

**EFFECT OF SUBSTRATES AND ENHANCERS ON THE ROOTING OF SOME ROSE VARIETIES OF THE TEA GROUP UNDER GREENHOUSE CONDITIONS****DIANA MIHAELA BRIZU, MARIA BĂLA**

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**ABSTRACT**

A rose assortment changes so much in time that, until something is published about it in a book, other new rose varieties are on the market. It is estimated that 150 million roses are cultivated each year in the world – both as cut flowers and as flowering plants for the decoration of green areas. They can be planted on slots along the road, in round and irregular flowerbeds (short roses), isolated or in groups, supported by fences, planted in pots or in flowerdisplays. The rose has always been the badge of many countries. East Mediterranean Sea and subtropical areas of East Asia are the place of origin of roses. The research was carried out at the Didactic Station in Timisoara in the conditions of a modern greenhouse of the Gothic 800 type and aimed at studying the rooting rate of rose cuttings in five rose varieties of the Tea group on different substrates. Multiplication through cuttings is among the first methods used to multiply roses and its advantage is that the plants obtained this way maintain all the features of the mother-plant and do not produce runners that require supplementary removal work.

**Keywords:** rose, cutting, variety, substrate, rooting enhancer

**INTRODUCTION**

Palaeontologists claim that roses date back to the Tertiary Era, 70 million years ago. Old writings show that roses have been known ever since 2350 BC. Around 2200 BC, King Sargon of Sumer became renowned for bringing home from one of his campaigns vine, fig and rose.

The first writings on rose cultivation and on winter cuttings belong to the Greek philosopher Theophrastus (382-287 BC). It seems that the surname "Queen of Flowers" was given by the Greek Achilles Tatios towards the end of the 2<sup>nd</sup> century AD.

The Genus *Rosa* has about 140 species, of which 95 originate in Asia, 18 in North America and the rest in Europe and North Africa. There is no rose coming from places south from the Equator (GRANT, 2004).

Some rose varieties have strong scents and have been intensely cultivated – therefore, their cultivation has turned into a good business. For instance, the Damascus rose and the Alba rose are the most used in the manufacturing of rose oil. The large flowered Hybrid Tea varieties produce the most fragrant roses and the best roses for cutting, although they generally bloom less frequently than the Floribunda (DE VLEESCHOUWER, 2004).

Between the two World Wars, most of the cultivated roses belonged to the Tea group. Since then, other roses such as covering roses, rose varieties from the groups Polyanthus, Floribunda and Patio, creeping and covering roses, roses from the David Austin group, and miniature roses were added to the Tea group roses to decorate green areas.

The main cut rose producing countries are Holland, Denmark, Israel, Kenya, Zimbabwe, the USA and Columbia. Roses find their place in all landscaping styles. Many of the great landscape and garden designers of the 20<sup>th</sup> century used roses in their schemes (COURT, 2004).

Our research consisted of determining the rooting rate in some rose varieties from the Tea group on different rooting substrates and with different rooting enhancers. The goal was to establish which of these rose varieties suited the best for multiplication through cuttings.

## MATERIALS AND METHODS

To carry out our research, we studied the following rose varieties from the Thea group: Prima Donna, Double Delight, Ambassador, Imperatrice Farah, Doamna în Mov, Pascali, Golden Elegance, Acapella, Madonna, and Mainzer Fastnacht.

Cutting was done in August. From the mother-plants, we took cuttings with 3-4 buds. We left 1-2 leaves above 2 basic leaflets. The cuttings were stuck in the rooting substrate about 3 cm deep. Row distance was 8 cm and plant distance was 5 cm (WAGNER, 2002).

The substrates used were sand, perlite and a mixture of peat, perlite and sand (in equal amounts). The rooting enhancer we used was Radifarm, a complex vegetal product, 100% natural that ensures the development of a vigorous root system. Measurements were made 6 weeks after the planting of cuttings

([HTTP://WWW.BLONDYROMANIA.RO/PHARMA/156.PDF](http://www.blondyromania.ro/pharma/156.pdf)).

