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AGRICULTURAL SCIENCES

HISTORY OF SORGHUM AS A CULTURE IN UKRAINE AND IN THE WORLD

Tretiakova Svitlana Oleksiivna

Candidate of Agricultural Sciences, Senior Lecturer

Department of Plant production

Uman National University of Horticulture,

Uman city, Ukraine

On the European continent, Pliny the Elder found the first mention of sorghum culture in the description of «Natural History in 37 Books», where it is reported that sorghum was brought to Rome from India and Egypt [2, 9].

Ancient Egyptian monuments, built over 2200 years BC, have been found drawings of the harvest and found sorghum grains, which testifies to the cultivation of this culture from time immemorial. Its antiquity is confirmed by ancient monuments in the countries of East and South Asia, so in the literature there are indications that some forms of it are of Indian origin, where cultivation was practiced for about 3000 years BC. In China, sorghum culture was known 2000 years BC. Therefore, the origin of sorghum may be equally related to Africa, India and China, where the crop originated independently [8].

In Africa, especially in arid and desert areas, sorghum, which is the main grain and fodder crop, is also used to prepare couscous (a national food product) and beer [9].

India, the USA, Argentina, Mexico, Nigeria, Sudan, China, Ethiopia and Burkina Faso occupy the largest acreage. They account for more than 90% of the gross harvest of sorghum grain. Over the last 30 years, global areas under sorghum have increased by 50%, yields - more than twice. The largest areas under sorghum are cereals, which are used as a staple food (16 million hectares), occupied in India. They are second only to rice and wheat. Grain is eaten cooked or fried (flakes) and bread is baked from flour. In India, sorghum is also grown for green fodder and silage [2, 8].

The increase in sorghum in recent years on continents, especially in Africa, is associated with exceptional drought and heat resistance, sun endurance and unpretentious soils. That is why its cultivation area covers vast territories south of the 50th parallel in the North and north of the 50th parallel in the Southern Hemisphere

In 1989, grain sorghum in the world agriculture amounted to 44.5 million hectares, and the gross grain harvest - about 60 million tons. It ranks fifth after wheat, rice, corn and barley. Currently, sorghum is grown in over 90 countries.

On the territory of Ukraine, sorghum began to grow in the early twentieth century. The expediency of growing sorghum in arid and semi-arid regions of our country is due to its high productivity and versatility of use in such climatic conditions, as well as the fact that the feed from this culture can be fed to all species of domestic animals. Corn sorghum at nutritional value is almost inferior to corn grain.

In the early 80's of the XX century, scientists scientifically justified the increase of acreage in the southern regions of Ukraine and the North Caucasus. In particular, a great deal of work was carried out by Doctor of Agricultural Sciences, Professor M.A. Shepel, who proved that in the southern regions of Ukraine the area of grain sorghum can be increased to 1.8 million hectares [13, 15].

In the late 80's - early 90's sowing area of sorghum in Ukraine was 20-25 thousand hectares. In the case of early maturing varieties and hybrids, grain sorghum can be grown up to 50-52 ° N and sorghum sugar and sorghum hybrids for green fodder and hay can be grown up to 55 °N, almost all over Ukraine. However, in the context of extensive farming in the early 1990s and the 1990s, and insufficient quantity of high quality seeds, farms were not interested in expanding sorghum areas. The main deterrent in increasing the crop area was the lack of antidote for seed treatment and the inability to use herbicides in crops [1, 4, 8].

Analysis of the climatic conditions of the Forest-Steppe of Ukraine over the last 30 years shows that 12 years have been very arid and another 6 years have been characterized by periodic arid conditions during the growing season of spring cereals. Such conditions led to a significant decrease in the yield of spring barley and maize. In these circumstances, it is particularly important to find new, unconventional crops

that are profitable and do not disrupt the rotation. If in the Central Forest-Steppe zone of Ukraine farms are able to sow and receive consistently high yields of certain crops, such as corn and sugar beet, in the steppe and eastern forest-steppe zones the crop rotation is limited due to insufficient moisture.

