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# THE USE OF THE FOG-SYSTEM IN THE OLIVE LEAFY CUTTING PROPAGATION

*Gregor OSTERC*
Institute for Fruit Growing, Viticulture and Vegetable Growing, Department of Agronomy, Biotechnical Faculty, University of Ljubljana, SI-1000 Ljubljana, Jamnikarjeva 101
E-mail: gregor.osterc@bf.uni-lj.si

*Dunja BANDELJ MAVSAR*
Institute for Mediterranean agriculture and olive growing, Science and Research Centre of the Republic of Slovenia, Koper, SI-6000 Koper, Garibaldijeva 18

*Franci ŠTAMPAR*
Institute for Fruit Growing, Viticulture and Vegetable Growing, Department of Agronomy, Biotechnical Faculty, University of Ljubljana, SI-1000 Ljubljana, Jamnikarjeva 101

## *ABSTRACT*

*The leafy cutting propagation of olive under mist is well known, although all so far carried out experiments have been based only on rooting results. The development of leafy cutting propagation method by woody plants has been made possible due to the development of the fog-systems in the last 15 years. Our experiment with the use of the fog-system in the propagation of 'Istrska belica' and 'Leccino' showed that the propagation of these olive cultivars in such a system is possible. The cuttings formed up to 7 main roots in the propagation season and their sprouts grew up to 20 cm.*

**Key words:** olive, fog-system, leafy cutting propagation, rooting

# L'USO DEL SISTEMA DI NEBULIZZAZIONE NELLA PROPAGAZIONE PER TALEA SEMILEGNOSA DELL'OLIVO

## *SINTESI*

*La propagazione dell'olivo tramite talea semilegnosa sotto nebulizzazione è ben nota, benché da tali esperimenti si siano avuti solamente risultati inerenti la radicazione. Negli ultimi 15 anni lo sviluppo del metodo della propagazione tramite talea frondosa con piante legnose è fortemente collegato alla nascita e allo sviluppo del sistema di nebulizzazione. Dagli esperimenti, nei quali è stato usato tale sistema nella propagazione delle specie Bianca Istriana e Leccino, risulta possibile la propagazione di questi cultivar di olivi con il sistema di nebulizzazione. Nella stagione della propagazione le talee hanno sviluppato fino a 7 radici principali e i loro germogli sono cresciuti fino a 20 centimetri.*

**Parole chiave:** olivo, nebulizzazione, propagazione per talea semilegnosa, radicazione

## INTRODUCTION

The olive propagation is carried out in the praxis mostly with leafy cuttings. In the praxis the cuttings are propagated on the moving tables under mist. As the cutting bases have to be heated during propagation period, the propagation costs are high. Using this system, the cultivars 'Istrska belica' and 'Leccino', which are the most important Slovenian cultivars, can be propagated relatively well, too.

The good experience with the use of the fog-system in the propagation of leafy cuttings with many woody plant species (and difficult-to-root species) in the last few years has enabled us to enhance the propagation success with the olive as well. As this method requires no heating of the cutting bases, it is much cheaper as the propagation in the mist system.

The effects of the slow release fertilizer, added to the rooting substrate, on the rooting and growth of cuttings were tested in the experiment.

In the past, many experiments with olive leafy cuttings under mist have been carried out. Rooting success depended strongly on the propagated cultivar. Vesel (1999) reported that the rooting results of the cv. 'Istrska belica' were about 60%, while the results with the cv. 'Leccino' were only about 30%. Contrary to such results are the farmers' findings: the rooting with the cv. 'Leccino' is better than with the cv. 'Istrska belica'. The outcomes of several experiments showed that the rooting success was only between 40% and 50% in various cultivars (Celik *et al.*, 1994; Fernandes-Serrano *et al.*, 2000). Celik *et al.* (1994) were able to reach better rooting results (up to 100%) by using a different type of tunnel in the cultivar 'Gemlik'. A very wide rooting range was also obtained by Özkaya and Celik (1994) who rooted cultivars 'Gemlik' and 'Domat' with rooting rates between 20 and 57% and in other treatments up to 100%.

