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Researches Regarding the *Picea abies* '*Nidiformis*' and *Picea glauca 'Conica'* Cultivars Propagation

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Abstract: This paper present the cutting propagation method, used for two cultivar of *Picea* genus. For that, there were made a tetra factorial experiment, the factors being: years of experiences, species, cutting type and rooting substrate. There were used three years for experiences, two *Picea* cultivars, two cutting type and six rooting substrate. For the conclusions, the results were processed using the Duncan test.

Key words: *Picea*, rooting, substrate, cutting, hook, heel

INTRODUCTION

As we know, the species from *Picea* genus could be obtained both generative (seeds) and vegetative (cuttings and grafting) propagation method. The small cultivars and the cultivars that are not producing seeds could be obtained only by vegetative method (Iliescu, 2002). This kind of multiplication could be an impediment because of the costs, but concerning the quality of obtained plants, it is a better method comparing with the seeds method. And that because the vegetative propagation method is made on purpose to obtain faster and easier the propagation material, and also to transmit constantly the specific characters of the mother plant. Taking in account that *Picea abies* '*Nidiformis*' and *Picea glauca* '*Conica*' cannot produce seeds in our country, and the same, the grafting metod is practically impossible because of the thinness of the branches, the cutting method is the last could be used with minimum costs (Marinelli *et al.*, 1997).

MATERIALS AND METHODS

The first factor of this experiment is represented by the year of experiences. The expriences were made over three years, consecutively, in the spring. For that, we can say that there were made green cuttings.

As it was mentioned in introduction, the dendrological material for this experience is represented by two cultivar belonging to the *Picea* species, namely *Picea glauca* '*Conica'* and *Picea abies 'Nidiformis'*. The cultivars is undersized, having a conical shape and respectively a nest bird shape (Bitner, 2007, Posedaru, 2005).

The third factor of the experiences is the kind of cutting. For that, there were used cuttings made simple and "with heel". In the cutting experiences, the most used are the cuttings with heel, obtained by snatching (pulling out suddenly reverse to the growth direction) and shorting the heel after.

Concerning the final factor of experiment, the substrate, there was used as substrates three elements: sand, perlite and peaty. So there were six substrates, obtained only by the

elements or from their combination: sand, perlite, peaty, sand with perlite, sand with peaty and perlite with peaty. The substrates with two elements are containing the elements in the same proportion (1:1).

RESULTS AND DISCUSSION

The element that was measured for statistical interpretation of results and formulation of conclusions on the experiences was the number of rooted cuttings. So, there were counted the cuttings rooted in each variant. There were considered rooted the cuttings with at least one root of first rang with minimum 1 cm length.

In interpreting the results in rooting cuttings, the data obtained from measurements were statistically processed by analysis of variance method using the method of multiple comparisons (Duncan test) (Ardelean *et al.*, 2002). This test involves comparing the variations between them, each with each, thereby ensuring a better interpretation of results than with differences limit.

Taking in account that the years of experience, respectively the environmental factors may influence the results, they were considered the experience factor. Thus, the tri factorial cuttings experiences made in each of the three years were analyzed as tetra factorial experiences, subdivided parcels model.

Tab. 1

The influence of genotype and cutting type on number of rooted cuttings

Species \ Cutting type	With hell	With hook	Average on species
Picea glauca 'Conica'	9,2[b]	9,4[b]	9,3 B
Picea abies 'Nidiformis'	12,7[a]	8,4[c]	10,5 A
Average on cutting type	10,9 M	8,9 N	

$DS_{5\%}$ for comparing two means of cutting method = 0,4 cuttings
$DS_{5\%}$ for comparing two means of species = 0,4 cuttings
$DS_{5\%}$ for comparing two means of cutting method x species= 0,5-0,6 cuttings
Note : the difference between any two values, followed by at least one common letter, is not significant

It is noted that the two species studied (*Picea glauca 'Conica' and Picea abies 'Nidiformis'*) had different values of the percentage of rooted cuttings, difference being significant at p 5%. Certainly *Picea abies* 'Nidiformis' seems more prone to multiplication by cuttings, with a rooting percentage of 35.1% compared with *Picea glauca 'Conica'*, whose share value reached only 30.9% (Fig. 1).

