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Full Length Research Paper

Vegetative propagation of Cherry laurel (*Prunus laurocerasus* L.) using semi-hardwood cuttings

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This study was conducted to investigate the effects of different IBA doses on rooting capacity of Cherry laurel (*Prunus laurocerasus* L.) types in greenhouse conditions under mist propagation unit in 2008 - 2009. This species has an economic and important value for medicinal and pharmaceutical industry. Determination of suitable conditions for cutting propagation of different types is too important for economic propagation. The cuttings collected in July were like semi hardwood cuttings and are treated with 1, 2, 4, 6 and 8 g/l Indole-3-butryric acid (IBA). The results were taken after 90 days and were evaluated using the analysis of variance (ANOVA) and Duncan test with a significance value P ≤ 0.05. The rooting rate (%), average root number (roots/cutting) and average root length (cm) were determined. The results showed that rooting rate and root quality were changeable according to types. The maximum rooting rates were obtained with 2 or 4 g/l IBA for most of the types. 1 or 2 g/L IBA obtained the maximum root length and increased the rooting length and root quality compared with control. The average number of roots increased in 2 g/l IBA and high doses of IBA resulted with breakable root formation that reduced the success rates in transplantation stages.

Key words: *Prunus laurocerasus* L., vegetative propagation, rooting, Indol-3-butyric acid.

INTRODUCTION

Cherry laurel (*Prunus laurocerasus* L.) is a fruit native to the regions bordering the Black Sea in Southwestern Asia and Southeastern Europe. It is widely distributed in the North-Eastern part of Turkey and there are many cultivars which show different characterization for flowering and ripening time as well as morphological differences (Kolayli et al., 2003). *P. laurocerasus* is evergreen, in flower from March to half of April and the fruit ripens in July and August according to types. Some of them have sweet and reasonably pleasant fruits when fully ripe and can easily grow in their native conditions. The plants tolerate light, medium and heavy soils; and can grow in heavy clay soil too (Huxley, 1992). It can tolerate strong winds and atmospheric pollution. It can be used as tall hedge and screen mass or group in large areas and has become popular garden plants. The flowers are very fragrant; smell sweet and delightful, and people like the appearance. It shows better pest resistance than most other species in the genus *Prunus* (Komarov, 1968; Frohne and Pfander, 1984). This species has an important economical value for medicinal industry too. The fresh leaves are antispasmodic, narcotic and sedative. It can be used as a treatment for cough, asthma, dyspepsia and indigestion. Externally, a cold infusion of the leaves is used as a wash for the eye infections. It is a good diet fruit and has antioxidant effect (Baytop, 1963; Grieve, 1984; Chief, 1984; Pieroni, 2000; Kolaylı et al., 2003).

Normally, people grow it like a border tree, as they are not closed orchards and as a result of insufficient cultural treatments, productivity is very low. This plant became more popular in recent years. The fruits have just started to find place in the big markets. It has very common use traditionally in northern part of Turkey as a fruit. To use

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these types in closed orchard system, we need to propagate them economically. The cherry laurel reproduces through seeds, which are distributed by birds, naturally. It is also give some new shoots, from cut stem and sucker. Genetic variation occurs when it is produced by seeds (Simancik, 1970; Kamenicka and Rypak, 1981) and for that reason cutting propagation becomes more important. Clonally propagation of many tree and shrub species is effective through cuttings. Cherry laurel grows and does well on its own roots in Black Sea Region. Therefore, it can potentially be produced by rooting of cuttings. Factors such as cultivar, the collection date, degree of hardening of the cuttings and the treatment concentration of auxin can affect rooting (de Olivera et al., 2003; Tsipouridis et al., 2003, 2006). Cuttings are usually made during the summer months. Observation of the rooting of stem cuttings of many different genera of plants indicate that better regeneration of roots occurs when cuttings are taken either before or after but not during flowering. Rooting followed a seasonal trend; highest rooting occurred in other plants due to seasonal variation which brought about regenerating capacity. The regenerating capacity is low during the months of flowering (Dore, 1953; Hudson, 1953). Mackowiak (1989) obtained some roots with semi-hardwood cuttings of some *Prunus* rootstocks but failed to root with softwood and hardwood cuttings. Larsen (2008) reported that, *P. laurocerasus* could be propagated with semi-hardwood or hardwood cuttings in summer or winter seasons and have a high rooting capacity. Previous experiments were carried out to study propagation aspects of cherry laurel with cuttings and obtained good results with 2 g/l IBA, with the springtime cuttings of cherry laurel (Sulusoglu and Cavusoglu, 2009). According to Hartmann et al. (2002), IBA is the best auxin for general use because it is non-toxic to plants and is effective in promoting rooting of a large number of plant species.

