Volume 16(4), 105- 109, 2012
JOURNAL of Horticulture, Forestry and Biotechnology
www.journal-hfb.usab-tm.ro

Results in *Ficus australis* rooting on different substrata and with different rooting enhancers with effect on cutting rooting in the fall

Anches C.[1]*, Bala Maria[1]

Banat's University of Agricultural Sciences and Veterinary Medicine Timişoara, Faculty of Horticulture and Forestry

*Corresponding author. Email: codrut.anches@iuliusmall.com

Abstract Ficus is an ornamental plant that, due to its presence, can add life and beauty to a flat room. So far, they know more than 800 species of ficus of the tree, shrub or climbing plant type (Bala Maria, Floricultura generala si speciala, 2007). A ficus can be described as a vigorous, woody plant with large, skinny, ellipse-shaped, dark green to yellowish leaves. The genus Ficus contains plants that are extremely varied from trees over 30 m tall in their countries of origin to dwarf, creeping species. Some of these species are largely used in manufacturing medicines.
Ficus Australis is a plant with difficult rooting: this is why we have used four types of rooting substrata and three rooting stimulators. The trial was carried out in the greenhouses of the Faculty of Horticulture of the Banat University of Agricultural Science and Veterinary Medicine of Timisoara (Romania) where climate factors supply good conditions for the rooting of this plant.
As a result of the trial, we came to the conclusion that the greenhouses in which we carried out the trial provide good conditions for plant growth and development over one or several years (Bala Maria, Floricultura Generala-Curs, 1998).
Results show that the culture substratum has different effects on plant rooting and development from the biostimulators used in the trial.

Key words

ficus, substratum, stimulator, rooting

Ficus is an evergreen, tree-like woody plant, with extremely decorative leaves due to their shape, size, and colour.
Ficus is a shrub with slower growth but with many branches. Its stem is elastic, slightly woody, and very branchy.

Ficus belongs to the Family Moraceae and it originates in the tropical areas of Asia, Africa, and Australia. There are several types of ficus: tree-like, shrubby, or climbing. The leaves are oval, skinny, dark-green, and shiny. No matter the species or cultivar, ficus is a slow-growing plant, particularly during winter. Because of its low branching ability, ficus needs more cutting to increase its decorating effect. The better the ficus is cared for, the larger and nicer it is (Van Wyk, p. 1972. *Copacii din Parcul Naţional Kruger*)
Let's position the plants where they can enjoy a good source of light, yet avoiding direct sunshine, which could cause antiaesthetic burnings on the foliage. These plants don't agree with cold temperatures during this time of year. They can be grown outside. The *Ficus australis* should be grown in a bright place, with direct sunlight.

There are several species of ficus with different low temperature tolerance levels, including *Ficus australis* which is more resistant to cold compared to other species and also adapted to maritime climate.
The number of rooted cuttings as well as their growth is influenced by greenhouse conditions, by rooting substratum, and by rooting biostimulators.
Ficus rooting and development depend on the quality of chemical and physical and cultivation substratum, as well as on the amount of assailable nutrients in the culture substratum (Militiu Amelia, Floricultura, 1965). Most ficus grow and develop well in aerated, humus-rich culture substrata, but there are also ficus that require a heavier or a lighter substratum.

Material and Methods

In this trial, we aimed at obtaining a larger number of ficus rooted cuttings and, therefore, healthy, vigorous plants.
The trials were carried out in the greenhouses of the Faculty of Horticulture and Forestry of the BUASVM Timisoara, where climate factors provide good

