



THE GROWING PECULIARITIES OF PEAR TREE PLANTING MATERIAL IN CONDITIONS OF HER-HER COMMUNITY OF VAYOTS DZOR REGION

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The current work pursues production goals, particularly from the prospect of expansion of pear tree nurseries. In our republic the great part of pear tree nurseries dries out due to the bacterial leaf blight, improper selection of rootstock and scion (grafter) varieties, as well as to the random selection of rootstocks. Analyses on the planting stock quality have been conducted during the work implementation in the nursery farm of Herher community considering the inoculation results of various rootstocks. Application of different rootstocks in the nursery farms promotes the establishment of saplings with high survival rate and productivity.

It is impossible to develop the branch of horticulture in the Republic of Armenia without the operation of nursery farm system and sustainable production of healthy, purebred, reliable and high quality planting material. It is relevant to use the seed plants of Willow-leaf pear tree and quince tree rootstock for the pear tree varieties investigated by our research group. Propagation via shrubs has been singled out as an efficient method for clonal rootstock propagation.

Nursery – pear tree planting material – rootstock (stock for grafting) – stem of planting stock – purebred planting material

Աշխատանքն ունի արտադրական նշանակություն հատկապես տանձենու տնկարկների ընդլայնման գործում: Հանրապետությունում տանձենու տնկարկների մեծ մասը չորանում է բակտերիալ այրվածքի պատճառով, սխալ ընտրված պատվաստակալ և պատվաստացու տրոսերի, պատահական պատվաստակալների ընտրության արդյունքում: Հերհեր համայնքի տնկարանային տնտեսությունում աշխատանքի կատարման ժամանակ, հաշվի առնելով տարբեր պատվաստակալների համաճի արդյունքները, կատարվել են վերլուծություններ տնկանյութի որակի վերաբերյալ: Տնկարանային տնտեսությունում տարբեր պատվաստակալների կիրառումը նպաստում է բարձր կաջողականությամբ և արտադրողականությամբ տնկարկների հիմնադրմանը:

Հայաստանի Հանրապետությունում առանց տնկարանային տնտեսության համակարգի գործունեության, առանց առողջ, մաքրաստրոտ, հուսալի ու հայտնի որակի տնկանյութի կայուն արտադրության հնարավոր չէ զարգացնել պտղաբուծություն:

Ուսումնասիրությունների արդյունքում պարզվել է, որ լավագույն պատվաստակալներ են համարվում ուռիատերև տանձենու սերմնաբույսերը և սերկնիլենու արմատակալները:

Տնկարան – տանձենու տնկանյութ – պատվաստակալ – տնկանյութի ելանք – մաքրաստրոտ տնկանյութ

Работа имеет производственное значение, особенно в деле расширения площадей насаждений. Большинство насаждений груши в республике высыхают от бактериального ожога, в результате неправильного избрания подвоя и привоя, случайного подбора подвоев.

В питомнике, находящимся в общине Гергер, во время нашего исследования учитывая результаты срастания различных подвоев, были проведены анализы о качестве саженцев. В питомнике использование различных подвоев дает возможность для закладки высокой приживаемости и продуктивности насаждений.

В РА невозможно развивать устойчивое плодоводство без скоординированной деятельности питомника и производство здоровых, чистосортных, надежных, известных, качественных саженцев.

Исследования показали, что лучшими подвоями являются сеянцы иволжистой груши и отводы айвы.

Питомник – саженец груши – подвой – выход саженца – чистосортный саженец

Our investigations are aimed at the study of growing peculiarities of pear tree planting materials in the nursery farms considering the rootstock. Intensification methods are considered to be actual in the branch of planting material production. Intensification of nurseries implies the import of new rootstocks, their testing per agricultural zones, then their introduction in the production, breeding of new rootstocks, application of intensive technologies for the growth of planting materials, as well as establishment of purebred and standard plant material. The current work is actual from the prospect of nursery management in the Republic of Armenia. For the first time the growing characteristics of pear tree planting stock per various rootstocks have been investigated in the Her-Her community of Vayots Dzor region.

