COMPORTAREA ÎN PROCESUL DE MULTIPLICARE A UNOR SPECII/VARIETĂŢI ORNAMENTALE DE CONIFERE CU VALOARE DECORATIVĂ RIDICATĂ
BEHAVIOUR OF SOME ORNAMENTAL CONIFEROUS SPECIES / VARIETIES PROPAGATION

Alina Rovină (Posedaru), Craisor Mazilu, Ion Duţu
Research Institute for Fruit Growing Pitesti, Romania

Abstract

The ornamental species and varieties of coniferous are of great decorative interest being utilized in landscape arrangements, as simple samples or in together with others. The propagation of these ornamental varieties is usually difficult due to their specific biological features. The commercial extension of these ornamental species/varieties was done into a less extent due to a low rate of propagation, although there was a great demand. Studies will be focused on: behavior of the some ornamental species/varieties: *Tujopsis dolobrata, Tsuga canadensis, Juniperus chinensis „Aureospicata", Juniperus chinensis „Blaauw's Varietat"* şi *Picea abies „Albertiana Conica"*during the initial multiplication process. The studies carried out at the Research Institute for Fruit Growing have had in view the response of five ornamantal species/varieties of coniferous to propagation by softwood cuttings, employing Radistim 1and Radistim 2 under artificial mist. *Thujopsis dolobrata* and *Tsuga canadensis* varieties showed the highest rooting percentage in all treatments (42,8-95,4% and 41,2-91,4%) and the little rooting percentage (10,4-51,2 %) of the *Juniperus chinensis „Blaauw Varietat"*. Application of the biostimulators (Radistim 1) has obviously improved the rooting yield versus the untreated control, treatment.

Cuvinte cheie: specii/varietăţi ornamentale**,** multiplicare, butaşi, biostimulatori de înrădăcinare,
Keywords: ornamental species/varieties, multiplication, cuttings, rooting biostimulators

1. Introduction

The ornamental species and varieties of wood coniferous plants are of great decorative interest being utilized in landscape arrangements as simple samples or together with others. The propagation of these ornamental varieties is usually difficult due to their specific biological features. The studies carried out at the Research Institute for Fruit Growing have had in view the response of these ornamental species to propagation by softwood cuttings and behaviour of ornamental wood plants in pot. The propagation by cuttings experiments, were done in plastic tunnels at the Research Institute for Fruit Growing Pitesti - Maracineni. We used ornamental varieties of: *Tujopsis dolobrata, Tsuga canadensis, Juniperus chinensis „Aureospicata", Juniperus chinensis „Blaauw's Varietat"* şi *Picea abies „Albertiana Conica",* during the initial multiplication process, as biological material. The biological material involved consisted of cuttings in the phase of semi-hard cuttings. The cuttings were defoliated, treated at the bottom by two biostimulators (Radistim 1 and Radistim, 2 % conc.), and then planted in a rooting perlite. After planting, the artificial mist was used.

2. Material and methods

Knowing the importance of the of the ornamental conifers in the landscape arrangements and the fact that the breeding of the ornamental varieties of *Juniperus, Picea, Tsuga and Thujopsis* is generally difficult due to each one's specific biological characteristics, we have proposed the following objectives:

- the comparative behavior of the ornamental varieties of: *Juniperus, Picea, Tsuga and Thujopsis* when they are bread by semi-wooden cuttings, in the solarium, under artificial fog;
- the testing of the rooting capacity of the studied ornamental varieties when they are treated with different rooting bio-stimulators;
- the effects of the bio-stimulators upon the radicular system and of the aerial part of the rooted cuttings;

The experiments were placed in the breeding places (solariums), in 2006 – 2009.

Biological material was used from 2 ornamental varieties of *Juniperus*, an ornamental variety of *Picea* and two species: *Tujopsis dolobrata, Tsuga Canadensis*.

The biologic material was represented by cuttings with *"heel"*, in the physiological semi-wooding state as *"green"* cutting. The cuttings were taken from mother plants, of over 10 years old, which are in the park-collection of R.I.F.G Pitesti, Romania.

