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FIRST INFORMATION ON THE STUDY OF THE CULTURE OF *Sorghum bicolorm* (L.) Moench IN THE NAKHCHIVAN AUTONOMOUS REPUBLIC

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ПЕРВЫЕ СВЕДЕНИЯ ПО ИЗУЧЕНИЮ КУЛЬТУРЫ *Sorghum bicolorm* (L.) Moench В НАХЧЫВАНСКОЙ АВТОНОМНОЙ РЕСПУБЛИКЕ

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Abstract. Sorghum bicolor considering its high-quality properties as a gluten-free, dietary food, was first planted for research purposes in a 0.33-hectare (3300 m²) area in the experimental field of the Nakhchivan Institute of Agriculture under the name of Academic HasanAliyev. The adaptation of this plant to the soil and climatic conditions of the Autonomous Republic was studied. Additionally, in line with the biological characteristics of the plant, its growth parameters, including plant height, number of leaves, spike weight, seed weight per spike, number of seeds per spike, 1000 seed weight, germination rate, flour yield, and dry matter content were examined. The article also demonstrates that sorghum, an alternative forage crop, adapts well to the climatic conditions of the Autonomous Republic. Its grain can be used as food, while its green biomass can serve to enhance the livestock feed base. Therefore, it is advisable to expand the cultivation of this plant.

Аннотация. Sorghum bicolor как высококачественная альтернативная культура, обладающая безглютеновыми и диетическими свойствами, была впервые посеяна в исследовательских целях на опытном участке Научно-исследовательского института сельского хозяйства Нахичеванской Автономной Республики на площади 0,33 га (3300 м²) для изучения адаптации растения к почвенно-климатическим условиям региона. В ходе исследований, проведенных с учетом биологических особенностей культуры, были изучены: высота растения, количество листьев, масса метелки, масса и количество зерен в метелке, масса 1000 зерен, процент всхожести, выход муки и содержание сухого вещества. Результаты исследования показали, что сорго успешно адаптируется к агроклиматическим условиям региона, а расширение посевных площадей является целесообразным как для использования зерна в пищевых целях, так и для увеличения кормовой базы животноводства за счет зелёной массы растения.

Keywords: alternative food, gluten-free food, sorghum flour, sorghum grain, yield.

Ключевые слова: альтернативная пища, безглютеновая пища, мука из сорго, зерно сорго, продуктивность.

Among the plants that make up the main food of our modern era, the need for alternative crops is increasing due to the declining productivity of wheat, especially in relation to current drought issues. Among these crops, amaranth, quinoa, sorghum, etc., can be highlighted, as they not

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only have multiple uses but also possess high marketability. For instance, the grain of these plants is used for food, while their green mass is used as animal feed. As they are highly productive and gluten-free, interest in cultivating these plants has been increasing in Azerbaijan in recent times.

One of the alternative plants with high nutritional value among forage crops is sorghum (Sorghum bicolor), a member of the Gramineae family. Its origin is known to be in northern and central Africa. Its strong root system enhances the plant's ability to grow in various soil types. There are three main varieties of sorghum worldwide: white, black, and red. Its total growing period ranges from 90 to 120 days, depending on the temperature. It is the fifth most important cereal crop in the world, following rice, wheat, maize, and barley. Typically, it is an annual plant, although some varieties are perennial. Sorghum grows across a wide temperature range, with an optimal growth temperature range of 12–34°C (54–93°F).

It can grow in soils with a pH ranging from 5.0 to 8.5, including heavy clay to sandy soils. Sorghum requires 25 kg of nitrogen, 10 kg of phosphorus, and 10 kg of potassium for 1000 m² of land. It is mostly grown as a second crop in many parts of the world. Sorghum is a biomass plant used in both human and animal nutrition [1, p. 70-73; 2, p. 13-15].

It is widely utilized in ethanol production. Its stem is also directly used as a bioenergy source. Processed in solid, gas, and liquid forms, bioenergy is obtained. The energy derived from biomass is called biomass energy [3, p. 25-28]. The most important factor in obtaining quality biomass from the sorghum plant is the sufficient amount of sunlight. Sorghum is one of the necessary varieties for bioethanol production and is one of the most studied plants in developing countries. Hydrogen fuel obtained from the processing of sorghum is a key raw material in the production of batteries [4, p. 63-75].

