Selecting variety samples for intensive apple orchards grown on m-9 rootstock

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Abstract: *This article outlines data about apple varieties of local M-9 rootstock that was introduced through the study in the condition of Tashkent region. According to this data the varieties with long duration flowering period include Liberty Zimniy, Pristin and Williams Pride varities (14,15,16 days) which were brought from abroad. It was defined that local summer Rustamiy variety belonged to early autumn group while Williams Pride was included to late summer group. Also it was detected that Stark Earliest, Isroil, Pristin, Prikubanskoye, Liberty Zimniy apple varieties were high productive varieties among the studied varieties when they had been grown on M-9 rootstock.*

Key Words: *intensive orchard, dwarf M-9 rootstock, local and introduced variety, maturation period of apple, chemical content of fruit, total acidity, dry matter and sugar quantity.*

1. INTRODUCTION:

In order to creat intensive orchards the water supply, ground water level, favourable rootstock and variety selection are needed to be considered depending on climatic condition of the land. It is essential to use dwarf rootstock types in fertile soil which is supplied with efficient water. M-9 rootstock is considered as the best dwarf rootstock regionized in Uzbekistan. The highest biological attributes of apple variety samples grown on this rootstock allow early maturation of yield. At the process of variety selection the apple varieties are selected which are adaptable to the newly created orchard with high efficiency in growth, development, productivity, fruit quality and of economically beneficial.

The study of farm valuable biological attributes of new local and introduced varieties can enrich the complex of fruit crops in the republic. For effective use of variety in horticulture the study of its essential biological attributes and farm valuable traits, such as maturation periods, productivity, resistance for winter cold, diseases and pests, life duration of trees, capability of self-pollination, fruit taste, quality of product and validity for processing, is important for suggestion of the varieties for production [2].

Apple is one of the main fresh fruits in provision of people with fruits the whole year. The efficacy and high quality of apple yield depend on mostly proper selection of variety and its rational positioning in the soil. The varieties should be selected to orchard in such way that fruit maturing of varieties should occur one after one in order to provide people with fresh fruit regularly [1].

2. MATERIALS AND METHODS:

The aim of the research is to select variety samples of apple grafted on dwarf M-9 rootstock with high biological attributes, early maturation and capable of providing qualitative and constant yield.

The following tasks have been set for implementation of this aim:

- study of growth and development features of apple variety grafted on M-9 rootstock;
- selection of variety sample which is fast maturing, productive, resistant to diseases and pests among other variety samples;
- study of morphological and farm valuable traits of variety sample tree and fruit.

The investigation were conducted on 35 local and introduced samples of varieties planted according to 4,0x2,5m scheme and grafted on M-9 rootstock of intensive apple. Varieties were investigated by dividing them into summer, early autumn, late autumn and winter variants in accordance with their maturation period.

For phenological experiments 15 typical trees were selected and observed during all years of the investigation.

For specifying average productivity of one tree the yield of 15 typical trees was obtained and tested.

Dry matters in fruit content were checked with refractometer; total sugar quantity was determined by Bertran method; acidity was tested by A.I.Yermakova method (titration) [3].

3. RESULTS AND DISCUSSIONS:

Uzbekistan has continental subtropical climate with long hot and dry summer, and winter with less snow and frost. Abundant heat and sunlight allow to cultivating fruit varieties in the republic that may mature in different periods of the year, and to obtain qualitative yield from them. The changes of climate and early or late beginning of spring affect to process of phenological phases.

Phenological observations are necessary for timely and qualitative agrotechnics (irrigation, fertilization, disease and pest control and tree formation), determining harvesting periods, selecting pollutants properly and etc.

The beginning of growth and flowering periods is hereditary attributes of tree types and varieties. Budding and flowering occur in spring when weather temperature and soil moisture get favourable. Flowering and blooming periods may begin early or late depending on plant variety, attributes, environmental factors and implementation of agrotechnical measures.

According to data on phenological observations the variants are classified as follows:

1. the beginning period of vegetation (early, medium and late growing);
2. duration of flowering period (short, medium and long);
3. fruit maturation period (early summer, summer, late summer, early autumn, autumn, late autumn, early winter, winter and late winter).

