



Examination of Compatibility of Autochthonous Pear Cultivars from the Region of Northeastern Bosnia with Vegetative Rootstock of the Genus *Cydonia* sp

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/IJPSS/2022/v34i430855

Open Peer Review History:

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: <https://www.sdiarticle5.com/review-history/83147>

Original Research Article

Received 05 December 2021
Accepted 11 February 2022
Published 18 February 2022

ABSTRACT

Rootstocks of the genus *Pyrus* are easily adapted to climatic conditions and such trees are more resistant to *Erwinia amylovora*, but they also have disadvantages because these trees are more lush and difficult to grow in dense composition. The production of pears in a dense composition is a tendency of intensive pear production, and quince rootstocks are used for this purpose, because it is easier to control the height of the stem.

The increase in the density of the composition in pear orchards is directly related to the use of vegetative rootstocks of less lushness, such as rootstocks of the genus *Cydonia* sp. The research included five autochthonous pear varieties: Takiša, Jeribasma, Šećerka, Karamut i Huseinbegovača.

The tests were performed at the location Voćni rasadnik, Špionica, City Srebrenik, Tuzla Canton, Bosnia and Herzegovina, during the vegetation of 2021.

Morphometric analyzes were performed on a sample of 30 seedlings for each pear variety. Average results are presented using MS Excel software packages.

Seedlings of grafted varieties on the basis of diameter did not meet the conditions of marketing, while on the basis of vegetative growth, three varieties met the conditions of marketing of planting

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material. The research was conducted within the project number 02 / 9-712-1-5-4 / 21. Grafted autochthonous varieties in the year of grafting showed extremely good adhesion with the vegetative rootstock BA-29, but did not have a good diameter. Due to the possibility of remanence, it is necessary to continue research after planting seedlings in plantations.

Keywords: Incompatibility; autochthonous varieties; vegetative rootstock BA 29.

1. INTRODUCTION

Balkan have been shaken by wars and migrations for centuries, and where migration and nomadic life are practically a century-old way of survival. Fruit trees are synonymous with peaceful living and the first sign that someone has settled in one place, where he sees the stability in front of him long enough to be able to plant fruit trees that will grow, bloom and bear fruit for many years to come.

This almost cultic attitude towards fruit trees has led to the fact that the local population in countless places in accordance with the customs of different ethnic and religious groups that met, touched and permeated in this area grew and preserved various fruits as part of their personal and cultural identity.

It is precisely in this attitude towards fruit trees that the Balkans has become a treasury in which longevity has been ensured for various species, varieties and natural populations of spontaneously isolated genotypes, ie an extremely rich gene pool of fruit trees has been preserved in a relatively small area.

The richness of the pear gene pool, but also its importance and value, can be highlighted by the fact that in BiH today about 20,000 pear seedlings are grafted and sold. Which spontaneously expanded and received the status of indigenous varieties. Although to date this issue is not scientifically processed and it has not been scientifically confirmed how much is really such genetic material that can be determined as a variety, or it is a population of genotypes under a common name, that is the same genotypes that have been given different local names [1].

Indigenous fruit varieties represent significant plant genetic resources that will be especially important in the future.

Domestic or autochthonous varieties are those varieties that have been associated with our region since ancient times, whose origin is unknown or if it is known, it is uncertain [2].

Scientific research has shown that the rootstocks strongly influenced the fruit yield, fruit quality and the intake of mineral elements of the leaves of certain pear varieties.

Pyrus rootstocks are also used for grafting pears because they are easily adapted to climatic conditions and such trees are more resistant to *Erwinia amylovora*, but they also have disadvantages because these trees are more lush and difficult to grow in a dense composition [3].

Quince rootstocks are used for the production of pears in a dense composition, because it is easier to control the height of the tree [4].

The increase in the density of the composition in the pear orchard is directly related to the use of vegetative rootstocks of less lushness, such as rootstocks of the genus *Cydonia* sp. [5].

Anatomical compatibility between rootstocks and seedlings is essential for grafting success [6].