Regarding the type of cutting used, the situation varies by species. If for species *Picea glauca 'Conica'* variety best results are recorded in the use of cuttings with hook, the difference being not statistically significant, for the species *Picea abies 'Nidiformis'* the heel cuttings have a higher percentage of catch, this time the difference being significant. The average on both species rank cuttings with heel first, beating by 6.6 percent grips the cuttings with hook (Mazăre *et al.*, 2005). This difference is statistically significant (Fig. 2).

Based on data inside tables we can say that the most effective vegetative propagation by cuttings is done to the species *Picea abies 'Nidiformis'* when using cuttings with heel, and lowest efficiency recorded in the same species when using cuttings with hook.

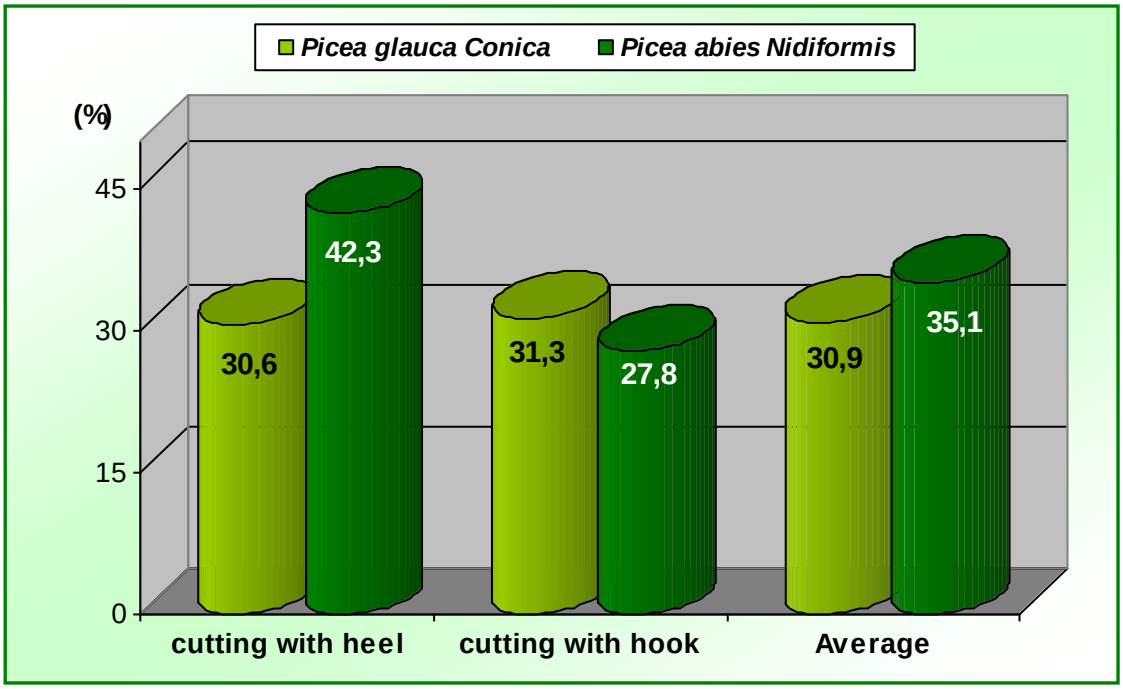

Fig. 1. The percentage of rooted cuttings by species, depending on cutting type

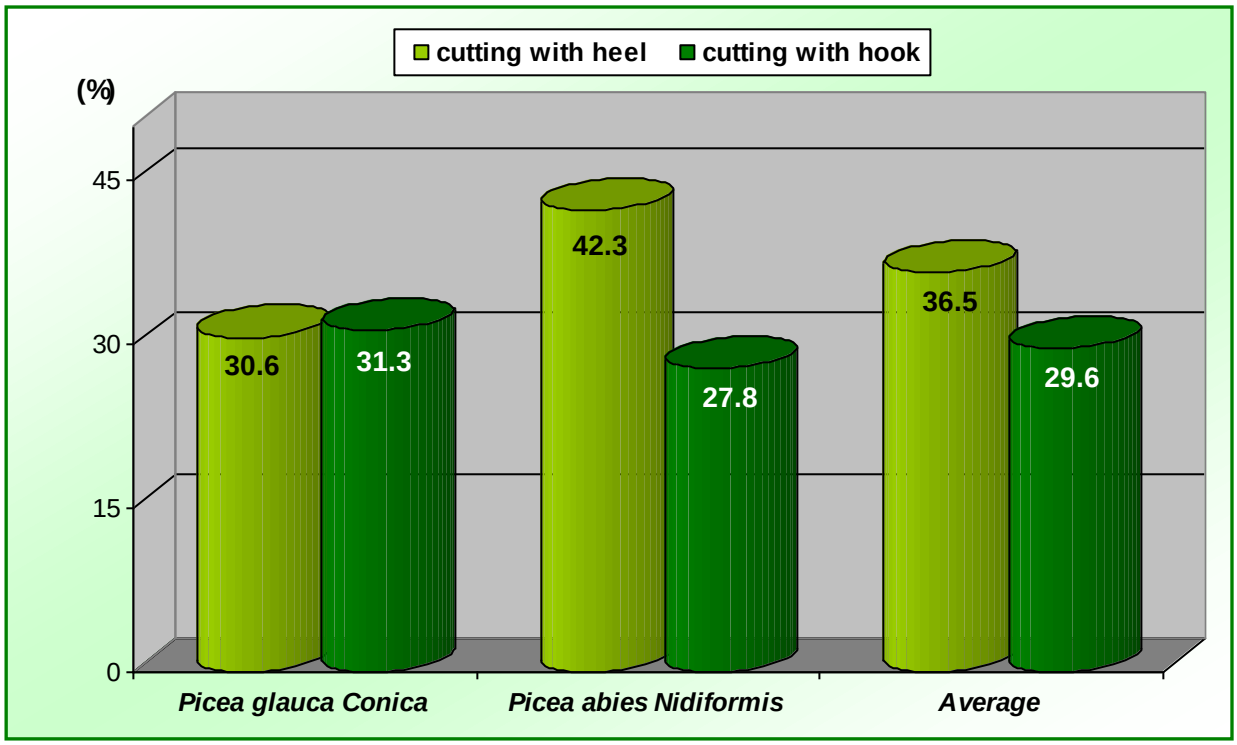

Fig. 2. The percentage of rooted cuttings by cutting types, depending on species

Data analysis from the summary Tab. 3 illustrates the contribution of the species, the rooting substrate and the interaction between these two factors on the efficiency of the genus *Picea* rooting. Again, the two species differ significantly from each other, as was normal from the results discussed in the previous table. *Picea abies 'Nidiformis'*, regardless of the type of substrate used, proves significantly more adapted to this type of vegetative propagation.

