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# Study of Remontant Strawberry Varieties Growing in the Condition of Uzbekistan

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**Abstract:** The article highlights the importance of strawberry cultivation in the world and in Uzbekistan today, one of the main requirements for the creation of high-quality strawberry varieties that produce a crop throughout the year is the correct selection of varieties on a scientific basis. Moreover, there is information about how to increase the number of strawberry varieties and their export potential, to provide the population with cheap strawberry fruit throughout the year by growing universal remontant strawberry varieties. In addition, information has been provided herein on the growth and development of remontant strawberry varieties with high yield, excellent fruit quality and tasting value.

**Keywords:** Varieties, Fruit, Introduction, Vegetation, Phenology, Yield, Chemical content, Tasting.

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## Introduction

The world's berry production, today, is 7-8 million tons, of which about 4,3 million tons are strawberries. The United States is the world leader in the cultivation of strawberries (*Fragaria* spp), yielding 825 thousand tons of strawberry. Spain produces 305 thousand tons of strawberry, Japan 209 thousand tons, and South Korea 203 thousand tons. In Europe, Poland and France lead in strawberry cultivation, with an annual output of 100-180 thousand tons [1,2,8].

Among the various fruit plants and berry plants grown in Uzbekistan, strawberry varieties play an important role.

A number of measures have been taken to increase the production and export potential of fruits and vegetables, increase the efficiency of the use of land and water resources, the introduction of innovative technologies in agriculture. However, the problems that hinder the cultivation of fruits and vegetables, the intensity of fruit production, increase productivity and their export to the domestic market and foreign countries have still been remained unsolved. In overcoming these problems, a creation of varieties that produce a crop several times during the same growing season of plants is a solution and regarded as an urgent task [3,7,10].

There are many strawberry varieties that produce a crop once a season and remontant strawberry varieties that produce a crop throughout the year. Today the most important issue is the creation and introduction into production of remontant strawberry varieties. The demand, especially for remontant varieties for open fields and greenhouses is very high. By creating favorable conditions for such varieties of strawberries, it is possible to get a good yield throughout the season. Remontant varieties of strawberries are distinguished by a feature of producing fruit more than once a season. Also, a distinctive feature of remontant varieties is the formation of fruits not only on the main bush, but also on the newly formed

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runner [4,6,9].

Due to repeated fruiting, such strawberry plants lose vigor and weaken faster than common strawberry plants. Therefore, plants need frequent watering and adequate fertilizing and care [5].

According to medical standards, the annual consumption per capita is 3,8 kg, which is a total of 129 thousand tons of strawberry products in the country. This indicates that the yield of strawberries is 18 times lower than its consumption rate. Therefore, in order to supply the population with berries, including strawberries throughout the year it is needed to import berry products, as grown strawberries in the country can not fully meet domestic demand during the year [1,2].

Over the past 100 years, plant breeders around the world have created more than 6,000 varieties of strawberries. Most of them are grown in Russia, USA, Canada, Great Britain. 75% of these created varieties are simultaneously maturing varieties. Most of the strawberry varieties grown in Uzbekistan are foreign varieties. The issue of creating and increasing the number of local remontant strawberry varieties in our country is also a topical issue today [4].

### **Methods of the research**

Field experiments are held at the central experimental field of the research institute of horticulture, viticulture and winemaking named after academician M. Mirzaev in Tashkent district of Tashkent region.

Geographical coordinates of the experimental site: 41 ° 25 ' north latitude and 69 ° 19 ' east longitude, 490 m above sea level, 5 km from Tashkent city.

The soil conditions of the experimental field are irrigated, typical gray soil with deep groundwater, with a carbonate content of 19 to 23%, weakly alkaline (pH-7,1), low structure, prone to hardening and compaction. Irrigation is artificial and water is carried out through ditches.

The object of the study are the strawberry varieties Uzbekistan guzali (Uzbekistan), Dildor (Uzbekistan) and Ada (Germany), planted in 2020 in the planting scheme 70 × 25 cm.

