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# Influence of sowing schemes on the fixibility of export-propected varieties of apple on different weldings depending on the climatic conditions of the republic of karakalpakstan

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**Abstract:** In 2025, experiments were conducted on an area of 0.15 hectares at the Қорақалпоқ Scientific and Experimental Station of the Academician M.M.Mirzaev Research Institute of Horticulture, Viticulture and Winemaking. The yield and growth of apple varieties grafted on MM-106, M-IX, MM-111 and seed grafts with 60x15 cm, 80x10 cm, and 50x20 cm grafting schemes were studied, and the degree of influence of bud grafting on the planting scheme and grafts was determined.

**Keywords:** Graft, dominant apple, variety, bud graft, vegetation, observations.

**Introduction:** Gross volume of apple production worldwide today

80.5 million tons, the leading positions are occupied by China (44.45 million tons, respectively), the USA (4.65 million tons), Poland (3.60 million tons) and Turkey (2.93 million tons). In countries that occupy the first places in

the world in the cultivation and export of apples, about 90-95% of apple orchards are grown in intensive orchards based on dwarf rootstocks. In these countries, in order to further intensify intensive apple orchards (using super dwarf rootstocks, studying meadow-like braided orchards), in-depth scientific research is being conducted on the cultivation of environmentally friendly products, the production of new competitive varieties with high yields, high-quality fruits, and resistance to environmental stress factors.

In the Action Strategy for the further development of the Republic of Uzbekistan, this issue is also defined as one of the priority areas - the propagation of weakly growing seedlings in local conditions and the organization of their delivery to farmers. However, in practice, since the main part of such seedlings is so far imported from foreign countries, the development of the national seedling industry and the establishment of technologies for growing weakly growing seedlings adapted to the local climate is of great importance.

In the Decree of the President of the Republic of Uzbekistan dated January 28, 2022 No. UP-60 "On the Development Strategy of New Uzbekistan for 2022-2026," special attention is paid to "increasing the income of dekhkans and farmers by at least 2 times through the intensive development of agriculture on a scientific basis, bringing the annual growth of agriculture to at least 5 percent, especially by 2026 bringing the volume of food products to 7.4 million tons, the level of processing of fruits and vegetables to 28 percent," based on the main indicators and indicators, it is planned to increase the area of seed orchards from 11,634 hectares to 10% in 2022, 15% in 2025, and 18% in 2030. In this regard, expanding the range of fruit varieties in Uzbekistan, selecting high-yielding varieties, and improving the technology of growing their seedlings is a relevant scientific direction.

### LITERATURE ANALYSIS

Today, in many countries where agriculture is developed on an industrial basis, fruit orchards are created mainly on weakly growing rootstocks. Consequently, in countries with a developed horticultural industry, such as England, France, Italy, the Netherlands, Belgium, Germany, and Spain, about 72-87% of orchards of fruit plants are created on weakly growing rootstocks. In recent years, 40-50% of seed orchards in the USA have been transplanted to dwarf rootstocks.

As one of the important elements of varietal agricultural techniques in apple cultivation, N.Ya. Asaliev and O.A. Khlustova [1, 19-20-p] demonstrate the correct selection of the rootstock. They studied the

potential productivity of apple varieties such as Jonathan, Golden Delicious, Mekintosh, Jonared, Kidz Orange Red, Royal Red Delicious, and Korey on the M-IV rootstock in the central horticultural region of Stavropol Krai. As a result of the collected economic indicators, the feasibility of cultivating the Golden Delicious and Korean varieties on the M-IV rootstock was proven. On this rootstock, their yield, yield of standard fruits, and crown productivity (average yield per 1 m<sup>3</sup> of crown - 9.4 and 14.2 kg) were high. These varieties yielded a stable harvest even in unfavorable weather conditions.[1, 19-20-p].

Shi Biying, in his scientific and practical research, studied the morpho-biological characteristics of the Golden Delicious apple variety depending on various rootstocks, the level of agrotechnical practices, and the necessary agrotechnical measures (shape, planting scheme, etc.). Based on research, the most optimal cultivation parameters for this variety have been scientifically substantiated [2, pp. 59-64].

A.R. Rasulov in a 12-year-old garden on 7 medium-growing rootstocks

The state of 9 apple varieties (M-II, M3, M-IV, M5, M-VII, MM106 and SK1) was studied. The highest productivity of the varieties on the M-IV rootstock ranged from 12.7 t/ha (variety Royal Red Delicious) to 23.4 t/ha (variety Alpinist). SK1 came in second, M-VII in third. The M-IV and SK1 rootstocks were not only more productive than other medium-growing rootstocks, but also produced high-quality fruit. The disadvantage of the MM106 rootstock is the tendency of the grafted varieties to sag. [3; 110-114-p.].

According to M.P. Tarasenko [4, p. 188], there are currently several types of intensive bonds: 1. On strong (seed) and weakly growing (clone) rootstocks with different shapes of branches; 2. Super intensive orchards; 3. Spur bonds; 4. Meadow gardens; 5. Column gardens. Old technologies of extensive horticulture no longer meet the requirements of modern intensive horticulture, since today intensive fruit cultivation requires obtaining maximum and high-quality fruits per unit of garden area.