The *"green"* cutting epoch has coincided with the calendar period of the 15th of July – the 10th of August, which is the growth period for sprouts (cuttings in the semi-wooding phase).

After producing the cuttings and removing the foils on the portion to be introduced in the planting orifice, the cuttings having the dimensions between 10.5-16.5 cm (according to each specie/variety), were treated at the base with the following rooting bio-stimulus bio-stimulators, as powder and solution:

- as powder:
- Radistim powder – a commercial product of the BIOS Chemistry Institute from Cluj Napoca;
- as solution:
- Radistim solution of 1% and 2% – a commercial product of the BIOS Chemistry Institute from Cluj-Napoca, (the immersion time of the cuttings being of 1 minute).

The planting of the cuttings in the rooting layers made of pearlite was performed in prior open orifices with the help of a planter. The plating distances were of: 7 cm between rows and 5 cm between the cuttings of a row, and the planting depth was of about 2/3 cm of the cutting length, in order to insure its vertical position.

When the cuttings were planted, the layer was sufficiently moist. After the planting, the artificial intermittent fog equipment was turned on, which was automatically released, at time periods of 5-10-20 minutes. The spraying period was of 5-10 seconds, according to the exterior temperature, so that the humidity state of the cuttings was maintained, stopping them from dehydrating or rotten.

3. Results and discussions

The variation of the rooting efficiency (%), of the semi-hardwood cuttings according to each species (varieties), for different rooting bio-stimulus was presented in figures 1a and 1b.

4. Conclusions

The researches regarding the propagation by “green” cuttings under artificial fog of the *Thujopsis dolobrata* and *Tsuga canadensis* species and the *Juniperus chinensis “Aureospicata”, Juniperus chinensis “Blaauw’s Varietat” and Picea abies “Albertiana Conica”* varieties, achieved in the 2005 – 2007 period, at Research Institute for Fruit Growing Pitesti, allow us to express some conclusions and recommendations which are useful for research and education, especially for the state and private production units.

1.In all the study years great efficiencies were emphasized for the *Thujopsis dolobrata* and *Tsuga canadensis* species (values between 42.8-95.4% and 41.2-91.4%).

2.The *Juniperus chinensis “Blaauw’s Varietat”* ornamental variety had the lowest rooting percentage, with values between 10.4-51.2% in all the study years.

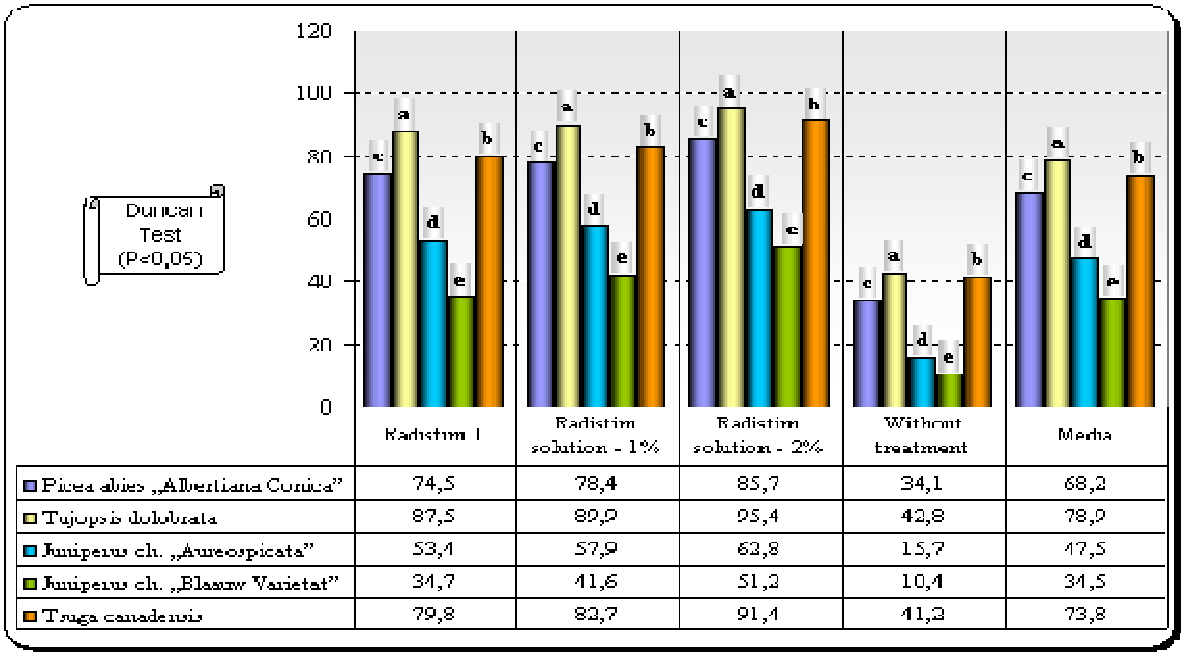
3. By using rooting bio-stimulus, the rooting efficiency was visibly improved, as well as the quality of the planting material, obtaining a radicular rich system, comparative to the untreated specimen.

