HORTICULTURAL PLANTS. INVESTIGATION AND STUDY ON THE CHARACTERISTICS OF STRAWBERRY HYBRID OFFSPRING

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Abstract. *This study highlights information about functional genomics of horticultural plants, the main horticultural crops cultivated and combining my own research direction about characteristics of strawberry. Horticulture is a branch of agriculture, which as a science teaches the morphological structure of fruit trees, their growth, development, methods of reproduction, and the laws of yield and care technology. The acquisition of the above knowledge is of great importance in the formation of agronomists, farmers and helps to carry out agro technical measures at a high level and in a timely manner. Horticulture is considered a highly profitable branch of agriculture, providing fruits and berries for the human body. Central Asia is the homeland of many fruit species. Over the centuries, highly productive varieties of apricots, apples, pears, walnuts, almonds, pomegranates, grapes have been created on the basis of folk selection. Many of them have a unique place in the world collection in terms of quality. Furthermore, it gives information about resistance of hybrid strawberry varieties to biotic and abiotic stresses, details and collection data about strawberry. Strawberries are very essential fruit crop cultivated worldwide. Researching the characteristics of strawberry hybrid offspring is very important to study strawberry varieties with high yield, disease resistance, large fruit, and long shelf life, adaptability to different climates, excellent taste, strong aroma and increased sweetness. Hybrid cultivars are appropriate for long-term postharvest storage, export markets, and intensive cultivation. Strawberry breeding is one of the most important agronomic fields in the world, and hybridization is a key tool for increasing yield, improving fruit quality, and disease resistance in new varieties.*

Keywords: *functional genomics of horticultural plants, biotic and abiotic stresses, characteristics of strawberry, hybrid strawberry, horticultural plants, agriculture.*

Introduction

These days horticultural plants play an essential role in agriculture. The reason is that horticultural plants are major part of agriculture. One of the main sectors that determine the economy of the Republic of Uzbekistan and bring in significant income is horticulture. Without developing this sector on a scientific basis, it is impossible to satisfy the demand for fruit products of the population and our industry. Therefore, it is necessary to thoroughly study the agricultural sectors, including horticulture, to identify the problems that have arisen and find positive solutions to them.

With the growth of the material well-being of the population, their needs for fruit products are also increasing, because fruits (in wet and dried forms) are nutritious, tasty and healing food necessary for human health. Therefore, ensuring the population's demand for fruits throughout the year is a requirement of this era. Horticulture is a branch of agriculture, which as a science teaches

the morphological structure of fruit trees, their growth, development, methods of reproduction, and the laws of yield and care technology. The acquisition of the above knowledge is of great importance in the formation of agronomists, farmers and helps to carry out agro technical measures at a high level and in a timely manner. Horticulture is considered a highly profitable branch of agriculture, providing fruits and berries for the human body. It contains sugars, organic acids, oxides, oils, vitamins, mineral salts, pectin, enzymes, colloids and other substances. Fruits and berries are raw materials for food and industry.

It is important to state that, more than 200 types of fruits, berries, and nuts are cultivated in world horticulture, of which 100 are of industrial importance. Apples, olives, palms, bananas, mangoes, and grapes are among the most widely cultivated fruit species. Horticulture is developed in China, the USA, India, Argentina, Brazil, Japan, Spain, France, Italy and Uzbekistan.

Central Asia is the homeland of many fruit species. Over the centuries, highly productive varieties of apricots, apples, pears, walnuts, almonds, pomegranates, grapes, etc. have been created on the basis of folk selection. Many of them have a unique place in the world collection in terms of quality. At the beginning of the 20th century, there were about 50 thousand hectares of orchards in the territory of present-day Uzbekistan, including 22 thousand hectares of orchards and 37 thousand hectares of vineyards. The main areas of orchards were the Fergana Valley (24%), the Tashkent Oasis (36%) and the Zarafshan Valley (50% of vineyards). In the orchards, stone fruits occupied 70% (mainly apricots), and pome fruits (apples, pears, quince) occupied 25% of the area. In the outskirts of cities and villages, in separate orchards and gardens (orchards, vineyards, melon gardens and flower gardens), local varieties of fruits, vines, and various flowers were planted. The grown fruits were consumed fresh, but the main production was the cultivation of plums and raisins.

From the second half of the 1920s, specialized fruit and viticulture farms began to be established, and collective farms located in the mountain and foothill zones also paid great attention to this sector. In order to improve the varietal composition of fruits, varieties of apples, pears, grapes, and others grown in European countries were introduced and planted. In the late 1950s and 1960s, agro-combinations with 2,500-3,000 hectares of orchards and vineyards were established. 20 types of fruits and berries are grown in the Republic. The main place is occupied by seed fruit trees (apple, pear, quince, etc.), stone fruit trees (apricot, peach, plum, cherry, sour cherry, gooseberry, etc.), subtropical plants (pomegranate, fig), nut fruits (walnut, pistachio, almond), berry fruits (strawberry, raspberry, currant, gooseberry). Summer, autumn and winter varieties of apples, pears and grapes are of significant economic importance. Viticulture has long been developed in the Tashkent and Samarkand regions, the Fergana Valley, and has food, raisin and canned products (molasses, jam, juices), as well as winemaking. Unique varieties of fruit jams and raisins are produced in Uzbekistan.

