Rooting of herbaceous minicuttings of different cultivars of peach rootstocks under the effect of IBA

Cari RF Timm1*, Márcia W Schuch1, Zeni FP Tomaz1, Doralice LO Fischer1 and Newton A Mayer1

1 Universidade Federal de Pelotas, Programa de Pós-Graduação em Agronomia, Postulaturas de Cultivo Temperado, Departamento de Fitotecnia, Caixa Postal 354, CEP 96.016-900 Pelotas, RS, Gran de do Sul, Brasil. E-mail: timm@ufpel.edu.br; marcosw@ufpel.edu.br; alpimenta@yahoo.com.br; dtomaz@ufpel.edu.br; ndamier@ufpel.edu.br; mfischer@ufpel.edu.br; ndmayer@ufpel.edu.br. *Doloriciente LO Fischer, Dra. Fariha RF Timm, PD Dr. Marcia W Schuch, Dr. Cari RF Timm, Dr. Newton A Mayer.

ABSTRACT

The use of sexually propagated rootstocks is a major problem for peach crops in Brazil due to lack of plant homogeneity, which affects orchard production and longevity. To tackle the heterogeneity problem, clonal propagation is a promising alternative for the production of quality seedlings. There are few rootstocks options available in Brazil for stone fruit, and research work in this area is relatively recent. Therefore, this study aimed at assessing the technical feasibility of the propagation of some peach cultivars such as Capdeboscq, Albrigh, Niamenad, Niemapuard and Rostapoud, through herbaceous minicuttings. In addition, different concentrations of IBA (0, 1.000, 2.000 and 3.000mg L⁻¹) were tested. The minicuttings were immersed in a solution for five seconds and, then, placed in a SANPACK® hinged clear plastic package for food, with 10x13x20cm of height, width and length, respectively, containing medium vermiculite. The experiment was conducted with four replications of 20 minicuttings, and kept in a greenhouse. At day 60, the rooting percentage, number and average length of the three longest roots, number and length of the longest root, and number and length of the longest shoot were evaluated. After the rooting period, the greatest rooting percentage for Capdeboscq cultivar was observed, with 74%, using IBA concentrations of 2.000 and 3.000mg L⁻¹.

Key words: Propagation, minicuttings, phytohormones, homogeneity.

INTRODUCTION

One of the main problems that peach crop presents in Brazil is the lack of plants homogeneity, resulting from sexual propagation of rootstocks. In other countries, the reality is different, since, in the main producing areas of the world, seedlings obtainment is done with clones and/or selections of genetically stable cultivars that guarantee orchards uniformity, longevity and productivity (Loerti 2008).

Despite the remarkable advances obtained with the breeding of crown-cultivars, there are few researches on rootstocks due to the absence of a clonal cultivar for recommendation (Mayer et al., 2007). In the southern region of the country, where stones from different cultivars of peach rootstocks are used, the uniformity problem, propaga-
tion is a promising alternative for the production of quality seedlings. There are few rootstocks options available in Brazil for stone fruit, and research work in this area is relatively recent. Therefore, this study aimed at assessing the technical feasibility of the propagation of some peach cultivars such as Capdeboscq, Albrigh, Niamenad, Niemapuard and Rostapoud, through herbaceous minicuttings. In addition, different concentrations of IBA (0, 1.000, 2.000 and 3.000mg L⁻¹) were tested. The minicuttings were immersed in a solution for five seconds and, then, placed in a SANPACK® hinged clear plastic package for food, with 10x13x20cm of height, width and length, respectively, containing medium vermiculite. The experiment was conducted with four replications of 20 minicuttings, and kept in a greenhouse. At day 60, the rooting percentage, number and average length of the three longest roots, number and length of the longest root, and number and length of the longest shoot were evaluated. After the rooting period, the greatest rooting percentage for Capdeboscq cultivar was observed, with 74%, using IBA concentrations of 2.000 and 3.000mg L⁻¹.

