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Research Article

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Study on some doses of *IBA* concentration in the rooting of olive (Olea europaea L.)

[1]Rakip Iljazi, [2]Hairi Ismaili, [2]Adem Salillari

[1]Department of Agriculture Delvine, Albania.

[2]Agricultural University of Tirana, Tirana Albania

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Abstract: This research yields the results of IBA doses for rooting the semi-lignified parts in 5 olive cultivars. The material was taken at the same foci of the inflorescence and treated with equal conditions, with the exception of IBA concentration with the Mist-propagation method. Green explants of the cultivars: "*Kaninjot, Kryps Berati, Nisjot, Ullastra* and *Frantoio* ", were stimulated with five IBA doses; $C_{12}H_{13}NO_2$; (O, 2000, 4000, 6000 and 8000 ppm), Hydroalcolic solution, and they were kept under similar temperature, humidity and light conditions. The results showed that the dose 4000 ppm proved the best IBA effect, which rendered the highest rooting percentage in four cultivars. On the other hand the variety "Ullastra" had better correlations with IBA, at the dose of 6000 ppm. IBA in each concentration stimulated rooting percentage from 23% up to 46% more than Control. The olive cultivars reacted differently to rooting, because the Kaninjot cv showed higher rooting percentage (86.6%), whereas Kryps Berati cv manifested lower rooting percentage (36.7%). Thus, considering the achieved results, it was proved that the genetic factor is of great importance.

Key words: Research; Mist-propagation; Factor; Hormones; Cultivar; Autochthonous

INTRODUCTION

The establishment of new olive groves is related to using seedlings of high biological values, whereas the efficiency of seedling production depends on the coefficient of propagation and

their production in the shortest possible time[1]. Thus plant hormones come into use. They incite the process of rhinogenesis and increase rooting capacity of the vegetative explants, where indole butyric acid (IBA) is mostly used[2]. IBA enables higher rooting of the vegetative explants, at rest and during vegetation[3]. Studies performed so far show that the different cultivars react differently as far as rooting percentage is concerned. The influence of IBA in the autochthonous Albanian olive cultivars was firstly studied by *Ismaili* who came to the conclusion that 2000 and 5000 ppm give a higher rooting percentage in some autochthonous olive cultivars, but in correlation with meristem development[5]. Different authors such as give similar data for the rooting of vegetative olive explants with different treatments and manners[6, 7]. However the use of plant hormones engages a range of problems for the solution, such as concentration dose, the period of keeping phytohormonal solution, combination with other factors or doses, conditions of treatment etc. In this respect different authors provide different data for different cultivars; doses of use, period of phytohormonal treatment, their combination with other hormones and cytokines etc[8]. From this point of view this research aims to find several correlations of the IBA concentrations, physiological characteristics of the plant material, and varietal characteristics of the rooting performance.

MATERIALS AND METHODS

Green explants were removed from the five most widespread olive cultivars in Albania: Kaninjot (Kan) cv, Kryps Berati, (KB) Nisioti, (Nis) Ullastra, (Ull) and Frantoio, (Fr), which were treated with five IBA concentrations in ppm**. (a)** (*Control without treatment*), (**b**) (*IBA 2000 ppm*). (**C**); (IBA 4000 ppm), (**D)**; IBA 6000 ppm, (**e**) IBA 8000 ppm. IBA l.a, was diluted in ethanol 96^0 and distilled water in the ratios (3, 5: 6, 5)

The experiment was repeated four times. Each repetition included 50 explants. The removed explants were the same age, had the same distribution from the apical bud and the same exposure to sun. Treatment and planting were performed within the same day at the beginning of March. The explants had 2 pairs of leaves, whereas 2 others in the basal segment had been removed. They were left for rooting at a perlite subtract table, with basal incubation and constant temperature 23-24^0C, during rooting period. Air temperature at the bank was kept 20^0C. The experiment concluded with several indices, but this article includes the two most important ones, percentage of callused explants without roots and the callused and rooted explants. The experiment was carried out at the greenhouse of olive seedlings in Delvina.

Statistical analysis: performed with software, referred to 100 green cuttings for each treatment. Variance demonstration, Correlation coefficient, coefficient of regression through the genotypes in correlation with treatments[9].

