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QUINOA (CHENOPODIUM QUINOVA WILLD) AND ITS GENERAL ANALYTICAL DESCRIPTION

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Abstract. This article presents information on the use of a wide row planting scheme in the cultivation of quinoa in the conditions of moderately saline arid soils of Surkhandarya region and the effect of the planting scheme on the height of the plant. In addition, conclusions from studies conducted by foreign and domestic scientists on the composition of the quinoa crop, plant cultivation and its importance are presented.

Key words: Quinoa, moderately saline soils, arid soils, wide row planting scheme, plant height, drought.

Introduction. Today, in many countries of the world, special attention is paid to the cultivation of quinoa (Chenopodium quinoa Willd.) due to its high protein content. In particular, this crop is widely cultivated in countries such as South America, Colombia, Ecuador, Peru, Bolivia, the Russian Federation, Turkey, Chile, and Argentina. By 2000, the cultivation and demand for this plant had expanded. With the increase in exports to the United States, cultivation also accelerated. Exports increased from 5,000 to 40,000 tons. In 2012 alone, 64% of the total production volume was supplied from Bolivia, and 26% from Peru. [J.E.Hermandez Bermejo "NEGLECTED CROPS: 1492 from a different perspective" 1994.]

In our republic, many studies are being conducted to cultivate this crop and use its unique properties. Also, the Decree of the President of the Republic of Uzbekistan No. PF-199 dated November 23, 2023 "On measures to ensure ecological sustainability through the consistent implementation of the national project "Green Space" to further increase the level of greenery in the republic" and the Decree No. PF-36 dated February 16, 2024 "On additional measures to ensure food security in the republic" serve as a framework for these studies.

2. General characteristics of quinoa (Chenopodium quinoa Willd.).

2.1. General characteristics of the plant. Quinoa (Chenopodium quinoa Willd) is one of the most important crops of the South American regions. This plant is also adapted to desert conditions, hot and dry, frosty and cold climates, and can grow in areas with a humidity of 40-

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88%. It can withstand temperatures from -4 to +450 C.

Quinoa has been cultivated in the Andes of South America since ancient times and is the main food crop for the local population. Quinoa usually contains more protein. This allows a person to feel full for a long time.

It is a plant rich in all the compounds that are beneficial for health, in particular manganese, magnesium, iron, vitamins E and B, and protein. [6.8.3.7] What makes it different from other plants is that the proteins in this plant are a group of proteins that are not produced by the body, but only need to be introduced into the body from the outside. At the same time, it contains substances that provide antioxidant properties, which serve as an important factor in the body's ability to fight diseases. The seeds of this plant can also be used to prepare various delicious dishes, soups, pastries, desserts, salads, and sauces. In addition to being as nutritious as cereal plants, it is also useful for people who want to lose weight healthily, satisfying the daily nutritional needs of the human body and preventing the accumulation of excess fat in the body. In addition, after the grains are separated, the stems and leaves are used as feed for cattle. Quinoa comes in white, red, black, and tricolor varieties, which are a mixture of three colors. Studies conducted by scientists around the world have shown that the darker the color of the quinoa seed, the higher the antioxidant content of the plant. That is, red and black quinoa have twice as much vitamin E and antioxidants compared to white quinoa, and the fat content is lower.[4.5.7] The low fat content does not reduce the absorption of omega-3s by the body.

The name of a cereal crop of the Chenopodiaceae family, which grows in the highlands of Peru, Bolivia, Chile, and Ecuador on the slopes of the Andes Mountains in South America. The Incas called quinoa "the mother of all grains" and "golden grain", which is not surprising since the basis of their diet was potatoes and corn. Inca warriors consumed quinoa with oil, believing that it would give them strength during long marches and battles.[1.2.4.6]

Quinoa is a monoecious annual plant and a pseudocereal. The plant reaches a height of 0.6–3 meters, depending on soil and climatic conditions. The stem is erect, rounded or cylindrical in cross section. The leaves are simple, polymorphic. The flowers are inconspicuous, with a simple perianth, bisexual or unisexual, collected in panicles. [5.7.] The flowers are self-pollinated (in 10–15% of cases they are pollinated from the outside). The fruit is a one-seeded nut. The growing season lasts 110–170 days, depending on the soil and climatic conditions of the region. The optimum temperature for germination is 15–20°C and the pH level is from 4.5 to 9. [4.2]

Quinoa is very adaptable to a wide range of agroclimatic conditions. The optimum temperature for comfortable growth and development is 15-20°C. The lower limit of frost resistance is -4°C. The upper limit of temperature is 45°C for the plant.

