INFLUENCE OF SUBSTRATE ON POMOLOGICAL AND CHEMICAL PARAMETERS FOR SOME APPLE CULTIVARS

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Abstract: The optimal planting distance of tree seedlings is a basic requirement for optimal utilization of agro-ecological conditions and achieving higher yields. This is especially important when it comes to apple vegetative rootstocks. Four apple cultivars were included in the research: Idared, Gloucester, Jonagold, Golden Delicious, grafted on two rootstocks. Idared cultivar is grafted on vegetative rootstock M 9, with planting distance 4 x 1.4 m, while the other three cultivars have planting distance 4 x 1.6 m, grafted on rootstock M 26. Research was conducted during 2018 and included vegetative and generative parameters for the aforementioned cultivars and rootstocks. Research has shown that the Idared cultivar grafted on the M 9 rootstock had a smaller trunk diameter of 24.13 cm while the Gloucester cultivar 28.06 cm grafted on the M 26 rootstock had the largest trunk diameter. The dry matter content in the largest fruit was in the Golden Delicious cultivar (19.37%) while the smallest amount in the Jonagold cultivar (16.97%). Differences between cultivars and rootstocks that were in research for the studied parameters were with high significant differences for both levels 0.05 and 0.01
The development of intensive orchards, represents a more accumulative production with high quality fruits in relation to the achieved yields. Based on practical experience, it has been concluded that the shape of the tree crown is only one of the successful factors in the profitability of fruit production, while all other factors are complementary, such as the number of plants per unit area and the technology of applied, which aims to maintain the most harmonious relations between the number of plants and the shape of the crown.
Keywords: Cultivars, rootstocks, pomological and chemical traits.

1. INTRODUCTION

The intensification of orchard production, and first of all the current situation of orchards in Kosovo made us think more seriously about this branch of agriculture in the future. The development of intensive orchards, represents a more accumulative production with high quality fruits in relation to the achieved yields. Based on practical experience, it has been concluded that the shape of the tree crown is only one of the successful factors in the profitability of fruit production, while all other factors are complementary, such as the number of plants per unit area and the technology of applied, which aims to maintain the most harmonious relations between the number of plants and the shape of the crown. With the introduction of contemporary tree crowns "Near the hand" has begun a new stage of development and intensification of orchards. Therefore, by cultivation system I mean the number of plants per hectare, the shape of the crown, the technology designed, the mechanism applied, etc. The lifespan of densely planted trees is 20-25 years and in order to achieve maximum intensification during exploitation, the most favorable conditions for trees should be created. The choice of rootstock, the distance of planting trees, the shape of the crown, pruning, fertilization and irrigation, requires specialists who know the new trends in the development of orchards Miljković 1991, Efendija, 2002. Apple cultivars grafted under the same conditions in different apple rootstocks over the years they develop in different thicknesses and dimensions of the crown. This change is important in the life of the tree judge Sylanaj et al. 2008. The aim of the research was to compare the impact of M 9 and M 26 rootstocks on some pomological parameters of Idared, Gloucester, Jonagold and Golden Delicious apple cultivars in order to show the impact of setting adequate planting distances.

2. MATERIAL AND METHODS

The research was conducted during 2018 in a private orchard with an area of 0.70 ha. The soil was of the Smonicë type (Vertisol), with good physical and chemical properties. Up to a depth of 60 cm on average contains 3-4% humus. The trees are grafted: Idared cultivar in M 9 rootstock with planting distances 4 x 1.40 m while Gloster, Jonagold and Golden Delicious cultivars in M 26 rootstock with planting distances 4 x 1.60 m. The shape of the crown is pointed shrubs. During the year all agro-technical maintenance measures were taken (pruning, fertilization, tillage, protection against diseases and pests). Research has included 4 bodies in 4 replications for each cultivar and rootstock. Vegetative growth (diameter, height and width of the crown) is measured at the end of vegetation. Samples were taken during the harvest to research the chemical content of the fruit. The following have been researched: dry matter content (determined with a refractometer), sugar with Brix, general acids- (titration with

NaOH), vitamin C (Iodometric method). The obtained results were processed by analysis of varianscs-ANOVA. The significance of the differences between the treatments was confirmed by LSD test at the level of 0.05 and 0.01.