In this context, vegetative propagation is very important to maintain the uniformity of the genetic material, ensuring plants uniformity. Among the methods of vegetative propagation, minicutting is an innovation of the conventional cutting that, in certain species, has enabled to increase productivity, uniformity and rooting percentage when speciﬁc nutritional and phytosanitary conditions are met (Titon et al., 2003).

Type of cutting is a factor that affects the rooting process directly, and for the vast majority of plants, herbaceous cuttings root easier than hardwood cuttings of the same species (Aguiar et al., 2005). Some techniques are necessary to try maximizing the rooting percentage of the herbaceous cutting, and the exogenous application of growth regulators is the most recommended (Toftani et al., 2002). Among them, an important role is assigned to auxin in the root formation process (Stefancic et al., 2005).

In this context, the objective of this study was to determine the appropriate concentration of IBA for the rooting of herbaceous cuttings from different peach rootstocks, to enable the propagation of clonal peach rootstocks.

Key words: Propagation, minicuttings, phytohormones, homogeneity.
Materials and Methods

A study was conducted in a greenhouse in the Department of Plant Science, (Elium Maciel Faculty of Agronomy / Federal University of Pelotas / Rio Grande do Sul). Herbaceous cuttings of Capdeboscq, Aldrighi, Nemared, Nemaguard and Florladora peach cultivars rootstocks were collected from a matrix located in the Fruitplan Mokaus Ltda nursery seedlings, in Pelotas/RS, packed in Styrofoam boxes, moistened with water and transported to the experiment location. Herbaceous cuttings, containing two yolks and a half leaf, were prepared by making a diagonal cut at the apex and a cross one at the base. With the aid of a utility knife, a superinduced lesion was made on the base of the cuttings that, subsequently, were dipped for 30 seconds in an IBA solution 0, 1,000, 2,000 or 3,000mg L^{-1}. They were placed in transparent, hinged, SANPACK® food plastic packages with 10x3.5x1cm of height, width and length, respectively containing expanded medium vermiculite, previously moistened with water. Holes were made at the bottom of the package with a utility knife for excess water drainage. Procedure of water spray was done whenever necessary, leaving the boxes closed to prevent dehydration. Dead cuttings were often taken out from the boxes to prevent contamination from the rest. Captan fungicide (3 g L^{-1} of commercial product in water) was applied.

After 60 days from the installation, the percentage of rooting cuttings, the number of roots per cutting, the average length of the three longest roots, the number of shoots and the length of the largest shoot were evaluated.

Data were submitted to an analysis of variance by the F test, and averages were compared through the Tukey test, at 5% probability level. Averages were subjected to a polynomial regression analysis and Pearson correlations between variables of interest, using the WINSTAT statistical program (Machado and Conceição 2007). Minicuttings percentage variables were transformed into an arcsin root (X/100).

Results and Discussion

In the Capdeboscq cultivar, the percentage of rooting cuttings increased up to a concentration of 2,500 mg L^{-1} of IBA, while in the Nemared cultivar, maximum efficiency occurred at 2,200 mg L^{-1} of IBA. Tinn et al. (2015a; 2015b) evaluated three peach rootstocks, including the Nemared and the Florladora, and found similar results with the point of maximum efficiency at concentrations of 1,590 and 1,660 mg L^{-1} of AIB, respectively. By propagating Florladora and Nemerged rootstocks using 2000 mg L^{-1} of AIB and vermiculite, the same authors found 63% and 58% of rooting, respectively. Okinawa evaluated semi-hardwood cuttings, Canolesi et al. (2007), and found that the point of maximum efficiency for rooting was at the concentration of 1,427 mg L^{-1}. However, Cardoso et al. (2011) found that the application of IBA at 2000 mg L^{-1} was more effective in 68% of the Okinawa peach cuttings rooting. After the maximum point of rooting, a reduction in the percentage of rooting minicuttings occurred, in both cultivars, probably due to the hypertoxic, caused by the high concentration of IBA.