RESULTS AND DISCUSSIONS

Callogenesis and rhizogenesis: the green explants have undergone several bio physiological processes in the nebulization bank under controlled thermal and humidity regimes. After cutting, stimulation and substrate residence the explants were healed. Healing through reproduction of parenchymal cells and wound regeneration, in the upper part which lasted for

10-15 days. Later intensive cellular reproduction occurred as a result of hormonal interaction and stimulation because of temperature and humidity in the substrate. This happened simultaneously with enlargement, forming the callus tissue. Generally this process occurred from the 15th to the 35th day.

Table- 1. The main data of rooting of five olive Genotype, and the Analysis of Variance, Means and Std Deviations for the rhizogenesis

Treatment Variety	Control	IBA 2000 ppm	IBA 4000 ppm	IBA 6000 ppm	IBA 8000 ppm
Kaninjot	24.7±1.0 ij	68.8±1.3 d	**86.6**±0.7 a	82.3±0.9 b	78.7±0.8 c
Kryps Berati	5.3±1.0 n	20.7±1.1 l	36.7±1.1 g	32.0±1.0 h	27.3±1.0 i
Nisjot	5.3±1.0 n	16.7±1.0 m	32.8±0.8 h	31.3±1.0 h	31.4±1.0 h
Ullastër	24.0±1.0 jk	58.6±1.4 f	78.7±0.9 c	83.3±0.7 b	67.4±0.9 d
Frantoio	21.3±1.0 kl	37.4±1.0 g	62.7±1.3 e	67.4±1.0 d	60.0±1.0 ef

Levels not connected by same letter are significantly different.

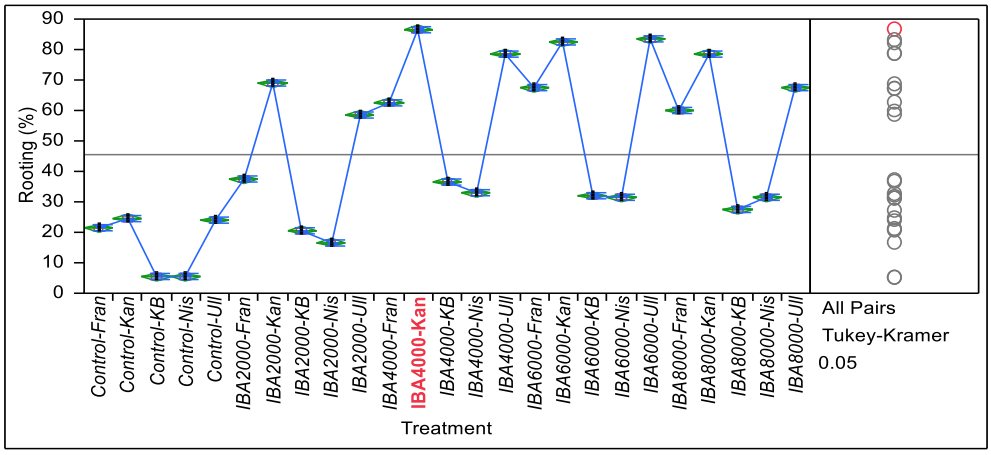

Figure 2: The One-way Analysis of variance of rooting (%) by Treatment of IBA concentration of five olive Genotype.

At the end of the rooting process the material was classified in two groups: (i) explants with callus – without roots and (ii) explants with callus – with roots.

Considering the data from tabele-*1*, the results present considerable changes of the number of uncallused explants from one cultivar to the other, caused by the concentrations of IBA in correlation with the reaction of cultivars (*lsd.1.33, alpha 0.05*). Higher values were presented by the cultivar Kryps Berati at the concentrations 2000 ppm, whereas the variety Nisjot did not display differences from one dose to the other, for the number of callused explants. This shows that this cultivar does not react considerably to the changes of IBA doses for this index. These data are clearly presented even in the graphical presentation in *figure-1*, resulting from the variance of the callused, not rooted explants, of the five olive genotypes treated with five IBA concentrations.

The Table 1, presents data from the analysis of the callused explants, which simultaneously have differentiated roots, resulting in various percentages of the rooted explants from one dose to the other, as well as from one cultivar to the other. Kaninjot cultivar was presented with a greater percentage of the rooted explants at 86.7% with the dose of 4000 ppm, whereas Nisjot cultivar with a lower percentage at a dose of 4000ppm and Kryps Berati with 36.7% at the dose of 4000 ppm. As of data of the variance analysis we highlight a significant obvious variation caused, not only by the IBA doses, but also by the cultivars' capacity.