### METHODS

Experiments were conducted in 2025 on 0.10 hectares of land at the Karakalpak Scientific Experimental Station of the Research Institute of Horticulture, Viticulture and Winemaking named after Academician Makhmud Mirzaev.

The experiments were conducted on the basis of the "Method and Program for the Study of Varieties of Fruit, Berry, and Nut Plants" (Orel 1999), developed by the All-Russian Research Institute of Fruit Crop Selection, and

the determination of the dynamics of rootstocks, seedlings, and annual branches was carried out according to the methods of V.L. Vitkovsky [3; 10-18 p].

**IMAGINATION AND RESULTS**

When propagating column-shaped apple varieties, the optimal planting scheme, as well as the indicators of apple rootstocks MM-106, MIX, MM-111 and seed rootstocks, were determined, and the history of their origin, their adaptation to the conditions, and their adaptation to the natural and climatic conditions of the republic, as well as their agrobiological characteristics, were studied.

In apple varieties grafted onto the MM-106 apple rootstock planted in the first field of the nursery in the third month of spring, the adhesion of small rootstocks and the percentage of adhesion, as well as the diameter and height of their trunks, were studied.

Our observations showed that the Ostankino and Prezident apple varieties, attached to the MM-106 rootstock, planted according to the 60x15 planting scheme, differed from other varieties in their resistance and development of the aerial part. That is, out of 200 cases, 148-149 were caught, which amounted to 74-74.5%. The circumference of the body was 12-13 mm, and the height was 78.5-80.1 cm.

In the Medok apple variety, the number of fruits was less than in other varieties, that is, 130 out of 200 fruits, which amounted to 65%. Body diameter 9 mm, and the height was 63.5 cm.

In the Vasyugan, Senator, Triumph, Jin, and Valyuta apple varieties, the above indicators were average, i.e., spring clustering was 138-146%, which amounted to 69-73%. The body diameter was 10-11 mm, and the average height ranged from 68.3 cm to 75.4 cm.

The Senator and Jin apple varieties, attached to the MM-106 rootstock, planted according to the 80x10 planting scheme, differed from other varieties in their resistance and development of the aerial part. That is, 142 out of 200 caught the disease, which constituted 71%. The circumference of the body was 11 mm, and the height was 77.8-78.3 cm.

In the Vasyugan apple variety, the number of fruits was less than in other varieties, that is, 129 out of 200, which amounted to 64.5%. The body diameter was 8 mm, and the height was 65.1 cm.

In the remaining apple varieties, the above indicators

were average, that is, spring clustering was 133-136, which amounted to 66.5-68%. The body diameter was 9-10 mm, and the average height ranged from 68.9 cm to 73.5 cm.

The Jin apple variety, attached to the MM-106 rootstock, planted according to the 50x20 planting scheme, differed from other varieties in its adhesion and development of the aerial part. That is, 142 out of 200 caught the disease, which amounted to 71%. The circumference of the body was 12 mm, and the height was 79.3 cm.

1 table

The Triumph apple variety, attached to the M-IX rootstock and planted according to the 80x10 planting scheme, differed from other varieties in its resistance and development of the above-ground part. That is, 152 out of 200 caught it, which amounted to 76%. The circumference of the body was 12 mm, and the height was 76.6 cm.

In the Ostankino apple variety, the number of fruits was less than in other varieties, that is, 132 out of 200 fruits, which amounted to 66%. The body diameter was 8 mm, and the height was 65.7 cm.

In the remaining apple varieties, the above indicators were average, i.e., spring clustering was 139-148, which amounted to 69.5-74%. Body diameter was 9-11 mm, and average height ranged from 70.6 cm to 74.5 cm.

The Triumph apple variety, attached to the M-IX rootstock and planted according to the 80x10 planting scheme, differed from other varieties in its resistance and development of the above-ground part. That is, 152 out of 200 caught it, which amounted to 76%. The circumference of the body was 12 mm, and the height was 76.6 cm.

In the Ostankino apple variety, the number of fruits was less than in other varieties, that is, 132 out of 200 fruits, which amounted to 66%. The body diameter was 8 mm, and the height was 65.7 cm.

In the remaining apple varieties, the above indicators were average, i.e., spring clustering was 139-148, which amounted to 69.5-74%. Body diameter was 9-11 mm, and average height ranged from 70.6 cm to 74.5 cm.

The Ostankino apple variety, attached to the M-IX rootstock and planted according to the 50x20 planting scheme, differed from other varieties in its adhesion and development of the above-ground part.