4. Out of all bio-stimulus, Radistim solution –2% proved to be the best both for rooting of the cuttings, as well as for the architectonics of the radicular system and of the aerial part of the cuttings, followed by Radistim solution –1%, comparative to the untreated specimen.

References

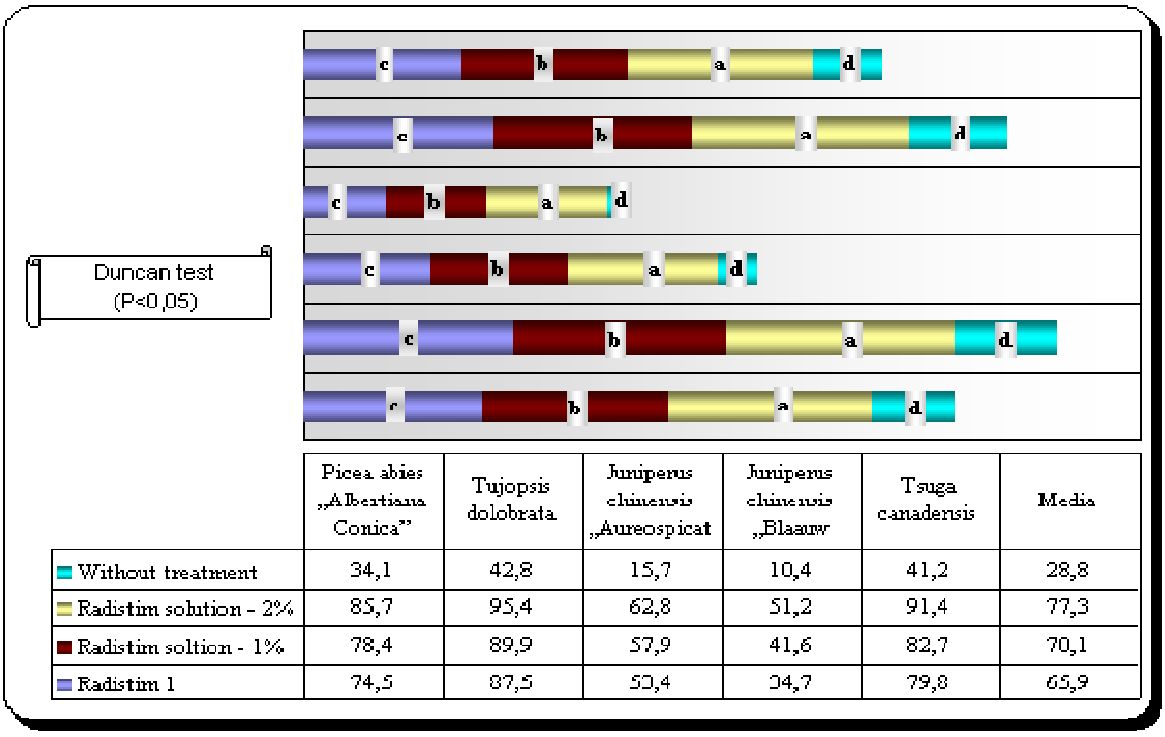
1. Iliescu Ana Felicia – Cultura arborilor şi arbuştilor ornamentali, Ed. Ceres, Bucureşti, 2002.
2. Elena –Alina Posedaru - *Sortiment de conifere pentru amenajari peisagistice – Dendrologie*, Ed. Universitatii din Pitesti, ISBN 973-690-416-6, 2005.
3. Alina Posedaru - *Behavior of ornamental decidious plants with hight decorative value to propagation by softwood cutting*, - Lucrari stiintifice, Anul XLVII – Vol. (48), Seria Horticultura, USAMV Iasi, Ed. Ion Ionescu de la Brad, I.S.S.N. 1454-7377, 2005
4. Posedaru Alina**,** Stanciu Nicolae - *Cercetări cu privire la creşterea şi fortificarea în containere şi câmp a unor foioase ornamentale cu valoare decorativă ridicată*, volumul ICDP Piteşti-Mărăcineni, 40 (1967-2007) de Ani în Pomicultură, Ed. INVEL Multimedia SRL, ISBN 973-7753-48-8, 978-973-7753-48-9, 2007, pag. 229-235.
5. Elena-Alina Posedaru – *Catalog de plante ornamentale* - Ed. INVEL Multimedia, Bucureşti, ISBN 978-973-7753-63-2, 2008.
6. Stănică Florin, Monica Dumitraşcu, Velicica Davidescu, Roxana Madjar, Adrian Peticilă – Înmulţirea plantelor lemnoase, Ed. Ceres, Bucureşti, 2002

