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Effect of cutting time and IBA application on rooting of edible cherry laurel (*Prunus laurocerasus* cv. 'Kiraz') cuttings

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ABSTRACT
Cherry laurel known as "karayemiş", "laz cherry" or "taflan", is a popular evergreen racemes fruit in Turkey and some other Caucasus countries. In this study, cherry laurel variety 'Kiraz' was propagated with hardwood, semi-hardwood and softwood cuttings with half leaf and effect of IBA application on rooting ability was determined. Cuttings with different lignification phase were collected from October, December, February (hardwood cuttings), May (softwood cuttings) and June (semi-hardwood cuttings) between 15th to 20th days and subjected to 0, 50, 100, 500 and 1000 ppm Indolebutryicacid (IBA). Cuttings were planted in bottom heated trays with perlite and over misting under greenhouse conditions. The percentages of rooting (100%), rootling (100%) and mortality (100%) were the highest at July's semi-hardwood cuttings while rooting degree was the highest at December hardwood cuttings (7.72). 100 ppm IBA concentration gave the highest ratios of rooting (96.44%), first grade rootling (90.22%) and mortality rate (84.89%). These results suggest that cherry laurel varieties could be easily propagated easily by July's semi hardwood cuttings subjected to 100 ppm IBA in perlite has bottom heating under greenhouse conditions with misting.

Anahtar Sözcükler:
Cherry laurel
Cutting time
IBA
Rooting

Çelik alma zamanı ve IBA uygulamasının karayemiş (*Prunus laurocerasus* cv. 'Kiraz') çeliklerinin köklenmesi üzerine etkileri

ÖZET
"Laz kirazı" veya "taflan" olarak da adlandırılan karayemiş, son yıllarda Türkiye ve bazı Kafkas ülkelerinde popüler olmaya başlayan herdemyeşil bir meyvedir. Bu çalışmada *Prunus laurocerasus* türüne ait Kiraz karayemiş çeşidinden farklı zamanlarda alınmış olan yeşil, yarı-odunsu ve odunsu yapraklı çeliklerin köklenmesi üzerine farklı dozlardaki IBA uygulamalarının etkisi araştırılmıştır. Ekim, Aralık, Şubat ve Temmuz aylarının ilk yarısında ve farklı odunlaşma aşamalarında alınan çelikler 5 farklı dozda (0, 50, 100, 500 ve 100 ppm) IBA uygulanmıştır. Çelikler sera şartlarında alttan ısıtmalı tavalardaki perlit içerisinde ve mistleme altında köklendirilmiştir. Temmuz ayında alınan yarı odunsu çelikler köklenme, fidan randımanı ve yaşama oranı bakımından %100'lük başarı göstermiştir. Köklenme derecesi ise Aralık ayında alınan çeliklerde 7.72 ile en yüksek olmuştur. 100 ppm IBA dozu gerek köklenme (%96.44), gerek fidan randımanı (%90.22) gerekse yaşama oranı bakımından en yüksek değerleri vermiştir. Bu çalışmanın sonuçlarına göre karayemişler, Temmuz ayında alınan yapraklı yarı odunsu çeliklere 100 ppm gibi düşük IBA dozu uygulanarak seradaki perlit ortamında ve mistleme altında kolaylıkla çoğaltılabilir.