However, the genetic variation probably will affect the rooting ability and types will show different characterization for rooting capacity too. Application of synthetic auxins to shoot cuttings may be very effective in promoting root formation in some genotypes (Howard, 1967). Tsipouridis et al. (2003) found that IBA concentrations of 2000 mg/l stimulated rooting of hardwood and semi-hardwood cuttings but rooting success varied with peach cultivar. Hence, the aim of the present investigation was to determine cutting rooting capacity of different selected types of cherry laurel and selection of suitable hormone doses.

MATERIALS AND METHODS

Plant material and cutting preparation

All experiments were carried out in the Kocaeli University Arslanbey Campus. Semi-hardwood cuttings were collected from sixteen native growing cherry laurel types, selected as a result of our pomological studies (unpublished data), during July in 2008 and 2009. Cuttings with one-half leaves and 15 - 20 cm in length were obtained from each shoot on collection day. During the rooting stage, leaves continue to lose water transpiration. If too much water is lost, leaves will wilt before new water-absorbing roots can form. The large leaves were clipped of one-third or one-half of the tips to reduce water loss in rooting stage.

Cutting treatments

After washing in running water, cuttings were surface sterilized by immersion in a 10% (v/v) aqueous solution of “Domestos” commercial bleach solution for 5 min and rinsed in tap water for three times for 5 min. IBA (Indole-3-butryric acid) solution at 1, 2, 4, 6 and 8 g/l was freshly prepared dissolving IBA powder in ethanol/water (50%). Cuttings were immediately (10 s) dipped in IBA solution wetting 2 cm of basal end. Cuttings were dipped in a 50% ethanol solution as a control treatment. After treatment the cuttings were placed in trays filled with perlite media to a depth of 10 cm under mist (15 s/30 min) in a greenhouse, maintained at 25 ± 5°C.

Sampling of cuttings and statistical analysis

The data were obtained 3 months after the establishment of the cuttings. At the end of the experiment, the cuttings were scored for rooting percentage (%), root number per cutting (roots longer than 5 mm in length) (root/plant) and average lengths of the roots (cm).

The experiment was conducted in randomized plot design with three replicates, 10 cuttings per replicates. All the data were evaluated using the analysis of variance (ANOVA) and the groups that showed variance were then subjected to the Duncan test with a significance value $P \leq 0.05$. Data on percent rooting was transformed by the arcsine square root transformation before performing the statistical analysis. There were no statistical differences between years; therefore, the data were pooled.

RESULTS

It is evident that the rooting of cuttings is a dynamic event and the root formation from cuttings for each type exhibited different outcomes. The rooting rate and root quality of cuttings was changeable according to types. Cherry laurel types gave different rooting percentage in different IBA doses and interaction between the types and IBA doses was found important statistically.

As far as rooting percentage is concerned, it was maximum with 2 g/l IBA dose for the cherry laurel types (1, 2, 6, 8 and 9). For the other most types this dose again gave high score too. Types 12 needed high doses of IBA and the best rooting occurred in 6 g/l IBA for this one. Increasing doses of IBA reduced the rooting capacity of cuttings and 8 g/l IBA had negative effects on rooting of all types (Figure 1). The roots showed breakable structure in high doses and roots were too small. The best rooting was observed with type 13 during