## RESULTS

Based on data presented in *Table 1* below, we can see that both rose varieties and rooting substrates had a real distinctly significant impact on the rooting of rose cuttings on the background of homogeneity of environmental conditions of the experiment. The rose variety had the highest impact (26.00%) on rose cuttings rooting, followed by the rooting substrate (11.96%), while the treatment with Radistim had a lower impact (0.21%), i.e. insignificant.

We can also see that the combined effects of the different factors had considerable impacts, statistically ensured, on the rooting of rose cuttings: thus, the highest impact was in the interaction between rose varieties and substrates (24.80%), and the lowest one was in the interaction between substrates and rooting enhancers (1.36%).

**Table 1. Analysis of the variance for the effect of variety, rooting substrate and rooting enhancer on rose cuttings rooting**

Source of variation	SP	GL	S <sup>2</sup>	F-test
Total	96044.2	179		
Repetitions variety	55.1	2	27.5	F=0.10
Variety	16890.0	9	1876.7	F= 7.14**
Substrat	7769.8	2	3884.9	F= 14.77**
Stimulator	137.2	1	137.2	F= 0.52
Variety x Substrat	16107.5	18	894.9	F= 3.40**
Variety x Stimulator	7765.3	9	862.8	F= 3.28**
Substrat x Stimulator	882.6	2	441.3	F= 1.68**
Variety x Substrat x Stimulator	15400.6	18	855.6	F= 3.25**
Error	31036.1	118	263.0	

On the background of different rooting substrates, we can see that rose varieties had amplitudes of the cuttings rooting percentages ranging between 56% when using perlite as

a rooting substrate and 36% when using the mixture of perlite, sand and peat as a rooting substrate. Thus, on the sand rooting substrate, the rose varieties Ambassador and Acapella had a significantly higher rooting percentage compared to the other rose varieties, except for the rose variety Madonna. The rose varieties Pascali and Golden Elegance valorised in the most effective way the rooting substrate of perlite, with significant 20-56% increases in rose cuttings rooting compared to most other rose varieties (except for the rose varieties Imperatrice Farah and Madonna). The rooting substrate made of perlite, sand and peat was the most favourable for the rooting of the rose cuttings in the rose varieties Imperatrice Farah, Pascali and Golden Elegance, which recorded maximum values of this process, significantly higher than the rose varieties Prima Donna, Double Delight, Doamna în Mov and Madonna.

In the case of the rose varieties Double Delight, Ambassador, Doamna în Mov, Madona and Mainzner Fastnacht, the composition of the rooting substrate had no significant impact on the rooting of rose cuttings. In the rose varieties Pascali and Golden Elegance, the sand rooting substrate resulted in a significantly lower rooting compared to the other rooting substrates which resulted in maximum values. In the Prima Donna rose variety, the rooting substrate made of perlite, sand and peat was significantly more effective than the other two rooting substrates. In the case of the rose variety Acapella, the rooting substrate made of perlite, sand and peat was more favourable to the rooting of rose cuttings than the perlite rooting substrate.

As for the combined effect of the rose varieties and of the rooting enhancer on rose cuttings rooting (Table 2), we can see a higher amplitude between the rose varieties when we did not apply any rooting enhancer (44.44%) compared to the results obtained on the background on which we applied Radifarm (28.57%).

When no rooting enhancer was applied, the highest rooting percentage was in the rose varieties Golden Elegance and Imperatrice Farah which resulted in statistically ensured increases compared to the rose varieties Prima Donna, Double Delight, Acapella and Madonna. The rose varieties Pascali, Acapella and Ambassador better valorised the treatment with the rooting enhancer Radifarm, resulting in significantly superior cuttings rooting percentages compared to the rose varieties Prima Donna, Double Delight, Doamna în Mov, Madonna and Mainzer Fastnacht.