conditions for the rooting and development of the species Ficus.
The trial was carried out on three species of Ficus, i.e. *Ficus elastica*, *Ficus Benjamina*, *Ficus australis*. In this paper, we refer only to the rooting of Ficus Australis, since in this species the number of rooted cuttings is smaller than in other species.
In order to establish the best rooting substrata, the trial was carried out in 4 variants: sand, perlite, peat + perlite, and peat + perlite + sand.
Anton Doina (Floricultura Generala, 2003) shows that, to make a ficus root, we can use special substrata produced by well-established companies; one of these substrata is THP25 produced by Turberies de France, whose chemical composition is 60% black peat, 35% blond peat, 5% soil with 15-20% clay.
According to Lazureanu Aurel (Agrotehnica, 1994), fertility is that property of the culture substratum of supplying the cuttings with smaller or larger amounts of nutrients in proper air and water conditions.
Each experimental variant had several replicas with 20 cuttings each, the control being represented the average of the trial. Previously to putting the cuttings to root, we treated them with rooting stimulators using Radistim, Revita, and Atonik.
To interpret the results, we used variance analysis. The variants were set after the randomised block method with 3 replicas specific to trials in forced, protected flower cultivation areas (Ciulca Sorin, Tehnica experimentala, Ed Mirton Timisoara, 2002).
The stimulators used to make the ficus cuttings root were atonik, radistim, and revital.
Davidescu D and Davidescu Velicica (Agrochimie horticola, 1992) recommend applying rooting N P K (2:1:1)-based biostimulators 0.5-0.7% 24 hours after harvesting from the mother-plant.
Penningsfeld F. cited by Sonea V. (Floricultura generala, 1971) recommend the periodical analysis of the rooting substratum to avoid nutrition unbalance caused by high rates of fertilisers; the same author groups Ficus among the plants with high tolerance to soil salinity.

Results and Discussions

Table 1

Analysis of variance concerning the substratum and rooting stimulator on *Ficus australis* cuttings rooting

Source of variation	SP	GL	S^2	Test F
Total	4,136.98			
Replicas	16.67	2	8.33	F=0.23
Substratum	2,493.23	3	831.08	F= 23.37**
Stimulator	364.06	3	121.35	F= 3.41*
Substratum x Stimulator	196.35	9	21.82	F= 0.61
Error	1,066.67	30	35.56	

Taking into account the results of the variance analysis (Table 1), we see that both studied factors had considerable, statistically ensured impact on the rooting of Ficus australis cuttings with little impact of environmental conditions on the results.

Table 2

Effect of rooting substratum on *Ficus australis* cuttings rooting

Rooting substratum	Averages (%)		Relative values (%)	Difference/ Significance
Perlite - Sand	61.25	52.92	115.74	8.33**
(Perlite+Peat) - Sand	70.83	52.92	133.84	17.91***
(Perlite+Peat+Sand) - Sand	69.58	52.92	131.48	16.66***
(Perlite+Peat) - Perlite	70.83	61.25	115.64	9.58***
(Perlite+Peat+Sand) - Perlite	69.58	61.25	113.60	8.33**
(Perlite+Peat+Sand) - (Perlite+Peat)	69.58	70.83	98.24	-1.25

$DL_{5\%}$=4.97 $DL_{1\%}$=6.89 $DL_{0.1\%}$=8.87

As for the effect of the substratum on the rooting rate of ficus cuttings (Table 2), we can see a medium variability (13.07%) and a span of 17.91% between the values corresponding to the four rooting substrata, with limits between 52.92% on sand and 70.83% on perlite + peat.

The most complex mixture (sand + perlite + peat) had the same high efficacy on ficus cuttings rooting resulting in significant increases of 16.66-8.33% more compared to results on sand + perlite. The lowest efficacy on cuttings rooting – significantly inferior to that of the other variants – was on sand.

Table 3

Effect of rooting stimulators on *Ficus australis* cuttings rooting

Rooting stimulator	Averages (%)		Relative values (%)	Difference/Significance
Radistim - Control	67.50	60.83	110.96	6.67*
Revital - Control	65.00	60.83	106.86	4.17
Atonik - Control	61.25	60.83	100.69	0.42
Revital - Radistim	65.00	67.50	96.30	-2.50
Atonik - Radistim	61.25	67.50	90.74	-6.25^{0}
Atonik - Revital	61.25	65.00	94.23	-3.75

$DL_{5\%}$=4.97 $DL_{1\%}$=6.89 $DL_{0.1\%}$=8.87

Taking into account the unilateral effect of cultivation duration, Table 3 shows that cell biomass had a low variability of 5% associated to a span of 6.67% with values between 60.83% in the treated variant and 67.50% in the variant treated with Radistim. This variability shows that there are smaller differences generally not ensured statistically between the different stimulators. As such, the treatment with Radistim had a significant effect on the cuttings rooting, resulting in increases of 6.25-6.67%, compared to the variant not treated and compared to the variant treated with Atonik. Applying Revital allowed an increase of about 7% of cutting rooting, but this value is not statistically ensured. Treatment with Atonik had an extremely low, insignificant effect on cutting rooting.