Tables and Figures



	Radistim 1	Radistim solution - 1%	Radistim solution - 2%	Without treatment	Media
Picea abies „Albertiana Conica"	74,5	78,4	85,7	34,1	68,2
Tujopsis dolobrata	87,5	89,9	95,4	42,8	78,9
Juniperus ch. „Aureospicata"	53,1	57,9	62,8	15,7	47,5
Juniperus ch. „Blaauw Varietat"	34,7	41,6	51,2	10,4	34,5
Tsuga canadensis	79,8	82,7	91,1	41,2	73,8

Figure 1a and b. The variation of the rooting efficiency (%) of the semi-hardwood **cuttings according to the bio-stimulus, for the studied coniferous species/varieties**



	Picea abies „Albertiana Conica"	Tujopsis dolobrata	Juniperus chinensis „Aureospicat	Juniperus chinensis „Blaauw	Tsuga canadensis	Media
Without treatment	34,1	42,8	15,7	10,4	41,2	28,8
Radistim solution - 2%	85,7	95,4	62,8	51,2	91,4	77,3
Radistim soltion - 1%	78,4	89,9	57,9	41,6	82,7	70,1
Radistim 1	74,5	87,5	53,4	34,7	79,8	65,9

STUDII PRIVIND MULTIPLICAREA *„IN VITRO”* LA SPECIA *COTINUS COGGYGRIA* VARIETĂŢILE *SIMFONIA VERII* ŞI *ROYAL PURPLE*
„IN VITRO” PROPAGATION OF 'SIMFONIA VERII' AND 'ROYAL PURPLE' *COTINUS COGGYGRIA* SCOP CVS.