**Table 2. The variety and stimulator effect on rooting of rose cuttings**

Nr.	Variety	Stimulator	
		Untreated	Radifarm
1	Prima Donna	y48.89d	x66.67d
2	Double Delight	x73.33bc	x68.89d
3	Ambassador	x82.22abc	x93.33ab
4	Imperatrice Farah	x93.33a	x80.00bcd
5	Doamna în Mov	x82.22abc	y66.67d
6	Pascali	x85.71ab	x95.24a
7	Golden Elegance	x93.33a	x86.67abc
8	Acapella	y67.78c	x94.44ab
9	Madonna	x77.14bc	x74.29cd
10	Mainzer Fastnacht	x80.00abc	x75.24cd

DL<sub>5%</sub>=15.14    DL<sub>1%</sub>=20.02    DL<sub>0,1%</sub>=25.80

The differences between the combinations noted with different letters: a, b, c – for vertical comparisons; x, y, z – for horizontal comparisons are considered significant

The treatment with Radifarm had a major, statistically ensured impact on the rooting of rose cuttings in the rose varieties Prima Donna and Acapella, determining increases between 17.78 and 26.66%. In the case of the rose variety Doamna în Mov, the treatment with the root enhancer Radifarm determined a significant diminution of 15.55% of the cuttings rooting percentage. In the other rose varieties, applying the rooting enhancer Radifarm had no impact whatsoever on rose cuttings rooting.

As for the combined impact of the rooting substrate and that of the rooting enhancer on the rooting of rose cuttings, we can see that, no matter the type of rooting substrate, the treatment with the rooting enhancer Radifarm had no significant impact on the rooting process: despite the increases of 4.23-5.48% on the rooting substrates of perlite and of perlite, sand and peat, these increases never reached the level of statistical insurance.

**Table 3. The substrate and stimulator effect on rooting of rose cuttings**

No.	Substrate	Stimulator	
		Untreated	Radifarm
1	Sand	x73.71b	x69.24c
2	Perlite	x76.67ab	x80.90b
3	Perlit+Sand+Peat	x84.81a	x90.29a

DL<sub>5%</sub>=8.29      DL<sub>1%</sub>=10.96      DL<sub>0,1%</sub>=14.13

The differences between the combinations noted with different letters: a, b, c – for vertical comparisons; x, y, z – for horizontal comparisons are considered significant

Taking into account the impact of the treatment with the rooting enhancer Radifarm on the rooting of rose cuttings on the three rooting substrates, we can see really significant differences between the rooting substrates (*Table 3*). When we did not apply any treatment, the mixture of perlite, sand and peat allowed a significantly superior increase in the rooting rate of the rose cuttings compared to the simple substrate made of sand alone.

The treatment with the rooting enhancer Radifarm allowed the best results in rose cuttings rooting on the complex rooting substrate, perlite, peat and sand, significantly 9.39-21.05% higher than the other rooting substrates. On the sand rooting substratum, the efficacy of its use was significantly, 11.66% lower compared to the perlite rooting substrate.

Taking into account the combined effect of the rooting substrate and that of the treatment with the rooting enhancer Radifarm on rooting, the rose varieties recorded, on the sand rooting substrate, variation amplitudes ranging between 60% in the control variant and 73.3% when applying the rooting enhancer Radifarm. On this rooting substrate, without applying any rooting enhancer, the rose variety Double Delight showed a cuttings rooting percentage significantly superior to that of the rose varieties Prima Donna, Pascali and Mainzer Fastnacht. Applying the rooting enhancer Radifarm on a sand rooting substrate was valorised at a very high level by the rose varieties Ambassador and Acapella which yielded maximum rooting percentages, significantly higher than those of the other rose varieties except the rose varieties Pascali and Madonna.

On the sand rooting substrate, the treatment with Radifarm had a significant effect only on the rooting of the cuttings of the rose variety Pascali, where it resulted in an increase of 28.57%. In the case of the rose variety Double Delight, the rooting enhancer Radifarm caused a significant decrease of about 73% of the rose cuttings rooting.