Table 4

Effect of substratum and rooting stimulator on *Ficus australis* cuttings rooting

Stimulator	Substratum					
	Sand	Perlite	Perlite+Peat	Perlite+Peat+Sand	$\bar{x} \pm s_{\bar{x}}$	$S_{\%}$
Control	z50.00a	yz56.67a	x71.67a	xy65.00b	60.83±3.25	18.50
Radistim	y56.67a	y61.67a	x75.00a	x76.67a	67.50±2.85	14.65
Revital	y55.00a	x65.00a	x70.00a	x70.00ab	65.00±2.22	11.83
Atonik	y50.00a	x61.67a	x66.67a	x66.67b	61.25±2.23	12.61
$\bar{x} \pm s_{\bar{x}}$	52.92±1.68	61.25±1.25	70.83±2.02	69.58±1.89	63.65±1.35	
$S_{\%}$	11.00	7.07	9.91	9.80	14.74	

$DL_{5\%}$=9.94 $DL_{1\%}$=13.39 $DL_{0.1\%}$=17.75

Can be considered significant the differences between the combinations marked a, b, c for vertical comparisons and x, y, z for horizontal comparisons.

On the substratum based on perlite, the cuttings resulted in an increase of the rooting percentage of 8.33% associated with a low variability of 7.07%, with a limit of 56.67% in the variant not-treated and 65.00% in the variant treated with Revital. Thus, on the substratum with rooting biostimulators, there was an increase of the cutting rooting percentage, but the increases were not statistically ensured.

On the mixture of perlite + peat, the cutting rooting percentage had a low variability close to the other two substrata (9.91%) for a span of 8.33%, with limits of 66.67% when treated with Atonik and 75.00% when treated with Radistim. Taking into account the low differences between the values related to the different treatments and the fact that only the treatment with Radistim allowed a rooting percentage superior to that of the control, we can say that the rooting stimulators used on this substratum had a very low, insignificant effect on cutting rooting.

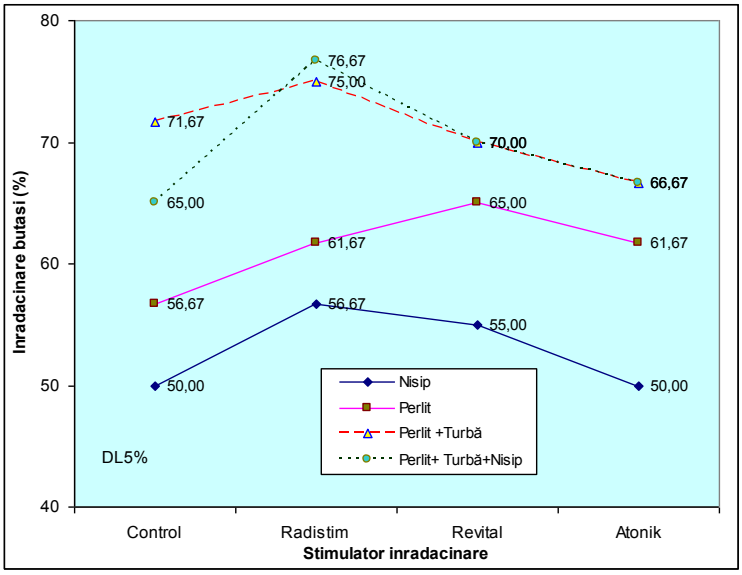

Fig. 1. *Ficus australis* cuttings rooting under the impact of different substrata and biostimulators

On the substratum of perlite + peat + sand, cuttings recorded a rooting percentage of 11.67% associated to a variability close to the average of the other substrata (9.80%), with limits between 65.00% in the control variant and 76.67% in the variant treated with Radistim. On this substratum, the treatments with biostimulators determined an increase of the percentage of cuttings rooting. From this point of view, the best results were after applying Radistim which allowed significant increases of 10.00-11.67% compared to the control variant or to the variant treated with Atonik.

The treatment with Radistim allowed the best results in cuttings rooting on complex substrata, i.e. on perlite + peat + sand, or perlite + peat, while more simple substrata such as sand or perlite alone are less effective.

Treatments with Revital and Atonik had a significant effect on cutting rooting on all substrata, except the treatment on sand alone.

