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VERIFICATION OF THE ROOTSTOCK ON THE INFLUENCE ON THE GROWTH AND FRUITING PROCESS TO SOME VARIETIES OF APRICOTS

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ABSTRACT

In order to achieve a balance between growth and fruiting, we need to know the peculiarities of growing and fruiting apricot varieties in different areas of the country, in different climatic conditions and under the influence of different rootstocks.

From the analysis of the root system we conclude that varieties with a more developed root system, such as NJA 42 have a higher vigor, and varieties with a more superficial root system, give the trees a lower vigor.

Varieties with thicker roots in greater numbers, help the absorption of nutrients from the soil, helping the normal development of trees.

The study of the peculiarities of tree growth, can specify the way of cutting the respective species, the optimal choice of the crown shape as well as the way of forming the crown.

According to the obtained data, we specify that the first order branches represent 30.6% of the total length of the skeleton, and the second order branches represent 69.2%.

In the southern part of the country, the researched apricot varieties have demonstrated their favorability for this area, through superior quantity and quality.

INTRODUCTION

Knowing the particularities of growing and fruiting, the evolution of the root system, the resistance to diseases and pests results in obtaining a maximum performance of those varieties in correlation with the rootstock and the climatic conditions in the area.

If the root system particularities are not considered, the agrotechnical measures applied for orchards cannot have the desired efficiency.

The rootstock selections also went on in France, (Bernhard et al., 1988), where varieties being more or less incompatible to the rootstocks are classified, but it is specified that the weak union is due to the growing conditions of the fruit tree.

The obtaining of new varieties of apricot tree that are qualitatively and quantitatively superior is signalled in many works; thus, in China, the Longjinmi variety was obtained, which is an early, stable variety with high performance and of high quality, (Xue et al., 2020). The low adaptability of the apricot tree has led to the implementation of some programs, so that the program in Slovakia followed several goals, namely: frost resistance, fruit quality, resistance to diseases (PPV, Monilinia), new varieties of apricot tree and new rootstocks, (Benedikova et al., 2010).

The largest surfaces of apricot tree were found, in 1985, in the counties in southern, south-eastern and western Romania, namely in Constanța, Tulcea, Dolj, Teleorman, Olt, Mehedinți, (Cociu, 1993).

Southern Oltenia offers very good conditions on sands for growing and fruiting pear varieties with early and late maturation, (Baciu et al., 2008).

Within the plum varieties grafted on different rootstocks, the varieties grafted on Oteșani 8, showed a lower intensity of photosynthesis than the varieties grafted on P.F. Roșior văratec, (Cichi et al., 2019).

There is also a program for apricot tree growth in Italy, where it is required to offer adapted varieties with high flavour, resistance to plum pox, resistance to brown rot and to fruit cracking, (Bassi et al., 2010). Some works specify the effect of the plum pox attack (Sharka) together with the methods to avoid the infection and also the use of those varieties resistant to Sharks, by removing the factors of virus transmission, (Nemeth et al., 1988).

The new, recently obtained selections of apricot tree, such as „VOJ 5/145”, are resistant to plum-pox, they are precocious and resistant to the low temperatures in spring, (Suran et al., 2020).

The Ruza variety was launched by the University of Belgrade; it is a productive variety, with late blooming, suitable both for processing and for fresh consumption, that may be grown in Belgrade area, (Milatović et al., 2018).

Worldwide fruits yield is limited by different biotic and abiotic constrainers. Among abiotic ones, pathogens attack may impact both fruits quantity and quality and sometimes leading even to the whole tree dieback, (Paraschivu et al., 2020; Paraschivu et al., 2021).

Climatic conditions influence the fruiting of trees, so in some plum varieties, the flowering phenophase occurred in just six days due to higher average temperatures, (Cosmulescu et al., 2008).

An important role is played by the identification and evaluation of varieties with productive performances and qualitative performances, (Cichi et al., 2019).