3. RESULTS OBTAINED AND DISCUSSION

The results of our research have included the collection of data on the vegetative growth parameters of apple cultivars grafted into two vegetative rootstocks.
These results are presented in tab.1.

Tab.1. Crown height on different apple cultivars (cm)

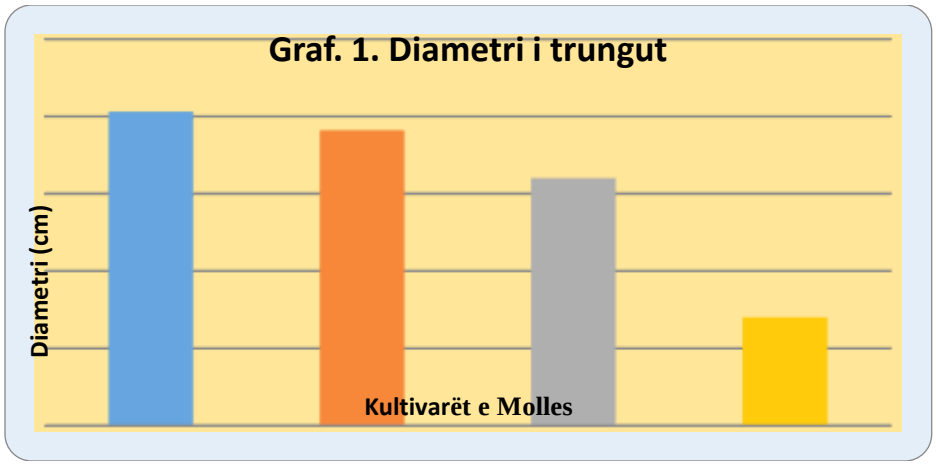
Cultivars and rootstocks	**Crown height**	**Gloster**	**Idared**	**Jonagold**
Golden delicious M 26	265.75	23.25	24.50*	25.75*
Gloster M 26	242.50		1.25	2.50
Idared M 9	241.25			1.25
Jonagold M 26	240.00			
LSD $_{0.05}$ = 23,79				
LSD$_{0.01}$= 32,13				

Based on the data presented in tab 1. it was found that the highest height of the crown had the cultivar Golden delicious (265.75 cm) grafted on the sub-root M 26, while the lowest height of the crown had the cultivar Jonagold (240.00 cm) grafted under M 26. The differences between the Golden delicious cultivar compared to the Idared and Jonagold cultivars were significant, whereas compared to the Gloster cultivar these differences were not significant. The fruiting beginning of the trees, while later the regular fruiting depends in the first place on the type of trees, the biological properties of the cultivar, as well as on the sub-graft in which the cultivar is grafted Zajmi et al.2002, 2006.
The results of crown width on cultivars and different apple rootstocks are presented in tab. 2.

Tab 2. Width of crown on cultivars and different apple rootstocks (cm.)

Cultivars and rootstocks	**Width of the crown**	**Gloster**	**Idared**	**Jonagold**
Golden delicious M 26	102.25	12.82***	38.22***	41.92***
Gloster M 26	93.42		25.40**	29.10**
Idared M 9	64.32	-	-	-
Jonagold M 26	68.02			3.70
LSD $_{0.05}$ = 4.70 0.01 = 5.49				

The width of the crown between cultivars is distinguished by changes in values. The largest width of the crown had the cultivar Golden delicious 102.25 cm drawn on the rootstock M 26, while the smallest width of the crown had the cultivar Idared 64.32 cm grafted on the rootstock 9. The differences between rootstocks and cultivars were high significant. The rootstock should have three main properties: good soil reinforcement ability, early fruiting and poor fertility Modric et al. 1980.
The same author finds that the sub-graft MM 106 at the end of the third vegetation has given higher rankings than all other sub-grafts. Our results approximately match the results mentioned by the aforementioned authors as the M 26 sublayer has the greatest buzz in all the researched parameters. Trunk diameter is a very important parameter for cultivars grafted on different apple rootstocks.
Trunk diameter data are presented in graph 1.