All these experiments are based only on rooting results. Such experiments can be very problematic, as there are many other factors that can also dramatically affect rooting or propagation success (plant growth in the propagation season, over-wintering etc.). Spethmann (1997) suggested observing cutting experiments widely, not only through one parameter, such as rooting percentage. Many new experiments with numerous woody species showed several important advantages of the fog-system used in the cutting propagation. For the first time, very important plant arts could be economically rooted with the use of the fog-system: *Acer, Quercus, Hamamelis, Prunus* (Spethmann, 1986a, 1986b, 1997).

## MATERIALS AND METHODS

The experiment was carried out in an unheated plastic house under a fog system in the experimental field of the Biotechnical Faculty in Ljubljana in 2001. Four levels (0, 0.2, 0.4 and 0.6g N/l substrate) of the slow release fertilizer "Osmocote-Plus 3-4M (15+11+11+2)" were tested with two olive cultivars 'Istrska belica' and 'Leccino'. The one-factor experiment with 4 replications and 30 cuttings per replication was carried out. The cuttings were cut at the end of June in a private orchard in Ankaran (Slovenia). Before being put in the rooting substrate (peat/sand in a 3:1 ratio), the cuttings were treated with 0.5% IBA (with 10% Euparen on talcum basis).

Data were collected in November 2001. The rooting results, the number and the length of the main roots and the sprout length were stated. The data were evaluated with ANOVA, the differences were tested with the Duncan-test at p=0.05.

## RESULTS AND DISCUSSION

The rooting results of this first experiment with olive leafy cuttings in the fog system reached average values in both cultivars 'Istrska belica' and 'Leccino', namely up to 30%. The fertilizer variants showed highly varying results depending on the cultivars. In the case of 'Istrska belica', the best variant was the lowest fertilizer variant (0.2 g N/l), in 'Leccino' both the control variant and the strongest fertilizer variant (0.6 g N/l) gave the highest rate of rooted cuttings (Tab. 1).

***Tab. 1: Rooting results regarding different fertilization variants of the substrate for two olive cultivars.***
***Tab. 1: Rezultati ukoreninjanja glede na fertilizacijske različice substrata za dva oljčna kultivarja.***

| Variant | Rooting (%) | |
|---|---|---|
| | 'Istrska belica' | 'Leccino' |
| Control | 10.0 | 24.2 |
| 0.2 g N | 30.9 | 7.8 |
| 0.4 g N | 10.0 | - |
| 0.6 g N | 5.0 | 23.4 |
| $Duncan_{0.05}$ | n.s. | -[a] |

-[a]: statistical analysis was not possible/statistična analiza ni bila mogoča

These results cannot be accepted as positive when compared with the results of other difficult-to-root woody species propagated in the fog-system (Spethmann, 1986a, 1986b; Osterc & Spethmann, 2000). Anyway, it should be mentioned that some other experiments with olive leafy cuttings under mist, especially with 'Leccino', showed similar rooting results (Vesel, 1999). The control variant (without fertilizer) had no negative effects on the rooting process. This can be well explained with the fact that substrate fertilizing shows its effect on cutting growth later in the propagation season, when the roots have already been formed (Spethmann, 1997).

The number of the main roots was the greatest at the control variant in both olive cultivars, while the length of the roots was the greatest at the 0.2g N variant (Tab. 2, Fig. 1).