Materials and methods. The aim of the research is to investigate different rootstocks of pear tree and their inosculation with regionalized varieties in conditions of Herher community of Vayots Dzor region. In the result of investigations, efficient, high quality varieties with low cost price should be selected, so as to grow dwarf planting material, as well as to establish and expand intensive nurseries in the Republic of Armenia. The experiments have been set up per each rootstock in triple replication with 30 rootstock-scion pair in each repetition.

The standard pear tree varieties “Dzmeruk” and “Forest Beauty” have been selected as a scion for our investigations.

The field experiments were implemented in the nursery of Herher community of Vayots Dzor region within the vegetation period of 2018-2020.

During the vegetation period the records and calculations related to the growth and development of rootstocks and grafted plants, as well as those about the output of planting material were conducted according to the universally accepted methods developed by the I.V Michurin Scientific Research Institute of Horticulture (1973), through those developed by V.A. Kolesnikov (1974), Karychev, K.G., Saveko, I.P. (2003), A.N. Tatarinov and V.F. Zuev (1984) [3; 4; 6; 10].

In the experiments the following methods were implemented to propagate the clonal rootstock - quince stock: shrub propagation and the willow-leaf pear tree was propagated via seeds.

After growing the rootstocks, grafting was implemented and then in the second field of experimental plot the survival rate was determined. The grafting per fusing each rootstock and scion was implemented in 3 repetitions and 30 pairs were used in each replication [5].

The data on the planting material output were subjected to statistic analysis through the method of two-factor experiment.

In order to determine the economic efficiency of the varieties recommended for the production, the total monetary investments and the received incomes were taken into account [2].

Results and Discussion. Planting of the rootstocks produced through vegetative method and via seeds was conducted in the experimental plot along 70x15cm² feeding area.

Our observations indicate (tab.1), that the willow-leaf pear tree has a high growing capacity. The stock of the quince tree gives way by 14.5 cm in its growing capacity. Regarding the indices of root neck diameter the seed plant of willow-leaf pear tree and rootstock of quince tree have recorded 0.8 cm-1.0 cm outcome, while the willow-leaf pear tree has been distinguished by high branching capacity.

So, the analyses of tab. 1 data disclose that the rootstock of the willow-leaf pear tree has an average growing capacity, while the quince stock has less than the average growing capacity, however, the rootstock of willow-leaf pear tree has been distinguished by high branching capacity.

Table 1. Rootstocks growing capacity before grafting

Rootstock	Average height, cm	Root neck diameter, cm
Willow-leaf pear tree	85.0	1.0
Quince tree stock	70.5	0.8

Studies on the survival rate of the grafts for different fruit varieties have been conducted by the following authors: E.N. Sinskaya (1961), Ya.S. Nesterov (1962), V.A. Polandjyan, et al., (1979), T.I. Makarenko (1987), E.S. Morikyan, G.G. Hovhannisyan (1998), I.I. Zhungietu (1991), V.I. Senin, V.V. Senin (2005), etc [1, 4; 7; 8; 9].

Table 2. The grafting survivability (success rate) of the pear tree varieties per the two-year average data /90 grafts in each rootstock-variety option/

Rootstock	Scion varieties	Total planting material, n	Grafting success rate (survivability), %	
			II field /spring testing/	
			number	%
Willow-leaf pear tree	Forest beauty	302	181	60.0
Willow-leaf pear tree	Dzmernuk	303	206	68.0
Quince tree stock	Dzmernuk	338	189	56.0
Quince tree stock	Forest beauty	338	213	63.0

The data of Table 2 testify that the Willow-leaf pear tree - Dzmernuk option demonstrates high indexes, where high grafting success rate (68.0 %) has been recorded, while in the option of Quince tree stock - Forest beauty the mentioned index was 63.0 %.

Relatively low result in inosculation has been recorded in the option of Willow-leaf pear tree – Forest beauty, the index of which makes 60.0 %. It is noteworthy that this index was only 56.0 % in the Quince tree stock – Dzmernuk option.