The largest diameter had the cultivar Gloucester 14.08 cm grafted on the rootstock M 26, while the smallest diameter had the cultivar Idared 13.70 cm grafted on the rootstock M 9. The differences between cultivars were significant.

The chemical properties of apple fruits grafted in different overgrowths are presented in tab. 3

Tab.3. Chemical properties of apple fruits grafted in different sub-grafts

Cultivars and rootstocks	**Water %**	**Materials dried %**	**Sugar Brix %**	**General acids (g/kg) and apple acid**	**Askorbic acid mg/kg**
Golden delicious M 26	81.36	18.63	11.90	5.46	70.6
Gloster M 26	82.33	17.66	11.50	4.83	72.7
Idared M 9	80.62	19.37	12.93	3.96	68.9
Jonagold M 26	83.02	16.97	11.63	4.13	74.7

From the data presented in the tab. 3 it can be seen that the highest percentage of water was in the Jonagold cultivar (83.02%) grafted on the M 26 rootstock, while the least water was on the Idred cultivar (80.62%) grafted on the M 9 rootstock. Dry matter 19.37% and Sugar 12.93% has the most Idared cultivar, while the least dry matter 17.66% and sugar 11.50% has the Gloucester cultivar grafted on the M substrate 26. General acids (3.96 g / kg) and Ascorbic acid 68.9 mg / kg Idared cultivar has the least, while Golden delicious cultivar grafted on M 26 has the most general acids (5.46 g / kg) and Jonagold cultivar grafted on M 26 graft has ascorbic acid (74.7 mg / kg).

4. CONCLUSION

Based on the research conducted for four apple cultivars, grafted on the vegetative rootstock M 9 and M 26 and planted in Smonic Soil (Vertisol) in agro-ecological conditions of the "Radullovc" facility, the following conclusions can be drawn:

- The crown height of different cultivars varies slightly. The highest crown height had the Golden delicious cultivar (265.75 cm) grafted on the rootstock M 26, while the lowest height of the crown had the Jonagold cultivar (240.00 cm) grafted on the sub-graft M 26.
- The largest diameter of the trunk is the Gloucester M 26 cultivar (18.08 cm) while the smallest Idared cultivar (13.70 cm.) Grafted on the M 9 rootstock.
- Dry matter 19.37% and Sugar 12.93% have the most Idared cultivar grafted on the rootstock M 9, while the least dry matter 17.66% and sugar 11.50% have the cultivar Gloucester grafted on the rootstock M 26.

These results will be important for further research on combinations of rootstocks and apple cultivars grown in Kosovo orchards.

LITERATURE

Duhanaj, Gj. (2017). Hulumtimet pomologjike ne pemishten individuale ne katër kultivarë te mollës. Punim i temës se masterit. Prishtinë.

Efendija, T. (2020). Pemëtaria e përgjithshme. Prishtinë.

Miljković, I. (2019). Suvremeno voćarstvo. Nakladni Zavod Znanje. Zagreb.

Modric, J., & Kolaric, J. (2019). Rezultati osmogodisnji proucovanja novijih sorti i podloga jabuka u plantazi "Borinci"-Vinkovci. Jugoslavensko vocarstvo.53-54:157-164.

Shala, A. (2015). Fisnikërimi i pemëve dhe hardhisë së rrushit. Fakulteti i Bujqësisë. Prishtinë.

Sylanaj, S., & Shoshi, R. (2018). Comparison of two methods of bud and scion grafting on apple rootstock. Zbornik referatov 2. slovenskega sadjarskega kongresa z mednarodno udeležbo Krško, 31. januar – 2. februar .

Zajmi, A.R., Sylanaj, S., & Berisha, B. (2016). Pemëtaria Praktike. Shoqata per Hortikulture e Kosovës. Prishtinë.

Zajmi, R., Sylanaj, S., & Zajmi, K. (2016). The Coefficient of Fruitfuness of Some Combinations betwen Rootstocks and Apple Varieties. XXVI th International Horticultursl Congres. Toronto. 11-17. 08.