THE EFFECT OF SOME BIOSTIMULATORS SUBSTANCES ON THE ROOTING OF THE ARAUCARIA SEEDLINGS

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Abstract

A study was conducted to see whether the growth of Araucaria excelsa seedlings could be hastened with the use of different synthetic auxins concentrations.

Auxins are natural, physiologically bivalent compounds, that, in extremely low doses, directly or indirectly, can affect the growth and development of plants, respectively the formation of vegetative and generative organs.

The use of growth substances has found a wide application in horticultural practice, taking part in the faster formation of roots and in a higher percent for species of plants, that, normally, root with difficulty through seedlings. Under this aspect, many synthetical compounds have proved to be very active (IAA, IBA, NAA, 2,4,5-T acid etc.) (Bandici, 2006, Milică et al., 1983).

Key words: growth substances**,** seedlings, rooting, the appearance, IAA, IBA.

INTRODUCTION

Araucaria excelsa (syn A. heterophylla) is a charming tall, evergreen and coniferous tree, which reaches a height of 30 meters under favourable conditions. in outdoor landscape, it is used as a specimen plant due to its beautiful form and attractive branches arrangement. the plant has an amicable profile, with whorls of horizontal branches bearing bright green, soft and glossy needles. small plants are commonly potted and do best as indoor foliage plants. however, araucaria grows very slow in the pot, especially at the seedling stage and nursery growers have to wait for several years to bring it to marketable size (Fuchigami, 1987; Gil-Albert, 1978).

Chemical growth regulators especially auxins perform an important role in the growth and development of plants (Hare, 1984).

For the Araucaria species further work is required to increase coppice growth rates and the speed of rooting (Bandici, Vlad, 2000).

A vegetative propagation method for A. falcataria is needed because of the difficulty of obtaining seed of well formed trees. For this species two different rooting techniques were used: an intermittent misting unit with electronic leaf control; and high humidity polythene propagator. The latter gave poor results. The efficiency of the misting unit was affected by unreliable electricity supply and the difficulty of obtaining spare parts (Ross et al., 1983).

The rooting medium that gave best results was sand from which the coarse and the fine factions were removed. Transplants about 4–12 months old were used as ortets, some of them repeatedly. Single node cuttings with part of one leaf were tested. In early experiments "first top node" cuttings were much poorer than cuttings which included second or third nodes from the apex, it was too early to conclude how cuttings from lower down on the ortet would perform. There was some indication that better rooting occurred in cuttings from younger than older ortets (Taiz, Zeiger, 2002; Wareing, 1970).

No clear trend resulted from tests of shading cuttings, though it seemed to promote rooting in younger "first top node" cuttings. Hormone treatment with IAA and IBA suspended in talc seemed to have a negative effect, while NAA trended to promote rooting of "2nd top node" cuttings. In trials to date water stress seems to lower rooting percentages. Excessive reduction of the leaf left on the cutting appeares to have the same effect (Cline, 1996; Coenen, 1997; DeYoe, 1976).

Survival after potting of rooted cuttings ranged from 10 to 50% in spite of the several weaning periods and transplanting methods tried. The reason for this, the most important problem encountered, is not known. This transplanting phase is the highest priority for future work (Kramer, Kozlowski, 1979; Little, Pharis, 1995).

MATERIAL AND METHODS

For the examination of the influence of some growth stimulators of the type IAA and IBA on the rooting percent of the seedlings, on the diameter of the root bale, on the number of roots and on the length of the roots for the species Araucaria excelsa, an experiment was organized at the University of Oradea, with the following variants:

V_1 – untreated witness (distilled water);

V_2 – treated with IAA solution, 500 ppm;

V_3 - treated with IAA solution, 1000 ppm;

V_4 - treated with IBA solution, 500 ppm;

V_5 - treated with IBA solution, 1000 ppm;

The treatment was carried out before planting, with previous moistering in distilled water of the portion that was to be treated and then the introduction of the 2-3 cm portion in the growth stimulating substances for 60 seconds, then the planting was carried out at 3 cm depth, at the distance of 6/6 cm, finally following the variant with the best results for the aimed purpose.

The results were statistically processed using the method of the "analyses of variance (ANOVAs)". Two proportion tests were used to determine significant differences in percentage analyses.

RESULTS AND DISCUSSION

From the analysis of the data in table 1, we notice the fact that the process of calusare of *Araucaria excelsa* seedlings, has begun at relatively close time spans, with a slight advantage in the case of the treated seedlings compared to the untreated ones, for example in the case of the variant treated with IAA 500 ppm, the time from the propagation by seedlings until the appearance of the calus was of 37 days, of 35 days in the case of the variant trated with IAA 1000 ppm, of only 34 days in the case of the variant treated with IBA 500 ppm and in the case of the variant treated with IBA 1000 ppm of 37 days, compared to the untreated witness.

The effect of different chemical growth regulators especially auxins concentrations on the growth and development of *Araucaria heterophylla* seedlings.

Table 1

The influence of the investigated factors on some phenological determinations for Araucaria excelsa (Oradea 2012)

Variant	Applied treatment	Date of propagation by seedlings	Date of the appearance of the calus	Date of the appearance of the roots	Date of the complete rooting	Days necessary for rooting
			days necessary	days necessary	days necessary	
V_1 (Control)	Distilled water	May 17	June 25 40 days	September 17 122 days	November 14 180 days	202
V_2	IAA 500 ppm /60 sec.	May 17	June 22 37 days	September 15 120 days	November 12 178 days	200
V_3	IAA 1000 ppm/60 sec.	May 17	June 20 35 days	September 15 120 days	November 13 179 days	201
V_4	IBA 500 ppm/ 60 sec.	May 17	June 19 34 days	September 13 118 days	November 10 176 days	198
V_5	IBA 1000 ppm/60 sec..	May 17	June 22 37 days	September 16 121 days	November 12 178 days	200

Regarding the period from the date of the planting of the seedlings to the date of the appearance of the roots, there were no major differences among the variants, this period being shorter with a few of days in the case of the treated variants, the best results being obtained in also this case for the variant treated with IBA 500 ppm (118 days compared to the untreated witness, 122 days).