On the results of observations conducted on summer varieties during the years the beginning period of vegetation occurred late in Mantet (Canada) and Stark Earliest (USA) comparing to control variant, and in Rustamiy (Uzbekistan) variety it occurred earlier. Duration of flowering period was observed short in Rustamiy variety, while in Mantet and Stark Earliest varieties it was short compared to the control. Among early autumn varieties fruit maturing period was noted earlier in Williams Pride (Ukraine), in Isroil variety (Uzbekistan) it was late comparing to control variant. Productivity was not observed in winter Fuji and Mutsu (Japan) varieties which have been under study (Table 1).

Table 1

Phenological indications of apple varieties with different maturation periods

Variety	Beginning of vegetation	Flowering				Fruit maturation		
		beginning	ending	duration (days)	level (score)	beginning	ending	duration (days)
Summer variety								
Pervenets Samarkanda (control)	31/III	05/IV	17/IV	13	4,1	23/VI	30/VI	7
Rustamiy	03/IV	18/IV	25/IV	8	4,5	14/VIII	22/VIII	8
Mantet	27/III	31/III	13/IV	14	5	17/VI	23/VI	6
Stark Earliest	30/III	05/IV	18/IV	14	5	19/VI	26/VI	7
Early autumn varieties								
Bolajon (control)	22/III	13/IV	20/IV	8	5	07/VII	15/VII	9
Isroil	23/III	14/IV	24/IV	11	5	25/VIII	04/IX	11
Pamyat Yasaula	22/III	17/IV	21/IV	5	3	18/IX	25/IX	8
Williams Pride	22/III	03/IV	18/IV	19	2,2	03/VII	11/VII	9
Pristin	24/III	04/IV	18/IV	15	1,7	10/VIII	18/VIII	9
Late autumn varieties								
King David (control)	24/III	17/IV	24/IV	8	5	28/VIII	04/IX	7
Prikubanskoye	23/III	14/IV	21/IV	8	5	15/IX	22/IX	7
Renora Zimnaya	23/III	14/IV	21/IV	8	5	8/IX	14/IX	6
Liberty Zimniy	23/III	07/IV	20/IV	14	5	15/IX	22/IX	7
Vagnera Prizovoye	22/III	14/IV	21/IV	8	4,3	11/IX	18/IX	7
Winter variety								
Nafis (control)	22/III	12/IV	21/IV	10	5	22/IX	31/IX	9
Mutsu	23/III	14/IV	20/IV	7	0,6	-	-	-
Fuji	24/III	17/IV	24/IV	8	0,4	-	-	-

Table 2
Productivity and quality indications of local and introduced apple varieties under investigation

Variety	Average productivity per one tree, kg			Compa-ring to control, %	Average sizes of fruit			Active tempe-rature sum (2017)	Chemical content of fruits, %		
	2016	2017	ave-rage		Weight, gr	Fruit height, cm	Fruit circle, cm		Dry matter	Sugar	Acidity
Summer variety											
Pervenets Samarkanda (control)	1,640	0,738	1,189	100	70-80	4,5	5,6	957,4	20,0±0,50	11,6±0,40	1,0±0,65
Rustamiy	1,437	2,288	1,862	157	120-135	5,5-6,0	6,0-6,5	1936,8	20,4±0,16	11,6±0,73	1,0±0,08
Mantet	2,190	2,510	2,350	198	70-80	3,3-3,6	5,0-5,5	829,7	20,2±0,08	9,4±0,16	1,2±0,04
Stark Earliest	2,838	3,357	3,098	260	60-70	3,5-4,0	5,5-6,0	876,8	19,5±0,41	10,6±0,45	1,0±0,49
Early autumn variety											
Bolajon (control)	2,381	2,096	2,238	100	40-60	3,0-3,5	4,0-4,5	1216,8	21,0±0,04	14,6±0,08	1,1±0,24
Isroil	3,802	4,327	4,064	181	250-300	7,5-8,5	8,0-8,5	2140,7	21,0±0,04	16,6±0,50	1,1±0,24
Pamyat Yasaula	0,867	1,768	1,317	59	170-180	8,0-8,5	7,0-7,5	2533,4	21,0±0,04	15,6±0,53	1,0±0,04
Williams Pride	0,611	1,324	0,967	43	100-110	4,0-4,5	6,0-6,5	1143,3	20,0±0,41	13,8±0,41	1,0±0,04
Pristin	4,198	3,429	3,813	170	140-160	5,0-5,5	6,5-7,5	2122,1	20,1±0,04	13,7±0,29	1,1±0,12
Autumn variety											
King David (control)	3,231	3,024	3,127	100	100-110	6,5-7,0	5,5-6,5	2190,4	20,0±0,20	14,0±0,41	1,0±0,08
Prikubanskoye	4,739	2,539	3,639	116	150-175	6,0-6,5	7,5-8,0	2546,7	20,0±0,07	13,8±0,09	1,1±0,16
Renora zimniy	4,293	1,038	2,665	85	180-190	6,0-6,5	7,0-7,5	2390,8	21,0±0,05	14,9±0,06	1,3±0,20
Liberty zimniy	3,949	2,986	3,467	111	130-150	6,0-6,5	7,0-7,5	2540,2	21,0±0,07	13,6±0,05	1,1±0,08
Vagnera prizovoye	-	2,103	2,103	67	240-270	7,5-8,0	8,0-8,5	2497,4	20,0±0,05	14,0±0,41	1,4±0,20
Winter variety											
Nafis (control)	1,207	3,098	2,152	100	160-170	7,0-7,5	7,5-8,5	2638,0	19,5±0,75	13,5±0,75	1,3±0,34
Mutsu	-	-	-	-	-	-	-	-	-	-	-
Fuji	-	-	-	-	-	-	-	-	-	-	-

