

DETERMINATION OF ECONOMIC AND BIOLOGICAL CHARACTERISTICS OF APPLE VARIETIES AND HYBRIDS

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Abstract: The study investigated the phenological phases and flowering characteristics of apple varieties and hybrids. According to the results, the ‘Dildora’ variety developed earlier than the other varieties in terms of bud bursting, leaf and flower bud development, and the onset of flowering. The flowering intensity of this variety was rated at 5.0 points. In contrast, the phenological phases occurred relatively later in the ‘Jonathan’, ‘Golden Winter Pearmain’ (*Parmen zimniy Zolotoy*), and ‘Mantuaner’ varieties. The ‘Dildora’ variety was evaluated as a promising cultivar.

Keywords: apple, variety, hybrid, phenological phase, bud bursting, leaf bud, flower bud, flowering, Dildora, Jonathan, Mantuaner, promising variety

Introduction. Today, global apple production exceeds approximately 89.3 million tons, ranking second only to bananas in terms of gross yield. In the Asian continent, which leads the world in apple cultivation, major producing countries include China (44.44 million tons) and India (2.87 million tons), alongside the United States (4.64 million tons) in the Americas, and Turkey (3.92 million tons) and Poland (3.60 million tons) in Europe. In these nations, this valuable fruit type is primarily cultivated using intensive technologies. In most apple-producing countries, continuous research is being conducted to develop brand-new, highly marketable apple varieties, radically increase production volume, and enhance fruit quality in order to secure a prestigious position in the global apple market.

These research tasks align with the implementation of the Decree of the President of the Republic of Uzbekistan No. PP-4549 dated December 11, 2019, “On additional measures for further development of fruit and vegetable growing and viticulture, creation of a value chain in the sector,” and the Decree No. PF-5853 dated October 23, 2019, “On approval of the Strategy for the Development of Agriculture of the Republic of Uzbekistan for 2020-2030.” These legislative acts specify key objectives such as manufacturing high-value-added products in the fruit, vegetable, and viticulture sectors, expanding export volumes, reclaiming abandoned and rainfed (*lalmi*) lands, and increasing the cultivation of export-oriented agricultural crops on areas optimized from cotton and grain production [1, 2, 5].

Materials and Methods

During the scientific research, field experiments and the agrobiological characteristics of the varieties were studied based on the “Methodology of Calculations and Phenological Observations in Conducting Experiments with Fruit and Berry Plants” developed by Kh.Ch.Buriyev, N.Sh.Yenileyev, et al. [3, 4].

Results and Discussion

According to the research results, the overall condition of the evaluated apple variety and hybrid trees was rated at 5.0 points for the ‘Nafis’ variety and 4.0 points for the remaining varieties and hybrids. The results of studying the timing of phenological phases in apple varieties and hybrids revealed specific variations among the cultivars regarding bud bursting, leaf and flower bud development, and flowering periods. These variations are attributed to the biological traits of the

varieties, their early or late development characteristics, and their adaptability to environmental factors.

Based on the observations, the earliest bud bursting was recorded in the ‘Dildora’ and ‘Mantuaner’ varieties, with this process initiating on February 20-21. While bud bursting was observed on February 20 in the ‘Dildora’ variety, this parameter fell on February 21 for the ‘Mantuaner’ variety. In the control variety ‘Jonathan’, bud bursting was recorded on February 22, and in ‘Golden Winter Pearmain’ (*Parmen zimniy Zolotoy*), it was noted on February 23. Consequently, among the studied varieties, ‘Dildora’ stood out for initiating its phenological development relatively early.

A similar trend was observed regarding leaf bud bursting. In the ‘Dildora’ and ‘Mantuaner’ varieties, leaf bud bursting was recorded on March 7-8, respectively. This phase occurred on March 9 in the ‘Jonathan’ variety and on March 10 in ‘Golden Winter Pearmain’. These results indicate that the vegetative development of the ‘Dildora’ variety begins slightly earlier compared to other cultivars.

