Growth and development characteristics of introduced varieties of kiwi (*Actinidia Deliciosa* A.Chev.) in Uzbekistan

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Abstract. Periods of transition between phenological phases in different kiwi plant varieties: one of the most widely grown fruits today, kiwis are grown extensively in many subtropical and temperate nations. Kiwi farming has recently piqued the curiosity of many fruit producers and landowners in our nation. In order to study the morpho-biological traits of the growth and development of these fruit plant varieties in the soil and climate conditions of Uzbekistan and to scientifically support the possibilities of establishing industrial kiwi gardens on this basis, it is necessary to conduct special scientific research on this plant. In the article, the duration of phenological phases of Kiwi (*Actinidia deliciosa* (A.Chev.)) varieties Hayward, Monty, Bruno, and pollinator Matua were observed in the climatic conditions of Tashkent region at the Extension center of Tashkent State Agrarian University in Uzbekistan. The sum of active temperatures above 10 °C was calculated for the growth phases of kiwifruit cultivars.

Keywords. *Actinidia deliciosa*, kiwi, Hayward, Monty, Bruno, Matua, variety, introduction, actinidia.

1 Introduction

Today, kiwifruit is grown in large areas in many subtropical and temperate countries of the world as one of the most popular fruits [1]. In recent years, fruit growers and farm land owners of our country have shown great interest in kiwi cultivation [2]. Because of this, it is necessary to carry out special scientific research on this plant in order to study the morpho-biological characteristics of the growth and development of this fruit plant varieties in the soil and climate conditions of Uzbekistan and to scientifically substantiate the possibilities of establishing industrial kiwi gardens on this basis.

Kiwifruit (sweet actinidia) - *Actinidia deliciosa* or *Actinidia chinensis* is a fruit plant grown widely in many subtropical regions of the world. According to its taxonomic classification, it is also called *Actinidia chinensis* var Deliciosa (A. Chev.) [3] or *Actinidia chinensis* var Hispida [4] or *Actinidia latifolia* var deliciosa A. Chev. [5].

Kiwi or sweet actinidia is a new fruit plant species that has recently started to be cultivated in subtropical regions [6, 7]. Initially, this type of actinidia was considered a

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variety of Chinese actinidia (*A. chinensis* Var, nispida) [8]. In 1975, a leading scientist on the classification of actinidia species, an expert at the Guangxi Botanical Center of China, concluded that the genus *A. chinensis* can be divided into two species. After that, the author, together with Ferguson, a botanist from Auckland (New Zealand), divided it into two species. In this *A. chinensis* is given the name *A. deliciosa*, which includes glabrous fruits and hairy fruits [9].

The modern name "kiwi" of sweet actinidia was given by Ellison, a famous breeder from New Zealand, in the 60s of the 20th century [10]. In this, he named this fruit because it is very similar to the bird "kiwi", which is common in this region and is the national symbol of New Zealand, whose image is on many stamps and emblems of the country.

2 Materials and methods

Based on the above opinions, during the years 2018-2021, the growth and development of the introduced Hayward, Monty, Bruno and pollinator Matua varieties of the kiwi plant in the experimental field of the Tashkent State Agrarian University Information and Consultation Center (Extension center) SUE in Uzbekistan studied. In addition, research was carried out to study the period and duration of phenological phases, morphological and biological changes in plants during these periods (Figure 1).

Figure 1. Collection nursery of kiwi plant varieties introduced to Uzbekistan.

In the experiment, the annual growth strength of the introduced kiwi plant varieties in the collective mother nursery, the duration of each vegetation phase during the annual development period, the total growth length of the plants, branching, degree of leaf coverage, and the size of the leaf were studied.

The kiwi plant grows in the natural conditions of the countries of its origin, that is, in the forests of China, mainly on the banks of the Yangtze River. This region is distinguished

by its continental climate, that is, it is close to the climate of Uzbekistan (very cold in winter and very hot in summer).

This shows that it is promising to grow kiwi in the territory of our country. However, the climate of this land is different in that there is no frost in spring and early autumn. According to literary sources, the kiwi plant is a deciduous fruit plant. Within its annual development, two periods are noted: the period of rest and the period of active growth and development.

3 Results and discussion

A kiwi plant wakes up a bit earlier than a vine plant. In our experiments, the data of phenological observation during the transition of vegetation phases in the introduced varieties of the kiwi plant showed that the period of bud formation in them corresponded to the last ten days of March. In this case, the earliest awakening was recorded in the early-morning Monty variety. In this variety, it was noted that the first recording of buds coincided with the 7th of March (Table 1).

Table 1. Transition period and duration of phenological phases in kiwi plant varieties, 2018-2021.

Varieties	Budding period	Leaf and branch development	Defoliation	Growing season period, days
Hayward	Mar 13	Apr 3	Nov 19	246
Monty	Mar 7	Mar 29	Nov 7	240
Bruno	Mar 7	Apr 1	Nov 11	243
Matua	Mar 9	Apr 2	Nov 10	242

Table data shows that the latest awakening of buds was observed in the Hayward variety in the evening, and it corresponded to March 13. The initial phase of buds was the same in Bruno and pollinator Matua and was intermediate. The beginning of shoots in these varieties was recorded on the 9th of March.

Table data show that leaf and shoot development differed among cultivars in relation to bud protrusion. The earliest complete formation of the first leaf was recorded in the Monty variety, and it corresponded to the 29th of March. In the remaining varieties, the full formation of the first leaf occurred in early April. The latest leaf emergence was observed in the Hayward variety (April 3).