**Table 4. The effect of variety, rooting substrate and stimulator on the rooting of rose cuttings**

Rooting substrate : Sand			
Nr.	Variety	Stimulator	
		Untreated	Radifarm
1	Prima Donna	x40.00c	x60.00b
2	Double Delight	x100.00a	y26.67c
3	Ambasador	x80.00ab	x100.00a
4	Imperatrice Farah	x80.00ab	x60.00b
5	Doamna în Mov	x80.00ab	x60.00b
6	Pascali	y57.14bc	x85.71ab
7	Golden Elegance	x80.00ab	x60.00b
8	Acapella	x80.00ab	x100.00a
9	Madonna	x80.00ab	x80.00ab
10	Mainzer Fastnacht	x60.00bc	x60.00b
Rooting substrate: Perlite			
Nr.	Variety	Stimulator	
		Untreated	Radifarm
1	Prima Donna	x46.67c	x40.00b
2	Double Delight	x60.00bc	x80.00a
3	Ambasador	x80.00ab	x80.00a
4	Imperatrice Farah	x100.00a	x80.00a
5	Doamna în Mov	x80.00ab	x80.00a
6	Pascali	x100.00a	x100.00a
7	Golden Elegance	x100.00a	x100.00a
8	Acapella	y40.00c	x83.33a
9	Madonna	x80.00ab	x85.71a
10	Mainzer Fastnacht	x80.00ab	x80.00a
Rooting substrate: Perlite+Sand+Peat			
Nr.	Variety	Stimulator	
		Untreated	Radifarm
1	Prima Donna	y60.00c	x100.00a
2	Double Delight	y60.00c	x100.00a
3	Ambasador	x86.67ab	x100.00a
4	Imperatrice Farah	x100.00a	x100.00a
5	Doamna în Mov	x86.67ab	y60.00bc
6	Pascali	x100.00a	x100.00a
7	Golden Elegance	x100.00a	x100.00a
8	Acapella	x83.33abc	x100.00a
9	Madonna	x71.43bc	x57.14c
10	Mainzer Fastnacht	x100.00a	x85.71ab

DL<sub>5%</sub>=26.22    DL<sub>1%</sub>=34.67    DL<sub>0.1%</sub>=44.69

The differences between the combinations noted with different letters: a, b, c – for vertical comparisons; x, y, z – for horizontal comparisons are considered significant

As for the perlite rooting substrate (Table 4), the rose varieties we studied presented amplitudes of the rooting percentage of 60%. On the background without the rooting enhancer Radifarm, the rose varieties Imperatrice Farah, Pascali and Golden Elegance yielded maximum yields of rooting, significantly superior to those of the rose varieties Prima Donna, Acapella and Double Delight. The treatment with the rooting enhancer Radifarm on this rooting substrate was valorised at maximum level by the rose varieties Pascali and Golden Elegance, while in the rose variety Prima Donna, the effect was significantly lower.

When using the perlite rooting substrate, applying the rooting enhancer Radifarm resulted in a significant increase of about 43% of the rose cuttings rooting only in the rose variety Acapella, while in the rest of the rose varieties, the rooting enhancer had a lower impact that was not statistically ensured on the rooting process.

On the rooting substrate of complex composition – perlite, sand and peat – without any treatment whatsoever, we could see that the rose varieties Imperatrice Farah, Pascali, Golden Elegance and Mainzer Fastnacht recorded maximum values of rooting that were significantly superior to those of the rose varieties Madonna, Double Delight and Prima Donna. The treatment with the rooting enhancer Radifarm was valorised at maximum level by most rose varieties, except for the rose varieties Madonna and Doamna în Mov, where the rooting percentage in these conditions was significantly lower. On the background of this complex substrate, the rooting enhancer Radifarm had a high impact on the rose cuttings rooting only in the rose varieties Prima Donna and Double Delight, where it generated significant increases of 40%. In the rose variety Doamna în Mov, applying this rooting enhancer resulted in a significant 26.7% decrease of rooting percentage, as it did on the sand rooting substrate.

## CONCLUSIONS

Analysing the data processed, we can recommend the multiplication through cuttings of the rose varieties Pascali and Golden Elegance as well as of the rose varieties Ambassador, Imperatrice Farah and Acapella.

We recommend cutting multiplication on a sand rooting substrate in the rose varieties Ambassador and Acapella, on a perlite rooting substrate for the rose varieties Pascali and Golden Elegance, and on a mixture of peat, perlite and sand rooting substrate for the rose varieties Imperatrice Farah and Golden Elegance.

The rose varieties Golden Elegance and Imperatrice Farah are recommended to be multiplied through cuttings but with no rooting bio-enhancer application.

Using the rooting bio-enhancer Radifarm is recommended in the rose varieties Pascali, Acapella and Ambassador, which yield significantly superior cuttings rooting percentages compared to the rose varieties Prima Donna, Double Delight, Doamna în Mov and Mainzer Fastnacht.

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