RESEARCH REGARDING THE INFLUENCE OF SOME GROWTH BIOSTIMULATING SUBSTANCES ON THE ROOTING OF JUNIPERUS HORIZONTALIS SEEDLINGS

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Abstract

The ornamental ligneous species can multiply vegetatively through propagation by seedlings, grafting, layering, separation of the bush, propagation by basal shoots. The most often used reproduction method in the case of most species is by seedlings, the material used for this type of reproduction being the seedlings, meaning those portions of the plant that, placed in favourable vegetation conditions according to the principle of restitution, restore organisms that are identical with those of which they were harvested.

A wide application in horticultural practice is the use of growth substances, that take 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, NAA, 2,4,5-T acid etc.) (Bandici, 2006; Milică et al., 1983).

Key words: NAA, procaine, bioactive substances, seedlings, rooting, growth substances.

INTRODUCTION

The rootability of evergreen cuttings is greatly dependent on the species involved. Most varieties of junipers, arborvitae, taxus, and boxwood root quite readily. Pine, spruce, and fir are readily grown from seed. However, in the interest of perpetuating specific forms, color, hardiness, etc., these species can and are propagated asexually. Although grafting is a common method of propagating pine, fir, and spruce, they can also be grown from cuttings (Adams 1987; Adams, Turner, 1970; Bandici, Vlad, 2000).

In general, cuttings are taken during late fall and during the winter. This, however, varies greatly and the literature should be checked for specific times for each species as in some instances, a month's difference in collection time will result in success or failure. One notable exception to the fall or winter collection is Mugo pine which roots best from cuttings taken in June, just as the candles unfold their needles. Evergreen cuttings are made from the current year's wood excluding the tender, soft tip of each branch. The cuttings should be 5-7 inches long with the lower needles removed from that portion of the stem which is inserted into the media (Flake et al., 1978; Gil-Albert, Boix, 1978).

In most cases, it is beneficial to treat evergreen cuttings with a rooting hormone. The hormone to use, and its concentrations is dependent

on species and variety. Mugo pine is again a good example wherein hormone treatment may be beneficial to some clones and detrimental to others. Bottom heat (65-75^{o}F) is usually required. Although a high humidity must be maintained during rooting, a mist system is not essential (Tauer et al., 1987; Van Haverbeke et al., 1978).

Broad-leaf evergreen cuttings, including boxwood, holly, ivy, myrtle, spurge, gardenia, rhododendron, camellia, etc., may be rooted from current year cuttings taken from late summer to early winter. Procedures are similar to those suggested for narrow-leaf evergreens (Peterson et al., 1979).

Two distinct varieties have been recognized in the United States. *Juniperus virginiana* var. *crebra* (Fernald) is a northern form having a narrow crown and slightly pitted seeds. The other variety, *J. virginiana* var. *ambigens, is* an intermediate form between eastern redcedar and creeping juniper, *J. horizontalis* Moench (Jonsen et al., 1974).

Although there are no recognized hybrids at this time, evidence is mounting that hybridization does occur. Population studies, especially in the western part of eastern redcedar's range, suggest that considerable introgression and perhaps blending of genetic differences have occurred whenever species' ranges overlap; and that *J. virginiana* readily hybridizes with *J. scopulorum, J. horizontalis,* and *J. ashei,* resulting in juniper populations that contain the germ plasm of two or three species (Lanphear et al., 1966). Research in the Ozarks, however, showed no evidence of introgression into *J. ashei* by *J. virginiana* where *J. ashei* was surrounded by *J. virginiana* (Bahari et al., 1985; Ormsbee et al., 1976; Pinney, John, 1970).

Eastern redcedar *(Juniperus virginiana),* also called red juniper or savin, is a common coniferous species growing on a variety of sites throughout the eastern half of the United States. Although eastern redcedar is generally not considered to be an important commercial species, its wood is highly valued because of its beauty, durability, and workability. The number of trees and volume of eastern redcedar are increasing throughout most of its range. It provides cedarwood oil for fragrance compounds, food and shelter for wildlife, and protective vegetation for fragile soils (Halls, Lowell, 1977).