Mirela Călinescu, Alina Rovină (Posedaru), Valentina Isac, Catiţa Plopa
Research Institute for Fruit Growing Pitesti, Romania

Abstract

This paper deals with some studies on *in vitro* clonal propagation of two *Cotinus coggygria* varieties: 'Royal Purple' and 'Simfonia Verii'. The biological material included the tip axillary buds on one year old branches collected from mature plants in the field. The culture media were composed of the following mineral salts and vitamins: Murashige and Skoog (MS)(1962), Lee Fossard (LF)(1972), Quoirin and Lepoivre (QL)(1977) and Linsmaier and Skoog (LS) (1965), adding also dextrose (40 g l^{-1}), iron chelate (32 mg l^{-1}), various growth hormones and agar as solidification agent (10 g l^{-1}). The growth hormones had various concentrations related to the culture phase. The best results regarding *in vitro* regeneration were recorded with *Cotinus coggygria* 'Royal Purple' on QL medium (83.3%), supplemented with GA_3 (0.1mg l^{-1}) and IBA (0.01 mg l^{-1}). On the same medium, *Cotinus coggygria* 'Simfonia Verii' explants regenerated 66.6%. The best period for collecting the plants and inoculation of the explants was March, at the beginning of growing season. The best multiplication and rooting percentages showed *Cotinus coggygria* 'Royal Purple' too. The multiplication rate was 10.5 plants/explant on basic medium QL with GA_3 0.1 mg l^{-1} and a hormonal balance of BAP (1 mg l^{-1}) and NAA (0.2 mg l^{-1}). The percentage of rooted shoots on QL medium supplemented to NAA (0.25 mg l^{-1}) was 66.0% for *Cotinus coggygria* 'Royal Purple' variety.

Cuvinte cheie: specii/varietăţi ornamentale**,** multiplicare, butaşi, biostimulatori de înrădăcinare,
Keywords: *Cotinus*, Basal medium, explants source, multiplication, rooting

1. Introduction

The ornamental varieties *Cotinus coggygria* 'Royal Purple' and *Cotinus coggygria* 'Simfonia Verii' have a great ornamental value because of the specific biological and aesthetic features. These varieties are frequently used in modern landscape architecture as simple, group or line designs.

Cotinus coggygria is an ornamental plant highly appreciated in the verdure spots especially in the blooming time and for the reddish color of its leaves. These varieties are less commercially grown due to their poor rate of propagation.

In case of the vegetative propagation of *Cotinus coggygria* species, its cuttings proved a poor rooting (35.4 %-37.6 %) – Posedaru Alina, 2007. To improve the rooting ability *in vitro* multiplication is an alternative o the classic vegetative propagation.

Recent results regarding the tissue culture and rapid propagation of *Cotinus coggygria* were reported by Cuiu. et al (2004). For having an efficient *in vitro* propagation system the studies were focused on: regeneration ability of explants related to the culture medium; optimum time for collecting the biological material; influence of nutrient medium on the *in vitro* multiplication and rooting of the two varieties.

2. Material and methods

The plant material used to initiate *in vitro* cultures of *C. coggygria* `Royal Purple` and `Simfonia Verii` was one-year old branches with 3-4 internodes collected from mature plants from the dendrological park of RIFG Pitesti-Maracineni, Arges.

Branches were collected at two developmental stages: in March (early growing season) and July (active growing season). The branch segments were treated with *Fundazol* 0.03% and kept in plastic bags at 4^0 C until the excision time.

The explants source was the axillary buds with leaf primordial. Branches were cut in small segments with one bud washed under running water and sterilized in ethanol (96^0) for 10 minute, immersed in $Ca(OCl)_2$ for 20 minutes and finally washed in sterile distilled water for 3-15 minutes.

For *in vitro* initiation and multiplication basal media included MS mineral salts and vitamins (Murashige and Skoog, 1962), LF macro and micro elements and vitamins (Lee Fossard, 1977) as well as QL macro and micro elements (Quoirin-Lepoivre, 1977) with vitamins according to Linsmaier-Skoog

(1965) (LS). Only one QL macro and micro elements with LS vitamins was used for the rooting phase. Growth regulators in various combinations and concentrations were added to each medium (Table 1).

