

Influence of Supporter Substrat on the Rooting Percentage of Kiwifruit Cuttings (*Actinide Delicious Cv. Hayward*)

Gjovalin Gjeloshi¹, Tokli Thomai², Hekuran Vrap³

¹PhD Candidate, Agricultural University of Tirana, Department of Horticulture,
Agricultural University Of Tirana, Albania

²Department of Horticulture Faculty of Agriculture & Environment,
Agricultural University Of Tirana, Albania

³Department of Plant Protection, Faculty of Agriculture & Environment,
Agricultural University of Tirana, Albania

Abstract:- The paper presents the influence of supporter substrate on rooting of greenwood and semi-hardwood cuttings of kiwifruit. The study was conducted during two consecutive years, 2013-2014, in a private greenhouse in Lezha, using two periods of taking cuttings: June 5, with greenwood cuttings, and September 5, with semi-hardwood cuttings. A randomized complete block design (RCBD) with two variants (in substrate prelate-peat mix (60:40) and substrate prelate 100 %) and three replications, with a plot size of 100 vegetative cuttings for variant for each replication, was used. Vegetative cuttings were pre-treated with indol-3-butyric acid (IBA) 3000 ppm and were planted under controlled environmental conditions (air temperature 17-18°C, basal supporter temperature 22-26°C, and 80-85% RH). In June, the experimental greenhouse was shaded with a black mesh. Obtained results showed that greenwood and semi-hardwood cuttings of planted in substrate prelate-peat (60:40) rooted better than cuttings of planted in substrate only prelate, in both planting periods (52.4% versus 46%, and 63% versus 54%). The highest rooting percentages were achieved using semi-hardwood cuttings planted in September 5 on supporter polite-peat mix substrate (63%) and only polite (54%). Differences between variants were testified using LSD and statistical ANOVA-tests.

Keywords:- substrate perlite-peatmix, greenwood cuttings, substrate prelate, kiwifruit, rooting percentage, semi-hardwood cuttings.

I. INTRODUCTION

Kiwifruit is native to southern China, where it is declared a National Fruit of China and can be grown as wild and half-cultivated plant, while other species of the genus *Actinidia* are native to India, Japan, and south-eastern Siberia (Ferguson, 1999). There are different thoughts about the number of kiwifruit species all over the world (Latocha, 1988). Some authors (Ferguson, 1999) report about 60-70 species, but others think that this number is higher. Hundred and fifty five species of acitinidia have eaten kiwifruits (Debersaques and Mekers, 1987). Species which have fruits that are commonly eaten are green kiwifruit or fuzzy kiwifruit (*Actinidia deliciosa*), golden kiwifruit (*Actinidia chinensis*), baby kiwifruit (*Actinidia arguta*), Arctic kiwifruit (*Actinidia colomicta*), red kiwifruit (*Actinidia melanandra*), silver vine (*Actinidia polygama*), and purple kiwifruit (*Actinidia purpurea*) (Ferguson, 1999; Lee, 1990). Kiwifruit is a perennial (>40-45 years) dioecious vine, with separate male and female plants. Some species are evergreen and, because of their beautiful creamy flowers, (especially male flowers), can be used as ornamental plants (Dedersaques and Mekers, 1987). Kiwifruit can be grown in most temperate climates with adequate summer heat. The most sprout species are *Actinidia deliciosa* (green kiwifruit or fuzzy kiwifruit), *Actinidia chinensis* (golden kiwifruit), and *Actinidia arguta* (baby kiwifruit). *Actinidia arguta* is sprout mainly in some countries, like Switzerland, Rumania, and Austria, where low temperatures are limited factor for *Actinidia deliciosa* and *Actinidia chinensis*.