The majority of horticultural plants are those that produce vegetables, fruits, ornaments, beverages, and herbal medicines. By meeting fundamental dietary needs, enhancing personal aesthetics, and adorning both urban and rural environments, these plants have played significant economic and social roles in human lives and health. For instance, according to the Food and Agriculture Organization of the United Nations, fruits and vegetables together are worth 137 points, whereas cereal foods combined are worth 125 points (normalized value) worldwide. By supplying oxygen and regulating urban temperatures, horticultural plants help enhance our biological environment and promote ecological equilibrium.

Numerous blooming plants and a few early-divergent land plants are among the several taxonomic plant spectra that comprise horticultural plants. Their genomes differ substantially in size. For instance, the diploid genome (2n = 16) of the vegetable garlic (Allium sativum) is believed to be larger than 30 Gb1, whereas the genome size of the onion (Allium cepa) is comparable. Furthermore, the majority of horticultural plants are domesticated, and significant artificial selection has shaped their genomic sequences. Citrus has been cultivated for more than 4,000 years, and grapes have been cultivated (via viticulture) for more than 6000 years. Furthermore, certain horticultural plants are hybrids of wild and domesticated species. For example, ginseng (Panax ginseng), noto ginseng (Panax notoginseng), and Artemisia (Artemisia annua) are used medicinally. High levels of genetic diversity and heterozygosity are found in many domesticated horticultural plants, including potatoes (4.8%)7, sunflowers (10% of bases differ between homologous chromosomes), and grapes (7%)6.

Cultivation scale: The scale of horticultural plant culture varies from heavy commercial production to small-scale home gardens. With a focus on high-value crops and intense maintenance, it lies in the middle of field agriculture and home gardening. Horticultural crops, which are often farmed with more intensive care than agronomic crops, include fruits, vegetables, flowers, ornamental plants, and turf. A closer look at the various scales is provided below: With less emphasis on specialized or large-scale output, small-scale horticulture includes home gardens, small farms, and subsistence plots. It frequently focuses on a range of fruits, vegetables, and flowers. Commercial horticulture: This refers to the larger-scale production of particular crops, including fruits, vegetables, or ornamentals, frequently using more sophisticated technologies and stricter management techniques. Orchards: Dedicated spaces for fruit tree cultivation, usually on a bigger scale than backyard gardens.

Vegetable farms: These farms focus on producing vegetables for commercial markets, frequently utilizing cutting-edge farming methods and equipment.

The commercial cultivation of flowers and attractive plants, which might be grown in open fields, greenhouses, or other specialized facilities, is known as floriculture.

Scale: While horticulture concentrates on smaller, more intensive operations, agriculture usually involves large-scale field crops.

Management: With an emphasis on output and cost-effectiveness, agriculture may require less intense management than horticulture.

Focus: While horticulture might encompass a wider variety of crops with particular market demands, agriculture may give priority to staple crops.

Results: Due to the increased productivity and profitability of Uzbekistan’s horticultural enterprises, about 34,500 permanent jobs—nearly 40% of which were held by women—and almost 22,000 seasonal jobs—of which 75% were held by women—were created. In auxiliary businesses including food distribution, storage, and packaging, an extra 5,000 jobs were generated. Instead of needing to go to the city, young rural workers were able to make a steady income in their villages because to new jobs in rural logistics and transportation.

By adopting greenhouse technology, accessing better inputs, and improving agricultural methods, participating fruit and vegetable producers saw a 25–30% rise in crop yields and a 35% increase in gross sales, which increased labor demand and job sustainability. The project helped more than 5,000 firms grow, improve their operations, and create jobs by facilitating more than $300 million in concessional loans to farmers and agribusinesses.

The Problem and Discussion: In 2024, 49% of Uzbekistan's 37 million residents resided in rural areas, and the number of people living in rural areas is increasing more quickly than that in urban areas. A significant economic sector, agriculture accounted for 27% of all jobs in 2019. This is partially because to Uzbekistan's ideal position for horticultural production in particular. The climate supports a wide range of crops while reducing pests and illnesses, and in most parts of the country, it permits double harvesting of vegetables, and in some locations, triple harvesting. However, a lack of mechanisms to efficiently connect farmers to markets, bottlenecks in the value chain, a substantial investment gap estimated at over $1 billion, and farmers' low understanding of contemporary agricultural practices all hinder the horticulture sector's ability to grow more quickly. Increasing lending and productivity might help Uzbekistan's agribusinesses grow faster, take advantage of the nation's significant comparative advantage, and give the expanding rural population the jobs and skills they need to live better lives.