Keywords:
Karayemiş
Çelik alma zamanı
IBA
Köklenme

1. Introduction

Cherry laurel (*Laurocerasus officinalis* Roem.) is a member of Rosaceae family, native to the west of Asia and cultivated throughout the northern Anatolia for its edible fruits (Browicz, 1972; Bostan, 2001; Islam, 2002; Islam et al., 2010; Sulusoglu, 2011; Celik et al., 2011). It is an evergreen shrub growing 6m - 10m at a medium rate and flowered from April to June, and the fruits ripen in September. The scented flowers are hermaphrodite and are pollinated by bees and Lepidoptera. It is noted both for attracting wildlife, human health, alternative medicine and local commercial fruit. The plant requires well-drained soil and can grow in light, medium or a heavy soil that is acidic, neutral and/or alkaline. Cherry laurel can grow in full sun or shade and requires moist soil. The plant can tolerate strong winds but not maritime exposure and can tolerate atmospheric pollution. Fruits are sweet and reasonably pleasant when fully ripe and are consumed as fresh, dried, various alcoholic drinks, pekmez, jam, pickled, marmalade and fruit juice products. Unripe fruit could be poisonous. The fruit is about 8mm in diameter and contains one large seed. Water distilled from the leaves is used as an almond flavoring and perfumery (Baytop, 1984, Ayaz et al., 1997; Kolayli et al., 2003; Ercisli, 2004; Colak et al., 2005; Liyana-Pathirana et al., 2006; Celik et al., 2011; Beyhan, 2010; Islam et al., 2010; Anonymous, 2014). In Turkey, many researchers have done on cherry laurel on the content of chemicals, antioxidants, quality attributes, selection and long term pollen storage of non-sprayed genotypes (Kolayli et al., 2003; Beyhan, 2010; Islam et al., 2010; Sulusoglu, 2011, Celik et al., 2011; Yıldız et al., 2014; Sulusoglu, 2014). Good yielded and palatable fruited trees of the cherry laurel grown around the Black Sea coastal, farmyard and forest area selected by inhabitants and propagated by longer cuttings over hundreds of years. Today cherry laurel has a wide range of diversity in north eastern part of Anatolia due to its controlled propagation by inhabitants and seedlings by birds and mammals (Islam et al., 2010; Beyhan, 2010; Sulusoglu, 2011). Cherry laurel propagates by seed, suckers, crown, layering, and root, leafy and micro cuttings. Locally the growers mostly use long crown and or sucker cuttings for propagation of palatable cherry laurel by planting them into wet and loamy soils besides tea plantation areas. On the other hand scientist tried to propagate cherry laurel by semi hardwood cuttings (Sulusoglu and Cavusoglu, 2010), leaf-bud, hardwood and hardwood with a small pieces of main shoot part (Yazici et al., 2009), softwood cuttings (Alexandrow and Bogdanov, 2009), semi-hardwood or hardened terminal cuttings (Adams, 1984), hardwood one-half leafy cuttings (Sulusoglu and Cavusoglu, 2009; Dudas et al., 2014) and they obtained different rooting percentage according to genotype, cutting type and several different IBA doses. On the other hand researches proved that rooting ability of the cherry laurel cuttings were affected by rooting temperature and relative humidity (Alexandrov and Bogdanov, 1988), rooting media (Attenburrow, 1981; Davis et al., 1986; Frangi et al., 2008), container type (Maunder, 1984), IBA concentration (Sulusoglu and Cavusoglu, 2010; Ribeiro et al., 2010), leaves and buds (Ul'yanov, 1976), powder and liquid auxins (Bragt et al., 1976), base and liquid fertilizers (Dinter and Eaton, 1976) and cutting time and type (Ul'yanov, 1975; Yazici et al., 2009). They claimed that the rooting percentages are between 6-100% and auxin concentration differed between 0 ppp and 7500 ppm. Ul'yanov (1976) proved that reducing the leaf area of softwood cuttings of cherry laurel under mist had little effect on rooting capacity but reduced the length of the primary roots. Adams (1984) used semi hard or hardened terminal cuttings for cherry laurel and they found that root formation was faster from June to September than from September to November. Conversely Ul'yanov (1975) found the best results from April (previous year's growth) or May (current season's growth) cuttings treated with 25 mgL^{-1} IBA under mist in the open.

The aim of this study is to propagate edible cherry laurel cv. 'Kiraz' by small and half-leafy cuttings taken at October, December, February, May and July and search out the interaction of cutting time and Indole-3-butryic acid (IBA) concentrations (0, 50, 100, 500 and 1000 ppm) on rooting of cuttings.

2. Materials and Methods

2.1. Plant material

The 'Kiraz' cherry laurel (Fig. 1) has 67.9 g cluster weight, 19 cherry like fruits per cluster, 15.4% TSS, 4.8 g fruit weight, 4.8 pH, 5.5 cm leaf width and 13.8 cm leaf length. Its taste perfect (4.5 over 5.0), reddish-black fruit color and harvestable during 20 August-10 September (Islam, 2002; Islam et al., 2010). The ten year old hedged 'Kiraz' cherry laurel trees grown in Samsun-Taflan (41°25'55 North) province were used as plant materials. According to the cutting time, the upper part of current and/or one year old shoots were collected from 'Kiraz' cherry laurel cultivar and moved to the cutting preparation house at the University of Ondokuz Mayis, Faculty of Agriculture, and Department of Horticulture during 2007-2010. Shoots for hardwood, semi-hardwood and softwood cuttings collected from October, December, February, May and June between 15th to 20th days. Collected shoots were covered with wet cloth and frequently misted during preparation of the cuttings.

