THE INFLUENCE OF ROOTING SUBSTRATE ON THE DEVELOPMENT OF ROSEMARY CUTTINGS

INFLUENȚA SUBSTRATULUI DE ÎNRĂDĂCINARE ASUPRA DEZVOLTĂRII BUTAŞILOR DE ROZMARIN

BUTA Erzsebet[1], CANTOR Maria[1], BUTA M[1]., HORȚ Denisa[1]
e-mail: ebuta2008@yahoo.com

Abstract. *The increasing the demand on the market of aromatic species determine more detailed study of rosemary propagation. This species is not only a seasoning plant; it is used in alternative medicine, but also modern and rustic gardens, balconies, terraces and sills. This paper makes some recommendations on the best substrate for rooting of Rosmarinus cuttings. During the experiments were made some morphological observations, were recorded dates regarding the growth and development of Rosmarinus cuttings in different rooting substrates. The dates were statistically interpreted by LSD test (Least Significant Difference) to illustrate the significance of differences. The best results concerning the total length of the cuttings and root systems were recorded in the substrate consist in peat and perlite. The number offshoots per cuttings was influenced most favorable by the substrate consist in peat with sand. Perlite of 0.02 mm favorably influenced the diameter of rosette and the number of leaves.*
Key words: medicinal properties, perlite, peat, propagation, aromatic plants

Rezumat. *Cererea tot mai mare pe piață a speciilor aromatice a determinat studierea mai amănunțită a înmulțirii rozmarinului. Această specie nu este numai o plantă condimentară, ea se foloseşte şi în medicina alternativă, dar şi în decorul grădinilor moderne şi rustice, balcoanelor, teraselor şi pervazelor. Lucrarea de față aduce câteva recomandări cu privire la cel mai bun substrat de înrădăcinare a butaşilor de Rosmarinus. Pe parcursul desfăşurării experiențelor s-au efectuat observații morfologice, s-au înregistrat date cu privire la creşterea şi dezvoltarea butaşilor de Rosmarinus în diferitele substraturi de înrădăcinare. Datele obținute au fost interpretate statistic cu ajutorul analizei varianței. Cele mai bune rezultate cu privire la lungimea totală a butaşilor şi a sistemului radicular s-au înregistrat în substratul format din perlit cu turbă. Numărul de lăstari pe butaşi a fost influențat cel mai favorabil de substratul compus din turbă cu nisip. Perlitul de 0,02 mm a influențat favorabil diametrul rozetei plantelor şi numărul de frunze.*
Cuvinte cheie: proprietăți medicinale, perlit, turbă, plante aromatice

INTRODUCTION

The history of herbs begin around 1066 AD, the custodians of medicinal herbs were European monasteries. After their dissolution herbs became the province of the manor house garden, and by Elizabethan times herb gardens had

[1] University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca, Romania

become very formal. In 1621, the first Botanic Garden in the UK opened at Oxford University, and in 1673 the Chelsea Physic Garden followed. By the 18th century, herbs became an informal part of the flower border and vegetable plot.

By the end of the 20th century, herbs were once again recognized for their own culinary and medicinal merit, and the dedicated herb garden plan has now undergone a huge revival (Jekka, 2010).

Rosemary, traditionally herb is a sweet-scented, shrubby, evergreen perennial that is usually grown as an annual in cooler climates. It is native to southern Europe, Morocco, and Tunisia (Small, 2001). Its scientific name *Rosmarinus* refers to its origins: "ros" is the Latin for "dew," and "marinus" means "belonging to the sea." Students in ancient Greece used to braid rosemary wreaths in their hair when taking examinations as the plant was thought to fortify the brain and refresh the memory.

In the Middle Ages, rosemary was believed to grow only in the gardens of the righteous, and so it was used as a magic charm to protect the wearer from the "evil eye." Placing a sprig under the pillow was also believed to have the power to repel evil spirits and bad dreams. For centuries, rosemary has been a symbol of happiness, fidelity, and love, and it has long been held that a man indifferent to rosemary's perfume is incapable of truly loving a woman.

Legend has it that when the Holy Family was fleeing from Herod's soldiers to Egypt, the Virgin Mary hung her blue cloak one night on a rosemary bush that had white flowers. The next morning the flowers had turned blue, like Mary's garment. From then on, the herb was known as "rose of Mary" (Small, 2001)

Rosemary is a woody evergreen with a height and spread of 80 cm - 1 m (Small, 2001; Jekka, 2010), 60-150 cm (Ardelean and Mohan, 2008). The flowers are small, pale blue, or bluish-lilac flowers (occasionally white or pink) that grow in clusters on the branches, it is appear in early spring and last until early summer, with, sometimes, a second flush in early fall. The leaves are short, needle-shaped, dark green and are highly aromatic when crushed. The leaves give off a pungent fragrance rather similar to tea or a combination of pine and nutmeg (Small, 2001). This is an important culinary and medicinal herb. Leaves, stems, and flowers can be used as culinary art.

Rosemary contains the antioxidants carnosic acid and rosmarinic acid and other bioactive compounds including camphor, caffeic acid, ursolic acid, betulinic acid, rosmaridiphenol, and rosmanol.