All media contained 40g l^{-1} dextrose, 9 g l^{-1} Duchefa agar and 32mg l^{-1} Na Fe EDTA. After dissection and inoculation the cultures were maintained at 22-24^0 C, 16 hours photoperiod at white fluorescent light irradiance 35-45 µmol $m^{-2}s^{-1}$. All experimental treatments consisting of three replicates were arranged in a completely randomized design. For culture initiations were used 6 tubes per replicate with 1 explant. New shoots were excised for each subculture every 4 weeks for multiplication study. There were 4 – 12 replicate bottles in different experiments depending of treatments in an experiment. Plants from multiplication phase were placed on rooting treatments. In each replicates we used 10 plants.

The regeneration ability of axillary buds explants (% of regenerated explants) was recorded 30 days after the culture initiation. The multiplications rate (MR) as average number of plantlets/original explant was recorded for 5 subcultures and the rooting ability (percentage of rooted plants) was recorded after 30 days.

The data were analyzed for significance ($P<0.050$ by ANOVA (analysis of variance) with the mean separation by Duncan's Multiple Range test (Duncan, 1995).

3. Results and discussions

The regeneration ability of axillary buds explants collected from *C. coggygria* `Royal Purple` and `Simfonia Verii` was good on all 3 basal media (Fig. 1). It was highest on QL medium and lowest on LF medium. However, some differences between the two ornamental varieties were observed (Fig. 1).

`Royal Purple` had a higher percentage of responding explants (50-83.3%) compared with `Simfonia Verii` (41.6-66.6%).

After one month, QL with LS vitamins proved to be the best cultural medium yielding the highest regeneration percentage - 83,3 % for `Royal Purple` and 66,6 % for `Simfonia Verii` (fig. 1). The optimum time for collecting the plants was March for both *Cotinus* varieties.

The multiplication rate depended on basal medium, variety and number of subcultures (Fig. 2,3). The best multiplication medium for both varieties was QL resulting in 5.8 and 10.5 shoots/explant for `Simfonia Verii` and `Royal Purple`, respectively. The multiplication rate on MS and LF medium was similar.

After 5 subcultures, some plants were transferred to rooting media and two variants V_1 and V_2 (Table 1) were tested. *In vitro* rooting of the two *Cotinus* varieties was most successful when NAA 0,25mg l^{-1} was added (Fig. 4), resulting in 66% and 23.3% rooted shoots of `Royal Purple` and `Simfonia Verii`, respectively. When IBA (0. 25mg l^{-1}) was supplemented only 50 % and 12.5 % rooted plants were recorded (Fig.4).

In conclusion we could recommend that axillary buds for micro-propagation of *C.coggygria* should be collected in March and grown on QL-medium for initiation, multiplication and rooting and 0. 25mg l^{-1} NAA should be added during the rooting.

References

1. CUI, J. - R., CHEN, C. - X., LI, C. (2004) *Tissue and rapid propagation of Cotinus coggygria „Royal purple*". Plant Physiology Communication vol. 40, part 5: 588.
2. LINSMAIER, E.M., SKOOG, F. (1965) *Organic growth factor requirements of tabacco tissue culture*. Physiol Plant 18: 100 – 127.
3. MURASHIGE T., SKOOG F., (1962) *A revised for rapid growth and bioassay with tabacco tissue cultures,* Physiol Plant., 15: 473 – 497.
4. POSEDARU, E. A., (2007) *Influenţa tipului de butaş asupra înrădăcinării unor specii ornamentale cu valoare decorativă ridicată*. Hortinform nr.1/161: 27 - 29.
5. QUOIRIN M., LEPOIVRE P., (1977) *Improved media for in vitro culture of Prunus* sp. ActaHorticulturae 78: 437 – 442.