In Albania, kiwifruit is not well-known and its domestic cultivation started in 1994, in Balldre, Lezhë, using kiwifruit seedlings imported from Montenegro (Gjeloshi, 2007; Çeko *et al.*, 2002). In Montenegro, kiwifruit orchards occupy over 50-60 ha, planted with “Bruno”, “Monty”, “Abbott”, and “Hayward” cultivars (Peroviç *et.al*, 1987). After 2002, in Albania, started the commercial planting by some farmers in Divjaka, Velipoja, Llakatund, Fier, Tiranë, Elbasan, showing high fruit quantity and quality, under plain Mediterranean climate conditions (Gjeloshi, 2007). Some studies show that kiwifruit find appropriate cultivation conditions, especially in the western plain and hilly areas of Albania (Gjeloshi, 2007). Because of the kiwifruit's importance, there is a need for seedling production and new kiwi orchard construction. Seedling production of kiwifruit can be using traditional methods and rooting of vegetative cuttings in greenhouses. Recently, a farmer

in Lezha (Gj. Gjeloši) has started seedlings production of kiwifruit, using mainly greenwood, semi-hardwood and hardwood cuttings, pre-treated with Indole-3-Butyric Acid (IBA) (Gjeloši *et al.*, 2013). For vegetative cuttings rooting acceleration can be used growth regulators such are Indole-3-Butyric Acid (IBA) and Naphthalene Acetic Acid (NAA).



1



2

**Photo Nr.1: cuttings planted on substrata prelate and
Photo Nr. 2: cuttings planted in substrate polite-peat mix. Lezha, 2014**

II. MATERIALS AND METHODS

The study was conducted during two consecutive years, 2013-2014, in a private greenhouse in Lezha, using two periods of taking cuttings: June 5, with greenwood cuttings, and September 5, with semi-hardwood cuttings. Greenwood and semi-hard cuttings were taken from healthy mother plants of 10 years old, cultivar “Hayward”, from the middle part of the one year vines, with a length of 12 cm (2-3 buds) and a diameter of 8-10 mm. A randomized complete block design (RCBD) with two variants: V1 – substrata only polite, and V2 – substrata prelate-peat and three replications, with a plot size of 100 greenwood and/or semi-hardwood cuttings for variant for each replication, was used. Vegetative cuttings were pre-treated with indol-3-butyric acid (IBA) 3000 ppm and were planted under controlled environmental conditions. Prepared IBA solution 3000 ppm was poured into Petri dishes, and the bottoms of the vegetative cuttings were dipped for a few seconds (5-7 sec). After the treatment with IBA, the kiwifruit vegetative cuttings were placed for rooting in distances 10 cm x 5 cm, sowing 200 vegetative cuttings per m². The air temperature in greenhouse was kept of 17-18, basal substrata

temperature 22-26°C, and air humidity 80-85%. In July, the experimental greenhouse was shaded with a black mesh.

Planting of the vegetative cuttings for rooting was carried out at the same period for the two consecutive years. Twenty days after sowing, there were observed the formation of root nodules and callus ring at the end of vegetative cuttings. Fifty days after sowing, was carried out the seedling trepanation, were counted rooted seedlings (rooted cuttings), was evaluated the rooting percentage, and was measured the root length for each variant on each replication. Vine length was measured 80 days after planting for each variant on each replication. Differences between variants, substrata only prelate and substrata prelate-peat mix (60:40), and planting periods were testified using statistical tests [LSD (95%) and ANOVA test] (Papakroni, 2001).

III. RESULTS AND DISCUSSION

3.1 Effect of supporter substrata on rooting percentage of the greenwood and semi-hardwood kiwifruit cuttings, pre-treated with IBA 3000 ppm, planted in different periods.

Observed results showed that the supporter substrata significantly affected the rooting percentage of the greenwood and semi-hardwood cuttings of kiwifruit. Greenwood and semi-hardwood cuttings of planted in substrata prelate-peat rooted better than cuttings planted substrata only prelate, in both planting periods (June and September). The highest rooting percentage was achieved using substrata prelate-peat mix hardwood cuttings planted in September 5 (63%), while the lowest rooting percentage was achieved using substrata only prelate greenwood cuttings (51%). There were observed significant differences for variants (substrata only prelate and substrata prelate-peat mix) and for different vegetative cuttings (greenwood cuttings planted in June 5 and semi-hardwood cuttings planted in September 5) (Table 1).