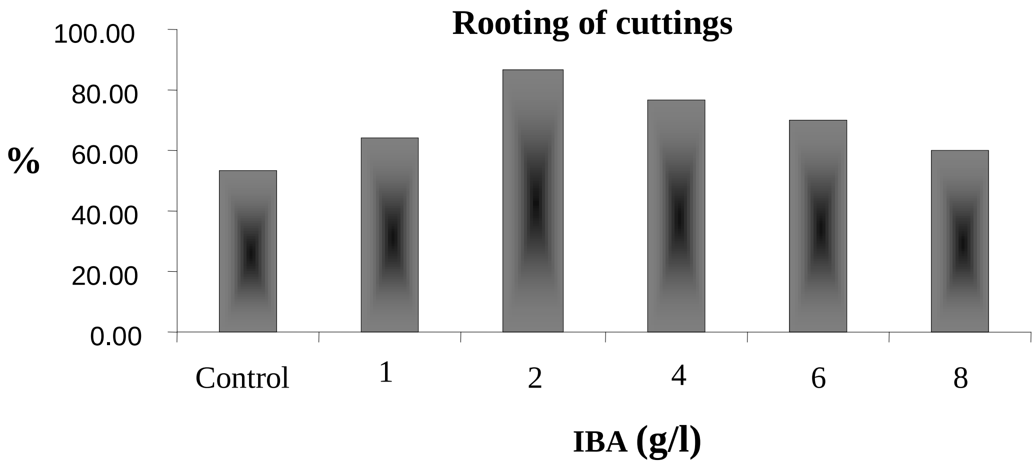

Figure 1. Rooting percentage of cherry laurel types semi-hardwood cuttings after 90 days with different IBA doses (average values of sixteen types).

Table 1. Rooting of cherry laurel types cuttings after 90 days to the establishment of cuttings (%).

Types	IBA doses (g/l)						Types mean
	0 (control)	1	2	4	6	8	
1	26.67cdE	56.67bEF	80.00aCD	36.67cDE	26.67cdE	23.33dDEF	41.67
2	63.33bC	56.67bEF	76.67aCDE	36.67cDE	13.33cF	10.00cGH	42.78
3	66.67aC	70.00aCD	63.33aE	43.33bD	33.33bDE	33.33bBCD	51.67
4	86.67aB	90.00aB	66.67bE	43.33cD	43.33cCD	23.33dCDEF	58.89
5	80.00bB	100aA	100aA	80.00bB	50.00cC	36.67dBC	74.45
6	40.00cD	46.67bcFG	73.33aDE	56.67bC	40.00cCD	40.00cB	49.45
7	100Aa	100aA	73.33bDE	60.00cC	53.33cC	30.00dBCD	69.44
8	33.33cDE	66.67bDE	90.00aB	33.33cDE	10.00dF	6.67dH	37.22
9	23.33cdE	40.00bG	76.67aCDE	33.33bcDE	26.67cdE	16.67dEFG	36.11
10	46.67bD	53.33bEFG	76.67aCDE	73.33aB	43.33bCD	23.33cDEF	52.78
11	40.00dD	50.00cdFG	63.33bE	100aA	66.67bB	60.00bcA	63.33
12	10.00cF	16.67bcH	26.67bG	26.67bE	46.67aCD	26.67bCDE	25.56
13	100aA	100aA	100aA	100aA	100aA	70.00bA	95.00
14	40.00bD	83.33aB	80.00aCD	76.67aB	40.00bCD	36.67bBC	59.45
15	23.33cE	23.33cH	50.00bF	76.67aB	23.33cE	13.33cFG	34.99
16	80.00abB	80.00abBC	86.67aBC	76.67abB	70.00bcB	60.00cA	75.56
Doses mean	53.75	64.58	86.67	76.67	70.00	60.00	54.27

Values in the same row (type) with different lower-case letters and values in the same column (IBA doses) with different capital letters are significantly different at P ≤ 0.05.

the experiment and the best rooting percentage occurred in 2 g/l IBA generally, but it is not statistically important (Table 1).