When growing pears on a quince rootstocks, there is incompatibility, inconsistency with certain varieties of pears, which means that some varieties can be grown directly on quince rootstocks and some can not [7].

The mismatch, or incompatibility, may be partial or complete. Complete mismatch is manifested in the way that the graft dries and does not stick to the substrate. In the case of a partial mismatch, the rootstock and the graft grow together, but there is still a disturbance in growth and fertility. In remanence, the rootstock and graft initially grow together and develop well, and with the emergence of the fruit, cracking occurs at the joint. Based on our own research on the variety Citronka, it was concluded that this variety grafted on vegetative rootstock BA 29 had exceptional adhesion, good diameter and good vegetative growth in the nursery. After planting the seedlings in the plantation, it had a weak vegetative growth and remained undeveloped.

In the case of pear varieties grafted on quince rootstock, it was found that they do not have good compatibility with quince rootstocks.

In practice, it is important to know which varieties of certain fruit species are compatible with each rootstocks.

Previous research has shown that the analysis of carbohydrate accumulation can determine the compatibility of grafting pear varieties with different rootstocks of quince and pear [8].

The choice of rootstocks can affect the growth, yield and quality of fruits as well as tolerance to pests and pathogens. [9,10]. Fruit trees grafted on lush rootstocks have the tendency of reduced availability of light, which results in poorer color of the fruit in contrast to poorly lush rootstocks [11]. Tests on the Pakams triumph pear variety showed that the yield was increased in trees grafted on the rootstock MC and that the dry matter content in the fruits of the tested variety was increased [12,13].

2. MATERIALS AND METHODS

Indigenous genotypes that have been the subject of research are some of the most famous and widespread domestic and domesticated varieties in BiH. The tests included 5 indigenous varieties of pears, Takiša, Jeribasma, Šečerka, Karamut

and Huseinbegovača at the location Špionica, Srebrenik (Fig. 1).

All varieties were grafted on vegetative rootstock of pear (Dunja BA-29 (BAC-29)) by the method of English compound on vegetative rootstock of pear (Dunja BA-29, planted a year ago with a planting interval of 0.15 x 0.90 cm. The cultivation and care of seedlings was carried out by known standard measures in nursery production.

Morphometric analyzes were performed on a sample of 30 seedlings for each pear variety with a digital movable Harden caliper (0 - 150 mm) and a wooden meter. Average results are presented using MS Excel software packages.

3. RESULTS AND DISCUSSION

I have just only one year old results at this time. It is necessary to continue the research in the next two years in order to determine the results of compatibility in the period after planting pears in the field and after their germination. Data on average vegetative growth are shown in Table no.1.

In the examined sample, the sort Karamut had the highest vegetative growth (902.2 mm) during one vegetation, while the sort Jeribasma had the smallest vegetative growth (483.3 mm) in the same time period.



Fig. 1. Voćni rasadnik, Srebrenik

Table 1. Height of one year old stems (mm)

Variety	Jeribasma	Takiša	Huseinbegovača	Karamut	Šečerka
Height of one year old stems (mm)	483,3	870	640	902,2	780

Table 2. The average diameter of the tree at a height of 100 mm from grafting spot

Variety	Jeribasma	Takiša	Huseinbegovača	Karamut	Šećerka
Average tree diameter	5,62	8,90	6,99	9,71	9,71

Table 3. Growth index

Variety	Jeribasma	Takiša	Huseinbegovača	Karamut	Šećerka
Growth index (diameter/growth)	1,161	1,022	1,092	1,076	1,24

The growth index of Šećerka was 1.24, while that of Huseinbegovača was 1.022

**Fig. 2. Cross-section of the grafting spot at the end of the vegetation**

According to the Rulebook on the marketing of fruit propagating materials and fruit seedlings intended for fruit production in Bosnia and Herzegovina, the minimum vegetative growth is 700 mm. Based on the results presented in Table No. 1, it can be concluded that in the sort Takiša, Šećerka and Karamut the average growth satisfies the conditions for placing planting material on the market. In the case of the Jeribasma and Takiša sorts, the average growth does not correspond to the conditions for placing planting material on the market. With these sorts, it is necessary to do additional treatment, additional education (care), another vegetation.