Table 1. Mean values of the observed rooting percentage of the full leaf and half leaf greenwood and semi-hardwood cuttings (superscript small letters indicate significant differences between variants at the same sowing period and superscript caps letters indicate significant differences between sowing periods – different vegetative cuttings at $p < 0.05$).

Variants	Planted cuttings	June 5 (greenwood cuttings)		September 5 (semi-hardwood cuttings)	
		Rooted cuttings	%	Rooted cuttings	%
V1 (only perlite)	300	139 ^{bD}	46	163 ^{bB}	54
V2 (perlite-peat)	300	157 ^{aC}	52.4	188 ^{bA}	63

3.2 Effect of supporter substrata on rooting system development (root length) (cm) of the planted substrata only prelate and substrata prelate-peat mix greenwood and semi-hardwood kiwifruit cuttings, pre-treated with IBA 3000 ppm, planted in different periods, at the trepanation period.

Measurements of the development of rooting system (root length) (cm) was carried out fifty days after planting, consisting on the trepanation period, for both planting periods. Results showed that rooting percentage was not in the right proportion with root length of rooted cuttings (future seedlings). For greenwood cuttings planted on July 5, there were observed significant differences between variants (planted substrate polite and substrate prelate-peat mix) for root length up to 10 cm (122 versus 1105 cuttings), and for root length over 10 cm (35 versus 34 cuttings) (Table 2). For semi-hardwood cuttings planted on September 5, there were observed significant differences between variants (substrate prelate and substrate prelate-peat mix) for root length up to 10 cm (109 versus 84 cuttings), and for root length over 10 cm is in same (79 and 79) (Table 2). The highest quality seedlings were achieved using semi-hardwood cuttings on substrate prelate-peat mix planted on September 5.

Table 2. Mean values of root system development (root length) (cm) of the planted substrat perlite and substrat perlite-peat mix greenwood and semi-hardwood cuttings at the trapiantation period (different letters indicate significant differences between variants at the same sowing period at $p < 0.05$).

Variants	June 5 (GWC)			September 5 (SHWC)		
	Rooted cuttings	Root length		Rooted cuttings	Root length	
		Up to 10 cm	>10 cm		Up to 10 cm	>10 cm
V1 (substrat perlite)	139	105 ^b (75.5%)	34 ^a (24.5%)	163	84 ^b (51.5%)	79 ^a (48.5%)
V2 (substrat perlite-peat mix)	157	122 ^a (77.7%)	35 ^a (22.3%)	188	109 ^a (58%)	79 ^b (42%)

3.3 Effect of supporter substrat on vine growth (vine length) (cm) of the substrat only perlite and substrat perlite-peat mix greenwood and semi-hardwood kiwifruit cuttings, pre-treated with IBA 3000 ppm, planted in different periods, 80 days after planting.

Measurements of the vine growth (vine length) (cm) was carried out 30 days after trepanation (80 days after planting) for both planting periods. Observed results showed in planting in supporter substrata significantly affected the rooting percentage and vine growth (vine length) of the future seedlings. For greenwood cuttings planted on June 5, there were observed significant differences between variants (substrata prelate and substrata prelate-peat) for vine length up to 20 cm (64.9% versus 65.5%) and for vine length over 20 cm (35.1% versus 34.5%) (Table 3), while, for semi-hardwood cuttings planted on September 5, there were observed significant differences between variants (substrata prelate and substrata prelate-peat mix) for vine length up to 20 cm (68% versus 58.8%) and for vine length over 20 cm (32% versus 41.2%) (Table 3).

Table 3. Mean values of vine growth (vine length) (cm) of the planted substrat perlite and perlite-peat mix greenwood and semi-hardwood cuttings, 30 days after traplantation (different letters indicate significant differences between variants at the same sowing period at $p < 0.05$).