Sorghum can grow in poor soils, but for quality yields, well-drained soils are preferred. Its strong and deep root system increases its drought resistance. The plant has a cylindrical, juicy stem, and its juiciness is significant for sugar production. It has long, striped leaves and its flowers are broom-shaped and split. The stem has high nutritional value and is readily consumed by animals. The seeds vary between 2–5 mm. Sorghum seeds are a rich source of energy, primarily composed of carbohydrates, proteins, and some micronutrients. Being gluten-free, it serves as an alternative food for individuals sensitive to gluten. It has strong antioxidant properties and is beneficial for the digestive system.

It helps stabilize blood sugar levels and is used in diabetic diets. The composition includes 60–75% carbohydrates, 8–14% proteins, 5–10% fiber, and 2–3% fat. Seeds are directly sown in the field [5, p. 82-86]. It is advisable to sow it in early spring when the soil temperature exceeds 10°C. During the growing season, irrigation is carried out according to the plant’s needs, depending on soil and climatic conditions. Sorghum bicolor is a universal plant of great importance for both food and industrial purposes. Before planting sorghum, the soil must be cleared of weeds, NPK fertilizers should be applied under plowing, and agronomic practices should be correctly applied based on the plant's biological characteristics. In many parts of Asia and Africa, bread made from sorghum flour is a staple food. One of the main uses of sorghum is as a gluten-free food, making it a primary food source for individuals suffering from celiac disease (Figure 1).

In livestock, both the grains and the stem in silage form are used as feed (Figure 2).

In our country, to strengthen food security and further develop the feed base, non-traditional crops are being adapted to the regions through trial plantings carried out by Scientific Research Institutes.

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Figure 1. Dietetic bread and wine made from sorghum (https://goo.su/ukv1DU)

Figure 2. Silaged sorghum plant (https://goo.su/mu7pF)

Materials and Methodology

The seeds of sorghum were obtained through cooperation with the Azerbaijan Ministry of Agriculture's Crop Production Scientific Research Institute. The experiments were conducted in two replications according to the planting scheme.

Experimental Section: The research plantings were conducted at the Sharur base station under the Nakhchivan Agricultural Scientific Research Institute named after Academician HasanAliyev, on an area of 0.33 hectares, following the planting scheme. Before planting, the field was plowed to a depth of 25–30 cm.

The planting work was carried out during the first ten days of May. Germination was observed 10–15 days after planting. During the growing period, urea fertilizer was applied for feeding purposes, and irrigation was carried out three times [5].

Regular phenological observations and biometric measurements were conducted on the plants, and records were taken. During the harvesting period, the plant's height, number of leaves (Figure 3), weight of the panicle, number of grains in the panicle, and weight of 1000 grains were studied (Figure 3).

The quality indicators of sorghum seeds have been analyzed at the Seed Analysis Laboratory under the Laboratory Center of the Ministry of Agriculture of Nakhchivan. The weight of 1000 seeds was found to be an average of 32 grams. For determining the germination capacity, the germination rate of 100 seeds was assessed, which was 97%. For flour yield determination, 475 grams of sorghum seeds were weighed on an analytical balance and ground, resulting in a flour yield of 25.92%. This means that 105 grams of flour was obtained from 475 grams of seeds (Figure 3).

