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PHENOLOGICAL CHARACTERISTICS OF SOME VARIETIES AND FORMS OF PISTACHIO (*PISTACHIA* L.) PLANT

Aynur Alovzat Arabzade^{1,2} ¹Azerbaijan State Oil and Industry University²Scientific Research Institute of Fruit and Tea Growing

aynurarabzade@gmail.com

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*The article studies the phenological characteristics of some varieties of Pistachio (*Pistachia* L.) plant introduced to the Absheron Experimental Base of the Scientific Research Institute of Fruit Growing and Tea Growing. During the research, the following varieties and forms were selected: Bina 1/91, Bina 2/92, Narinj, Khanim 17/85, Parvin 14/84, Aylin, Buzovna 65/84, Mardakan 19/95, Bulbula. As a result, well-flowering varieties and forms, phenological groups, and vegetation period were determined. The studied varieties and forms underwent normal vegetation in the soil-climatic conditions of Absheron, the duration of vegetation varied between 224-226 days depending on the varieties and forms. Based on phenological groups, the varieties and forms Bina 1/91, Narinj, khanum, Parvin, Buzovna 65/84 were attributed to the ML group, Bina 2/92, Aylin, Mardakan 19/95, bulbula to the LL group. The flowering rate was evaluated as 3 points in Bina 1/91, Bina 2/92 varieties, and 4 points in Kalam varieties.*

Keywords: phenology, pistachio, Absheron, variety, form

INTRODUCTION

Pistachio (*Pistachia* L.) is the most widely used industrial and food plant in the world. Pistachio is long-lived and has the ability to grow in difficult environments, and is drought-resistant. Some varieties of this plant are cultivated in large areas in many countries of the world. Although some valuable varieties and forms of pistachio are cultivated in Azerbaijan, especially in the Absheron region, they do not cover very large areas. In this regard, the main goal of the research work is to select varieties and forms of pistachio that are better suited to the Absheron region, expand the cultivation areas, establish large gardens and introduce them to the world market. In this regard, the topic under study is very relevant.

Pistachio grows naturally in many areas of East and Central Asia, South and North America. There are large forests of this plant in areas such as South America, Mediterranean coastal countries, Iran, Italy, Syria, Spain, China, Japan, and Turkey [1, 2, 3].

In almost all countries where pistachios have been cultivated for centuries, new large-fruited, productive pistachio varieties have been obtained through natural selection and folk selection [4]. J.Mammadov, A.Maharramov, A.Arabzade studied some developmental features of the pistachio plant. They conducted research on the establishment of new pistachio orchards, selection of promising varieties and forms for this, propagation and grafting of rootstocks in the territory of the Absheron Experimental Base [5].

World scientists A. Kader [6], D.H. Maggs [7] studied some bioecological features, evolution, and prospects of pistachios, R. Polat, A. Jevat [8] studied the physical and mechanical properties of



pistachios. Z. Siyahnouri, M. Bullo et al. [9] determined the content and amount of minerals in pistachios, and investigated their health effects. Studying phenological characteristics in plants allows us to determine how they have adapted to the conditions in which they were introduced.

MATERIAL AND METHODS

During the research, the following varieties and forms were selected: Bina 1/91, Bina 2/92, Narinj, Khanim 17/85, Parvin 14/84, Aylin, Buzovna 65/84, Mardakan 19/95, Bulbula. The experiments were conducted at the Absheron Experimental Base of the Scientific Research Institute of Fruit Growing and Tea Growing of the Ministry of Agriculture of the Republic of Azerbaijan.

The soils of the research area are gray-brown, and the climate is mainly temperate-hot and dry subtropical in flat areas, semi-desert type. Summer is dry, winter is relatively mild [10].

Phenological studies on the studied varieties and forms of pistachio plants were carried out by N.I.Beideman [11], P.I.Lapin [12], I.N.Elagin, A.I.Lobanov [13] and the generally accepted methods of the Main Botanical Garden of Russia [14]. Research work was carried out from early February to late November. Thus, records were made twice a week in the summer months and once every 10 days in June-September. Finally, the duration of vegetation and phenological groups were determined for each variety and form.

RESULTS AND DISCUSSION

Phenological observations were conducted on pistachio varieties and forms previously introduced from different areas to the collection area of the Absheron Experimental Base. The experiment lasted simultaneously in the morning at 8:00-10:00 and in the evening at 17:00-19:00, for 1.5-2.0 hours. The northern part of the tree canopy was taken as experimental branches, these branches were numbered, and records were made annually. In each variety and form, the swelling of shoots, budding, flowering, fruiting, and leaf fall were recorded.