The formation of the crop can occur at air humidity from 40 to 90%. The plant is resistant to moisture deficiency due to its deep root system.

Quinoa requires an average of 200 mm of precipitation per year. It can grow at altitudes up to

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4000 m above sea level.[5.6.7]

According to Valery Mendoza, Roberto Mendoza, Dmitry V. Dmitriev, during 2022, an experiment was conducted at the Quinoa Center experimental site located on the Novokubansk farm in the North Caucasus, Krasnodar Territory, Russia (45°06 N 41°03' E). In 2022, four varieties of quinoa were used as an experiment to study scientific introduction. The variety taken for control is about 220 cm tall. When ripe, the stem has a straw-yellow color with a pinkish tinge. The ripe panicle is lanceolate, 60-65 cm long, medium density, yellow-orange in color. The seeds are disc-shaped, the weight of 1000 seeds is 3.4-3.5 g. The average yield in the conditions of the Krasnodar Territory is 41.7 t / ha. The growing season is 111-112 days. Biological characteristics: during the growing season, plants are sensitive to frost, in the early stages they are demanding on moisture. The flowering and ripening periods are extended in due time (up to 30 days each).[7.6]

2.2. Areas of use. According to E.E. Gridneva, G.Sh. Kaliakparova, S.U. Abdibekov, several properties of quinoa are listed. In particular:

-it belongs to the category of healthy food products, that is, it contains a high content of proteins, amino acids, minerals, vitamins, fats, as well as other nutrients in large quantities.

- It is used for cooking various dishes, salads, pastries, and various drinks are also prepared;

- NASA considers quinoa to be an ideal product for a space diet (it can be grown in space);

- it can also be used in animal husbandry as animal feed in the form of green mass.

Studies conducted by Y. Tang have shown that phytochemicals in the seeds of quinoa and amaranth plants and their antioxidant properties,

and anti-inflammatory and potentially beneficial health properties, as well as instructions for use.

Martinez E.A. According to a study conducted by, the nutritional aspects of six quinoa (Chenopodium quinoa willd.) ecotypes in three geographical regions of Chile are studied. Based on the studies, it is known that the protein content of quinoa is higher in all areas than in cereal grains such as rice and corn. It has been proven that the six quinoa ecotypes contain more Ca, Mg, as well as higher amounts of Fe and P, Mn, Cu and Zn than in wheat, barley, oats, rye or rice. The content of this quinoa varies continuously in the six regions. This is due to the different moisture content, climate and mechanical composition of the soil in these regions. [4;175-181-b]

A.M. Filho, M.R. Pirozi, J.T. Da Silva Borges have proven the natural protein richness of quinoa and its beneficial aspects in its consumption as a food based on their studies.

According to Rodriguez, L. A. and Isla, M. T., quinoa (Chenopodium quinoa Willd.) is a widely consumed food and a major source of protein for many indigenous peoples of the Andean region of South America. The identification of quinoa varieties is based on phenotypic characters. In this work, the degree of polymorphism and genetic linkage were investigated using molecular markers using the amplified fragment length polymorphism (AFLP) technique and twenty

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morphological characters. With these tools, it was possible to identify molecular differences and similarities that could be associated with important morphological characters such as grain color, panicle color, phenology and geographical distribution.[6;210-216-b]

2.3. Cultivation around the world. The biological properties of quinoa by Kukharenkova O.V. and Kurenkova Ye.M. allow this crop to be grown in all types of agroecological and agroclimatic conditions. Due to the high content of organic matter and vitamins in its composition, there is a high demand for the cultivation of this crop in agriculture.

Currently, active research and commercial use of quinoa continues in 123 countries of the world.

The world quinoa market is divided into five main regions: Latin America, North America, the Middle East and Africa, and the Asia-Pacific region. According to FAOSTAT, the main producing countries for 2021 are Bolivia, Peru and Ecuador, the only countries in the world with quinoa, Bolivia is the leader in the cultivation of this crop in terms of area.

According to research, initially this plant species was known only to the inhabitants of South America, who enjoyed the beneficial properties of this plant. By 1900, the number of such countries was 6, in 1941 it was more than 11, and as of 2020, it was cultivated and introduced into consumption in more than 123 countries.

3. In conclusion, although this crop is an unknown crop in our region, there is enough information and research on the cultivation and consumption of this crop in other countries. Therefore, due to the richness of this plant in terms of composition, attention around the world is increasing year by year. It would be appropriate to develop recommendations for cultivation in our republic, especially in the Surkhandarya region.

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