Tables and Figures

Table 1. **Cultural media tried in the *in vitro* differentiation phase**

Growth regulators	Initiation and sterilization	Multiplication	Rooting	
			V1	V2
GA_3 (mg l^{-1})	0,1	0,1	-	-
BAP (mg l^{-1})	-	1,0	-	-
NAA (mg l^{-1})	-	0,2	0,25	-
IBA (mg l^{-1})	0,01	-	-	0,25

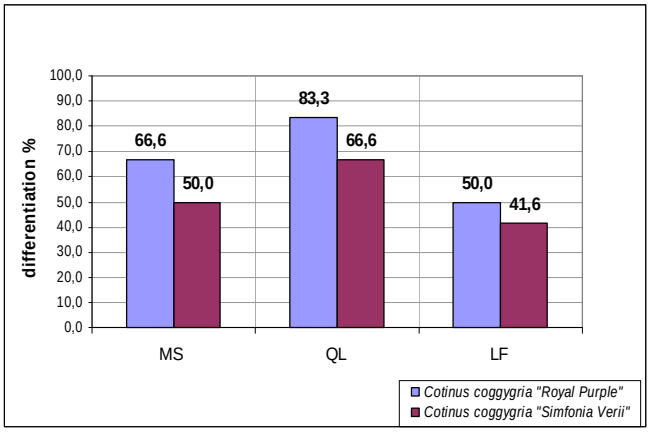


Fig. 1 – Differentiation of *Cotinus coggygria* various cultural media.

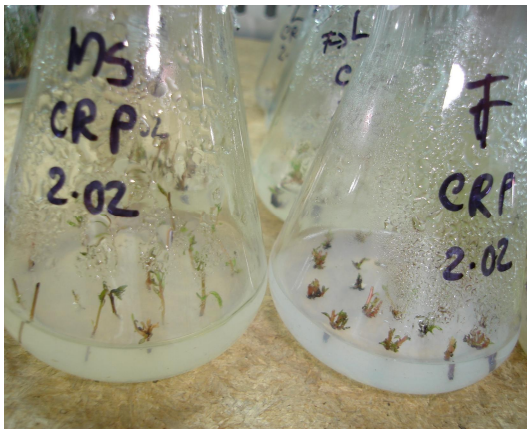


Fig 2- The multiplication of *Cotinus coggygria* 'Royal purple' on cultural media

Fig. 3-Differentiation of *Cotinus* 'Royal purple'

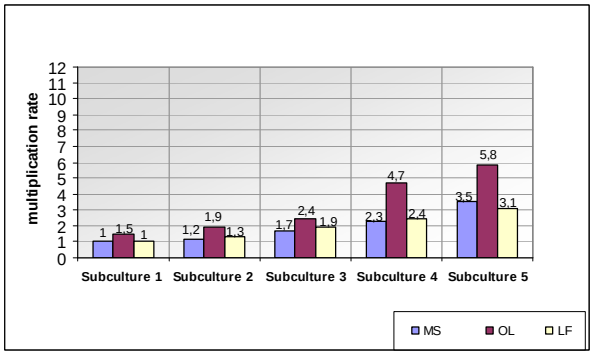


Fig. 4 – Multiplication rate of *Cotinus coggygria* 'Simfonia Verii'

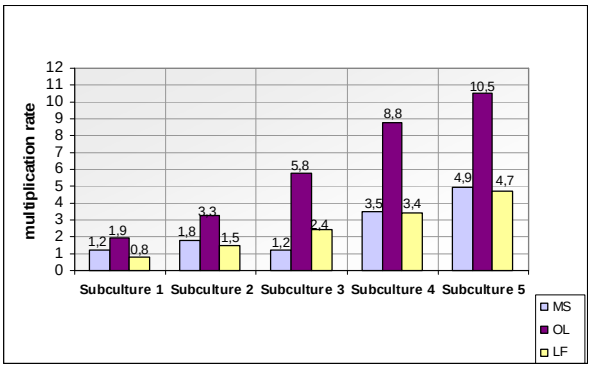


Fig. 5 – Multiplication rate of *Cotinus coggygria* 'Royal Purple'