MATERIAL AND METHOD

The experiment refers to seven varieties grafted on wild apricot tree on a package, the used distance was 4,0/5,0 m, the used crown shape was improved and the researched varieties were the following: Timpurii de Arad, N.J.A. 42, Pannonia, Harcot, Cea mai bună de Ungaria, Sulmona, Excelsior. The measurements and the observations were made throughout the two years of research and the goals were the following: monitoring the development of the rootstock root system; specifying the growing and fruiting profile of the experimented varieties; the total length of the biostructural elements of the tree crowns; the intensity of the leaf photosynthesis process; the resistance degree to diseases and pests; the production quantity and the fruit quality.

During the 2017-2019 research, many determinations were accomplished, namely: the phenophases of the vegetation organs and of the fruiting organs were registered on certain control branched that were established and marked; there were measurements for the annual growths, the fruit tree height, the width of the fruit tree trunk, the fruiting organ were monitored on control branches.

The monitoring method for the root system growth is the profile method and the intensity of the leaf photosynthesis processes was determined by means of the spectrophotometer. For interpreting the physiological phenomena specific to this experiment with seven varieties and one rootstock, we harvested apricot leaves from the shoots from the bottom, from the middle and from the top of the trees, Similarly, the leaves coming from these shoots were harvested from the middle of the shoot.

The resistance degree to the attack of diseases and pests is primary and it was appreciated by means of the FAO scale. Regarding the soil preparation, it was done according to the corresponding technology.

RESULTS AND DISCUSSIONS

According to these mentioned data, (figure 1) we found more roots for the NJA 42 variety – 144, then for the Sulmona variety – 121 roots, for the Excelsior variety - 99 and the smallest number of roots was present for the Timpurii de Arad variety - 93. The NJA 42 variety showed, on the wild apricot tree, a soil penetration depth of up to 70 cm, the Timpurii de Arad and Excelsior varieties went up to 60 cm, and the roots only got to 50 cm for the Sulmona variety. Therefore, the NJA 42 variety, having the richest root system proves medium to high vigour, the Sulmona variety proves medium vigour and the Timpurii de Arad variety, having the smallest number of roots, proves low vigour.

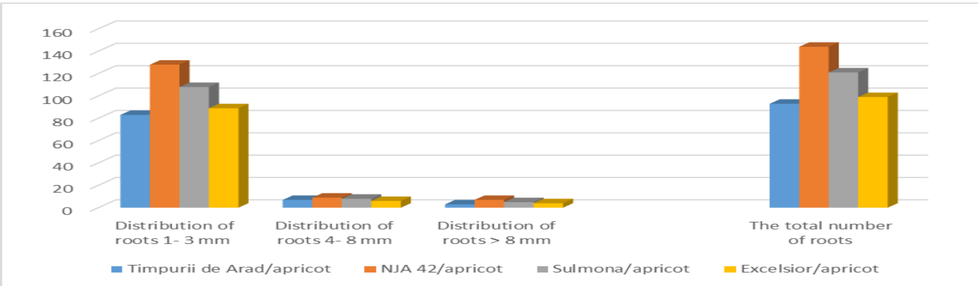

Figure 1. Distribution of the root system in some varieties of apricot

Depending on the vegetation start, the varieties having an early start are Timpurii de Arad, NJA 42, the varieties having medium start are Pannonia, Harcot, Cea mai bună de Ungaria. The varieties having late vegetation start were Sulmona and Excelsior: March 23th – March 30th.

The varieties having early blooming are Timpurii de Arad and NJA 19 between March 28th, - April 2nd, then Pannonia and Harcot between March 30th – April 3rd. The blooming ends 12-14 days after the appearance the first blossoms, which is an important aspect supporting the pollination and the fruit bearing.

The fruiting diversity, respectively the high vigour of the varieties of Harcot, Pannonia and NJA 19, is also supported by the long and short formations and the May bouquets, namely the short formations, prove the low vigour of the fruit trees.

Depending on the development of the main branches, we may classify the varieties on their vigour as such: - varieties having medium to high vigour: the NJA 42 variety having a branch amount for the 1st and 2nd order of 4900 cm/tree; - the varieties having lower vigour are Timpurii de Arad (4100 cm/tree), Harcot (4210 cm/tree), Sulmona (4650 cm/tree) and Excelsior (4910 cm/tree).