Our investigations have revealed that grafting success rate (survivability) declines in spring and vegetation period due to the varietal peculiarities of the rootstock and scion, incompatibility in inosculation, mechanical damages and grafting in unfavorable conditions.

Removal of the planting material and its delivery is the last and most important stage in the nursery activities. The success of various procedures and quality of the produced planting material is related to the organization of the mentioned work in most accurate manners. Preparatory activities for this stage were implemented 1-1.5 month prior to the removal of planting material.

The quality and varietal purity of the planting material was checked (shape and fuzziness of leaves, color and fuzziness of shoots, growing capacity of the aboveground part, the quantity). The planting material was removed in autumn.

The planting material is ranked in the first category, if it develops 3-5 roots with 35 cm length, which are covered with great amount of undamaged root hair, while the stem is straight and the wounds in the sections of thickened shoots' removal are well recovered. The trunk height is 20-50 cm, thickness is 2-2.5 cm, the number of main branches is 3-5 with 30-50 cm length.

In case of planting material of the 2nd category the deviations from the indices of the abovementioned category should be insignificant, i.e. it is characterized with slightly crooked trunk, shortness of the main branches and relatively small amount of root hair.

The planting materials of the third category, which are viewed as discards, have a great number of damaged roots, the trunk is well crooked, while the key branches are not developed due to which they are mainly replanted.

The subject of qualitative indices of the planting material were addressed in the research works conducted by the following authors: A.A. Simonyan (1959), K.A. Sergeeva (1971), V.K. Smykov (1982), I.S. Flyurtse, et al. (1982), E.Ye. Arakelyan (1985), L.M. Smychenko (1987), V.E. Slavgorodskiy (1987), L.I. Sergeev (2003) [1; 7].

In case of willow-leaf pear tree rootstock the variety of Dzmernuk stands apart by the high output (46.6 %) of first-category planting material (Table 3). In case of combination of the Dzmernuk variety and Willow-leaf pear tree rootstock the output of planting material fit for planting makes 98.0%. The combination of Quince tree stock and the Forest beauty variety has been distinguished by the first-category planting material (46 %). The combination of Quince tree rootstock and Dzmernuk has resulted in great amount of fit-for-planting stocking material, the output of which makes 95.8 %. The discard rate was high in the combination of Willow-leaf pear tree and Forest beauty variety (6.0 %), while in case of Quince tree stock the same variety has recorded 7.0 % discard rate.

Regarding the total planting material quantity the Dzmernuk variety together with Willow-leaf pear tree has demonstrated remarkable output amounting to 206.0 items, while the combination of quince tree rootstock and the variety of Forest beauty has resulted in 213.0 planting material.

The output of second-category planting material in the combination of Willow-leaf pear tree - Forest beauty variety has made 55.2 %, in case of Willow-leaf pear tree and Dzmernuk variety the outcome of the second category planting material has made 51.4%.

In the combination of Willow-leaf pear tree and Forest beauty the output of planting material fit for planting makes 94.2%, which lags behind the option of the same rootstock and Dzmernuk variety combination by 3.2 %. The sum of the first and second category planting material is considered to be that of fit for planting.

The discard or third category planting material has recorded low indices in the option of Willow-leaf pear tree and Dzmernuk variety (2.0%).

The data of Table 3 indicate that in the combination of Quince tree stock and Forest beauty the output of second category planting material makes 47.0%, and the output of stocking material fit for planting amounts to 93.0 % which stays behind the option of Quince tree stock and Dzmernuk by 2.8 %.

In the combination of Quince tree stock and Dzmernuk variety the output of second category planting material makes 95.8 %, while the output of the third category planting material has made 4.2 %.