In turn, the rooting substrate seems to have also a significant influence on rooting efficiency of the two species studied. The data from the Tab. 2 emphasize that the highest efficiency, expressed by the number of rooted cuttings is obtained on sand + peat substrate, followed by the sand + perlite substrate. The difference between these two substrates, although significant, is not an absolute value too high (1.4). The worst results are obtained on perlite simple multiplication by cuttings, where the efficiency is only 13.7% (Fig. 3).

Tab. 2

The influence of genotype and rooting substrate on number of rooted cuttings

Species / Substrate	*Picea glauca* var. *'Conica'*	*Picea abies* var. *'Nidiformis'*	Average on substrates
Sand	8,8^{e}	8,8^{e}	8,8 D
Perlite	3,9^{f}	4,3^{f}	4,1 F
Peat	4,9^{f}	9,9^{d}	7,4 E
Sand+ Perlite	12,8^{c}	14,6^{b}	13,7 B
Sand+ Peat	12,8^{c}	17,4^{a}	15,1 A
Perlite+ Peat	12,4^{c}	8,1^{e}	10,3 C
Average on species	9,3 N	10,5 M	

$DS_{5\%}$ for comparing two means of species = 0,6-0,7 cuttings
$DS_{5\%\ \%}$ for comparing two means of substrates= 0,4 cuttings
$DS_{5\%\ \%}$ for comparing two means of = 0,9-1,0 cuttings
Note : the difference between any two values, followed by at least one common letter, is not significant