The research was carried out on the basis of the method "Method and program for the study of varieties of fruits, berries and nuts" (Oryol 1999) [4]. In observing the phenological phases, the buds formation, the beginning of blooming, full blooming, beginning of fruits ripening, full ripening and ending, changing of the leaves and the vegetation ending were observed and noted.

### **Phases of phenological development**

#### **Blooming stage**

A) beginning – blooming of the first flowers (10%);

B) full blooming (60%);

B) ending of blooming – 5% of the full flowers remained in the bushes, while others shedding petals. Evaluation of blooming vigor is determined at the level of 5 points, taking into account the age and development of the bush.

#### **Fruit ripening stage:**

A) beginning – ripening of the first healthy fruits;

B) full ripening of fruits (50%);

B) ending of fruit ripening (90%).

Observations are made by visual inspection, depending on the formation of the crop and color of fruit. The weight of the fruit is determined by picking from each bush. In areas where the bushes of different ages are grown, the main attention is paid to the method of comparing yields, indicating the year of planting and the level of development.

Due to the prolongation of ripening of strawberries, harvesting takes place several times. Healthy strawberries and infected berries with rot disease are collected separately, weighed and then added to the total weight by their varieties. At the end of the harvesting, the percentage of damaged berries is determined as a ratio to the total yield.

### **Determining the average weight of berries**

To evaluate the strawberry, the berries are taken from the first and second harvest when they are ripe, and their size, shape and taste qualities are clearly expressed.

### **Taste (degustation) evaluation of freshly picked berries**

Depending on the ripening of the berries of varieties, tasting is carried out when the fruits have a good taste and good quality, that is, during the period of consumer ripeness.

The state of ripening of the berry is determined on the tasting sheet, as the tasting check may include the onset of immaturity or ripening of the fruit.

During the discussion of the results of the evaluation of the names of the varieties to be evaluated, the names are written after decoding.

Prior to the start of tasting check, it is necessary for the commission members to conduct the evaluation in a closed manner, and also to meet the basic requirements for the commission members with the rules for filling out the evaluation form and good quality berries for degustation.

It is not recommended to evaluate more than 12-15 varieties at once, as their accuracy will be compromised in large quantities.

Each evaluator enters the results of the evaluation into an evaluation sheet.

An assessment of the fruit (berry) is given in terms of the size, appearance, and the taste by points and then in overall score. The size of the fruit (within these plants) is evaluated by the following points:

5 - the largest;

4 - large;

3 - medium size;

2 - small;

1 - very small.

The attractiveness of appearance is assessed by size, shape and color (points):

5 - very beautiful, the fruit is large, shape and color are attractive;

4 - beautiful, slightly larger;

3 - the fruit is of medium appearance (not so large in size, less attractive in color and shape);

2 - the fruit is not beautiful (small, less attractive in color and shape);

1 - the fruit is very ugly, small, irregular in shape, poor color).

The quality of taste, especially the combination of sugar and acid in the fruit, as well as the presence of additives, is determined by the following terms:

- sweet (acid taste is not noticeable);
- sour-sweet (sourness and the presence of acid is noticeable, but it is sweet);
- sour-sweet (the presence of acid and sugar is noticeable, but not sweet taste);
- sweeter -sour (sour taste is felt, but the sweetness is noticeable);
- sweet-sour (sweet is felt, but acid taste predominates);
- sour (sweetness is not noticeable at all);

In addition, the different colors and sourness, bitterness and the presence of various strange flavors are noted separately.