Concordance of rootstock with variety scion may decide the productivity and economical efficacy of organized orchard. In the early years of investigation (2014-2015) productivity was not observed, because during the adapting period (5-8 days) of newly planted apple-tree grafts in newly organized orchard the fall of buds occurred. Due to sudden fall (-9,5-10,0C) of temperature in March (30-31) 2015, cold weather affected to flowering phase of trees of investigation and resulted in loss of 98-100% of fruit buds. But the varieties under the study of 2016-2017 began to produce yield. According to results the highest productivity was noted in introduced Stark Earliest variety among other summer varieties. Average productivity per a tree increased year-by-year in Rustamiy variety (3,116 kgs in 2018).

With its highest productivity Isroil variety was differentiated among early autumn varities. Comparing to control variant Pamyat Yasaula and Williams Pride varieties which were brought abroad, gave lower productivity.

Among autumn varieties Prikubanskoye(Ukraine) variety showed the highest productivity point (4,739 kgs in 2016).

The size and weight of apple varieties under investigation are categorized as follows: small (45-90 gr), medium (90-135 gr), bigger than medium (135-180 gr), bigger (180-250 gr), the biggest (250 and more gr). Small fruit producing varieties are Mantet and Stark Earliest, fruit size of Rustamiy and Williams Pride is medium, The biggest fruits are produced by Isroil and Vagnera Prizovoye varieties.

Chemical content of fruits is one of the quality indicators. It is known that the quantity of sugar matter and organic acids, and their proportion indicate consumption rate and taste. Their quality and chemical content depend on several factors, such as, geographical position of orchards, rootstock, biological attributes of

variety, conducted agrotechnical measures (irrigation, fertilization, formation) and maturation periods. Quality indications of fruits of studied varieties are shown in the data of table 2.

4. CONCLUSION:

On the data of phenological observations conducted through several years the beginning time of vegetation occurred late in studied summer varieties and it was determined that those varieties included to late growing group. The varieties with long flowering period included Liberty zimniy, Pristin and Williams Pride (14, 15, 16 days) varieties brought from abroad. According to fruit mature period local summer Rustamiy variety is related to early autumn group, Williams Pride belongs to late summer group.

By productivity Stark Earliest, Isroil, Pristin, Prikubanskoye, Liberty zimniy varieties among the studied varieties grown on M-9 rootstock have been considered as highest productive ones. Mutsu and Fuji varieties which brought abroad gave their first yield in 2018, and therefore these varieties have been regarded as late yield producing varieties comparing to other varieties grown on M-9 rootstock.

It has been determined that according to quality indications of fruit Stark Earliest apple variety has been differentiated with its fleshy fruit of fine view, good taste and precocity among summer apple varieties. Isroil features with its big shape round fruits that have good storage quality. Pristin fruits are colored, dark red, covered with spray, fruit flesh is light yellow, fleshy and storage quality is medium and similarly Liberty zimniy fruits are also colored and dark red with sprays, flesh is light yellow, dense and fleshy, good storage quality and resistant for transportation. Fruits of Rustamiy are colored and dark red, round and in fine view, flesh is light colored and medium dense, it has good storage and transportation quality and is widely served in any celebrations and parties.

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