The period of complete rooting of the seedlings was extended to a period of 180 days since planting, the best results being obtained also in the case of the variant treated with IBA 500 ppm the period of the complete propagation by seedlings being 4 days shorter than in the case of the untreated variant.

Table 2

The influence of the investigated factors on the number of rooted Araucaria excelsa seedlings (Oradea 2012)

Variant	Applied treatment	Nr. treated seedlings (pieces)	Nr. rooted seedlings	Diff. ±	%	Signif.
V_1 (Control)	Distilled water	150	83	-	100.0	NS
V_2	IAA 500 ppm /60 sec.	150	90	+7	108.0	NS
V_3	IAA 1000 ppm/60 sec.	150	98	+15	118.0	*
V_4	IBA 500 ppm/ 60 sec.	150	123	+40	148.0	***
V_5	IBA 1000 ppm/60 sec.	150	105	+22	122.0	***
	LSD 5 % LSD1 % LSD 0.1 %			12 16 22		

Note: NS = Non-significant=under 12.0; * Significant =12.0-16.0; ** = Significantly different =16.0 - 22.0; ***very significant = over 22.0

In table 2 we show a synthesis of the results regarding the rooting of *Araucaria excelsa* seedlings (number of rooted seedlings and the percent of rooting of the seedlings compared to the untreated witness), where the best treatment has proved to be also in this case variant 4 (IBA 500 ppm).that increased the rooting rate of the seedlings with 48 % compared to the untreated witness, followed by variant 3 (IBA 1000 ppm) under the statistical aspect the differences being very significant in the case of variant 4 and significant in the case of variant 3.

Out of the data in table 3, we notice that the average number of roots on a seedling has recorded increased values for all variants treated with bioactive substances of the type AIA and IBA, the best variant being variant 4 (IBA 500 ppm).

Table 3

The influence of the investigated factors on the number of roots for Araucaria excels (Oradea 2012)

Variant	Applied treatment	Nr. of roots	Diff. ±	%	Signif.
V_1 (Control)	Distilled water	15.1	-	100.0	NS
V_2	AIA 500 ppm/60 sec.	18.2	+3.1	120.5	*
V_3	AIA 1000 ppm/60 sec.	17.0	+1.9	112.5	NS
V_4	IBA 500 ppm/ 60 sec.	22.0	+6.9	145.6	***
V_5	IBA 1000 ppm/60 sec.	15.2	+0.1	100.6	NS
	LSD 5 % LSD1 % LSD 0.1 %		2.9 4.9 7.2		

Note: NS = non-significant=under 2.9; * significant =2.9 - 4.9; ** significantly different= 4.9 - 7.2; *** very significant = over 7.2

The effect of the bioactive substances in the enhancement of the rooting capacity of Araucaria excelsa seedlings results also from the vegetative potential of the newly formed plants expressed through the length

of the roots and the diameter of the bale. (tables 4 and 5), the best variant being in both cases variant 4 (IBA 500 ppm).

Table 4

The influence of the investigated factors on the diameter of the bale for Araucaria excelsa (Oradea 2012)

Variant	Applied treatment	Average diameter of the roots (cm)	Diff.±	%	Signif.
V_1 (Control)	Distilled water	3.2	-	100.0	NS
V_2	AIA 500 ppm /60 sec.	4.4	+1.2	137.5	*
V_3	AIA 1000 ppm /60 sec.	4.1	+0.9	128.12	NS
V_4	IBA 500 ppm / 60 sec.	5.3	+2.1	165.62	***
V_5	IBA 1000 ppm /60 sec..	4.6	+1.4	143.75	**
	LSD 5 % LSD1 % LSD 0.1 %		1.0 1.3 1.9		

Note: NS = Non-significant = under 1.0; * = significant 1.0-1.3** = significantly different = 1.3-1.9; *** = very significant =1.9.

Table 5

The influence of the investigated factors on the length of the roots for Araucaria excels (Oradea 2012)

Variant	Applied treatment	Average length of the roots (cm)	Diff.±	%	Signif.
V_1 (Control)	Distilled water	8.5	-	100.0	NS
V_2	IAA 500 ppm /60 sec.	15.5	+7.0	182.0	*
V_3	IAA 1000 ppm /60 sec.	13.5	+5.0	159.0	NS
V_4	IBA 500 ppm / 60 sec.	17.8	+9.3	209.0	**
V_5	IBA 1000 ppm /60 sec..	16.3	+7.8	192.0	*
	LSD 5 % LSD1 % LSD 0.1 %		6 9 15		

Note: NS = Non-significant = under 6.0; * = Significant = 6.0 – 9.0; ** = Significantly different = 9.0-15.0 ; *** = very significant = over 15.0

CONCLUSIONS

1. The species Araucaria excelsa, being an ornamental shrub with economical implications useful through its ornamental value, can be multiplied vegetatively through propagation by seedlings.

2. The enhancement of the reproduction rate through propagation by seedlings can be stimulated using different bioactive substances, which can secure the enhancement of the rooting percent of the seedlings by approximately 48 %.

3. The stimulation of the rooting of Araucaria excelsa seedlings with the help of some bioactive substances from the group of the auxins, of the type IAA and IBA, secures a superior vegetative potential for the newly formed plants.

4. The working methos can contribute to the future extension in culture of Araucaria in our country.

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