The temperate continental climate of southern Ukraine, with insufficient and unstable moisture, as well as large resources of solar radiation, formed the steppe sub boreal (semiary) landscapes.

As of 2019, 44 varieties and hybrids of sorghum are included in the State Register of Varieties of Plants of Ukraine, as well as 13 - sorghum. However, the introduction of this culture in Ukraine is slow [8].

Due to low sowing rates (4-7 kg per 1 ha using high quality seeds), long seed germination and late sorghum sowing are a potentially strategic crop for sowing during the mass destruction of winter and early spring crops. This was confirmed in 2003, when sorghum was sown later (late May-early June) and yields varied within 3-5 t / ha.

In addition, sorghum is a good precursor for many spring-cultivated crops, and can be grown as a monoculture, if mineral fertilizers are applied and appropriate agrotechnical measures are taken during soil preparation [3].

Biological and genetic features of different hybrids and the presence of favorable factors and optimal conditions for plant development, especially during critical periods, influence sorghum grain formation. With modern intensive technologies of growing sorghum, it is important to get timely and friendly sprouts. The most optimal conditions are created when the soil moisture is at the level of 65-75% of total moisture capacity, and the average daily soil temperature at a depth of 10 cm is kept at the level of 15-18°C. The period from sowing to emergence of seedlings with intense stalk growth is 10-12 days at maximum field germination. Sowing sorghum in unheated soil (up to 7°C) causes the seeds to germinate, not to germinate for a long time, the seedlings are thinned, and the crops are overgrown with weeds.

Because this crop is tropical, sorghum is very sensitive to lower temperatures and frosts - the seedlings die at 2-3°C. Because this plant is thermophilic, it requires a

late sowing period. Sorghum is successfully grown as a post-harvest crop and used in compatible crops with corn, soybeans, amaranth, yielding high yields [4, 6].

Thus, the data shows that in arid and semi-arid regions of Ukraine, as well as other countries, sorghum can provide high and sustainable crops, but it is necessary to take into account all aspects of soil and climate zones and local economic and economic factors. It is necessary to have a clear idea that the deviation of meteorological elements from the climatic norm affects the temperature regime, plant moisture, and feeding regime, sowing time, seeding rates, duration of vegetation and, ultimately, the yield and quality of production [2, 3].

According to the literature, the content of protein and starch in the grain of different hybrids of grain sorghum of different breeding is slightly different. So, in French breeding hybrids such as: Iggor, Aggil, Anggy, Oggana, Otelo, the starch content of the grain is 70%, only Brigga is 74 %, while the protein content is 13%, but in Targga hybrids - 14%, Burggo - 11,3% [10].

Hybrids of grain sorghum of American breeding, namely Tzuni, Yuki, Kato protein content is 13%, but the content of starch in the grain these hybrids are slightly different. In the hybrid - Tzuni - 70%, in Kato - 72%, in Yuki - 73%. The Ponki hybrid of this breeding is characterized by a protein content of 14% and a higher starch content in the grain - 75.0% [2, 7, and 10].

In terms of fiber composition, sorghum is ahead of corn by 1.6%, wheat by 0.9% [8]. In terms of amino acid content and basic feed indicators, sorghum grain is identical to maize and better than millet. In terms of forage sorghum is closer to corn and barley. Thus, 100 kg of sorghum grain contains 118-130 kg, in green mass - 24-25 kg, silo - 22-23 kg. [6, 8]. Non-nitrogenous extracts of sorghum grain are composed mainly of starch, so its digestibility is very high [9].

The value of sorghum culture, consisting in the ability to tolerate periods of drought and high temperatures without great damage to the crop, to effectively use rainfall in the second half of summer, to grow after a long anhydrous period and to produce high enough yields, allows it to be grown in arid zones:

Thus, the spread of sorghum in the world indicates the great success of many countries in this direction. Sorghum has high potential, which puts it among the leading cereals and food crops.

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