

# Features of Phenological Phases of Blackberry in the Conditions of the Samarkand Region

Noila Shokirovna Jumakulova, Flora Djabbarovna Kabulova, Alisher Nuraliyevich Khujanov, Yigitali Shavkatillayevich Tashpulatov, Mukaddas Pulat Kizi Elomonova

Department of Plant Physiology and Microbiology, Samarkand of Agro Innovations and Research University, Samarkand, Uzbekistan

Email: yigitali\_t1981@mail.ru

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## Abstract

The article presents data on the study of phenological phases of blackberries in the Samarkand region in 2022-2023. The influence of differing in weather conditions, especially at the beginning and end of the growing season, on the timing of onset and duration of the main phenophases of the plant is analyzed. The objects of the study were 4 varieties of different genetic and ecological-geographical origin of foreign selection: Brazos, Jumbo, Thornfree and Karaka Black. Phenological observations were carried out according to the classical methodology developed for this crop in Russia. The timing of all phenophases was significantly dependent on the temperature conditions of the growing season: in the year with a higher sum of average daily temperatures, the corresponding phenophases occurred earlier. According to preliminary data, the climatic indicators of the vegetation period of this region allow for the cultivation of blackberries of the main morphological groups (erect, semi-erect, trailing) and different ripening periods.

## Keywords

Blackberry, Phenophases, Flowering, Ripening Time, End of Growth

## 1. Introduction

Recently, amateur gardeners in Uzbekistan have begun to grow thornless varieties of blackberries. Interest in this crop arose due to the fact that it is used not only as a food plant, but also as a medicinal plant. Blackberry berries and leaves contain tocopherol, micro- and macroelements, tannins, pectin, organic acids, vitamin P and vitamins A, B, and C. Compotes, jam, marmalade, and juices are made from the berries. The leaves are used in the form of decoctions, infusions, teas, and

juice. They have a diaphoretic and diuretic effect and are used to treat skin and dental diseases. The berries cleanse blood vessels, activate brain function, support the heart muscles, and increase metabolism. The root is used for ascites, tonsillitis, and urolithiasis [1]-[3].

A good set of adaptive properties, the creation of thornless varieties with high-quality berries, and modern marketing opportunities have ensured the rapid growth in popularity of the crop [4]-[7]. Thornless varieties of blackberries are grown in many countries around the world and have gradually begun to appear among amateur gardeners in Uzbekistan. Therefore, this study is aimed at identifying varieties that can adapt well to the conditions of this region and produce high yields here.

Blackberries adapt well to various growing conditions and demonstrate high productivity. One of the indicators of plant adaptability to specific climatic zones is the timely passage of the main phenological phases, including fruiting. As is known, when cultivating fruit plants, their phenophases reflect the possibility or impossibility of obtaining a full harvest [8] [9]. Blackberry cultivation is limited to regions with a fairly warm climate, mainly the southern fruit growing zone. The study of the phenological phases of blackberry includes a number of studies in Russia [10]-[12]. They show the phases of seasonal development of a number of thornless varieties, the berries of which ripen long before the onset of low autumn temperatures. In the conditions of Uzbekistan, such studies are just beginning. The collection fund of blackberries in the Samarkand State University, named after Sh. Rashidov currently includes 9 varieties of blackberries of different genetic and ecological-geographical origins.

The purpose of this research is to study the timing of the passage of the main phenological phases in representatives of various morphological groups of blackberries in the conditions of the Samarkand region relating them to the climatic indicators of the vegetation in the region and to assess the possibilities of growing this crop in the conditions of the region.