Significant interaction occurred between cherry laurel types and IBA doses for root number produced per cutting. IBA doses increased the root number according to control except 8 g/l dose. Fourteen of sixteen types produced higher numbers of roots in 2 and 4 g/l IBA doses and it is statistically important according to others doses. Results regarding number of roots showed that type 3 produced maximum average numbers of roots per cuttings, type 7 and 2 followed as second and third position, while type 15 produced the minimum number of roots, but the difference is not important, statistically

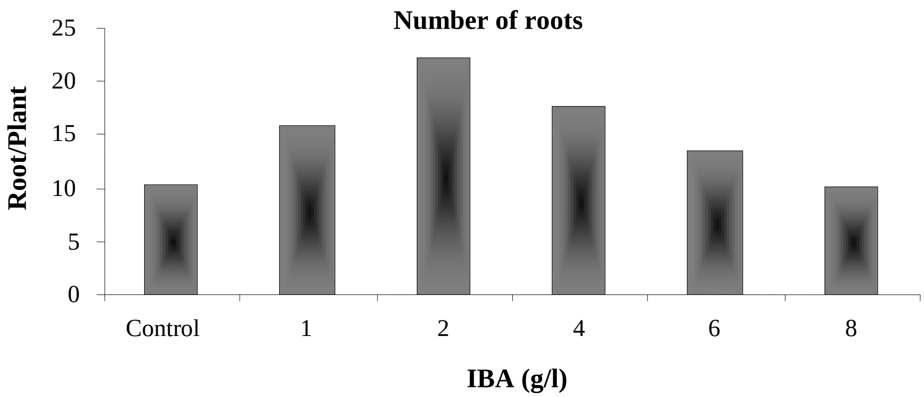

Figure 2. Root number of cherry laurel types cuttings after 90 days, with different IBA doses; (average values of sixteen types).

Table 2. Root numbers of cherry laurel types cuttings after 90 days with different IBA concentration (root/plant)

Types	IBA doses (g/l)						Types mean
	0 (control)	1	2	4	6	8	
1	5.67cE	8.33cIJ	17.00aG	12.67bHI	8.33cF	7.67cE	9.94
2	12.67cBC	20.00bcDE	37.00aB	36.00aA	12.67cDE	8.00dE	21.06
3	23.67bA	25.33bA	44.67aA	19.67cCDE	18.33cdBC	15.33dB	24.5
4	6.33cE	14.00bG	22.67aCD	8.67cJK	12.33bE	7.67cE	11.94
5	13.33cBC	19.67bDE	25.33aC	17.00bEFG	8.33dF	6.00dE	14.94
6	4.67dE	8.33bcIJ	12.00aH	9.67bIJ	10.67abEF	6.00cdE	8.56
7	11.00dC	24.33bAB	38.00aB	36.67aA	17.67cBC	11.33dCD	23.17
8	7.33cE	23.00aABC	19.33bEFG	6.00cKL	2.00dG	2.50dF	10.03
9	10.67cCD	12.33bcGH	11.67bcH	18.67aDEF	19.67aB	14.33bBC	14.56
10	7.67cDE	21.67aBCD	20.67aDEF	22.00aBC	15.67bCD	7.33cE	15.83
11	11.33cC	12.00cGH	16.00bG	18.00bEF	24.33aA	26.33aA	18
12	7.00dE	10.67cHI	18.33aFG	14.00bGH	13.33bcDE	14.00bBC	12.89
13	13.33cBC	17.33bEF	25.00aC	23.33aB	17.00bBC	9.33dDE	17.56
14	15.33cB	17.33bcEF	21.67aDE	21.67abCD	19.33cB	14.33cBC	18.28
15	4.67bcE	6.00bJ	9.33aH	3.33bcL	3.00bG	1.67cF	4.67
16	10.67cdCD	15.00abFG	17.00aG	15.67abFGH	13.67bcDE	9.33dDE	13.56
Doses mean	10.33	15.96	22.23	17.69	13.52	10.07	14.97

Values in the same row (type) with different lower-case letters and values in the same column (IBA doses) with different capital letters are significantly different at $P \leq 0.05$.

(Figure 2). In contrast, root number was increased by the increasing doses of IBA for type 11 (Table 2).

All IBA doses increased the rooting rates compared with control (Figure 1) but just 1 and 2 g/l IBA increased the root length statistically too (Figure 3). Significant importance occurred between the cherry laurel types for length of roots produced per cutting and the longest main root was recorded in type 13 cuttings (9.83 cm) and the shortest in type 15 (2.00 cm) and type 8 (2.77 cm) cuttings. As far as doses were concerned, length of roots was increased in 1 and 2 g/l IBA doses (respectively 6.26 cm and 6.60 cm) and increasing doses of IBA reduced the root length. The longest roots were recorded with type 13 as 11.41 cm in 4 g/l IBA (Table 3).