Table 3. The average data on pear tree planting material

Rootstock	Scion	Total planting material, n	Planting material output per categories					
			I		II		III	
			number	%	number	%	number	%
Willow-leaf pear tree	Forest beauty	181	70.0	38.7	100.0	55.3	11.0	6.0
Willow-leaf pear tree	Dzmernuk	206	96.0	46.6	106.0	51.4	4.0	2.0
Quince tree stock	Forest beauty	213	98.0	46.0	100.0	47.0	15.0	7.0
Quince tree stock	Dzmernuk	189	68.0	36.0	113.0	59.8	8.0	4.2

/Mathematical processing was conducted through the method of two-factor experiment $LSD_{05}=9.43$, $Ex\%=1.38$ /

Table 4. The indices of economic efficiency of planting material production for different pear tree varieties (depending on the rootstock per 100 m²)

Rootstock	Scion	The total number of saplings produced per 100 m ²	Production costs per 100 m ² , thousand AMD	Sale outcomes per 100 m ²		
				Monetary income, AMD	Profit, AMD	Profitability level, %
Willow-leaf pear tree	Forest beauty	181	50.0	90500	40500	81.0
Willow-leaf pear tree	Dzmernuk	206	50.0	103000	53000	106.0
Quince tree stock	Forest beauty	213	50.0	06500	56500	113.0
Quince tree stock	Dzmernuk	189	50.0	94500	44500	89.0

Based on the circumstance that the rootstocks are planted in the experimental plot with 0.75*0.15m² feeding area and for each rootstock 890 planting material per 100 m² land area is produced, the sale price for a planting material has been estimates as 500 AMD also considering that produced planting material is annual and the 1st category planting material has very poor branching capacity and is incomplete.

With respect to profitability level the Willow-leaf pear tree and Dzmernuk variety combination has been distinguished (106.0%), while the same index in the option of Quince tree stock - Forest beauty has amounted to 113.0 %.

Production costs per 100 m² land area have been calculated as 50 000 AMD, while the prime cost has been estimated as 63.4 AMD.

It is relevant to use the seed plants of Willow-leaf pear tree and quince tree rootstock for the pear tree varieties investigated by our research group. Propagation via shrubs has been singled out as an efficient method for clonal rootstock propagation.

Application of clonal rootstocks, namely quince tree stocks, promotes the development of intensive horticulture.

REFERENCES

1. *Apoyan L.A.* Results of Research on the Cultivation of Planting Material and the Selection of Rootstocks of Fruit Crops in Arm. SSR: Collection of Scientific Proceedings/Armenian Scientific Research Institute of Viticulture, Winemaking and Fruit-growing-Yerevan, Edition XIV.- pp. 159-173, 1977.
2. *Grigoryan K.A., Grigoryan K.K., Manasaryan A.A.* The Issues of Fruits Production and Processing Economics and Marketing in the RA. Support to the AAA Student / K.A. Grigoryan, K.K. Grigoryan, A.A. Manasaryan- Yerevan, 65 p., 1999.
3. *Karychev K.G., Saveko I.P.* Efficiency of Reproduction of Clonal Rootstocks and Varieties by lignified cuttings // Horticulture and viticulture. № 6, pp. 10-11, 2003.
4. *Kolesnikov V.A.* Root system of fruit and berry plants.-M.: Kolos, 509 p., 1974.
5. *Polandjyan V.A., Apoyan L.A., Sosyan I.E.* Structural Interaction of Grafting Components with an Intercalary Insert // Biological Journal. Yerevan, 32, 7, pp. 704-708, 1979.
6. Program and methodology for the study of varieties of fruit, berry and nut crops. Michurinsk, 1973.-493 p. (Ministry of Agriculture of the USSR. All-Russian Scientific Research Institute of Horticulture named after IV Michurin, 1973).
7. *Sergeev L.I.* Plant resistance // Horticulture and viticulture.. M, № 2, pp. 10-12. 2003.
8. *Sinskaya E.N.* The Perfect State of the Question on Higher Plants Population. L., № 1, pp. 23-26, 1961.
9. *Senin V.I., Senin V.V.* Accelerated cultivation of cherry seedlings with the insertion of weak rootstocks // Horticulture and viticulture. M., № 6, p. 13-14, 2005.
10. *Tatarinov A.N.* Horticulture on Clonal Rootstocks. 2nd Edition. Kyiv: Harvest, 207 p., 1988.

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