Flower bud bursting also occurred at varying times across the varieties. In the ‘Dildora’ variety, flower bud bursting was observed on March 14, representing the earliest date. This phase was recorded on March 16 in ‘Mantuaner’, March 17 in ‘Jonathan’, and March 18 in ‘Golden Winter Pearmain’. The early bursting of flower buds subsequently influenced the early onset of the succeeding flowering phases.

Regarding the flowering process, the earliest indicators were recorded in the ‘Dildora’ variety. In this variety, flowering began on March 17, progressed to full bloom by March 20, and concluded on March 25. The total flowering duration spanned 9 days, and the flowering intensity was evaluated at 5.0 points. This demonstrates that the ‘Dildora’ variety possesses the highest flowering activity among the investigated cultivars.

In the ‘Mantuaner’ variety, flowering commenced on March 21, reached full bloom on March 25, and ended on March 30. The flowering duration for this variety was 10 days. This parameter was 1 day longer than that of the other varieties, indicating that the flowering process in ‘Mantuaner’ was relatively prolonged. The flowering intensity for this variety was evaluated at 4.0 points (Table 1).

Table 1.

Timing of phenological phases in apple varieties and hybrids.

Varieties and Hybrids	Bud bursting, day/month	Leaf bud bursting, day/month	Flower bud bursting, day/month	Onset of flowering, day/month	Full bloom, day/month	End of flowering, day/month	Flowering duration, days	Flowering intensity, score
Jonathan (control)	22/II	09/III	17/III	22/III	26/III	30/III	9	4,0
Dildora	20/II	07/III	14/III	17/III	20/III	25/III	9	5,0
Golden Winter Pearmain	23/II	10/III	18/III	23/III	27/III	31/III	9	4,0
Mantuaner	21/II	08/III	16/III	21/III	25/III	30/III	10	4,0

In the ‘Jonathan’ variety, which served as the control, flowering initiated on March 22, progressed to the full bloom stage on March 26, and concluded on March 30. The total flowering duration spanned 9 days, with a flowering intensity rated at 4.0 points. Similarly, in the ‘Golden Winter Pearmain’ variety, flowering began on March 23, reached full bloom on March 27, and ended on March 31. This cultivar also exhibited a flowering duration of 9 days and was evaluated with a flowering intensity score of 4.0 points.

Furthermore, the results of the phenological observations conducted in 2024 demonstrated that the ‘Dildora’ variety completed all major phenological phases earlier than the other cultivars.

This variety showed distinct precocity, particularly in bud bursting, flower bud bursting, and the onset of flowering. The flowering intensity of 'Dildora' reached 5.0 points, indicating its profuse flowering capacity and high biological activity.

In contrast, the phenological phases in 'Jonathan', 'Golden Winter Pearmain', and 'Mantuaner' occurred 2 to 6 days later compared to 'Dildora'. This indicates that they possess mid-season or relatively late development characteristics. Based on the research findings, the 'Dildora' variety stands out as a highly promising cultivar under the climatic conditions of Uzbekistan due to its early phenological development, superior flowering intensity, and stable flowering performance.

Conclusion

1. According to the research results, among the studied apple varieties and hybrids, 'Dildora' was distinguished by the earliest initiation of its phenological phases. In this variety, bud bursting was observed on February 20, leaf bud bursting on March 7, and flower bud bursting on March 14.

2. Distinct variations were identified among the apple varieties regarding their flowering periods. Flowering in the 'Dildora' variety began on March 17 and concluded on March 25, demonstrating its early flowering trait relative to the other cultivars.

3. The highest indicator for flowering intensity was recorded in the 'Dildora' variety at 5.0 points. Meanwhile, 'Jonathan', 'Golden Winter Pearmain', and 'Mantuaner' achieved a flowering intensity score of 4.0 points, indicating a relatively stable and consistent flowering pattern.

4. Based on the comprehensive analysis, the 'Dildora' variety was evaluated as a promising cultivar for the conditions of Uzbekistan, owing to its early development, high flowering activity, and phenological stability. Conversely, the 'Jonathan', 'Golden Winter Pearmain', and 'Mantuaner' varieties were characterized by a delayed development of 2 to 6 days compared to 'Dildora'.

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