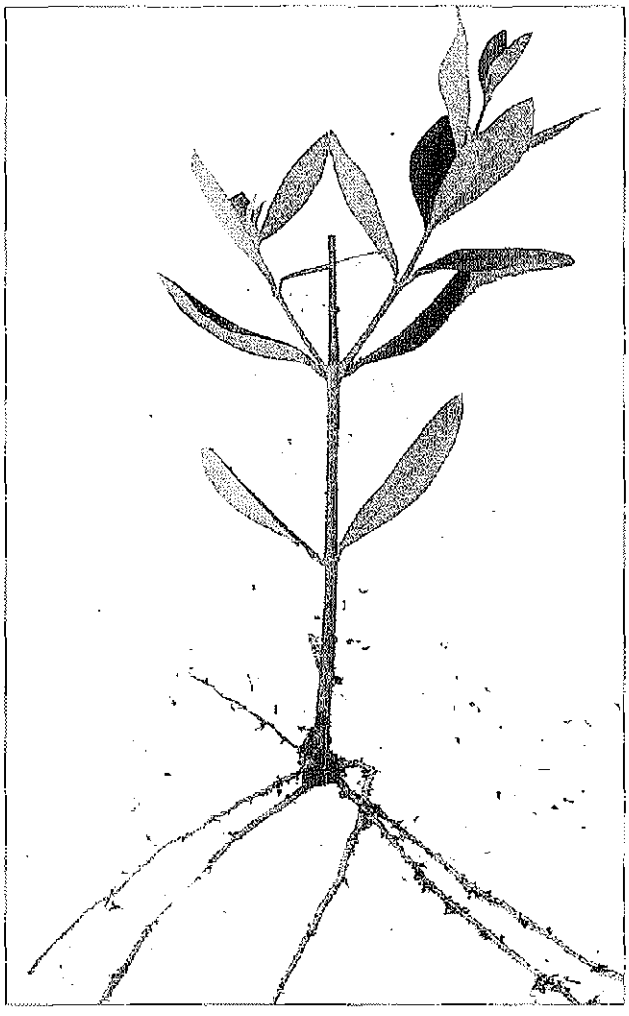

*Fig. 1: Very well developed root system of olive cuttings cv. 'Istrska belica' at the end of the propagation season.*
*Sl. 1: Zelo dobro razvit koreninski sistem potaknjenca 'istrske belice' ob koncu razmnoževalne sezone.*

*Tab. 2: Number and length of the main roots regarding different fertilization variants of the substrate for two olive cultivars.*
*Tab. 2: Število in dolžina glavnih korenin glede na fertilizacijske različice substrata za dva oljčna kultivarja.*

| Variant | Number | | Length (cm) | |
|---|---|---|---|---|
| | 'Istrska belica' | 'Leccino' | 'Istrska belica' | 'Leccino' |
| Control | 5.4 | 5.3 | 14.7 | 13.6 |
| 0.2 g N | 3.7 | 2.7 | 20.9 | 15.1 |
| 0.4 g N | 4.0 | - | 9.7 | - |
| 0.6 g N | 2.8 | 3.2 | 12.5 | 10.8 |
| $Duncan_{0.05}$ | n.s. | -[a] | n.s. | -[a] |

-[a]: statistical analysis was not possible/statistična analiza ni bila mogoča

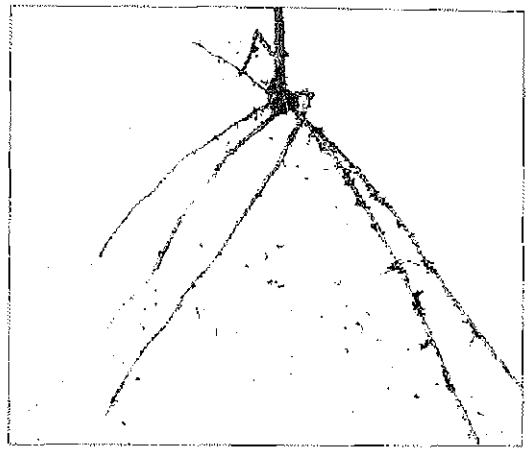

*Fig. 2: Very well developed root system enables strong sprout growth of olive cuttings in the propagation season (cv. 'Istrska belica').*
*Sl. 2: Zelo dobro razvit koreninski sistem omogoča močno rast poganjkov oljčnih potaknjencev v razmnoževalni sezoni (cv. 'istrska belica').*

It can be concluded yet again that substrate fertilizing showed its effect for first time when the rooting process had already been finished. The positive effect of the presence of the fertilizer can be seen in the phase of the root growth. This influence of the fertilizer has already been described several times in the case of many woody species in the new literature data (Spethmann, 1997; Osterc & Spethmann, 2000). But there is a lack of similar experiments with olive cuttings. There have been no literature reports in the last ten years on experiments with the olive leafy cuttings, which would include other rooting parameters beside rooting percentage as well (Celik *et al.*, 1994; Özkaya & Celik, 1994; Vesel, 1999).