The percentage of the 2nd order branches is smaller for the low-vigour varieties Timpurii de Arad – 67,5 %, Sulmona – 66,6 % and Excelsior – 69,2 %, (figure 2).

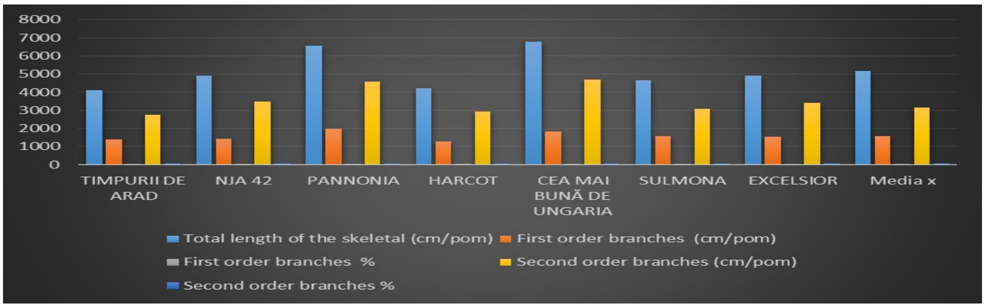

Figure 2. The total length of the skeletal branches of the crown of trees to several varieties of apricot

The analysis of the physiological phenomena was accomplished between 2017 - 2019 and it referred to photosynthesis. All these phenomena were studied within two final phenophases, namely: the intense growth of shoots (CIL), decelerating and stopping the shoot growth (ICL).

Thus, figure 3 shows that the intensity of the photosynthesis process varies from one year to another and from one combination (variety/rootstock) to another. On the wild apricot rootstock, we found that certain varieties presented an intensity of the photosynthesis process higher than the other varieties. Considering the average of the years, with high photosynthesis intensity, the following varieties stood out: Harcot (23,8 mg $CO^2/dm^2/h$), NJA 42 (23,1 mg $CO^2/dm^2/h$) and Excelsior (23,0 mg $CO^2/dm^2/h$). The varieties having a lower intensity were Sulmona and Timpurii de Arad with values such as 22,7 and 22,3 mg $CO^2/dm^2/h$. The varieties of Pannonia and Cea mai bună de Ungaria registered the lowest values of intensity, respectively 20,0 – 20,4 mg $CO^2/dm^2/h$.

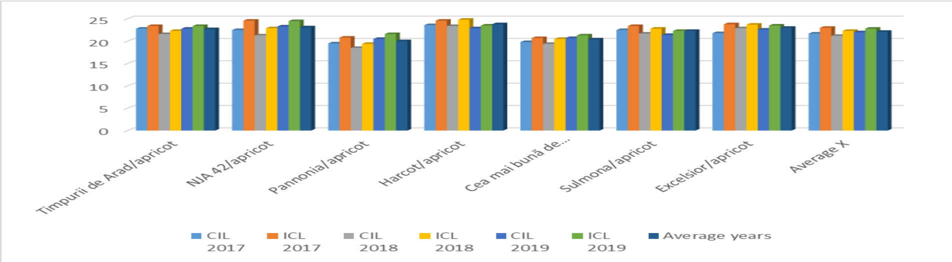

Figure 3. The intensity of the photosynthesis process (mg $CO^2/dm^2/h$)

Considering the two vegetative phases, the phase of decelerating and stopping the shoot growth has high values of intensity than the intense growth of shoots, therefore, in 2017, the value was 23,0 mg $CO^2/dm^2/h$, in 2018, it was 22,3 mg $CO^2/dm^2/h$ and in 2019 it was 22,8 mg $CO^2/dm^2/h$.

This happens because of the continuous forming of new leaves reaching normal sizes, the assimilation surface enlarges and, at the same time, the photosynthesis intensity is higher than the one of the intense growth of shoots. In the years 2017 and 2019, the intensity of the photosynthesis process was higher than in the year 2018 for both of the phenophases.