## 2. Research Methods

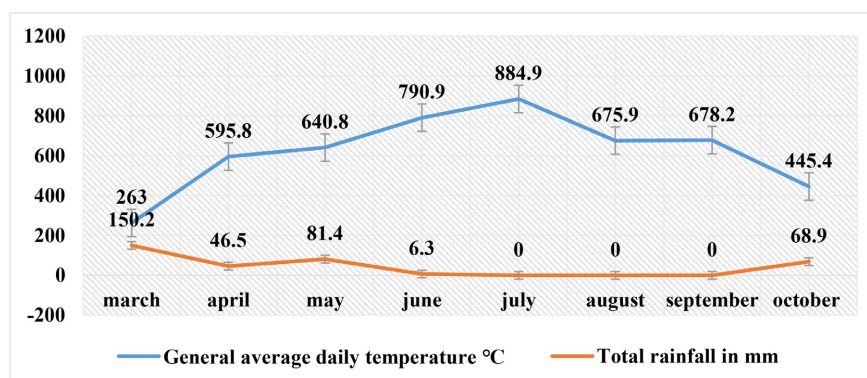
The research was conducted in 2022-2023 on an experimental plot located on the land of the Agromeva farm in the Samarkand district of the Samarkand region in accordance with the "Program and methodology for variety study" [13] [14].

The objects of the study were the Brazos, Jumbo, Thornfree, and Karaka Black blackberry varieties, belonging to 3 morphological groups: erect, semi-erect and creeping.

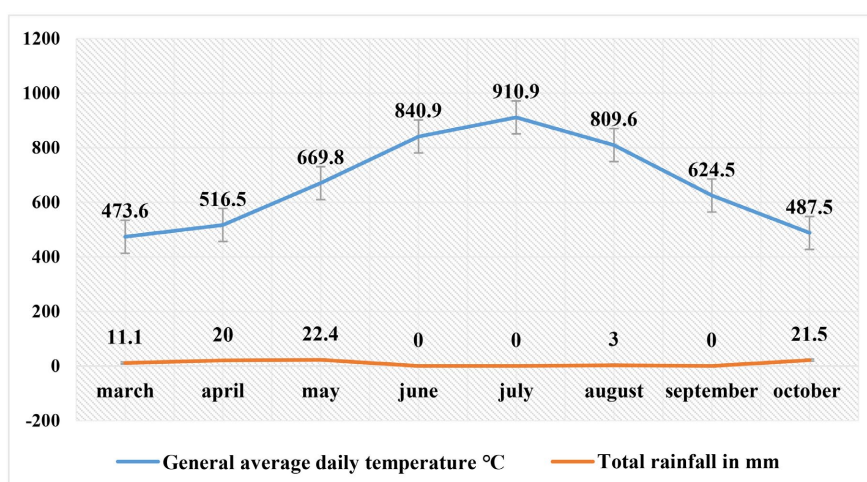
The climate in the research area is characterized by hot and dry summers with relatively cold winters. The average annual temperature is +16.5°C; the average January temperature is +0.2°C, the average July temperature is +27.0°C. The lowest recorded temperature minimum temperature was -26°C, the absolute temperature maximum was +58°C. On average, the region receives 310 - 330 mm of precipitation per year (most of it falls in spring and autumn). The vegetation period

lasts 218 - 220 days.

The hydrothermal coefficient in 2022 was 0.81, and in 2023 was 0.04. From **Figure 1** and **Figure 2**, it can be seen that in March 2022 the sum of average daily temperatures was lower than in 2023, and in April 2022 it was higher than in 2023. In May 2022 this indicator was lower than in May 2023 [15].



**Figure 1.** Sum of average daily temperatures and precipitation during the blackberry growing season in 2022.



**Figure 2.** Sum of average daily temperatures and precipitation during the blackberry growing season in 2023.

The soils of the experimental site are a mixture of light gray soils and meadow soils. In them, the total nitrogen content in the upper and middle layers is 0.09 and 0.06%, respectively, and in the lower layer, its amount decreases. The total amount of phosphorus is 0.141 - 0.144 and potassium 2.28% - 2.30%; the greatest amount is observed in the moving layer. The mobile form of phosphorus and potassium is 23.0 - 23.4 and 168 - 200 mg/kg, respectively.

The temperature regime and the amount of precipitation varied by year, and this affected the timing of the phenophases of the studied blackberry varieties. In this study, the beginning of the growing season for all studied varieties is associated with a stable transition of the average daily air temperature from +5°C to +25°C.