2.2. Cutting treatment

Small and leafy cuttings with 3 nodes and half leaf were prepared and misted frequently for humidity. According to the Sulusoglu and Cavusoglu (2010), cuttings were washed under running water and then disinfected by aqueous solution (10% v/v) of "Domestos" commercial bleach solution for five minutes and rinsed with distilled running water for three times. IBA (Indole-3-butryic acid) solution at 0.05, 0.1, 0.5 and 1.0 g lt-1 was freshly prepared dissolving IBA powder in pure ethyl alcohol. After waiting the evaporation of the heavy wetness around the cutting base, they were dipped in 0 (control, pure ethyl alcohol), 50, 100, 500 and 1000 ppm liquid IBA solution for 10 second by 2 cm basal end. IBA applied cuttings were planted into benches that had 30 cm depth perlite with 23°C root zone heating. Rooting benches were mounted one meter height from the floor and they were constructed under greenhouse with over misting (15 s for 30 min). The greenhouse was maintained at 25±5°C and 80% humidity during the experiment.

2.3. Sampling of cuttings and statistical analyses

Rooted cuttings were removed from the rooting trays after two months and the data was obtained. Cuttings were scored for rooting percentage (%), shooting percentage (%), rooting degree (1-9; 1=no root, 3=thin roots, 5=medium

Figure 1. Edible cherry laurel (*Prunus laurocerasus* cv. 'Kiraz') bunches, the cuttings, rooting media and young rootling.

roots, 7=strong roots and 9=very strong roots), root number per cutting (>5mm in length), mean root length (cm) and root diameter (mm). The rooted cuttings planted into one liter pots with Lithuanian peat moss, perlite and fine soils (1:1:1 v/v), growth under greenhouse for two months and moved to the outside under 60% shade. After a year commercial rootling grade (%) and mortality (%) also determined. The experiment conducted in split plots randomized complete block design with three replications and fifteen cuttings were used per replicate. All the data were evaluated using the analyses of variance (ANOVA) and the differences between means evaluated with Duncan's Multiple Range Test (p.<.01). Data on percent were transformed using arcsin□x transformation and statistical analyses performed over transformed data. Data were pooled due to the non-statistical differences between years.

3. Results and Discussion

It was proved that rooting of cuttings is a dynamic event and could affected by media, exogenous plant growth regulators, cutting type and time, leaves and buds, humidity and temperature. The rooting rate and the quality were also changeable to the cultivars and types. We found that there are important differences between cutting take time for all characters determined. Semi hardwood cuttings collected during July gave the best rooting (100%) while hardwood cuttings collected during October showed the lower rooting degree (Table 1 and Fig. 2). On the other hand December and May cuttings gave the secondarily highest rooting degree. Hardwood leafy cuttings taken in December performed better rooting degree scaled as 1-9. The highest rooting degree observed on December cuttings as 7.72. Cuttings taken from current season's shoot during May and July have less root number than cuttings taken from previous year's shoots. So December cuttings had the highest root number (41.98). October cuttings had the lowest root number. On the other hand cuttings taken from current seasons shoot (July) generally gave the longest roots (12.67 cm) than cuttings taken from previous year's shoot (Table 1 and Fig. 3). Root diameter is the best (1.63 mm) at cuttings taken from February. The rootling grade is an important parameter for nursery. Because all rooted cuttings don't turn to commercial plants. Cuttings taken from July gave the best rootling grade and mortality as 100% (Table 1 and Fig. 4).

Researcher proved that exogenous auxins have positive effect on rooting degree and root quality. In the present study, it found that small quantities of IBA (100 ppm) gave the highest rooting rate as 96.44%. But there is no statistically a difference between 50 and 100 ppm IBA dose. Increasing dose of IBA had negative effect on rooting but it increased the rooting degree. The highest IBA doses gave the highest rooting degree (7.48). Increasing IBA doses from control to 500 ppm also increase the root

Table 1. The changing of rooting (%), rooting degree (1-9), root number, diameter and length, rootling grade and mortality of edible cherry laurel (*Prunus laurocerasus* L. cv. 'Kiraz') leafy-cuttings according to the cutting take time