Apple varieties	Number of grafted seedlings, pcs.	15.10.2024 status		25.05.2025 status			
		Quantity of catches,	Consistency, %	Quantity of catches,	Consistency, %	Plant body diameter,	Plant height, cm

		pieces		pieces		mm	
<b>MM -106 varieties of apples grafted on the graft (planting scheme 60x15 CM)</b>							
Vasyugan	200	182	91	145	72,5	11	75,2
Medok	200	167	83,5	130	65	9	63,5
Prezident	200	185	92,5	148	74	12	78,5
Djin	200	185	92,5	146	73	11	75,4
Triumpf	200	176	88	138	69	10	68,3
Senator	200	181	90,5	144	72	10	69,7
Valyuta	200	181	90,5	143	71,5	10	68,8
<b>MM -111 Apple varieties grafted onto a rootstock (planting scheme 50x20 cm)</b>							
Vasyugan	200	166	83	129	64,5	8	65,1
Medok	200	172	86	135	67,5	9	68,9
Prezident	200	170	85	133	66,5	8	70,6
Djin	200	183	91,5	142	71	11	78,3
Triumpf	200	172	86	136	68	10	71,6
Senator	200	181	90,5	142	71	11	77,8
Valyuta	200	175	87,5	135	67,5	9	73,5
<b>M-IX varieties of apples grafted on the graft (planting scheme 80x10 centimeters)</b>							
Vasyugan	200	172	86	135	67,5	10	74,1
Medok	200	174	87	136	68	10	66,8
Prezident	200	172	86	132	66	11	78,6
Djin	200	182	91	142	71	12	79,3
Triumpf	200	178	89	138	69	10	74,6
Senator	200	169	84,5	129	64,5	9	64,8
Valyuta	200	171	85,5	131	65,5	10	72,5

In the Senator apple variety, the number of fruits was less than in other varieties, that is, 129 out of 200 fruits, which amounted to 64.5%. Body diameter 9 mm, and the height was 64.8 cm.

In the remaining apple varieties, the above indicators were average, that is, spring clustering was 131-138, which amounted to 65.5-69%. The body diameter was 10-11 mm, and the average height ranged from 66.8 cm to 74.6 cm.

In apple varieties grafted onto the M-IX apple rootstock planted in the first field of the nursery in the third month of spring, the adhesion of small rootstocks and the percentage of adhesion, as well as the diameter and height of their trunks, were studied.

Our observations showed that the Vasyugan and Jin apple varieties, attached to the M-IX rootstock,

planted according to the 60x15 planting scheme, differed from other varieties in their resistance and development of the above-ground part. That is, out of 200 cases, 148-149 were infected, which amounted to 74-74.5%. The circumference of the body was 11 mm, and the height was 75.2-76.4 cm.

The President apple variety had less fruit than other varieties, that is, 120 out of 200 fruits, which amounted to 60%. The body diameter was 8 mm, and the height was 61.2 cm.

In the remaining apple varieties, the above indicators were average, that is, the spring captivity was 129-146 units, which amounted to 65.5-73%. The body diameter was 9-10 mm, and the average height ranged from 64.5 cm to 69.9 cm.

The Triumpf apple variety, attached to the M-IX rootstock, planted according to the 80x10 planting

scheme, differed from other varieties in its resistance and development of the above-ground part. That is, 152 out of 200 caught it, which amounted to 76%. The circumference of the body was 12 mm, and the height was 76.6 cm.

In the Ostankino apple variety, the number of fruits was less than in other varieties, that is, 132 out of 200 fruits, which amounted to 66%. The body diameter was 8 mm, and the height was 65.7 cm.

In the remaining apple varieties, the above indicators were average, i.e., spring clustering was 139-148, which amounted to 69.5-74%. The body diameter was 9-11 mm, and the average height ranged from 70.6 cm to 74.5 cm.

The Ostankino apple variety, attached to the M-IX rootstock, planted according to the 50x20 planting scheme, differed from other varieties in its adhesion and development of the above-ground part. The Triumph apple variety, attached to the M-IX rootstock, planted according to the 80x10 planting scheme, differed from other varieties in its resistance and development of the above-ground part. That is, 152 out of 200 caught it, which amounted to 76%. The circumference of the body was 12 mm, and the height was 76.6 cm.

In the Ostankino apple variety, the number of fruits was less than in other varieties, that is, 132 out of 200 fruits, which amounted to 66%. The body diameter was 8 mm, and the height was 65.7 cm.

In the remaining apple varieties, the above indicators were average, i.e., spring clustering was 139-148, which amounted to 69.5-74%. The body diameter was 9-11 mm, and the average height ranged from 70.6 cm to 74.5 cm.

The Ostankino apple variety, attached to the M-IX rootstock, planted according to the 50x20 planting scheme, differed from other varieties in its adhesion and development of the above-ground part. (1- table).

### CONCLUSION

Our observations showed that the Vasyugan and Jin apple varieties, attached to the M -IX rootstock, planted according to the 60x15 planting scheme, differed from other varieties in their resistance and development of the above-ground part. That is, out of 200 cases, 148-149 cases were detected, which amounted to 74-74.5%. The circumference of the body was 11 mm, and the height was 75.2-76.4 cm.

When studying the survival rate of apple varieties grafted onto apple seed rootstocks according to the 60x15 cm planting scheme, the survival rate of the President and Jin apple varieties was higher compared to other varieties and amounted to 87.5-89%.

In the Vasyugan variety, the number of stem-shaped

apples was less than in other varieties, that is, 129 out of 200, which amounted to 64.5%. The body diameter was 8 mm, and the height was 65.1 cm.

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