### 3. Results and Discussion

At the experiment site, the new vegetation a week earlier than in 2022, and for the trailing Karaka Black variety—10 days earlier (**Table 1**). In the group of semi-erect varieties (Jumbo and Thornfree), such differences were not revealed, which indicates a lower sensitivity to the specified temperature difference at the beginning of the growing season. Approximately the same differences between the morphological groups were observed during the period of emergence of replacement shoots above the soil. In the erect and Trailing varieties, shoots appeared above the soil significantly earlier (by a week or more) in 2023 than in 2022. In the semi-erect Jumbo variety, new growth started at similar times in both years, and in the semi-erect Thornfree variety, it began 5 days earlier in 2022 than in 2023. This indicates individual varietal responsiveness to temperature differences at the beginning of the growing season.

**Table 1.** The beginning of vegetation and growth of blackberry shoots in 2022 and 2023.

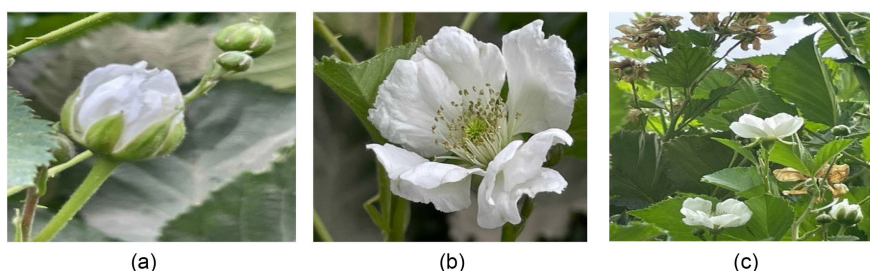
Name of the variety	2022, date		2023, date	
	Beginning of the growing season	The emergence of shoots above the soil	Beginning of the growing season	The emergence of shoots above the soil
<i>Erect</i>				
Brazos	10.03	04.04	03.03	27.03
<i>Semi-erect</i>				
Jumbo	08.03	01.04	07.03	30.03
Thornfree	04.03	31.03	02.03	26.03
<i>Trailing</i>				
Karaka Black	15.03	09.04	05.03	28.03

In addition to establishing the beginning of vegetation and shoot growth of different blackberry varieties, we studied flowering periods. The results of our observations are presented in **Table 2**.

**Table 2.** Flowering times of different varieties of blackberries in the conditions of the Samarkand region.

Name of the variety	2022, date			2023, date		
	Bloom			Bloom		
	Start	Mass	End	Start	Mass	End
<i>Erect</i>						
Brazos	10.04	08.05	10.06	30.04	30.05	25.08
<i>Semi-erect</i>						
Jumbo	28.04	22.05	25.06	23.05	15.06	05.07
Thornfree	25.04	18.05	20.06	10.05	31.05	10.07
<i>Trailing</i>						
Karaka black	01.05	20.05	20.06	10.05	30.05	12.07

In 2022, the Brazos variety started flowering earlier than other varieties at an average daily temperature of 18°C, while the latest flowering was observed in the Karaka Black variety at an average daily temperature of 25.5°C. Mass flowering in all varieties was observed on average after 20 - 25 days and lasted about months [16] [17] (Figure 3).



**Figure 3.** Flowering of blackberry variety Brazos ((a) – budding, (b) – flowering, (c) – mass flowering).

In 2023, the Brazos variety also began flowering earlier than other varieties at an average daily temperature of 22°C. Flowering in blackberries during the years of study occurred from the second ten days of April for the earliest varieties to the end of the first ten days of July for the latest. Relatively late flowering was observed in the Karaka Black variety in 2022, starting on May 1 and lasting until June 20. In 2023, flowering in the Brazos variety began on April 30 and lasted until August 25, and it was of an extended nature. Relatively late flowering is probably due to a decrease in average temperature in April 2023 compared to 2022.

