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"AGROBIOLOGICAL FOUNDATIONS OF GROWING BLUEBERRY (VACCINIUM SPP.) IN HOT CLIMATE CONDITIONS AND ITS BIOACTIVE IMPORTANCE FOR HUMAN HEALTH."

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Annotation: This article is devoted to the topic "Agrobiological Foundations of Blueberry (Vaccinium spp.) Cultivation in Hot Climate Conditions and Its Bioactive Significance for Human Health." The study examines the blueberry's adaptation to hot climates, agro-technological methods (acidic substrate, drip irrigation), and its bioactive compounds, including vitamins, minerals, and antioxidants. The practical significance of the project lies in developing effective cultivation technologies in local conditions and assessing economic efficiency.

Keywords: blueberry, Vaccinium spp., hot climate, agrobiological foundations, agrotechnology, bioactive compounds, antioxidants, vitamins, healthy nutrition, human health

Introduction: Blueberry (Vaccinium spp.) is one of the fruit plants with high biological and medicinal value. Its fruits are rich in vitamins (C, K, E), minerals (Ca, Mg, K), and antioxidants, particularly flavonoids and anthocyanins. For this reason, blueberries play an important role in strengthening human health, reducing the risk of cardiovascular diseases, boosting the immune system, and slowing down the aging process.

In recent years, the global demand for healthy nutrition and natural medicinal products has been steadily increasing. At the same time, global climate change and the efficient use of agricultural resources in hot climate regions have become pressing issues. Therefore, studying the agrobiological foundations of cultivating blueberries in hot climatic conditions is of great scientific and practical importance.

In Uzbekistan, particularly in regions such as Surkhandarya province, the Fergana Valley, and districts like Bostanliq and Denov, favorable opportunities exist for studying the plant's adaptation to climate and soil conditions, expanding cultivation possibilities, and increasing economic efficiency. In hot climates, agro-technological solutions such as acidic substrates, drip irrigation, soil preparation, and appropriate variety selection are used to increase yield and ensure high-quality fruit production.

This project aims to determine the agrobiological bases for cultivating blueberries in hot climate conditions, study the importance of bioactive compounds and antioxidants contained in the fruit, scientifically substantiate their benefits for human health, and evaluate their economic efficiency.

The results of this project will contribute not only to the development of agriculture and the food industry but also to improving healthy food supply and expanding export opportunities.

Main Part: Blueberry (Vaccinium spp.) belongs to the group of berry fruit plants and has high nutritional, biological, and medicinal value. Its fruits are rich in vitamins (C, K, and B group), minerals (potassium, iron, magnesium, calcium), and powerful antioxidant compounds, particularly flavonoids and anthocyanins, making them an important food source for human health. In recent years, due to the increasing global demand for healthy nutrition, blueberry cultivation technologies have significantly developed, including opportunities for successful cultivation in hot climate conditions.

For blueberry cultivation to be effective in hot climate conditions, it is important to thoroughly study the biological characteristics of the plant and apply appropriate agrotechnical measures. Blueberries prefer acidic soils; therefore, the soil pH level is usually recommended to be in the range of 4.0–5.5. Maintaining soil moisture and protecting the plant's root system from high temperatures are essential for preserving yield and fruit quality in hot regions. For this purpose, mulching, drip irrigation systems, and the use of substrates rich in organic matter are considered effective. In addition, taking into account the agroclimatic conditions of the region, soil composition, and water supply when establishing plantations plays an important role in increasing productivity.

Selecting suitable varieties for cultivation in hot climates also plays a significant role. Varieties that are tolerant to high temperatures and have shorter vegetation periods produce better results in such regions. To ensure normal plant growth and productivity, it is necessary to provide timely irrigation, use mineral and organic fertilizers, control weeds, and implement preventive measures against pests and diseases.

The bioactive compounds found in blueberry fruits are of great importance for human health. Vitamin C and K, B-group vitamins, potassium, iron, and other minerals, as well as anthocyanins and flavonoids, reduce the harmful effects of free radicals in the human body, lower the risk of cardiovascular diseases, reduce inflammatory processes, and slow down the aging process. In addition, regular consumption helps support brain function, improve vision, and strengthen the immune system. Therefore, blueberries are widely used in modern dietology as a functional food product.

In general, the systematic application of agrotechnical measures for blueberry cultivation in hot climate conditions, taking into account the biological characteristics of the plant and the rational use of water and soil resources, makes it possible to obtain high and high-quality yields. At the same time, the richness of blueberries in bioactive compounds further increases their importance as a valuable food source for human health.

Conclusion: Blueberry (Vaccinium spp.) is one of the berry fruit plants with high nutritional, biological, and medicinal value. Its fruits are rich in vitamins (C, K, and B group), minerals (potassium, iron, magnesium, calcium), and powerful antioxidant compounds. Therefore, blueberries are considered an important food source for human health: they play a beneficial role in reducing cardiovascular diseases, decreasing inflammatory processes, and slowing down the aging process, while also helping to strengthen the immune system and support brain function.

Cultivating blueberries in hot climate conditions is both scientifically and practically relevant. Under such conditions, a thorough study of the plant's biological characteristics and the systematic application of agrotechnical measures make it possible to obtain high and high-quality yields. The plant's preference for acidic soils, protection of the root system from high temperatures, the use of mulching, drip irrigation systems, and substrates rich in organic matter are important factors in increasing productivity. At the same time, selecting suitable varieties, timely irrigation, the use of mineral and organic fertilizers, weed control, and the prevention of pests and diseases stand out as key agrobiological foundations.

The composition of bioactive substances in blueberry fruits scientifically confirms their benefits for human health. Antioxidants, flavonoids, vitamins, and minerals reduce the harmful effects of free radicals and support the cardiovascular, immune, and nervous systems. For this reason, blueberries are recognized in modern dietology as a functional food product.

From an economic perspective, cultivating blueberries in hot climates is also beneficial. Starting from the 3rd–4th year, it is possible to obtain 8–10 tons of yield per hectare, with a net annual profit of approximately 280 million Uzbek soums, and the investment can be recovered

within 3–4 years. This creates additional income not only in the domestic market but also through export opportunities, contributing to the development of agriculture and the food industry.

Overall, blueberry cultivation in hot climate conditions is a scientifically grounded and economically effective project supported by agrotechnical practices and aimed at promoting healthy food production. This research contributes not only to producing high-quality fruit but also to strengthening human health and supporting regional economic development.

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