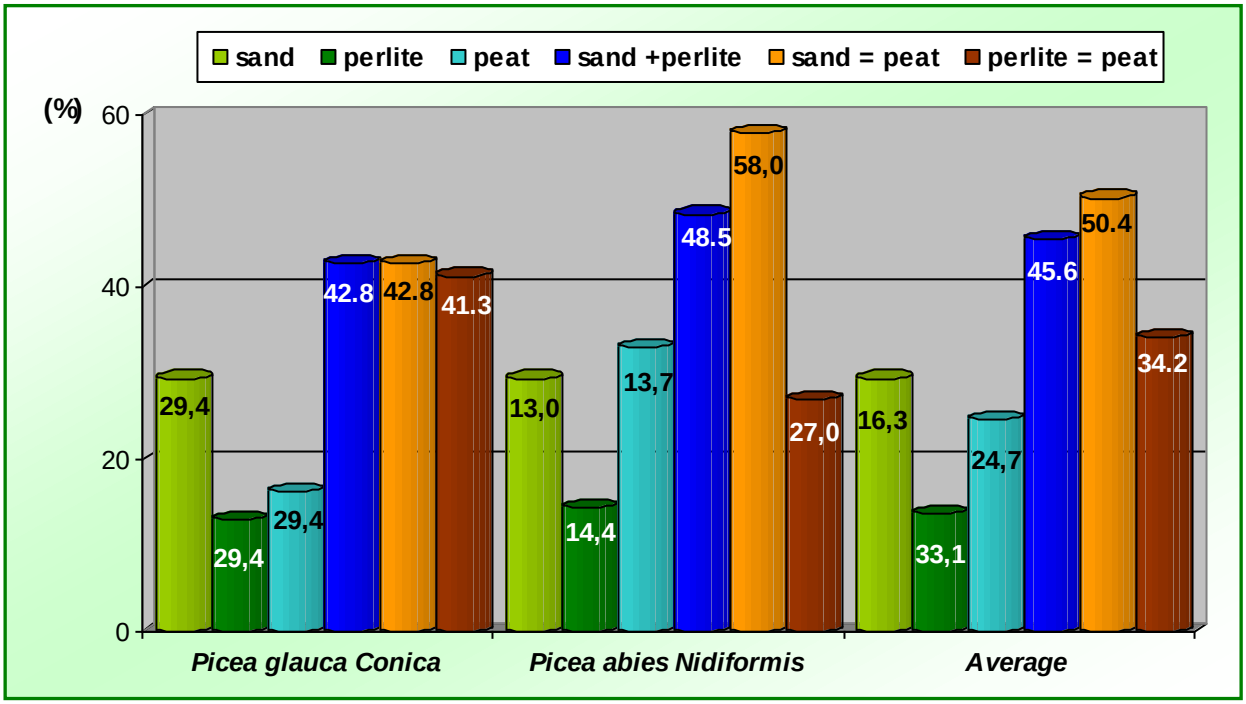

Fig. 3. The percentage of rooted cuttings by rooting substrates, depending on species

Logically the interaction of two factors highlight the salutary effect on the number of rooted cuttings of the combination combinations *Picea abies 'Nidiformis'* x sand + peat or sand + perlite, with a percentage of rooted cuttings between 48.5% and 58.0 %. Propagation by cuttings of both species on simple perlite have the lowest rooting efficiency, at significant differences in all other combinations of the two factors (Fig. 3).

Table 3 highlights the influence of cuttings' shaping, of the type of substrate used for rooting cuttings and the interaction of these factors on rooting efficiency.

Tab. 3

The influence of rooting substrate and cutting type on number of rooted cuttings

Substrate \ Cutting type	With heel	With hook	Average on substraturi
Sand	9,6[e]	8,1[f]	8,8 D
Perlite	4,0[h]	4,2[h]	4,1 F
Peat	9,7[e]	5,2[g]	7,4 E
Sand+ Perlite	14,9[b]	12,4[c]	13,7 B
Sand+ Peat	16,0[a]	14,2[b]	15,1 A
Perlite+ Peat	11,4[d]	9,1[e]	10,3 C
Average on cutting type	10,9 M	8,9 N	

$DS_{5\%}$ for comparing two means of cutting method = 0,6-0,7 cuttings

$DS_{5\%}$ for comparing two means of substrate = 0,4 cuttings

$DS_{5\%}$ for comparing two means of cutting method x substrate= 0,9-1,0 cuttings

Note : the difference between any two values, followed by at least one common letter, is not significant

According to results presented in previous tables, the best results are achieved, regardless of rooting substrate, by the cuttings with heel. Similarly to what was discussed before, substrates which provide high efficiency are the mixed ones, among which stands out the format of sand + peat, with a rate of 50.4% rooted cuttings. At the opposite is the substrate composed of perlite simple with a rooting percentage of only 13.7%, significantly lower.