Cutting take time	Rooting (%)	Rooting degree (1-9)	Root number (n)	Root length (cm)	Root diameter (mm)	Rootling grade (%)	Mortality (%)
October	81.33 d*	5.26 c	15.57 d	6.04 c	1.10 e	70.67 d	45.33 d
December	97.78 ab	7.72 a	41.98 a	11.52 a	1.24 d	97.33 ab	97.33 b
February	83.55 c	5.76 c	28.56 b	7.97 b	1.63 a	76.89 c	54.22 c
May	96.00 b	6.82 b	16.50 d	11.47 a	1.48 b	95.55 b	95.55 b
July	100.00 a	7.04 b	24.60 c	12.67 a	1.34 c	100.00 a	100.00 a

*There is no differences between the data in the column has the same letter in p<0.05

number from 11.47 to 32.96 but higher doses like 1000 ppm slightly lowered the root number. It was proved that there are no statically differences on root length between control and IBA doses but 1000 ppm IBA application gave the highest root length as 10.82 cm. Root diameter did not affect by IBA dose as statistically. And some higher doses decreased the root diameter. 50 ppm IBA application gave the highest root diameter (1.48 mm). Rootling grade slightly affects by IBA doses and 1000 ppm IBA gave the highest rootling grade as 90.67%. But there is no statically a difference between lower and higher doses of IBA. On the other hand mortality was higher on the cuttings applied by 100 ppm IBA (84.89%) (Table 2 and Fig. 2, 3 and 4).

Table 2. The changing of rooting (%), rooting degree (1-9), root number, diameter and length, rootling grade and mortality of edible cherry laurel (*Prunus laurocerasus* L. cv. 'Kiraz') leafy- cuttings according to the IBA (ppm) doses

IBA (ppm)	Rooting (%)	Rooting Degree (1-9)	Root Number (n)	Root Length (cm)	Root Diameter (mm)	Rootling Grade (%)	Mortality (%)
0	83.11 b*	5.19 c	11.47 c	9.96 ab	1.46 a	82.22 b	76.44 c
50	95.11 a	6.51 b	20.25 b	9.95 ab	1.48 a	90.22 a	74.67 bc
100	96.44 a	6.95 b	32.67 a	10.17 a	1.37 b	89.78 a	84.89 a
500	90.67 a	6.43 b	32.96 a	8.77 c	1.17 c	87.55 a	76.00 bc
1000	93.33 a	7.48 a	29.87 a	10.82 a	1.31 b	90.67 a	80.44 ab

*There is no differences between the data in the column has the same letter in $p<0.05$

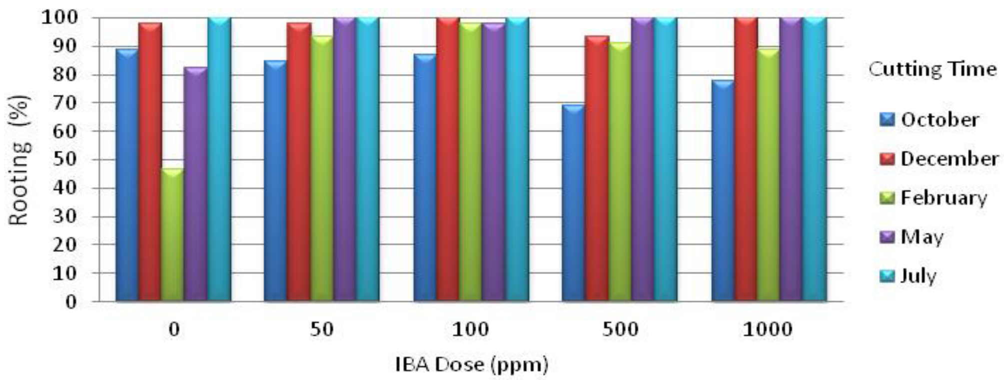

Figure 2. The changing of rooting (%) according to cutting time and IBA doses

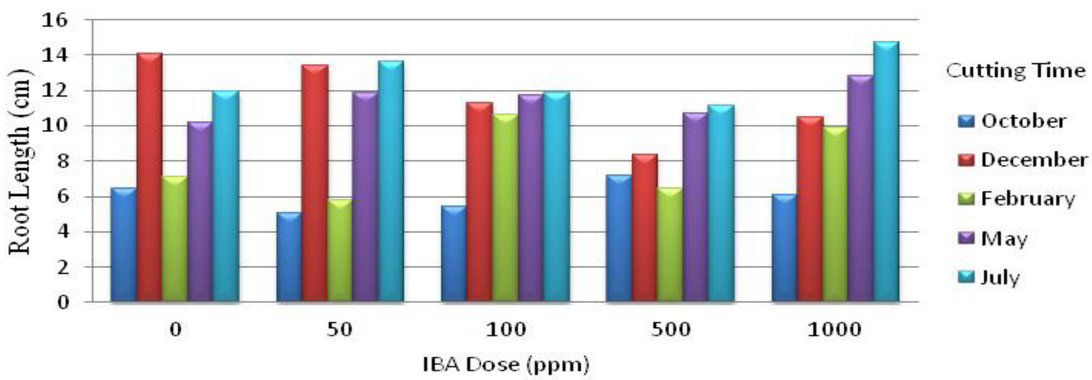

Figure 3. The changing of root length (cm) according to cutting time and IBA doses