The plant has a very long tradition as a medicinal herb (Al-Sereiti, 1999). Hungary water was an infusion of flowering apices and wine that was allegedly formulated by Queen Elisabeth of Hungary in the eleventh century. The wine was used as a cordial for palpitations, to stimulate kidney function, or as a remedy against headache caused by insufficient circulation.

A steamy infusion of flowering apices is a good remedy for colic, colds, and nervous depression. It has a marked action on the nervous system, by reducing mental fatigue and stimulating memory and aids recovery from long-term stress and chronic illness (Jekka, 2010). Because of its antimicrobial activity, it can be used for acne and other skin infections (Burlando, 2010).

Fragrant rosemary enhances the flavor of any food – savory or sweet – to which it is added. Widely used to season meat, and is also added to jellies, jams, cakes and cookies. Can be adding to salads and vegetable dishes and is an essential ingredient in herb breads and biscuits, including "focaccia", the classic Italian flat bread (Small, 2001). If dried rosemary is utilized to uncooked foods is necessary to introduce in hot water before adding it. The flowers, with their milder flavor, can be candied, preserved, or added to jellies, honey, vinegar, and wine. Flavor olive oil by adding a few sprigs of rosemary. The essential oil is a good insect repellent (Jekka, 2010).

In traditional folk medicine, rosemary tea was used to stimulate the heart, alleviate headaches, and induce sleep. This species is not used much in modern medicine, although the oil does have antibacterial properties. Researchers are presently studying the value of rosemary in treating indigestion, rheumatic disorders (Iserin, 2001), and circulatory problems, and there is some promise of new medicinal uses. Rosemary oil is used commercially in various personal care products, including shampoos for oily hair and conditioners to bring out the highlights in dark hair (Small, 2001).

Rosemary is used as a decorative plant in gardens for xeriscape landscaping, especially in regions of Mediterranean climate. It is considered easy to grow and pest-resistant. It is often used in topiary, that venerable craft in which shrubs are trained into ornamental shapes.

MATERIAL AND METHODS

Experiences regarding the unilateral influence of substrate on the development of rosemary cuttings were placed in the greenhouse belonging to the Floriculture Department of UASVM - Cluj-Napoca. The greenhouse is old, flat glass, with semi-automatic equipment. Rooting was carried out on tables in substrate and growing trays.

The experiment was carried out during 2011 and was organized an experience with two factors and the analyzed factors were *Rosmarinus officinalis* and different rooting substrate.

The experience was monofactorial with four variants which were placed in randomized blocks, in three repetitions. The rooting substrate was consisting in the following: a_1 perlite; b_2 peat + perlite 1:1; b_3 peat + sand 1:1. The peat provides from Lithuania, was crushed, fertilized and neutralized (TS 3 peat).

The control of experience was the average of experience. For the propagation of *Rosmarinus*, on 15.06.2011 were collected 15 cuttings for each variant from the healthy mother plants, vigorous and free from diseases and pests. Cuttings were made from the middle-aged healthy stems. The prepared cuttings were treated with Radistim 1 for a better rooting.

Biological material prepared before had been planted in three rooting substrates, the cuttings being introduced in the substrate with at thickness of 8-10 cm. The rooting process was developed different according to the substrate: in perlite – 48 days, in peat+perlite – 37 days and peat+sand – 41 days.

RESULTS AND DISCUSSIONS

The recorded data concerning the influence of substrate on the

development of rosemary cuttings were statistical interpreted with „LSD" test (Least Significant Difference) to illustrate the significance of differences.

In the table 1 are presents data concerning the influence of rooting substrate on the total length of *Rosmarinus* cuttings. Significant difference comparing with the control (average of experience) were registered at the substrates consist in peat + perlite 1:1, which excel the control with 2.80 cm. The third substrate (peat+sand 1:1) achieved the same difference as the control.

Table 1

Unilateral influence of rooting substrate on the total length of *Rosmarinus* cuttings

Rooting substrates	The total length of cutting		±d (cm)	Signification of difference
	Absolute (cm)	Relative (%)		
Perlite	18.90	87.1	-2.70	-
Peat + perlite	23.70	113.4	2.80	*
Peat + sand	20.90	100.0	0.00	-
Average of experience (control)	20.90	100.0	0.00	-
LSD (p 5%)			2.71	
LSD (p 1%)			4.97	
LSD (p 0.1%)			6.02	

Table 2

Unilateral influence of rooting substrate on length of *Rosmarinus* cuttings

Rooting substrates	The length of cutting		±d (cm)	Signification of difference
	Absolute (cm)	Relative (%)		
Perlite	7.83	69.9	-3.37	00
Peat + perlite	12.10	108.0	0.90	*
Peat + sand	13.75	122.8	2.55	**
Average of experience (control)	11.20	100.0	0.00	-
LSD (p 5%)			0.83	
LSD (p 1%)			1.53	
LSD (p 0.1%)			3.40	

Results concerning the unilateral influence of rooting substrate on the length of rosemary cuttings are presented in table 2. Data show that the best substrate was the mix of peat + sand 1:1, which has generated distinct significant differences, which exceeds the control with 2.55 cm. The second substrate (peat+perlite) registered significant positive differences comparing with the control (0.90 cm).