Method: In order to increase production and profitability, the World Bank collaborated with recipients throughout the horticulture value chain in Uzbekistan. With an emphasis on climate-smart technologies that helped secure long-term employment growth, the Uzbekistan Horticultural Development Project taught farmers to modern farming practices including hydroponics and irrigation that uses less water and energy. In addition to enhancing post-harvest handling, the interventions made horticulture occupations more sustainable and raised beneficiaries' profitability by more than 120 percent. Because farmers were able to sell their higher yields in new markets, horticulture exports surged, which was crucial for sustainability and employment development along the value chain. In order to increase women's employment, the project also featured focused interventions such financial incentives, training courses for female entrepreneurs, and skill development in high-value horticultural occupations.

Previously unavailable in Uzbekistan on a large scale, the World Bank worked with regional financial institutions to launch a special loan line for horticulture initiatives. This made it possible for farmers to obtain preferential financing for processing, export facilities, cold storage, and contemporary greenhouses. With a more than five-fold rise in gross sales, farms were able to create tens of thousands of jobs and help reshape the sector's economy. Our ability to produce up to 2,000,000 eco-friendly boxes annually—which local farmers and agribusinesses also use to export fruits and vegetables to markets in Europe and Asia—was greatly increased by the project, which allowed us to invest in state-of-the-art packaging production equipment. Currently, we employ about 300 individuals in stable jobs, with women and young people making up 60% of the workforce. (Rustam Buriyev) Owner of packaging production company, Tashkent, Uzbekistan.

If I relate this topic to my own research topic, at these days growing fruit is one of the most essential branches of agriculture. Because fruits have a lot of beneficial vitamins and ingredients, which are very useful to mankind. That's why much effort is paying attention to growing fruits not only in our country, but also all over the world. Importantly, I chose strawberry and strawberries are very essential fruit crop cultivated worldwide. Firstly, I gathered information about strawberry, in details I read about strawberry from books, magazines, newspapers and other online sources. After I collected data about strawberry, of course I went to strawberry fields. Following this, I analyzed strawberries.

Especially, I paid attention shapes of fruits, outer sides of fruits and I evaluated tastes of strawberries. Interesting factor that, I observed, if the strawberry has more leaves, it will bloom more. Moreover, when strawberries bloom, they need to be given calcium. Another interesting factor that, if strawberry grows in winter, it will be tastier, bigger than which is grown in summer.

It is the best temperature for strawberry is +18. In the evenings strawberry is developing and growing very well, +8 temperature is very suitable for strawberry in the evenings. Moreover, strawberry is the tastiest fruit in summer and it is very tasty and useful fruit. Everybody likes strawberry from 7 to 70 years old people. In summer, people eat fresh strawberry and it is prepared jam, juice from strawberry for winter. It is important to state that, in every season you can find strawberry in any supermarkets. I study and research the characteristics of strawberry hybrid offspring. **My goal** is to study strawberry varieties with high yield, disease resistance, large fruit, long shelf life, adaptability to different climates, excellent taste, strong aroma and increased sweetness. Additionally, I aim to research marketable varieties that do not spoil quickly and are suitable for long-distance transportation.

Resistance of Hybrid Strawberry varieties to biotic and abiotic stresses. In order to increase their tolerance to biotic stresses, which are brought on by living things, hybrid strawberry cultivars are frequently created.

The total output, fruit quality, and plant growth may all be adversely impacted by these st ressors. Strawberry hybrids include: Carefully chosen to be resistant to biotic stressors, like common illnesses and insect pests. They can flourish in a variety of soil and climate conditions because they were bred to withstand abiotic stress. Because of these traits, hybrid cultivars are appropriate for long-term postharvest storage, export markets, and intensive cultivation.

Many studies show that hybrid lines exhibit wide phenotypic variation in leaf shape, vigor, stolon formation, flower morphology, and fruit shape. The occurrence of conical, oval, round, and deformed shapes among hybrid fruits is one of the main problems in the early stages of selection. Studies confirm that the coefficient of variation for fruit shape and weight is high, and that these traits are polygenically inherited. Strawberry breeding is one of the most important agronomic fields in the world, and hybridization is a key tool for increasing yield, improving fruit quality, and disease resistance in new varieties. The phenotypic and genotypic variation observed in hybrid progeny offers great opportunities for breeders, but at the same time complicates the selection process due to the complex genetic structure. Strawberry plants possess fasciculated roots that consist of a significant proportion of volume specifically allocated to providing support to the plant and other components. These rootlets are responsible for absorbing nutrients and water necessary for the plant's development.

In conclusion, this study demonstrates functional genomics of horticultural plants, their types and sectors and their roles in agriculture. Horticultural plants play a vital role in agriculture and they are major part of agriculture. It is considered a highly profitable branch of agriculture, providing fruits and berries. Strawberries are vital fruit crop grown around the globe. In addition, collected data about strawberry and analysis of strawberry, resistance of hybrid strawberry varieties to biotic and abiotic stresses. It is essential to study strawberry varieties with high yield, disease resistance, large fruit, long shelf life, adaptability to different climates, excellent taste, strong aroma and increased sweetness. Hybrid varieties are suitable for extended post-harvest storage, overseas markets and high-intensity farming. Hybridization is an essential method for enhancing yield, boosting fruit quality and increasing disease resistance in new varieties.

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