From the analysis of the values representing the number of rooted cuttings we can say that the most effective method is the cuttings that are using cuttings with heel on the substrate made of sand + peat, with a percentage of rooting of cuttings by 53.3%. The smallest number of rooted cuttings are recorded when is used the cutting with heel on the substrate composed of perlite, rooting percentage being only 13.3% (Fig. 4) (Mazăre, 2010).

CONCLUSIONS

The species *Picea abies* var. *Nidiformis* is prone species propagation by cuttings compared with *Picea glauca* var. *Conica.*

Shaping mode has an important influence on the results of experiments. Even if the heel cuttings give best results, in this paper was investigated the effect of cuttings with hook on rooting. But results have confirmed that the first type of bending cuttings precedence over the other. Cuttings with heel have a higher rate than cuttings with hook, which is noticed in both experiments. The same results are found separately, by species.

Mixed substrates, composed of equal proportions combination of the three elements, taken two (sand, perlite and peat) ensuring better conditions for rooting cuttings. These results confirm the recommendations of specialists, that reccomend mixture of two or three items in a rooting substrate to resinous species.

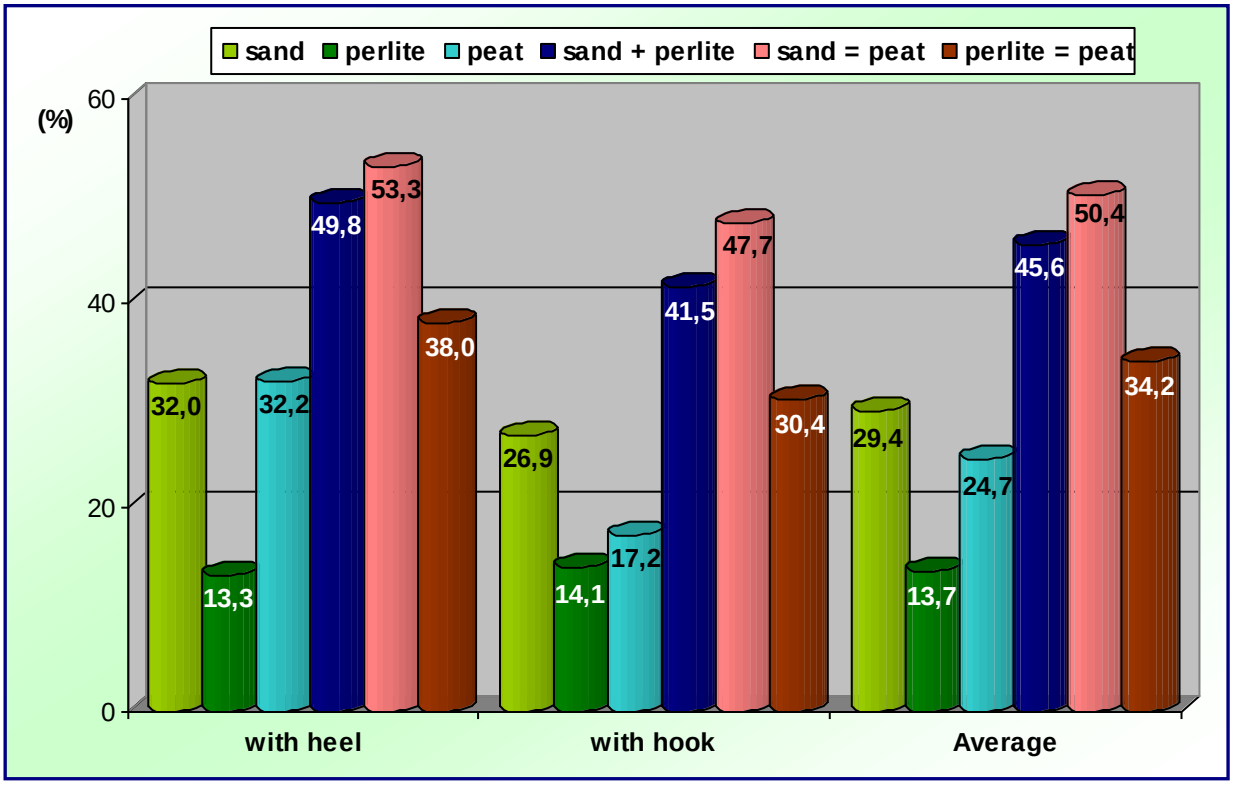

Fig. 4. The percentage of rooted cuttings by rooting substrates, depending on cutting type

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