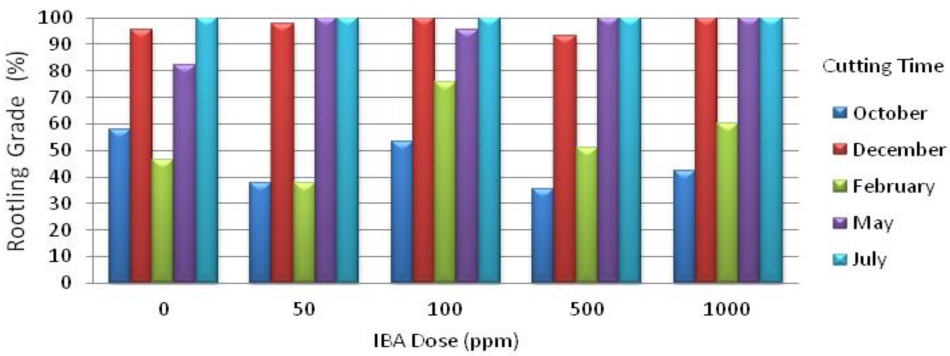

Figure 4. The changing of rootling grade (%) according to cutting time and IBA doses

Edible cherry laurel is known over hundred years by Black Sea inhabitants as a medicinal plant and growth at backyard or fences. Last decade it has become more popular and growers would like to establish new and commercial plantations. Selection studies for the best variety confirmed during last year. Due to the lack of rootling and true to name with high quality plants, an efficient propagation method needs to be determined. Exogenous application of auxins has the major role of rooting and root formation. And IBA is the most using auxins (Srivastava, 2002). It is clear that cutting time had a strong effect on all parameters investigated. Cuttings taken from current year's growth at July gave the full rooting (100%) while December and May cuttings followed. July cuttings also have the longest roots, rootling grade and mortality. On the other hand December cuttings have the highest rooting degree and root number than other cutting time. However February cuttings gave the highest root diameter. Results showed that root formation may differ to the cutting time as proved by Adams (1984) and Ul'yanov (1975). Results for all parameters we obtained are higher than Yazici et al. (2009) findings. This may be affected by rooting temperature and growing ecology of the tree (Alexandrov and Bogdanov 1988). Ul'yanov (1975) and Yazici et al. (2009) also found that the rooting percentage, root number and quality also differ to the cutting time and type. They found that the rooting percentages for cherry laurel were between 6-100. In the present study, it reached to full rooting and mortality percentage at July cuttings taken from current season shoots. Rootling grade is an important parameter for nursery as commercial. According to the cutting time, July (100%) and December 97.33%) gave the highest rootling grade. Sulusoglu and Cavusoglu (2010) also found that the July cutting time is the best but they were used higher IBA concentration. We found that 50 ppm IBA application was good for rootling grade.

Low dose application of IBA (50 ppm or 100 ppm) to the cherry laurel cuttings gave the better rooting results. Conversely Sulusoglu and Cavusoglu (2010) gathered high rooting percentage either 2000 or 4000 ppm IBA application. This claimed that rooting ability may differ to the selection and cultivars of cherry laurel. On the other hand, several researchers reached to highest rooting percentage from control to 1000 ppm IBA (Sulusoglu and Cavusoglu, 2010; Ribeiro et al., 2010). Root quality also affected by IBA doses. Rooting degree, root number and root length increased with the increasing of IBA. However root diameter reached to the top only 50 ppm IBA application. Riberio et al. (2010) also proved that root quality and length could be increase by increasing the IBA dose. Rootling grade was also higher at IBA applications than control.

4. Conclusion

We proved that lower dose of IBA is more effective to the rooting of cherry laurel semi hardwood leafy cuttings. July as cutting time and 100 ppm IBA may offer for 'Kiraz' cherry laurel for rapid and successful commercial propagation under greenhouse condition at perlite media with bottom heating and over misting.

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