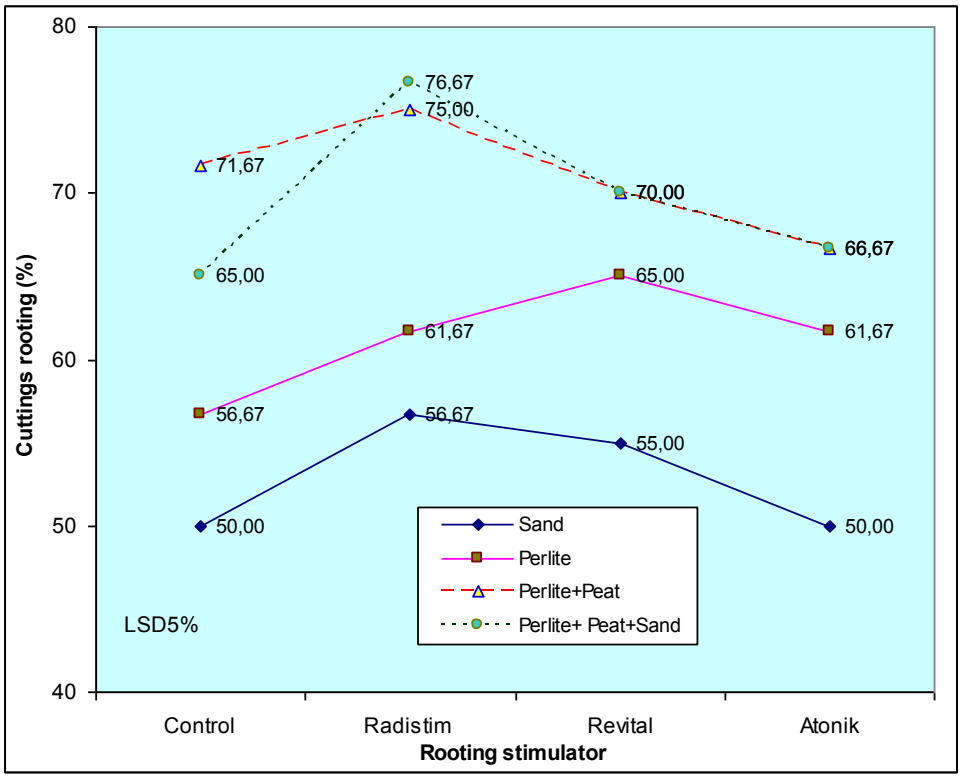

Fig. 2. Rooting of *Ficus australis* cuttings under the influence of different substrates and stimulators

Conclusions

- The substratum had a higher contribution (81.65%) on rooting variability compared to the effect of growth stimulators (11.92%). The combined effect of the substratum and rooting stimulators had a low influence, not ensured statistically (6.43%) on the variability of the rooting level of the focus cuttings (Table 1).
- Using the mixture of perlite + peat allowed the best rooting results, statistically ensured, between 9.58% compared to the perlite and 17.91% compared to the sand (Table 2).
- As far as the combined effect of substratum and stimulators on *Ficus australis* cuttings rooting is concerned, we can see that on the sand substratum this feature recorded a very low variation span (6.67%) and a low to medium variability (11.00%) associated with insignificant differences between the different stimulators. As such, on this substratum, the stimulators we used had no significant impact on cuttings rooting in this species.
- Taking into account the effect of the different stimulators on cuttings rooting on the four substrata, we can see there are significant real differences between the substrata depending on the three stimulators. When no stimulator was applied, the mixture perlite + peat allowed a cutting rooting percentage significantly superior to that of the simple substrata – sand or perlite alone. The complex mixture sand + peat + perlite assured the conditions for a significantly higher percentage of rooting compared to the substratum based on sand alone.

Bibliography

1.Anton Doina et al., Floricultura generala, Ed Universitaria Craiova, 2003.
2.Bala Maria, Floricultura generala, Ed Mirton Timisoara, 2003.
3.Bala Maria, Floricultura generala si speciala, Ed de Vest, Timisoara, 2007
4.Ciulca Sorin, Tehnica experimentala, Ed Mirton Timisoara, 2002.
5.Ciulca Sorin, Metodologii de experimentare in agricultura si biologie, Ed Agroprint Timisoara, 2006.
6.Davidescu D si Davidescu Velicica (Agrochimie horticola, 1992)
7.Lazureanu Aurel, Agrotehnica, Ed Helicon, Timisoara, 1994.
8.Militiu Ameia, Floricutura, Ed Agro-Silvica,1965
9.Penningsfeld F. cited by Sonea V. (Floricultura generala, 1971
10.Van Wyk, p. 1972. Copacii din Parcul Național Kruger. Purnell, Cape Town.