MATERIAL AND METHODS

At University of Oradea, a polyfactorial experiment was initiated regarding the effect of some growth stimulating substances on the rootings of *Juniperus horizontalis* seedlings, following the influence of the naftilacetic acid (NAA) and of procaine on the rooting percent, on the diameter of the root bale, of the number of roots and of the root length.

There were used semilignificated *Juniperus horizontalis* seedlings, with the length of 7-12 cm, the experiment including the following variants:

V_1 – untreated witness (distilled water);

V_2 – treated with NAA solution, 500 ppm;

V_3 - treated with NAA solution, 1000 ppm;

V_4 - treated with procaine solution 0.5 %;

V_5 – treated with procaine solution 2.5 %.

Before planting, the treatment was carried out through previous moisturing in distilled water of the portion that was to be treated and then the introduction of the portion of 1.5-2.5 cm in growth stimulating substances (NAA and procaine) for 30 seconds; then the planting was carried out at 3 cm depth, at the distance of 5x5 cm, finally following the variant with the best results for the aimed purpose.

The results were statistically processed using the method of the "variation analysis".

RESULTS AND DISCUSSION

The process of calusare of the seedlings started at close time spans, with a slight advantage in the case of the seedlings treated with bioactive substances compared to the untreated ones. From the analysis of the data in table 1 we notice that the best results regarding the calusarea were obtained in the variant treated with procaine solution 0.5 (V_4), when the period of propagation by seedlings until the appearance of the calus was of only 32 days, 4 days shorter than in the case of the untreated witness.

Table 1

The influence of the investigated factors on some phonological determinations for *Juniperus horizontalis* (Oradea 2012)

Var	Investigated factors	Immersion time (sec.)	Date of propagation by seedlings	Date of the appearance of the callus	Date of the appearance of the roots	Date of the complete rooting	Days necessary for rooting
V_1	Distilled water	30	June 5	July 10	August 11	September 14	102
V_2	NAA 500 ppm	30	June 5	July 10	August 9	September 12	100
V_3	NAA 1000 pmm	30	June 5	July 8	August 9	September 11	99
V_4	Procaine 0.5 %	30	June 5	July 6	August 7	September 8	96
V_5	Procaine 2.5 %	30	June 5	July 9	August 10	September 10	98

From the data of the same table 1, we can notice that the period from the date of plantating of the seedlings until the date of the appearance of the roots is smaller than in the case of variant 4 (procaine 0.5 %), of only 64 days compared to the untreated witness.

The period of complete rooting of the seedlings was extended over almost 100 days (102 days in the case of the untreated witness), with an advantage of a few of days in the case of the variants treated with growth stimulating substances. Also in this case the best results were obtained in the case of variant 4 (procaine 0.5 %), with 6 days advantage compared to the untreated witness.

Under a relative aspect, all treatments with growth stimulating substances increase the rooting percent of the Juniperus horizontalis seedlings (Table 2), the best treatment proving to be that with procaine 0.5 % (V_4), that enhanced the rooting rate of the seedlings with 27.35 % compared to the untreated witness, followed by the treatment with NAA solution 1000 ppm (16.98 %).

Table 2

The synthesis of the results regarding the rooting of the *Juniperus horizontalis* seedlings, (Oradea 2012)

Var.	Applied treatment	Immersion time (sec.)	Nr. treated seedlings	Nr. rooted seedlings	Diff. ±	%	Signif.
V_1	Distilled water	-	150	106	-	100.0	-
V_2	NAA 500 ppm	30	150	110	+4	103.7	-
V_3	NAA 1000 pmm	30	150	124	+18	116.9	*
V_4	Procaine 0.5 %	30	150	135	+29	127.4	***
V_5	Procaine 2.5 %	30	150	123	+17	116.1	*
	LSD 5 % LSD1 % LSD 0.1 %				15 19 24		

Note: NS = Non-significant = under 15; * = Significant = 15 – 19 ; ** = Significantly different = 19 - 24; *** = very significant = over 24

Besides the enhancement of the rooting rate, the treatments with stimulating substances of the type NAA and procaine have positive effects on the quality of the rooting process, highlighted by the number and length of the roots.