For the Aldrighi, Nemaguard and Florladora cultivars, there was an increased linear behavior, indicating that when the IBA concentration increases, there is an increase in rooting percentage. The rooting percentage among cultivars was different, showing that genetic characteristics and minicuttings rooting capacity as observed by Trevián et al. (2000) and Oliveira et al. (2003).

For all tested cultivars, the percentages of rooting were very low when IBA was not used. With these results, it is clear that the levels of endogenous auxin present in the minicuttings of all cultivars were insufficient to promote rooting and the herbaceous type of material minicuttings (Figure 1).

An important aspect in studies of rooting refers to the joint analysis of number and length of roots variables since a cutting that produces multiple roots with good growth, in a short period of time, is more suitable than a cutting that produces one long root or several roots of short length. Therefore, a particular condition or treatment that results in a balance between these variables must be sought; in other words, a condition and treatment that result in a cutting that produces multiple roots with good growth, in a short period of time, is more suitable than a cutting that produces one long root or several roots of short length.

Pearson correlation coefficients between the average number and length of roots, and the number and length of shoots are shown in Table 1. Significant correlations were observed between number and length of roots variables; in other words, the more roots in the minicuttings, the greater their length. There was also a correlation between number and length of shoots.

Several studies have demonstrated the need for exogenous auxin application in peach cuttings to increase the percentage of rooting. Indole butyric acid (IBA) is a substance of synthetic origin, which was more effective in promoting rooting (Fachinello et al., 2005). However, concentrations vary for each species or cultivar and for each type of cutting. While conducting a research on various peach, it has not yet been well established the ideal concentration to increase rooting percentage.

www.asbjournal.com

Agronomy Sciences and Biotechnology, Volume 1, Issue 2, Pages 83 - 88, 2015
Table 1. Pearson correlation among root number and average length; number and length of shoots of peach rootstocks, for different concentrations of IBA.

<table>
<thead>
<tr>
<th>Correlation</th>
<th>Roots Number</th>
<th>Average Length</th>
<th>Shoots Number</th>
<th>Shoot Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roots Number</td>
<td>1</td>
<td>0.803054</td>
<td>0.29638</td>
<td>0.002338</td>
</tr>
<tr>
<td>Average Length</td>
<td>0.803054</td>
<td>1</td>
<td>0.142812</td>
<td>0.002338</td>
</tr>
<tr>
<td>Shoots Number</td>
<td>0.29638</td>
<td>0.142812</td>
<td>1</td>
<td>0.041989</td>
</tr>
<tr>
<td>Shoot Length</td>
<td>0.002338</td>
<td>0.002338</td>
<td>0.041989</td>
<td>1</td>
</tr>
</tbody>
</table>

Figure 1. Percentage of herbaceous minicuttings rooting of peach rootstocks, treated with different concentrations of IBA, Pelotas, RS, 2010.

Capdeboscq: $-0.12x^2 + 0.60x - 0.002 / R^2 = 99.97$
Aldrighi: $0.17x + 0.02 / R^2 = 98.23$
Nemared: $0.09x^2 + 0.40x + 0.05 / R^2 = 98.93$
Nemaguard: $0.21x - 0.02 / R^2 = 81.45$
Flordaguard: $y = 0.18x + 0.02 / R^2 = 77.24$

CONCLUSIONS

The propagation of Capdeboscq, Aldrighi, Nemared, Nemaguard and Flordaguard cultivars by herbaceous minicuttings is technically possible. The application of IBA is critical to obtain peach rootstocks. Concentrations of 2.000 and 3.000 mg L$^{-1}$ of IBA provided the best results in herbaceous minicuttings rooting.

ACKNOWLEDGMENT

We'd like to thank Frutplan Mudas Ltda, Pelotas, RS, for providing the plant material for the experiment.
Figure 2. Minicuttings placed to take root in plastic packaging.

Figure 3. Minicuttings Florlaquard.
REFERENCES