DISCUSSION

P. laurocerasus has become more popular nowadays and an efficient propagation method for commercial

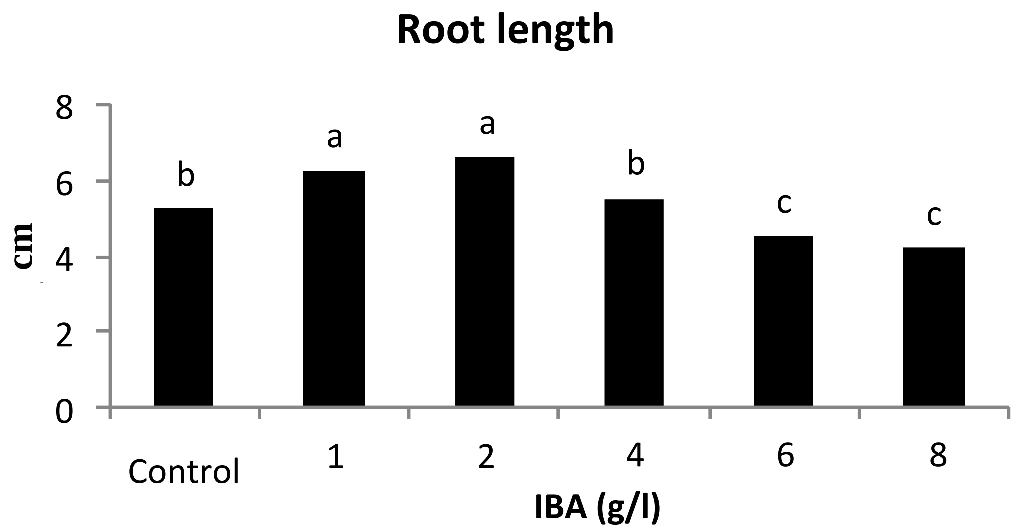

Figure 3. Length of roots formed on cherry laurel types after 90 days, with different IBA doses (average of sixteen types).

Table 3. Root length of cherry laurel types cuttings after 90 days with different IBA concentration (cm).

Types	IBA doses (g/l)						Types mean
	0 (control)	1	2	4	6	8	
1	2.51	7.16	5.27	3.69	3.31	3.02	4.16fg
2	5.16	4.54	4.94	4.07	3.26	2.43	4.06fg
3	5.14	6.91	6.24	3.86	3.78	3.22	4.86ef
4	5.61	4.68	4.72	3.4	3.15	2.19	4.06fg
5	7.77	6.36	5.91	5.55	4.81	4.45	5.81cde
6	5.92	5.69	6.15	7.05	4.41	4.22	5.57de
7	7.02	7.2	9.03	7.35	6.22	4.55	6.90bc
8	2.76	3.98	5.42	2.98	0.73	0.73	2.77h
9	4.54	5.56	9.24	7.41	6.91	6.91	6.76bcd
10	6.86	8.76	9.01	6.41	6	6.29	7.22b
11	4.43	3.6	2.75	2.67	2.45	2.49	3.06gh
12	4.03	5.22	6.9	6.3	6.42	5.35	5.70cde
13	8.57	9.67	10.47	11.41	9.44	9.39	9.83a
14	4.99	8.58	6.99	6.54	5.36	5.84	6.38bcd
15	1.65	2.68	3.14	2.88	0.9	0.77	2.00h
16	6.95	9.6	9.47	6.29	5.21	5.59	7.19b
Doses mean	5.24b	6.26a	6.60a	5.53b	4.52c	4.22c	5.40

Values in the same row (type) and values in the same column (IBA doses) with different lower-case letters are significantly different at $P \leq 0.05$.