In the introduced varieties of the kiwi plant, the initial shedding of leaves was noted - the khazonrezgi in the Monty variety. The beginning of this variety was first recorded on November 7. In other varieties, this phenological phase started 6-12 days later than this variety. The latest onset of hazonarization was observed in the Hayward variety. It should be noted that in the soil-climatic conditions of Uzbekistan, the process of leaf senescence in kiwi plants does not come to an end, that is, even in the last months of autumn, most of the leaves do not lose their green color. They have a very slow natural shedding of leaves. Only after the first autumn frost, when frostbite occurs on all leaves, they completely dry up and then shedding is noted. Therefore, in the soil-climatic conditions of Uzbekistan, the period of autumn can be considered as the beginning of autumn depending on the beginning of yellowing of the leaves in the lower layer.

The duration of the vegetation period was different in kiwi plant varieties depending on the dates of the beginning of buds and the beginning of autumn. The Monty variety stood out with the shortest growing season. The duration of the vegetation period in this variety was 230 days. The Hayward variety stood out with the longest growing season. In this

variety, this indicator reached 236 days. The remaining varieties occupied an intermediate position between these two varieties.

Judging by the dates of the beginning of budding and the beginning of autumn in kiwi plant varieties, as well as the duration of the vegetation period, it can be concluded that all kiwi plant varieties are suitable for the soil and climate conditions of Uzbekistan and can be grown successfully.

According to the literary sources, for the biodegradation of fruits of the cold-resistant actinidia colomicta type of kiwi, 1700 and 2500-4200 °C are needed for the Chinese actinidia type. Therefore, in our research, we have made a comparative analysis of the suitability of the sum of active temperatures for the cultivation of the kiwi plant in the conditions of the central region of Uzbekistan.

Calculation of sum of active temperatures higher than 10 °C in terms of growth phases of kiwi plant varieties showed that the initiation of buds starts when active temperature of 13-18.5 °C is accumulated. The lowest active temperature sum was recorded in early morning Monty variety. A total active temperature of 13 °C was required for budding of this cultivar. The highest active temperature sum for the awakening of buds was needed for the late Hayward variety and it was 18.5 °C. The sum of the active temperatures required for the awakening of the buds of the remaining varieties was intermediate and was around 13.5 °C.

In kiwifruit cultivars, the sum of active temperatures required for first leaf formation showed the same trend as bud awakening. In this case, the lowest active temperature sum for the formation of the first leaf was recorded in the early Monty variety. In this variety, an active temperature sum of 70.5°C was needed for the formation of the first leaf. The highest active temperature sum for the formation of the first leaf was needed for the late Hayward variety and it was 80.5°C. In the remaining varieties, the sum of active temperatures required for the formation of the first leaf took an intermediate position and changed accordingly around 74-77 °C (Figure 2).

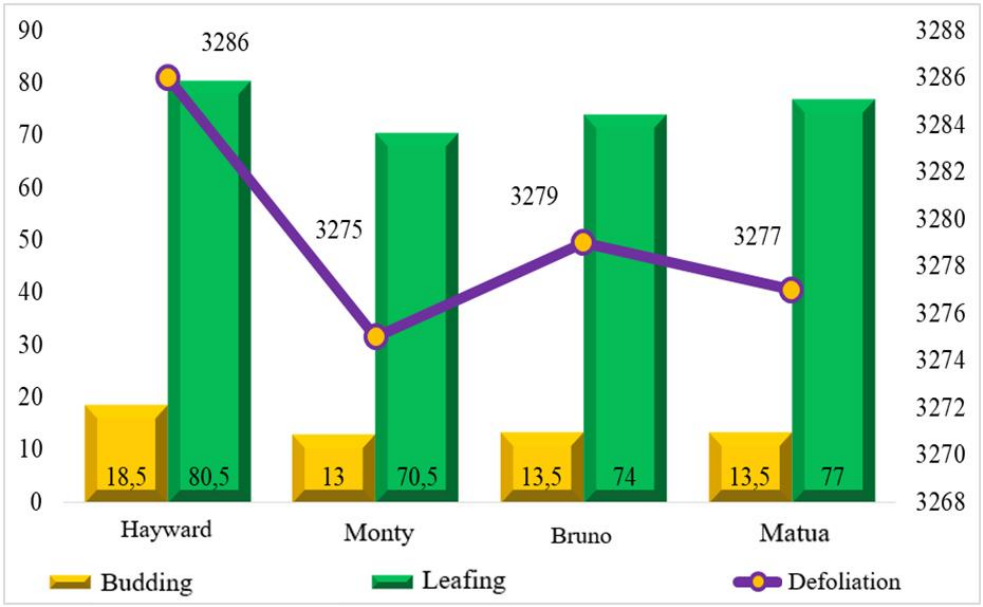

Figure 2. Sum of active temperatures in kiwi varieties by phenological phases (above 10°C, Tashkent region, Uzbekistan), °C; 2018-2021.

The data of Figure 2 above shows that, among other things, the sum of active temperatures in this region was 3286 °C. It was noted that the onset of the first defoliation symptoms was around 3275-3286 °C.

4 Conclusions

It is worth noting separately that in literary sources it is stated that varieties of kiwi plant belonging to this species can withstand -20 and -25 degrees of cold during the winter rest period. It seems that this plant can be grown successfully in the conditions of the central climatic region of Uzbekistan. After all, even in the coldest winter period of the region, according to long-term meteorological observations, such a negative temperature has not been recorded for the last 43 years, and there is a possibility of its recurrence in many years. Taking into account the extreme continentality of the climatic conditions of Uzbekistan, it is better to protect it from the cold like a vine plant in the years when the winter season has a high degree of frost.

In conclusion, it can be said that the climatic conditions of the central region of Uzbekistan are perfect for growing kiwi. It was observed that all 4 of his introduced varieties - Hayward, Monty, Bruno pollinating Matua varieties grew well in the climatic conditions of Tashkent region in Uzbekistan.

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