OBSERVATIONS REGARDING MULTIPLICATION ON VEGETATIVE WAY OF *BUXUS SEMPERVIRENS* L. SPECIES IN IAŞI COUNTY CONDITIONS

OBSERVAȚII PRIVIND ÎNMULȚIREA PE CALE VEGETATIVĂ A SPECIEI *BUXUS SEMPERVIRENS* L. ÎN CONDIȚIILE JUDEȚULUI IAŞI

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Abstract. *Within the multitude of dendrological species, Buxus species are particular importance in green areas and especially in our country's conditions that are generally favorable and very favorable to these species. The aim of the paper is to highlight the potential for vegetative propagation of the most popular species, namely Buxus sempervirens L., which is found in Iasi county. During the vegetation period, observations were made on the action of rooting biostimulators and the growth rate of cuttings roots by determining the percentage of rooted cuttings, the average length of roots emitted per cuttings and the average number of roots per cut.*
Key words: seedlings, substrate, rooting bio-stimulators.

Rezumat. *În cadrul multitudinii de specii dendrologice, speciile genului Buxus au o importanță deosebită în amenajarea spațiilor verzi şi mai ales în condițiile de la noi din țară care sunt în general favorabile şi foarte favorabile pentru aceste specii. Scopul lucrării este de a pune în evidență potențialul de înmulțire pe cale vegetativă a celei mai cunoscute specii, respectiv Buxus sempervirens L., care se întâlneşte în județul Iaşi. Pe parcursul perioadei de vegetație s-au efectuat observații privind acțiunea biostimulatorilor de înrădăcinare şi sporul de creştere al rădăcinilor butaşilor prin determinări privind procentul de butaşi înrădăcinați, lungimea medie a rădăcinilor emise pe butaşi şi numărul mediu de rădăcini pe butaş.*
Cuvinte cheie: butaşi, substrat, biostimulatori de înrădăcinare

INTRODUCTION

One of the basic components of the green spaces that ensures the aesthetic appearance of the localities is the landscaping.

Within the multitude of dendrological species of ornamental shrubs, Buxus species are of particular importance in green areas, and the conditions in our country that are generally favorable and very favorable to this species.

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The necessity of diversifying the assortment is a priority given the diversity of biological material and especially the achievements achieved worldwide. This work is complemented by specialists in the field as an efficient and well documented material because it follows the percentage of rooting in *Buxus sempervirens* L. under unprotected conditions (Bernardis, 2010, Iliescu, 2002).

MATERIAL AND METHOD

The production of the rooted cuttings of *Buxus sempervirens* L. took place in the Tudor Neculai nursery in Iaşi in 2017. The knock-off period and the arrangement on rooting substrates was carried out in April. The time interval was two months (april, may).

The biological material used consists of semi-milled cuttings from spiked peaks, with an average length of 6-8 cm that have been degraded in the basal part on a segment of 4 centimeters. The cuttings were harvested from healthy plants from the Tudor Neculai nursery collection in Iasi. The harvesting, preparation and placement of the cuttings on the rooting substrate took place on the same day.

The experience is of type 3x2, in two repetitions:

-Factor A - the type of rooting substrate with three graduations: a1- Prut sand; a2-Prut sand + forest vegetation (1: 1); a3-pearlite granules + sand (1: 1);

- Factor B - treatment with rhizogenic bio-stimulators (Radi-Stim No 2): b1-treated; b2-untreated.

By combining factor A with factor B and graduations, 6 experimental variants resulted (tab. 1). These variants were based on the subdivided plot method.

The substrates prepared for the experiments were placed on a layer 15 cm thick uniformly. Twenty cuttings were prepared and seated for each intentional experimental variation.

Table 1

Experimental variants of rooted cuttings *Buxus sempervirens* L.

Vararіant	Var. symbol	Type of substrate/type of cuttings
V_1	a_1 b_1	Prut sand, untreated cuttings
V_2	a_1 b_2	Prut sand, treated cuttings
V_3	a_2 b_1	Pearlite granules + sand (1:1), untreated cuttings
V_4	a_2 b_2	Pearlite granules + sand (1:1), treated cuttings
V_5	a_3 b_1	Black earth + sand (1:1), untreated cuttings
V_6	a_3 b_2	Black earth + sand (1:1), treated cuttings

Measurements and determinations have been made regarding the percentage of rooted cuttings (the number of rooted cuttings from the total of those planted on variants); the average length of roots emitted per cuttings and the average number of roots per cut.