According to the observations conducted every year, the beginning, end and duration of phenological phases in winter and spring were different depending on the climatic conditions.

The observations conducted show that in Absheron conditions, depending on the climate, the vegetation of pistachio varieties and forms begins in late March or early April at a temperature of $+10+12^{\circ}\text{C}$, bud opening at $+12+14^{\circ}\text{C}$; flowering at $+15+17^{\circ}\text{C}$; fruit ripening at $+22+27^{\circ}\text{C}$.

The beginning and end of vegetation in all varieties and forms were almost the same. Bud swelling and opening were recorded in the first decade of April, flowering at the end of April, and the end of flowering at the beginning of May (Table 1).

Usually, generative buds open 7-10 days earlier than vegetative buds. In general, male and female flowers opened at the same time in the studied varieties and forms. However, in some forms (Bina 1/91, Bina 2/92), male flowers opened earlier than female flowers. Flowering usually lasted 20-22 days in male flowers and 15-18 days in female flowers. The strength of flowering was measured using a 5-point system (Figure 1).

Table 1.

Phenological observations on varieties and forms in the pistachio (*Pistacia L.*) experimental garden of the Absheron Experimental Base

№	Sorts and forms	Bud swelling		Bud opening		Flowering				Flowering rate	Fruit ripening		Leaf fall	
		Vegetative	Generative	Start	Massive	Start		Massive			Start	The end	Start	The end
						Female	Male							
1.	Bina 1/91	10.04	02.04	04.04	07.04	16.04	12.04	24.04	02.05	3	23.05	26.08	14.10	20.11
2.	Bina 2/92	12.04	03.04	04.04	07.04	17.04	11.04	24.04	03.05	3	24.05	27.08.	16.10	22.11
3.	Narinc	08.04	01.04	05.04	08.04	13.04	13.04	23.04	01.05	4	22.05	25.08	13.10	19.11
4.	Khanim 17/85	10.04	02.04	06.04	08.04	14.04	14.04	24.04	02.05	4	23.05	26.08	14.10	21.11
5.	Parvin 14/84	09.04	01.04	04.04	09.04	13.04	13.04	23.04	01.05	4	22.05	25.08	13.10	19.11
6.	Aylin	11.04	03.04	05.04	08.04	15.04	15.04	25.04	03.05	4	24.05	27.08	16.10	22.11
7.	Buzovna 65/84	09.04	01.04	05.04	08.04	15.04	15.04	25.04	03.05	4	24.05	27.08	16.10	22.11
8.	Mardakan 19/95	12.04	02.04	06.04	09.04	14.04	14.04	24.04	02.05	4	23.05	26.08	14.10	21.11
9.	Bulbula	11.04	03.04	05.04	08.04	16.04	16.04	26.04	03.05	4	24.05	27.08	16.10	22.11



Fig. 1. Flowers and fruits of the pistachio plant. 1. Male flowers. 2. Female flowers. 3. Fruits

Fruit formation began in the second decade of May, and fruit ripening began in the third decade of May. Full fruit ripening was completed by the end of August. Starting in October, leaves be-



gan to fall, and in November they were completely shed, and vegetation ended. The duration of vegetation in different varieties and forms varied between 224-226 days.

The studied varieties and forms of pistachio were divided into phenological groups based on the start and end of vegetation: those with a medium-early vegetation period (ML), those with a late-early vegetation period (LL). Those whose vegetation began from March 20 to April 10 were grouped as medium-early, and those whose vegetation began after April 10 were grouped as late-early. Those that shed their leaves by November 10 are classified as early-early, and those that shed their leaves after November 10 are classified as late-early (Table 2).

Table 2.

Placement of varieties and forms in phenological groups

№	Sorts and forms	Phenological groups	Vegetation length (in days)
1.	Bina 1/91	ML	225
2.	Bina 2/92	LL	226
3.	Narinc	ML	224
4.	Khanım 17/85	ML	226
5.	Parvin 14/84	ML	224
6.	Aylin	LL	226
7.	Buzovna 65/84	ML	227
8.	Mardakan 19/95	LL	225
9.	Bulbula	LL	226

Based on phenological groups, varieties and forms were divided into 2 groups: medium-early, late-ending (ML) and late-early, late-ending (LL). Bina 1/91, Narinc, Khanım, Parvin, Buzovna 65/84 varieties and forms were attributed to the ML group, Bina 2/92, Aylin, Mardakan 19/95, bulbula to the LL group. The vegetation period was 224-226 days.