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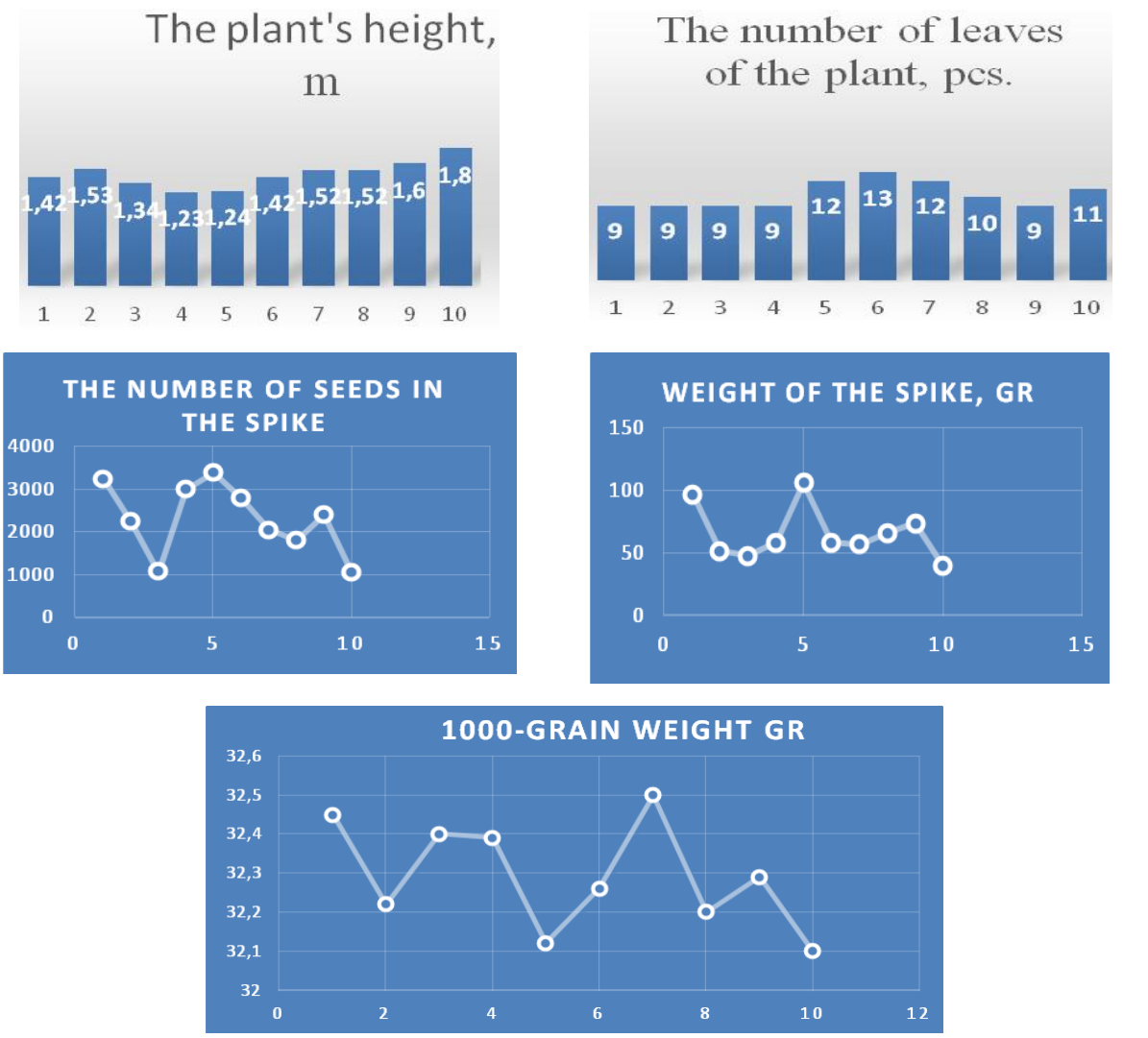

Figure 3. Analyz at the Seed Analysis Laboratory

The quality indicators of sorghum seeds have been analyzed at the Seed Analysis Laboratory under the Laboratory Center of the Ministry of Agriculture of Nakhchivan.

Figure 3. Determination of the germination rate and flour yield of sorghum seeds.

Determination of dry matter: A 25-gram sample of sorghum seeds was weighed on a balance with a sensitivity of 0.0001 grams. The sample was placed in a drying oven set at a temperature of 133°C and kept for 3 hours. The final weight of the dry matter was determined to be 22.4 grams, which corresponds to 89.6%.

Result of the study

The conducted research indicates that the sorghum plant adapts well to the soil and climatic conditions of the Nakhchivan Autonomous Republic, and its green mass is suitable for use as livestock feed. Based on the data presented in the article, it can be concluded that the use of sorghum in areas where flour and seed yield are optimal is advisable.

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