The strongest growth of the main sprout can be observed with 7.0 cm at the 0.2 g N variant in 'Istrska belica' and with 5.4 cm at the control variant in 'Leccino' (Tab. 3, Fig. 2).

*Tab. 3: Sprout growth of the cuttings regarding different fertilization variants of the substrate for two olive cultivars.*
*Tab. 3: Rast poganjkov potaknjencev glede na fertilizacijske različice substrata za dva oljčna kultivarja.*

| Variant | Sprout growth (cm) | |
|---|---|---|
| | 'Istrska belica' | 'Leccino' |
| Control | 4.4 | 5.7 |
| 0.2 g N | 7.1 | 3.0 |
| 0.4 g N | 0.7 | - |
| 0.6 g N | 1.5 | 3.5 |
| $Duncan_{0.05}$ | n.s. | -[a] |

-[a]: statistical analysis was not possible/statistična analiza ni bila mogoča

The results with 'Istrska belica' confirm that the fertilizer in the substrate reacts in the propagation phase

when the rooting process has already been completed. The worse results with higher fertilizer concentration (0.6 g N variant) showed that higher N concentrations in the substrate could have negative effects on the cutting growth process. Such results were obtained also in the *Prunus*-cuttings (Osterc & Spethmann, 2000).

Although the propagation of olive leafy cuttings seems to be well developed, a number of experiments have shown relatively low rooting success, especially with some olive cultivars ('Leccino'). Additionally, many new experiments with several woody species in the last years have indicated a necessity to observe other propagation parameters as well, such as the number and the length of the main roots and sprout growth. The aim of our experiment was to optimise the method of the propagation of olive leafy cuttings. We used in our experiment the well-developed fog-system, and not only did the results deal with the rooting success but also with other parameters of the rooting and sprout growth. Some technical problems (insufficient fogging) caused relatively low rooting success on average, although some variants were more successful. However, it can be concluded that the new concepts in the propagation of leafy cuttings in various woody species (fog-system, time of cutting, over-wintering) can be successfully used also in the olive propagation process. The propagation method based on the fog-system does not require heating of the cutting bases, so the propagation costs are incomparably lower as in the mist system. The experiments should be continued to accurately determine and improve the steps of the process.

## UPORABA SISTEMA MEGLENJA PRI RAZMNOŽEVANJU ZELENIH POTAKNJENCEV OLJKE

*Gregor OSTERC*
Inštitut za sadjarstvo, vinogradništvo in vrtnarstvo, Oddelek za agronomijo, Biotehniška fakulteta, Univerza v Ljubljani, SI-1000 Ljubljana, Jamnikarjeva 101
E-mail: gregor.osterc@bf.uni-lj.si
*Dunja BANDELJ MAVSAR*
Inštitut za sredozemsko kmetijstvo in oljkarstvo ZRS Koper, SI-6000 Koper, Garibaldijeva 18
*Franci ŠTAMPAR*
Inštitut za sadjarstvo, vinogradništvo in vrtnarstvo, Oddelek za agronomijo, Biotehniška fakulteta, Univerza v Ljubljani, SI-1000 Ljubljana, Jamnikarjeva 101

*POVZETEK*

*Proces razmnoževanja zelenih potaknjencev oljke s sistemom pršenja je dobro poznan. Vsi dosedanji rezultati temeljijo le na rezultatih koreninjenja. Razvoj metod razmnoževanja zelenih potaknjencev pri lesnatih rastlinah v zadnjih 15 letih je močno zaznamovan s pojavom in razvojem sistemov meglenja. Poskus razmnoževanja zelenih potaknjencev sort 'istrska belica' in 'leccino' z meglenjem je pokazal, da je takšno razmnoževanje možno. Rastline so v razmnoževalni sezoni razvile do 7 glavnih korenin ter pognale do 20 cm dolge poganjke.*

**Ključne besede:** oljka, sistem meglenja, razmnoževanje zelenih potaknjencev, ukoreninjanje

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