Taste is determined by points:

- 5 - Excellent, dessert taste, sweetness is in balance with sourness;
- 4 - Good taste;
- 3 - Moderate taste;
- 2 - Poor taste, the fruits are almost unsuitable for consumption in fresh form;
- 1 –fruits cannot be consumed at all in fresh form

### Results of research

At the research institute of horticulture, viticulture and winemaking named after academician M.Mirzaev, scientists R.M.Abdullaev, Kh.R.Abdullaeva studied more than 50 local and introduced common and remontant varieties of strawberries, their valuable economic traits in 2009-2011 and obtained a new hybrid combination by crossing “Zenga Zengana” variety of common strawberry as a paternal form and “Ada” remontant variety as a maternal form. During 2012-2016, valuable economic and biological properties of hybrid combinations obtained from Zenga Zengana x Ada varieties were studied extensively. The 38/5785 hybrid obtained as a result of the study was distinguished from other hybrids as it yielded throughout the year. Also, this hybrid was distinguished from the control variety by such characteristics as fruit quality, large size, transportability and productivity. In 2020, this variety was named as Dildor and submitted to the Intellectual Property Agency for a patent. During 2020-2021, remontant varieties of strawberry Dildor and Ada varieties were studied comparatively with standard strawberry variety Uzbekistan guzali on their valuable economic and biological properties.

In the years of study, the vegetation period of strawberry varieties began very early. Due to the warm winter in these years, new leaves started to appear in early February, i.e. in Dildor variety the beginning of vegetation was noted to begin on January 27 among the other varieties, in Ada on January 30, and in the control variant Uzbekistan guzali on February 3. The Dildor variety started vegetation 7 days earlier than the control variety, while the Ada variety started 4 days earlier.

**Table-1 Occurrence of phenological phases in strawberry varieties (in 2020-2021)**

Varieties	Beginning of vegetation	Beginning of blooming	Beginning of fruit ripening	Vegetation period, days
Uzbekistan guzali	03/II	27/III	03/V	185
Dildor	27/I	20/III	02/V	220
Ada	30/I	20/III	29/IV	214

Blooming started on March 20 in Dildor and Ada varieties, while on March 27 in the control variety. Remontant varieties were found to start blooming 7 days earlier than control varieties. The onset of fruit ripening was observed in the Ada variety on April 29, the Dildor variety on May 2, and the control variety on May 3. Among the varieties, the growth period was 185 days in the control variety, 214 days in the Ada variety, i.e. 29 days longer than in the control variety, 220 days in the Dildor variety, that is, 35 days longer than in the control variety.

When studying the yield of strawberry varieties in the years of the study, the average yield from 5 bushes was 485 grams in the Uzbekistan guzali variety, and the average yield per bush was 97 grams. The yield was 55.4 c / ha. The average weight of one berry was 10 grams, the largest berry weighed 21 grams, and the tasting score was 5 points.

**Table-1 The yield indicators of strawberry varieties (in 2020-2021).**

Varieties	Yield			Average taste of berry	Weight of the largest berry	Tasting score
	Yield from 5 bushes (g)	Average yield per bush, (rp)	c/ha			
Uzbekistan guzali (st)	485	97	55,4	10	21	5
Dildor	909	181,8	103,9	11	27	5
Ada	647	129,4	74,0	5	7	4,5

Among the remontant varieties, the yield parameters of the Dildor variety was much better than that of the control variant. At the same time, the yield from 5 bushes was 909 grams, the average yield per bush was 181.8 grams, and the total yield was 103.9 centners, which is 48 c / ha higher than the control variety. The average berry of strawberry weighed 11 grams and the largest berry weighed 27 grams, which was found to be 6 grams higher than the control.

### Conclusion

It can be concluded that:

1. In the conditions of Uzbekistan in the open fields, the vegetation in remontant varieties of strawberry begins much earlier, at the end of January, than ordinary strawberry varieties. The duration of vegetation of remontant strawberry varieties was longer than that of ordinary strawberry varieties, including 214 days in Ada variety, 29 days longer than control variant, 220 days in Dildor variety, and 35 days longer than control variant.
2. In terms of yield, remontant strawberry varieties were found to have much higher yield than ordinary strawberries as they yielded throughout the year. At the same time, the yield of Dildor variety was 103,9 centners, which is 48 c / ha higher than the control variety.

In 2020, the Dildor variety was submitted to the Intellectual Property Agency for a Patent.

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