We may notice the variety effect on photosynthesis, which stands out separately on phenophases throughout the three years. Therefore, the varieties having higher intensity for the intense growth of shoots were: the Harcot variety for all three years, Timpurii de Arad and NJA 42 in 2017 and 2019, Excelsior in 2018 and 2019, Sulmona in 2017, Pannonia and Cea mai bună de Ungaria in 2019.

For the phase of decelerating and stopping the shoot growth, the values of the photosynthesis intensity were oscillating, thus the varieties having higher values of the photosynthesis were the following: Harcot in 2017 and 2018, Timpurii de Arad and NJA 42 in 2017 and 2019, Excelsior in 2017 and 2018, Sulmona in 2017, Pannonia and Cea mai bună de Ungaria in 2019, (figure 4).

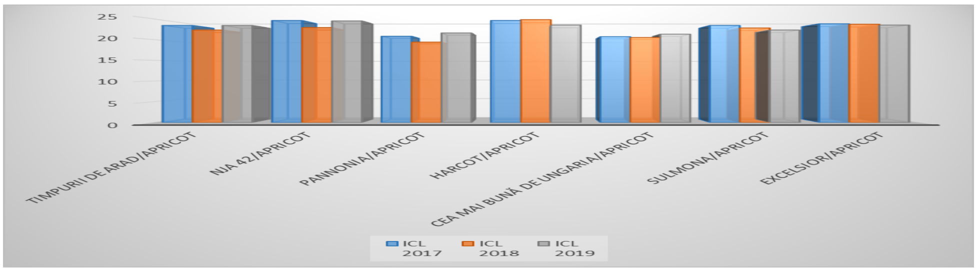

Figure 4. Influence of the variety on the photosynthesis for the phase of decelerating and stopping the shoot growth (mg $CO^2/dm^2/h$)

The effect of the separate rootstock for the two phenophases may be noticed in figure 5, where the wild apricot rootstock influences the highest intensity of the photosynthesis in the vegetative phenophase of decelerating and stopping the shoot growth in all three years, as the values are between 23,0 – 22,3 – 22,8 mg $CO^2/dm^2/h$.

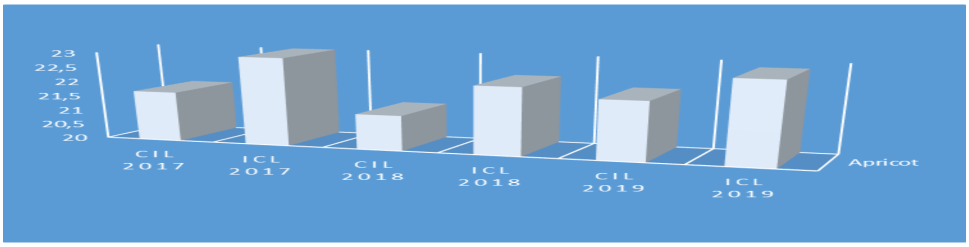

Figure 5. Influence of the rootstock on photosynthesis within both of the phenophases (mg $CO^2/dm^2/h$)

This is because the leaves grow during the phenophase of stopping the shoot growth, respectively the leaf stomata become mature.

CONCLUSIONS

The high number of absorption roots of 1-3 mm requires the provision and distribution of fertilizers along the whole projection of the crown, for a very good development of the fruit trees.

After analysing all the phenophases of the vegetation organs, we appreciate that the apricot species has a long vegetation period, with an average of 135 – 145 vegetation days.

The beginning of the blooming is a very important phenophase because the early blooming may be surprised by a comeback of the low temperatures in March, which will totally affect the open blossoms.

The varieties show different maturation depending on the climate development, thus the fruit maturation occurs approximately in the same period due to some favourable temperatures that followed immediately the blooming.

The fruition particularity represents an important element that influences the vigour of the fruit trees.

The main branches of the 1st and 2nd order are an important element for the development of the fruit trees.

The intensity of the photosynthesis process may be influenced by the combination of the two partners, namely variety/rootstock, but also by the external factors. For the apricot tree, the variety has greater influence on the photosynthesis process.

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