Variants	June 5 (GWC)			September 5 (SHWC)		
	Rooted cuttings	Vine length (cm)		Rooted cuttings	Vine length (cm)	
		Up to 20 cm	>20 cm		Up to 20 cm	>20 cm
V1 (substrat perlite)	139	91 ^b (65.5%)	48 ^a (34.5%)	177	104 ^b (58.8%)	73 ^a (41.2%)
V2 (perlite-peat mix)	157	102 ^a (64.9%)	55 ^a (35.1%)	188	128 ^a (68%)	60 ^b (32%)

Obtained data were similar to Gjeloši *et al.* (2013) findings, who have reported that kiwifruit cuttings (seedlings) show a vigorous growth after rooting, although in the early stages show a slowly growth. For kiwifruit seedling producers, rooting percentage of the vegetative cuttings seems to be the most important issue on seedling production (Gjeloši *et al.*, 2013).

IV. CONCLUSIONS

Supporter substrata significantly affected the rooting percentage, root system development and vine growth. Greenwood and semi-hardwood cuttings planted on substrata prelate-peat mix rooted better than cuttings planted on substrata only prelate in both planting periods (June and September). The highest rooting percentages were achieved using semi-hardwood cuttings planted on substrata prelate-peat mix in September 5, by 63%. Achieving of higher rooted cuttings is the most important issue for kiwifruit seedlings producers, since kiwifruit cuttings recover the slow growth in the early stages.

The best quality seedlings of kiwifruit, with a strong rooting system and normal vine growth, can be guaranteed using semi-hardwood cuttings on substrata prelate-peat mix planted in September.

REFERENCES

- [1]. Çeko, A., Kongjika, E., Salillari, A., Kongjika, S. (2002). "Kiwi, Actinidia", 19-23.
- [2]. Debersaques, F., Mekers, O. (1987). "Growth and production of kiwifruit and kiwiberry". Soils, Plants Growth and Crop Production, Belgium, Vol. 2, 123-126.
- [3]. Ferguson, A. R., Costa, G. (2011). "Final discussion in Symposium VII International of kiwifruit". Acta Horticulturae 913, 340-345.
- [4]. Ferguson, A. R., MacRae, E.A. (1992). "Vitamin C in Actinidia". Acta Horticulturae 297, 142-146.
- [5]. GIXHARI Belul, Michaela PAVELKOVÁ, Hairi ISMAILI, Hekuran VRAPI, Alban JAUPI and Petr SMÝKAL (2014) Genetic Diversity of Albanian Pea (*Pisum sativum* L.) Landraces Assessed by Morphological Traits and Molecular Markers Original Paper Czech J. Genet. Plant Breed., 50, 2014 (2): 177–184
- [6]. Gjeloši, Gj. (2007). "Kiwi, adaptation on Albanian Western Lowland climate conditions", 157 p, 86-89.
- [7]. Gjeloši, Gj., Susaj, E., Ferraj, B., Susaj, L. (2013). "The influence of planting period and IBA (indol-3-butyric acid) concentration on rooting of the vegetative cuttings of kiwifruit (*Actinidia deliciosa*)". Proceedings of the 2nd International Conference "Research and Education in Natural Sciences", November 15-16, 2013, Shkodër, Albania, Vol. 2, 59-65.
- [8]. Latocha, P. (1988). "Some morphological and biological features of "Bingo"- a new hardy kiwifruit cultivar", Warshava, Poland, 17-34.

- [9]. Lee, S. (1990). Kiwifruit resources and production in China. *Acta Horticulturae* 282, 57-63.
- [10]. Papakroni, H. (2001). Used Programs on computer - (2) Excel. Agricultural University of Tirana, 165-175.
- [11]. Peroviç, T., Cizmoviç, M., Popoviç, R. (1987). "The cultivation of kiwifruit in Montenegro". Podgorica, 217 p, 17-23.
- [12]. Peticila, A. G., Stanica, F., Dimitriu Oana, V., Roxana, M. (1991). "Studies on the multiplication of two new fruit-growing species, *Actinidia deliciosa* and *Actinidia arguta*". University of Craiova, 1991, 235 p.
- [13]. Susaj, L., Susaj, E., Ferraj, B., Stase, J. (2011). "Effect of NAA concentration in the rooting of vegetative cuttings of *Thuya occidentalis* Emeraud". Proceedings of the International Conference of Ecosystems (ICE), Tirana, Albania, June 4-6, 2011, 76-81.