Fruit ripening in blackberry varieties occurred in the years of study at the end of May through June and lasted until the beginning of September (Table 3). The earliest ripening of fruits was observed in the Brazos variety in the third ten-day period of May. Fruiting in this variety was the longest and continued until the end of the first ten-day period of September. In other varieties, fruit ripening began in the first ten-day period of June and continued until the end of July.

**Table 3.** Ripening of fruits and end of growth of blackberries in 2022-2023.

Name of the variety	2022, date				2023, date			
	Ripening			End of shoot growth	Ripening			End of shoot growth
	Start	Mass	End		Start	Mass	End	
<i>Erect</i>								
Brazos	25.05	10.06	10.09	20.10	20.05	22.06	08.09	19.10
<i>Semi-erect</i>								
Jumbo	05.06	25.06	30.07	10.10	25.05	20.06	28.07	08.10
Thornfree	01.06	21.06	25.07	20.09	01.06	27.06	29.07	18.09
<i>Trailing</i>								
Karaka Black	02.06	22.06	31.07	21.09	05.06	29.06	30.07	23.09

The end of shoot growth in the Thornfree and Karaka Black varieties was observed at the beginning of the third ten-day period of September, and in the Jumbo and Brazos varieties later—in the second ten-day period of October (Figure 4).

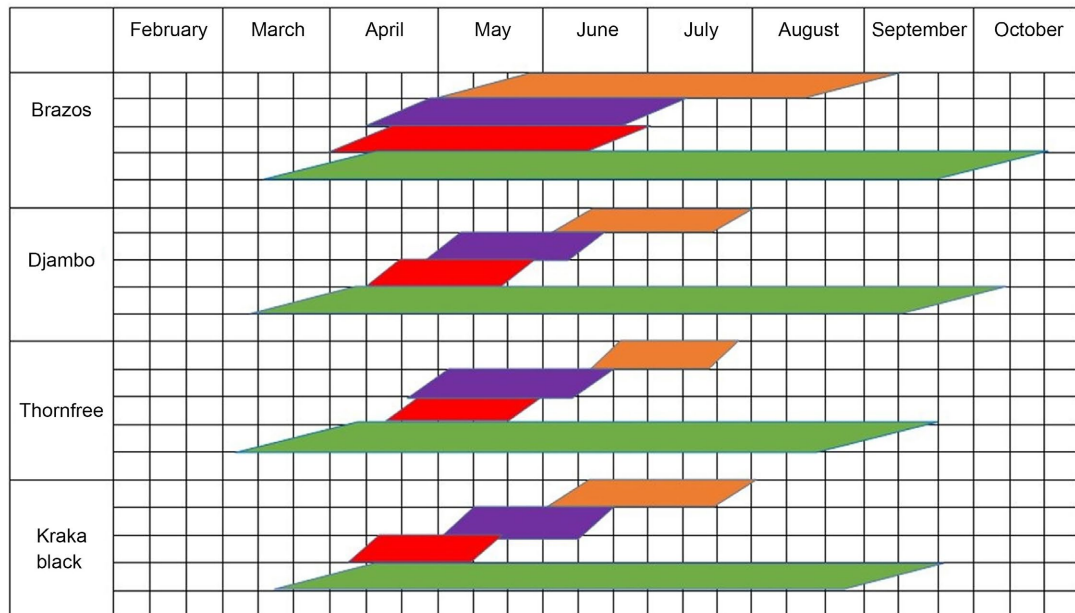


Figure 4. Phenospectrum of blackberry varieties.

In the trailing Karaka Black variety, a rooting zone formed on the tops of the shoots in the second ten-day period of September.

#### 4. Conclusion

All phenological phases of blackberries in this study occur in favorable periods of the year in the conditions of the Samarkand region, allowing blackberries of different morphological groups and ripening periods to be grown here. At the same time, the onset of phenophases largely depends on the hydrothermal regime of each specific year and the characteristics of the variety. The rainy season has a positive effect on the growth and development of branches at the beginning of the vegetation of blackberry varieties. Pollination and fruit quality are negatively affected during the flowering and fruiting stages.

#### Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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