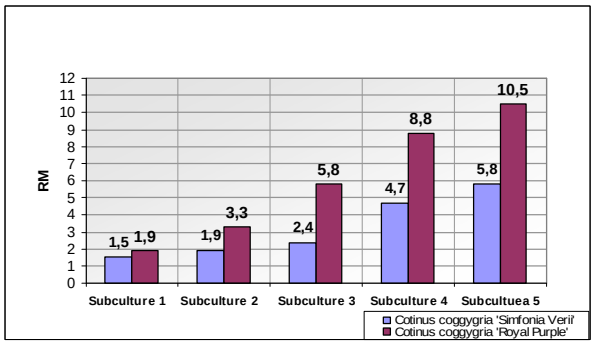


Fig. 6 -Multiplication rate of *Cotinus* varieties on QL cultural medium

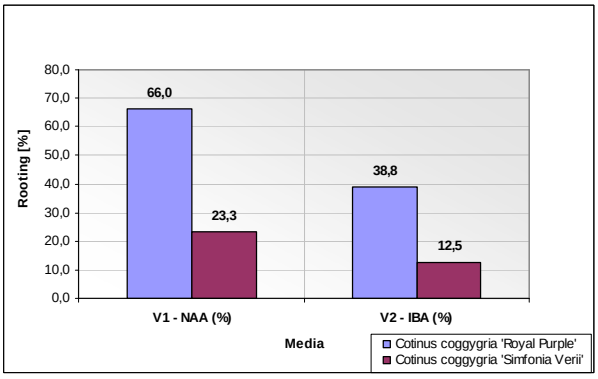


Fig. 7 – Rooting percentage on QL medium of *Cotinus* ornamental varieties

Fig. 8 - The multiplication of *Cotinus coggygria* 'Royal purple' on LF cultural medium

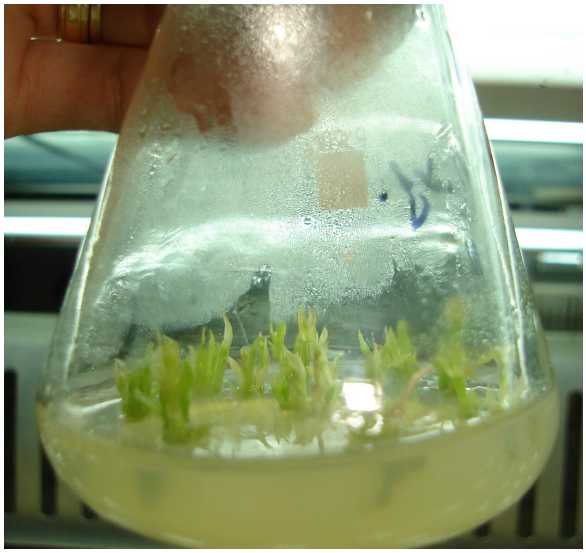


Fig. 9- The multiplication of *Cotinus coggygria* 'Simfonia Verii' on MS cultural medium

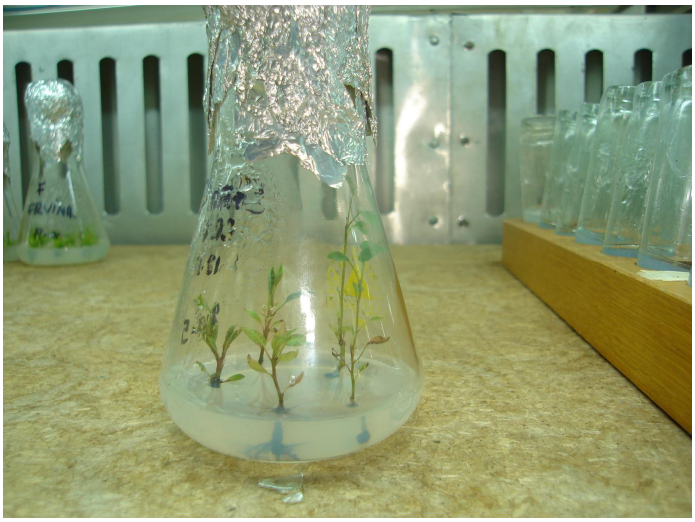


Fig 10 - The rooting of *Cotinus coggygria* 'Simfonia verii'

Fig.11 – The rooting of *Cotinus coggygria* 'Simfonia verii'

Fig. 12- The rooting of *Cotinus coggygria* 'Royal Purple'