4% to 92.0%, and the number of plants preserved at the end of the growing season increased by 0.4%.

2. When seed consumption is increased from 110,000 to 140,000 seeds, the seed germination rate increases from 91.3% to 93.1%, and the number of plants saved at the end of the growing season increases by 1.9%.

3. The number of seeds in the panicle, which is the main indicator of the harvest, was 1398.4 seeds weighing 27.0 grams when 110 thousand seeds were used per ha, and 1322.0 seeds weighing 27.8 grams when 100 thousand seeds were planted per ha. was found to be grams. The number of seeds in the panicle was less in the variants with a low sowing rate.

4. Seed yield is 29.3 q/ha when 80,000 seeds/ha are used, 32.0 q/ha when 90,000 seeds/ha are used, 34.0 q/ha when 100,000 seeds/ha are used and when 110,000 seeds/ha are used, it is 35.2 q/ha.

References

1. Edenbaev D. «Karakalpak sorghum» «Karakalpakstan» Nukus-1991
2. Abdolnyazov B. Maintenance of nutritious repeated crops – J, Agriculture of Uzbekistan, No. 2, 2002, P.44.
3. Abdalniyazov B. In Khorezm – sorghum cultivation technology. // Agriculture of Uzbekistan, 2006-№7, - P.40.
4. Alabushev A.V., Beskrovnyi V.I. and others. Sweet sorghum in the steppe zone. // - Agriculture, 1993, - No. 5, - P.24
5. Atabayeva H.N. Biology and cultivation technology of grain crops – Tashkent, 2009, P.120-121

DOI 10.66073/ReFocus-Conf/1610051