In conclusion, it was determined that the studied varieties and forms were well adapted to the soil and climatic conditions of Absheron and had a normal vegetation period.

CONCLUSION

1. During phenological observations, well-flowering varieties and forms were identified. These are Narinc, Khanım 17/85, Parvin 14/84, Aylin, Buzovna 65/84, Mardakan 19/95, Bulbula varieties and forms. The flowering rate was evaluated as 3 points in Bina 1/91, Bina 2/92 varieties, and 4 points in Kalam varieties.

2. Based on phenological groups, Bina 1/91, Narinc, Khanım 17/85, Parvin 14/84, Buzovna 65/84 varieties and forms were attributed to the ML group, Bina 2/92, Aylin, Mardakan 19/95, Bulbula to the LL group.

3. The studied varieties and forms underwent normal vegetation in the soil-climatic conditions of Absheron, and the duration of vegetation varied between 224-226 days depending on the varieties and forms.

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PÜSTƏ (*PİSTACHIA* L.) BİTKİSİNİN BƏZİ SORT VƏ FORMALARININ FENOLOJİ XÜSUSİYYƏTLƏRİ

A.Ə. Ərəbzadə

Məqalədə Meyvəçilik və Çayçılıq Elmi Tədqiqat İnstitutunun Abşeron Təcrübə Bazasına introduksiya olunmuş Püstə (*Pistachia* L.) bitkisinin bəzi sortlarının fenoloji xüsusiyyətləri öyrənilmişdir. Tədqiqatlar zamanı Binə 1/91, Binə 2/92, Narınc, Xanım 17/85, Pərvin 14/84, Aylin, Buzovna 65/84, Mərdəkan 19/95, Bülbülə sort və formaları götürülmüşdür. Nəticədə yaxşı çiçəkləyən sort və formalar, fenoloji qruplar, vegetasiya müddəti müəyyən olunmuşdur. Yaxşı çiçəkləyən sort və formalar Narınc, Xanım 17/85, Pərvin 14/84, Aylin, Buzovna 65/84, Mərdəkan 19/95, Bülbülə sort və formalarıdır. Fenoloji qruplara əsasən Binə 1/91, Narınc, xanım, Pərvin, Buzovna 65/84 sort və formaları OG qrupuna, Binə 2/92, Aylin, Mərdəkan 19/95, bülbülə GG qrupuna aid edilmişdir. Çiçəkləmə dərəcəsi Binə 1/91, Binə 2/92 sortlarda 3, qalan sortlarda isə 4 balla qiymətləndirilmişdir. Öyrənilən sort və formalar Abşeronun torpaq-iqlim şəraitində normal vegetasiya keçirmişlər, vegetasiyanın davam etmə müddəti sort və formalara görə 224-226 gün arasında dəyişmişdir.

Açar sözlər: *fenologiya, püstə, Abşeron, sort, forma.*



ФЕНОЛОГИЧЕСКИЕ ХАРАКТЕРИСТИКИ НЕКОТОРЫХ СОРТОВ И ФОРМ РАСТЕНИЯ ФИСТАШКА (*PISTACHIA* L.)

А.А. Арабзаде

В статье изучены фенологические особенности некоторых сортов растения фисташка (*Pistachia* L.), интродуцированных на Абшеронской экспериментальной базе Научно-исследовательский институт плодоводства и чаеводства. В ходе исследований были отобраны следующие сорта и формы: Бина 1/91, Бина 2/92, Нариндж, Ханым 17/85, Парвин 14/84, Айлин, Бузовна 65/84, Мардакян 19/95, Бульбуля. В результате были определены хорошо цветущие сорта и формы, фенологические группы и период вегетации. Изучаемые сорта и формы прошли нормальную вегетацию в почвенно-климатических условиях Абшерона, продолжительность вегетации в зависимости от сорта и формы колебалась в пределах 224-226 дней. По фенологическим группам сорта и формы Бина 1/91, Нариндж, ханум, Парвин, Бузовна 65/84 были отнесены к группе СП, Бина 2/92, Айлин, Мардакян 19/95, бульбуля к группе ПП. Интенсивность цветения оценена в 3 балла у сортов Бина 1/91, Бина 2/92 и 4 балла у сортов Калам.

Ключевые слова: фенология, фисташка, Абшерон, сорт, форма.