Data on the average diameter of trees of autochthonous varieties at a height of 100 mm from the grafting spot, grafted in the Voćni Rasadnik Špionica in the year of observation are shown in Table 2.

Based on the table data, it can be seen that the sorts Karamut and Šećerka had the same and the largest average seedling diameter (9.71) measured at a height of 100 mm from the grafting spot.

The Jeribasma sort had the smallest average diameter (5.62). The tested grafted sorts based

on the average diameter do not meet the conditions of marketing (min. 10 mm) of planting material.

4. CONCLUSION

At the end of the vegetation, by controlling the coalescence, it can be concluded that the coalescence was extremely good (Fig. 2). There were no cracking of seedlings, at the grafting spot, during removal as well as during manual bending and breaking. Seedlings of grafted sorts on the basis of diameter did not meet the conditions of marketing, while on the basis of vegetative growth, three sorts met the conditions of marketing of planting material. Research needs to continue due to the possibility of remanence.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Salkić B. Characterization of the autochthonous pear gene pool in BiH, 10 /

- 3.2084 / 12, Faculty of Agriculture in Banja Luka; 2012.
2. Nenadovic-Mratinic E. Indigenous apple varieties in the Potkopaonica region, Jug.vocarstvo, no. 86., Čačak; 1988.
 3. Ikinici A, Bolat I, Ercisli S, Kodad O. Influence of rootstocks on growth, yield, fruit quality and leaf mineral element contents of pear cv. 'Santa Maria' in semi-arid conditions. Biol Res. 2014 Dec 16;47(1):71. DOI: 10.1186 / 0717-6287-47-71. PMID: 25723734; PMCID: PMC4289542.
 4. Betol N, Edvan AC, Sanches J, Antonijali S. Production and postharvest quality of pear tree cultivars in subtropical conditions at eastern of Sao Paulo state, Brazil. 2014;44:1740-1746. DOI: 10.1590 / 0103-8478cr20131574.
 5. Francescatto P, Pazzin D, Gazolla Neto A, Fachinello JC, Giacobbo CL. Evaluation of graft compatibility between quince rootstocks and pear scions. Acta Horticulturae. 2010;872(872):253-260. DOI: 10.17660 / ActaHortic.2010.872.34.
 6. Sansavini S, Musacchi S. New pear orchards: densities, rootstocks, training systems, Rivista-di-Frutticoltura-e-di-Ortofloricoltura. 2000;84-94.
 7. Rafael P, Edvan AC, Wilson B, Maria L. Sant'anna T, Francisco de Assis AMF, Marcelo AC. Production of quince nursery trees by different grafting methods, Ciência Rural, Santa Maria. 2010;40(5):1049-1052. ISSN 0103-8478.
 8. Miljković I. Pear rootstocks, Pomologica croatica. 1997;3(1-4).
 9. Anoban N, Öztürk A. Determination of graft compatibility of pear cultivars grafted on different rootstocks by carbohydrate analyzes. Commercial Construction; 2022.
 10. Đurić G, Žabić M, Rodić M, Stanivuković S, Bosančić B, Pašalić B. Biochemical and pomological assessment of European pear accessions from Bosnia and Herzegovina. Horticultural Science (Prague). 2015;42(4):176-184.
 11. Ikinici A, Bolat I. Comparasion of yield, fruit quality and leaf nutrient content of some pear cultivars. International Multidisciplinary Congress of Eurasia, Proceedings; 2016;2:208-219.
 12. Palmer J, Lozano L, Chagne D, Volz R, Lin-Wang K, Bonany J. Physiological, molecular and genetic control of apple skin coloration under hot temperature environments. Acta Horticulturae. 2012;929:81-87.
 13. Pasa M. da S, Fachinello JC, Schmitz JD, De Souza ALK, De Franceschi E. Growth, yield and fruit quality of pear grafted on quince rootstocks and Pyrus calleryana. Revista Brasileira de Fruticultura, Jaboticabal-SP. 2014;34(3):873-880.

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Peer-review history:

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