To determine the average root length of the cuttings, measurements were made for each individual root and their amount was reported as the number of roots.

With these measurements, the parameters related to the evolution of the growth of the root system of the cuttings, the importance of the rooting biostimulators on the rooting efficiency and the growth rate of the roots of the cuttings were calculated.

RESULTS AND DISCUTIONS

In Romania, *Buxus sempervirens* L. are found in most nurseries, having an ornamental, therapeutic and environmental value (Mihail, 2005). An extremely valuable method for production is the multiplication of the species by vegetative way through cuttings. The results obtained at the end of the rooting period of cuttings of *Buxus sempervirens* L., untreated and treated with rhizogenic bio-stimulator, on various rooting substrates were reported in table 2 and table 3 and the primary data were statistically transformed and interpreted. Risogenesis is the phenomenon of organogenesis with a major implication in vegetative multiplication, because in its study a complex of factors that interact must be considered.

Table 2

Experimental results on the rooting of untreated cuttings by *Buxus sempervirens* L. under the influence of substrate composition

Substrate type	Rooted cuttings (%)
	b_1— untreated
a_1 - Prut sand	37
a_2 - perlit granules + sand (1:1)	50
a_3 - black earth + sand (1:1)	92

Table 2 shows large differences in the rooting percentage of untreated cuttings on the three rooting layers. We observe that the highest rooting percentage is obtained with the mixture of black earth + sand (1: 1), 92%, and the percentage difference between it and the Prut sand is 55%. 2 variants of the total of the 3 experimental variants ensured a rooting of over 50%.

Table 3

Experimental results on the rooting of treated cuttings by *Buxus sempervirens* L. under the influence of substrate composition

Substrate type	Rooted cuttings (%)
	b_2— treated
a_1 - Prut sand	78
a_2 - perlit granules + sand (1:1)	33
a_3 - black earth + sand (1:1)	100

According to table 3, we notice large differences in the rooting percentage of the cuttings at the level of the three rooting layers due to the risogenic Stimulator treatment Radi-Stim no. 2. We find that the highest rooting percentage

was achieved in the case of the black earth + sand (1: 1) mixture, 100%. Two variants of the three experimental variants ensured a 78% -100% rooting.

The highest rooting percentage was achieved with black / sand (1: 1) mixed soil, 92% -100%. Three variants of the total of the 6 experimental variants ensured a 78% -100% rooting. The rhizogenic substance and the composition of the substrate have differentially influenced the rooting of *Buxus sempervirens* L. cuttings.

Table 4

Primary results on the rooting of the cuttings of *Buxus sempervirens* L.

Var. no.	Var. symbol	Average roots length (cm)	Average number of roots (pcs.)
V_1	a_1 b_1	6.30	7.00
V_2	a_1 b_2	6.30	7.50
V_3	a_2 b_1	7.70	26.50
V_4	a_2 b_2	8.60	24.60
V_5	a_3 b_1	5.50	20.50
V_6	a_3 b_2	7.20	18.20

The first data in table 4 was statistically processed to determine the influence of the stimulator and the substrate on the rhizogenesis of *Buxus sempervirens* L. The results are presented and interpreted in tables 5 and 6.

Table 5

Influence of substrate composition on the average length of roots of untreated cuttings of *Buxus sempervirens* L.

Var. no.	Substrate type	Average roots length (cm))		Diferences (cm)	Semnific.
		cm	%		
V_1	Prut sand, untreated cuttings	6.30	100	-	-
V_3	Perlite granules+sand (1:1)	7.70	116.2	1.20	**
V_5	Black earth+sand (1:1)	5.50	80	-0.80	00
DL 5%=0.45 DL 1%=0.76 DL 0.1%=1.40					

It is found that the best results were obtained in variant V3 regarding the influence of the type of substrate on the average length of the untreated *Buxus* roots on 7.70 cm Prut + peat (1: 1) sand substrate with a difference of 1.20 cm (tab. 5).