Thus, from the data in table 3 we can notice that the average number of roots on a seedling has recorded increasing values in the case of all variants treated with stimulating substances, the best results being obtained in the case of variant 4 (procaine 0.5 %), where the average value was of 13.2 pieces compared to only 4.3 pieces for the untreated witness.

From the data in table 4 result aspects regarding the diameter of the bale of roots that vary within quite large limits, in the case of variant 4 (procaine 0.5 %), the diameter of the bale of roots being of 5.1 cm compared to 2.7 cm in the case of the non treated witness.

Table 3

The synthesis of the results regarding the number of roots for *Juniperus horizontalis* (Oradea 2012)

Var.	Applied treatment	Immersion time (sec.)	Number of roots	Diff. ±	%	Signif.
V_1	Distilled water	-	4.3	-	100.0	-
V_2	NAA 500 ppm	30	6.2	+1.9	144.1	-
V_3	NAA 1000 pmm	30	7.8	+3.5	181.3	*
V_4	Procaine 0.5 %	30	13.2	+8.9	306.9	***
V_5	Procaine 2.5 %	30	11.1	+6.8	258.1	**
	LSD 5 % LSD1 % LSD 0.1 %			3.5 6.8 8.7		

Note: NS = Non-significant = under 3.5; * = Significant = 3.5 – 6.8; ** = Significantly different = 6.8-8.7 ; *** = very significant = over 8.7

Table 4

The synthesis of the results regarding the diameter of the root bale for *Juniperus horizontalis* (Oradea, 2012)

Var.	Applied treatment	Immersion time (sec.)	Average diameter of the root bale (cm)	Diff. ±	%	Signif.
V_1	Distilled water	-	2.7	-	100.0	-
V_2	NAA 500 ppm	30	3.0	+0.3	111.1	-
V_3	NAA 1000 pmm	30	3.3	+0.6	122.2	*
V_4	Procaine 0.5 %	30	5.1	+2.4	188.8	***
V_5	Procaine 2.5 %	30	4.2	+1.5	155.5	***
	LSD 5 % LSD1 % LSD 0.1 %			0.6 0.9 1.3		

Note: NS = Non-significant = under 0.6; * = Significant = 0.6 – 0.9; ** = Significantly different = 0.9-1.3 ; *** = very significant = over 1.3

Regarding the length of the roots, from the data in table 5 results that, if for the untreated variant the formed roots have recorded lengths of 5.5 cm, for the seedlings treated with bioactive substances of the type NAA and procaine, the length of the roots was longer, the best variant being that treated with procaine solution 0.5 %, where the average length of the roots was 13.2 cm.

Table 5

The synthesis of the results regarding the length of the roots for *Juniperus horizontalis* (Oradea 2012)

Var.	Applied treatment	Immersion time (sec.)	Average length of the roots (cm)	Diff. ±	%	Signif.
V_1	Distilled water	-	5.5	-	100.0	-
V_2	NAA 500 ppm	30	6.2	+0.7	112.7	-
V_3	NAA 1000 pmm	30	7.8	+2.3	141.8	*
V_4	Procaine 0.5 %	30	13.2	+7.7	240.0	***
V_5	Procaine 2.5 %	30	11.1	+5.6	201.8	**
	LSD 5 % LSD1 % LSD 0.1 %			2.3 3.1 6.2		

Note: NS = Non-significant = under 2.3; * = Significant = 2.3 – 3.1; ** = Significantly different = 3.1-6.2 ; *** = very significant = over 6.2

CONCLUSIONS

From the presented facts, we can say that the species *Juniperus horizontalis* (ornamental shrub), can be multiplied vegetatively through propagation by seedlings, while the enhancement of the reproduction rate through propagation by seedlings can be stimulated by using growth substances of the type NAA and procaine with almost 30 %. By using bioactive substances we can also notice an enhancement of the number of roots and of the diameter of the root bale.

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