propagation needs to be determined. It is generally accepted that auxins play a central role in the process of root formation (Davis et al., 1989; De Klerk et al., 1999). For successful root induction, plants need to contain a certain quantity of IBA. It is common to use IBA for rooting of fruit type because it has a greater ability to promote adventitious root formation in comparison to IAA (Spethmann and Hamzah, 1988; Riov, 1993; De Klerk et al., 1999; Ludwig-Müller, 2000). It is more stable and less sensitive to the auxin degrading enzymes (Nordstrom et al., 1991; Riov, 1993). The results confirmed the convenience of cuttings for economical propagation and importance of exogenous IBA applications too. All IBA doses improved the rooting of cuttings. Research with species of *Prunus* also showed that the addition of IBA was deemed effective for promoting rooting of cutting (Deghan et al., 1990; Tchoundjeu et al., 2002; Tofanelli et al., 2002). The most important factor in successful propagation was the use of the right doses of plant growth regulator which increased the root development. The results reported herein indicate that IBA treatments improved the rooting percentage, root number and main root length and 2 or 4 g/l doses of IBA are the most adequate doses to propagate cherry laurel cuttings. These results are in harmony with previous study outcomes (Sulusoglu and Cavusoglu, 2009).

IBA at 6 or 8 g/l showed lower rooting percentages and root quality. The increase of IBA concentration was accompanied by the decreased rooting percentage, suggesting that high IBA concentrations were not suitable for the root formation process (Singh et al., 2003; Moreira et al., 2009). Weaver (1972) reported that the increasing doses of IBA could encourage the rooting ability of cutting but also could change the rooting structure.

In our previous studies on cherry laurel cuttings rooting had good results too but in this study the root quality and length was increased. It is shown that the length of rooting stage is very important and instead of 60 days, 90 days was better. The breakable root number decreased in this experiment, just high doses of IBA produced this kind of roots. The quality of formed roots could be strongly influenced by varieties (Stanica, 2007) and seasonal variation. In this experiment, all types, except one (type 11) had less number of roots with the increasing doses of IBA but all of the types gave more breakable roots in higher doses. Instead of March, better rooting cuttings occurred in July, with good quality and improved rooting ability too. In other studies, semi-hardwood cuttings were effective to propagate *Prunus serotina* (Deghan et al., 1990) and some cultivars of *Prunus persica* (Tofanelli et al., 2002) too.

Conclusion

In conclusion, according to results, it appeared that 2 or 4 mg/l doses of IBA are good for rooting of cherry laurel cuttings and to put the cuttings in rooting media for 90 days. Since there is considerable variability in the rooting of cherry laurel types, large-scale propagation should not be attempted until the best procedures for producing rooted cuttings of specific types have been determined. But the results of this study should be helpful for selection of the IBA doses for rooting too. We expect that this study will prompt further research for rooting and clonal propagation of cherry laurel.

REFERENCES

Baytop T (1963). Medicinal and Poisonous plants of Turkey. I.U. publications, 1039: 501.

Chief R (1984). Encyclopedia of Medicinal Plants. MacDonald. ISBN: 0356105415.

Davis TD, Haissig BE, Sankhla N (1989). Adventitious root formation in cuttings. Advences in Plant sciences Series, Vol. 2. Dioscorides Press, Portland, Oregon, USA.

de Klerk GJ, van der Krieken W, De Jong JC (1999). The formation of adventitious roots: new concepts, new possibilities. *In vitro* Cell. Dev. Biol. Plant, 35: 189-199.

de Oliveira AP, Nienow AY, Calvete A, de Oliveira E (2003). Rooting potential capacity of peach tree cultivars of semi-hardwood and hardwood cuttings treated with IBA. Rev. Bras. Frutic., 25: 282-285.

Deghan B, Sheehan TJ, Kane ME, Almira, FC (1990). Vegetative propagation of Florida native plants. V *Prunus* spp. Proc. Florida State Horticult. Soc., 103: 172-174.

Dore J (1953). Seasonal variation in the regeneration of root cuttings. Nature, 172: 1189.

Frohne D, Pfander J (1984). A colour Atlas of Poisonous Plants. Worfe ISBN 0723408394.

Grieve A (1984). Modern Herbal. Penguin ISBN: 0140464409.

Hartmann HT, Kester DE, Davis Jr FT, Geneve R L (2002). Plant propagation: Principles and practices. New Jersey: Prentice Hall.