In rooted cuttings, we observe positive values recorded in variants V4 due to the influence of the factors studied on the root length at the rooted cuttings, perlite granules + sand (1: 1), cut cuttings, with a difference of 2.13 cm from the Prut sand.

Observing the results obtained for the 6 variants analyzed, we observe very positive values recorded on variant V4, perlite granulate + sand (1: 1) substrate, treated cuttings, with a difference of 2.13 cm from the Prut sand and distinct values significantly positive were made on variant V3, perlite granulate + sand (1: 1), to untreated cuttings, with a difference of 1.20 cm from the Prut sand.

Table 6

The combined influence of the substrate and rhizogenic composition on the average length of the roots of *Buxus sempervirens* L.

Var. no.	Substrate type	Average roots length (cm)		Diferences (cm)	Semnific.
		no	%		
V_1	Prut sand, untreated cuttings	6.30	100	-	-
V_2	Prut sand, treated cuttings	6.30	100	-	-
V_4	Perlite granules+sand (1:1)	9.64	127.5	2.13	***
V_6	Black earth+ sand (1:1)	7.20	95.8	-0.50	0
DL 5%=2.67 DL 1%=3.60 DL 0.1%=7.80					

Table 7

Influence of substrate composition on the average number of roots on untreated cuttings of *Buxus sempervirens* L.

Var. no.	Substrate type	Average roots number		Diferences (cm)	Semnific.
		no	%		
V_1	Prut sand	7.00	100	-	-
V_3	Perlite granules+ sand (1:1)	26.50	373.4	19.50	**
V_5	Black earth+ sand (1:1)	20.50	280.4	13.50	**
DL 5%=2.67 DL 1%=3.60 DL 0.1%=7.80					

Regarding the influence of the type of substrate on the average number of roots on the Buxus untreated cuttings, it was found that the best results are in variant V3, perlite granulate + sand (1: 1) substrate of 26,50, the difference being of 19.50 compared to Prut sand and variant V5, on the ground of black forest + sand (1: 1) with a number of 20.50, the difference being of 13.50 compared to Prut sand (tab. 7), thus showing significant positive differences in the two cases.

The combined influence of the studied factors on the average number of roots in the rooted cuttings shows significant positive values recorded in variants V4 (perlite granulate + sand substrate in 1: 1 ratio), with a difference of 13.30 roots compared to sand of Prut, V6 on a black ground + sand substrate in a ratio of 1: 1, with a difference of 10.20 roots to the Prut sand (tab. 8).

Table 8

Combined influence of substrate and rhizogenic composition on the average number of roots on *Buxus sempervirens* L.

Var. no.	Substrate type	Average roots number		Diferences (cm)	Semnific.
		no.	%		
V_1	Prut sand, untreated cuttings	7.00	100	-	-
V_2	Prut sand, treated cuttings	7.50	103.0	0.20	-
V_4	Perlite granules+sand (1:1)	24.60	270.0	13.30	**
V_6	Black earth +sand (1:1)	18.20	239.2	10.20	**

CONCLUSIONS

According to recorded and analyzed data, at the end of the rooting period, the following were found:

1. A very good percentage of 90% was obtained by rooting the untreated cuttings on a black soil + sand (1: 1) substrate, with a 50% percentage difference from the Prut sand substrate;
2. Using the rhizogenic stimulator, 100% was obtained in combination with the black soil + sand (1: 1) substrate which influenced the rooting of the previous situation;
3. The perlite granule + sand substrate (1: 1) influenced a long-term increase in the root system of the Buxus untreated cuttings; there were significant positive increases;
4. The combination of the studied factors influenced the average number of roots in the rooted cuttings, observing positive values recorded in the variants V4 (on a pearlite granulate + sand substrate in a ratio of 1: 1), with a difference of 13.30 roots from the sand of Prut, V6 on the ground of black forest + sand in a ratio of 1: 1, with a difference of 10.20 roots to the Prut sand.

It has been found that the substrate provides a triple and double percent of the number of cuttings roots, either treated with or without rhizogenic biostimulators.

The success of a large number of cuttings depends on the roots that will be adapted to the conditions in the nurseries.

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