Regarding the influence of rooting substrate on the number of leaves at rosemary cuttings can conclude that in similar way perlite and the mix of peat+perlite registered significant positive differences (tab. 3).

Table 3

The influence of rooting substrate on number of leaves of *Rosmarinus* cuttings

Rooting substrates	The number of leaves		±d	Signification of difference
	Absolute	Relative (%)		
Perlite	14.65	105.8	0.80	*
Peat + perlite	14.50	104.7	0.65	*
Peat + sand	12.50	90.3	-1.35	000
Average of experience (control)	13.85	100.0	0.00	-

LSD (p 5%) 0.54
LSD (p 1%) 0.98
LSD (p 0.1%) 1.18

In the case of *Rosmarinus officinalis*, the best results regarding the influence of rooting substrate on diameter of rosette was registered when was used the perlite. The difference which exceeds the control was 1.31 cm, distinct significant positive (tab. 4).

Table 4

The influence of rooting substrate on diameter of rosette of *Rosmarinus* cuttings

Rooting substrates	The diameter of rosette		±d (cm)	Signification of difference
	Absolute (cm)	Relative (%)		
Perlite	10.60	114.1	1.31	**
Peat + perlite	9.40	101.2	0.11	-
Peat + sand	7.89	84.9	-1.41	00
Average of experience (control)	9.26	100.0	0.00	-

LSD (p 5%) 0.62
LSD (p 1%) 1.14
LSD (p 0.1%) 2.52

Statistical data shows that in the substrate composed of peat + sand 1:1 the number of offshoots exceed the control of experiences. The value of 2.50 determines a significant difference. The peat+perlite substrate has a positive influence on the number of offshoots, but not statistically assure. The substrate that generates negative influence, in this case, was perlite (tab. 5).

Table 5

The influence of rooting substrate on the number of offshoots of *Rosmarinus* cuttings

Rooting substrates	The number of offshoots		±d	Signification of difference
	Absolute	Relative (%)		
Perlite	4.50	62.1	-2.75	0
Peat + perlite	7.50	103.4	0.25	-
Peat + sand	9.75	134.5	2.50	*
Average of experience (control)	7.25	100.0	0.00	-

LSD (p 5%) 2.43
LSD (p 1%) 4.46
LSD (p 0.1%) 5.88

Analyzing the influence of rooting substrate on the length of rosemary roots, data presented in table 6 show that the first and second substrates (perlite and peat+perlite) registered distinct significant differences. At the first substrate de difference which exceeds the control was 1.45 cm, at the second 1.50 cm.

Table 6

The influence of rooting substrate on the length of roots of *Rosmarinus* cuttings

Rooting substrates	The length of roots		±d (cm)	Signification of difference
	Absolute (cm)	Relative (%)		
Perlite	10.95	115.2	1.45	**
Peat + perlite	11.00	115.7	1.50	**
Peat + sand	8.20	86.3	-1.30	00
Average of experience (control)	9.50	100.0	0.00	-
LSD (p 5%)			0.45	
LSD (p 1%)			0.83	
LSD (p 0.1%)			1.84	

CONCLUSIONS

Based on the results the following conclusions and recommendations:

1. The rooting process was the best in the second substrate (peat+perlite), cutting were rooted in 37 days.
2. The total length of cuttings was influenced positive by the second substrate (peat+perlite), which generate significant difference.
3. Regarding the length of cutting can conclude that peat+perlite determine significant difference and peat+sand achieved distinct significant difference.
4. The number of leaves was influenced favorable influenced by perlite and peat+perlite.
5. Concerning the diameter of rosette, best results were obtained in case of perlite.
6. Favorable influence was registered at peat+sand in case of number of offshoots.
7. Almost similar differences were registered at perlite and peat+perlite in case of length of roots.

REFERENCES

1. **Ardelean A., Gh. Mohan, 2008 –** *Flora medicinală a României,* Ed. Alfa All, Bucureşti.
2. **Al-Sereiti MR, Abu-Amer KM, Sen P, 1999** - *Pharmacology of rosemary* (*Rosmarinus officinalis* Linn.) *and its therapeutic potentials*. Indian J. Exp. Biol. 37, p. 124–30.
3. **Burlando Bruno, Luisella Verotta, Laura Cornara, and Elisa Bottini-Massa, 2010 -** *Herbal Principles in Cosmetics Properties and Mechanisms of Action*, Taylor and Francis Group, LLC, p. 303-307.
4. **Iserin P.**, **2001** - *L'Encyclopédie des plantes médicinales*, Larousse, Paris, p. 128.
5. **Jekka Mcvicar, 2010 -** Grow herbs, Dorling Kindersley Limited, London, p. 180-181.
6. **Small E., Deutsch G., 2001 -** *Culinary herbs for short - season gardeners*, National Research Council of Canada & Ismant Associates Inc., p. 147-150.