Howard BH (1967). Rootstock propagation by hardwood cuttings: A progress for nurserymen. Report of the East Malling Research Station for 1966, p. 202.

Hudson JP (1953). Factors affecting the regeneration of root-cuttings. Nature, 172: 412.

Kolaylı S, Küçük M, Duran C, Candan F, Dinçer B (2003). Chemical and Antioxidant Properties of Laurocerasus officinalis Roem (Cherry laurel) Fruit Grown in the lack sea Region. J. Agric. Food Chem., 51(25): 7489-7494.

Kamenicka A, Rypak M (1981). Abscisic-Acid levels during storage of the seed of Cherry Laurel *Prunus laurocerasus*. Biologia (Bratislava), 36: 43-50.

Komarov VL (1968) Flora of the USSR. Israel Program for Scientific Translation 1968.

Larsen FE (2008). Propagation deciduous and evergreen shrubs, trees and vines with stem cuttings. A pacific Northwest Cooperative Extension Publication-Washington-Oregon-Idaho, PNW0152.

Ludwig-Müller J (2000). Indole-3-butyric acid in plant growth and development. Plant Growth Regul., 32: 219-230.

Mackowiak M (1989). Vegetative propagation of selected rootstock for sweet cherries. Ogrodnictwo, 194(16): 245-256.

Moreira O, Martins J, Silva L, Moura M (2009). Propagation of the endangered Azorean cherry *Prunus azorica* using stem cuttings and air layering. Arquipelago. Life Mar. Sci., 26: 09-14.

Nordstrom AC, Jacobs FA, Eliasson L (1991). Effect of exogenous indole-3-acetic acid and indole-3-butyric acid on internal levels of the respective auxins and their conjugation with aspartic acid during adventitious root formation in pea cuttings. Plant Physiol., 96: 856-861.

Pieroni A (2000). Medicinal Plants and Food Medicines in the folk Traditions of the upper Lucca Province, Italy. J. Ethnopharmacol., 70: 235-273.

Riov J (1993). Endogenous and exogenous auxin conjugates in rooting of cuttings. Acta Hortic., 329: 284-288.

Simancik F (1970). Germination of seeds of *Prunus laurocerasus* L after Gibberellic-Acid treatment at warm cold and warm followed by cold stratifications. Proc. Int. seed testing Assoc., 35: 393-402.

Singh S, Kumar P, Ansari SA (2003). A simple method for large-scale propagation of *Dendrocalamus asper*.

Spethmann W, Hamzah A (1988). Growth hormone induced root system types in cuttings of some broad leaved tree species. Acta Hortic., 226: 601-605.

Stanica F (2007). Propagation of *prunus* rootstocks by cuttings on composed rooting substrates. Acta Hort., 734: 8. International Symposium on Plum and Prune Genetics, Breeding and Pomology.

Sulusoglu M, Cavusoglu A (2009). Cutting Possibilities of Natural Cherry Laurel (*Prunus laurocerasus* L.) of Turkey. Am. Eurasian J. Sustain. Agric., 3(2): 234-237.

Tchoundjeu Z, Avana M, Leakey R, Simons A, Assah E, Duguma B, Bell J (2002). Vegetative propagation of *Prunus africana*: effects of rooting medium, auxin concentrations and leaf area. Agroforestry Syst., 54: 183-192.

Tofanelli MBD, Chalfun NNJ, Hoffmann A, Chalfun A (2002). Effect of indolebutyric acid on rooting ability of semi hardwood stem cuttings of peach. Pesquisa Agropecuaria Brasileira, 37: 939-944.

Tsipouridis C, Thomidis T, Isaakidis A (2003). Rooting of peach hardwood and semi-hardwood cuttings. Avust. J. Exp. Agric., 43: 1363-1368.

Tsipouridis C, Thomidis T, Bladenopoulou S (2006). Seasonal variation in sprouting of GF 677 peach 'almond (*Prunus persica*' *Prunus amygdalus*) hybrid root cuttings. N.Z. J. Crop Hortic. Sci., 34: 45-50.

Weaver RJ (1972). Plant Growth Substances in agriculture. W.H.Freeman and Company. San Fransisco, p. 504.