Despite this, considering all the results IBA 4000 ppm is the dose, which ensures the highest percentage rooted explants[10, 11]. This has been confirmed even by the studies of the authors which provide several similar doses with the ones in our study. The natural rooting capacity of the 5 cultivars was on average 16.2%. The results showed that the explants removed at the beginning of March and treated with IBA at 2000 ppm yielded rooting percentage of 40.4% i.e., 24.2% more than Control. Increase in the dose of the hormone was simultaneously associated with the increase of rooting dose at 6000 ppm; respectively: 59.5 and 59.2% i.e. 43.3% more than Control. It was confirmed that the increase of the dose above 6000ppm did not yield the rooting percentage, but decreased it at 7-9%, as a result of the toxic effect that caused on the green explants. In general increase of the rooting capacity because of the hormone, is related to its advantages in circulating and increasing carbohydrates towards the new explants as well as increase of hormonal concentration in the green explants.

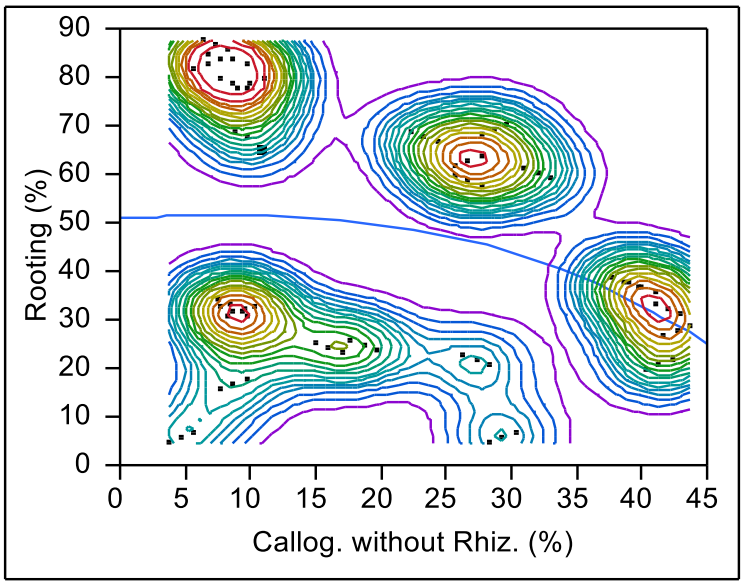

Figure 3: The Polinomynal analysis for Statistics Comparisons and the correlation of Call genesis without rhizogenesis (%). By Rooting (%) of five cultivars according to the applied treatments.

Interfactorial correlations. Several features which were related to the rooting of vegetative explants of five different IBA doses express different relations. There is a relation between callusing and rooting, where the correlation coefficients differ from $r^2=0.80$ in Ullastra cultivar to $r^2=0.99$ in Frantoio cultivar. In figure-3, Polynomial analysis of this correlation is strongly positive and

expressed with the equation: *Rooting (%) = 57.486786 - 0.3945355*Call. without Rhiz. (%) - 0.0199688*(Call. without Rhiz).*

Analysis of the results shows strong positive correlations between the initial phase of callusing and rooting. This shows that these two processes go in parallel and have a strong relation. Strong positive relations are obvious even in the middle of the first roots, the length of the explants and the number of rooted explants.

The process of initial rooting correlates negatively with the number of the primary roots, length of the explants and the number of rooted explants. Even in this case the coefficients of correlations do not display differences to the degree of being expressed among the analysed cultivars. Exception in this Case is noticed among the relation between the beginning of rooting and the number of primary roots, which varies from r^2=*-0.98* for Kaninjot cultivar to r^2=*-0.55* for Frantoio cultivar. Referring to the correlation coefficients, it is obvious that in different cultivars the degree of expressing these relations there is a similarity, but without significant changes among them.

CONCLUSIONS

The cultivars have displayed considerable variation for the rooting capacity. Kaninjot cv, Kryps Berati, and Nisjot display a higher rooting percentage at the concentration 4000 ppm, whereas cv. Frantoio and Ullastra at 4000 ppm and 6000 ppm yield similar results. Cv. Kryps Berati has shown weaker correlations at each IBA dose, and had the lowest rooting percentage. In conclusion the dose that ensures more rooted explants in the olive cultivars varies from 4000 to 6000 ppm. The use of IBA, despite its concentration has stimulated in each case rooting compared to control. During rhizogenesis, morphological changes have been accompanied with several relations among the factors and cultivars, which have a positive or negative character and must be taken into consideration.

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Corresponding Author: Hairi Ismaili,
Albanian Gene Bank, Agricultural University of Tirana, Tirana, ALBANIA
E-mail: *hairiismaili@yahoo.fr;*