



Rooting of Apical Softwood Cuttings of *Cotoneaster horizontalis* Dcne with Application of IBA and Air Humidity

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ABSTRACT

In this research, softwood apical cuttings were taken from *Cotoneaster horizontalis* Dcne. plants grown in Konya Alaeddin Keykubat campus in early July. The softwood cuttings were rooted in pumice medium under misting system (90-100 % humidity level) after treating with 0 (control), 1000, 2000, 3000, 4000 ppm and 5000 ppm Indole-3-Butyric Acid (IBA). Cuttings are investigated in terms of rooting percentage; all the applications included in the control group were obtained 100 %. The highest root number was obtained from 4000 ppm dose application (28.90 number/cutting); the lowest one was control group (18.62 number/cutting). In terms of root length, the longest root (5.39 cm) was obtained from 1000 ppm IBA hormone dose application, the shortest root (4.50 cm) was obtained 2000 ppm hormone dose application. Also, the highest rooting area length was found 5000 ppm hormone dose (13.26 cm), the lowest one was obtained from control group (6.61 cm).

1. Introduction

The genus *Cotoneaster* (*Rosaceae*) consists of around 300 species of woody plants varying in stature from 0.2 m shrubs to 15-20 m trees, and occurring all over Europe, North Africa, and temperate regions of Asia excluding Japan (Bartish et al. 2001). Many *Cotoneaster* species have become popular ornamentals due to the diversity of their form, glossy green foliage, abundant flowers and attractive fruits. One of the important species of *Cotoneaster*, *Cotoneaster horizontalis* Dcne (Rock Cotoneaster) is a deciduous shrub (*Maloidea*: *Rosaceae*) widely used as ornamental shrubs due to the diversity of their form and the beauty of their flowers and fruits (Zeilinga, 1964). This shrub can be propagated via generative and vegetative methods. Vegetative propagation technique is one way of multiplying and improving clones for cultivation and research. It is mostly practiced for horticultural crops for the production of good materials within a short period. The res-

ponses of different tree crops to this method vary considerably according to their genetic constitution (Nanda et al., 1968). Many plant and environmental factors, including genotype, nutritional status, phenological stage, and climatic conditions lead to seasonal variation in rooting ability of softwood cuttings. Vegetative propagation by rooting leafy cuttings in a mist system is widely used for the propagation of ornamental plants. This technique is considered to be easy, inexpensive and appropriate for mass plant production (Fontanazza, 1993; Wiesman and Lavee, 1995a). Also in this method, the stimulation of rooting hormones are used extensively applied to the cuttings. These hormones auxins have been shown to have the greatest effect on rooting (Hartmann et al. 2001; Kelen and Ozkan, 2003; Negash, 2003). Auxin can be either naturally occurring in the plant (endogenous auxin) or it can be applied to the plants during vegetative propagation (exogenous auxin). Since the first auxins were artificially synthesized after the discovery of IAA in the 20th century (by Went 1934), the practice of exogenously applied auxins to promote vegetative propagation started. Numerous

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of experiments in these early years tried to find the best combination of concentration, formulation, duration of treatment, etc. needed for optimal root formation. The naturally occurring auxin, indole-3-acetic acid (IAA) is synthesized in growing apices, young leaves and buds. On the other hand synthetic auxins (especially IBA) are more effective on rooting of cuttings than natural ones. Because, the transport of exogenously applied IBA was more intense in the cuttings of plants that tend to root better (Ludwig-Muller, 2009).

In this study, the influence of various concentrations of external IBA applications and relative humidity conditions on rooting of 'Cotoneaster horizontalis Dcne.' apical softwood cuttings was assessed to develop an alternative and efficient propagation system for 'Cotoneaster horizontalis Dcne.'

2. Materials and Methods

In this research, the softwood top cuttings of *Cotoneaster horizontalis* Dcne. taken from Nursery of Selcuk University Sarayönü Vocational High School were used. 90 – 100 % humidity level, perlite media (0.0 – 5.0 mm) and Indole-3-Butyric Acid (IBA) in different doses [0 (control), 1000, 2000, 3000, 4000 ppm and 5000 ppm] were utilized.

The research was carried out in the "Mist Propagation Unit" of Research and Practice plastic greenhouse at Selcuk University Sarayönü Vocational High School. Softwood top cuttings were taken to be 20-25 cm length, 3-4 mm diameter; and the pinched leaves are below the point where one or two leaves are attached to the stem and then planted into the rooting media (Kalyoncu 1996). In the research, 0 ppm (control), 1000, 2000, 3000, 4000 ppm and 5000 ppm Indole-3-Butyric Acid doses were applied. In practice, in the form of sheaves of cutting, 1-2 cm of the bottom parts were dipped in IBA solution for a period of five seconds and we waited for a short period of time for the alcohol to release. Then cuttings were planted in a rooting media (buried about 2/3 their height) by 10 x 10 row and plant spacing. The relative humidity levels, rooting area temperature and ambient temperature in the mist propagation unit were 85-90%; 95-100%; 18-20°C; 29-31°C, respectively. This experiment was carried out in a randomized block factorial designs, with 3 replicates. Each replicate consisted of 8 cuttings. Later, *Cotoneaster horizontalis* Dcne. cuttings, for a period of 47 days, were subjected to root mist propagation system; they were investigated in the following areas: cutting vitality (number), cutting length (cm), callus status (%), rooting ratio (%), cutting diameter (cm), rooting surface area length (cm), root number (number/cutting), the longest root length (cm), the shortest root length (cm), root branching (number/cutting), root diameter (cm). "MINITAB" computer package program was used in the statistical analysis. The differences between averages were controlled by Duncan test (Düzgüneş et al., 1987).

3. Results and Discussion

Characters attributed to some of the examined characteristics were found statistically significant and averages of the characters and Duncan test are shown in the Table 1.

3.1. Rooting ratio

Relations between hormone applications in terms of rooting rate were found statistically insignificant and the insignificance was also noticed when Table 1 was examined. The percentage of rooting rate of 100% was obtained for all applications including the control group.

There are no studies in any of the literature on rooting of *Cotoneaster horizontalis* Dcne. softwood cuttings. But various researchers made rooting studies using to the same system on the softwood cuttings of various species and obtained high levels of rooting with the humidity level and hormone dose applications (Arslan et al. 1993, Kalyoncu, 1996, Kalyoncu and Ecevit, 1995; Kalyoncu and Özer, 2000; Kalyoncu, 2001; Kalyoncu et al. 2007; Özer and Kalyoncu, 2007; Kalyoncu et al. 2008a; Kalyoncu et al. 2008d; Kalyoncu et al. 2009; Ersoy et al. 2010; Babaoğlu and Kalyoncu, 2011).

It was determined that softwood top cuttings of a cherry tree (*Prunus avium* L.) which were cut in early June were experienced different rooting rates at the air relative humidity level of 85 – 90 % and 95 – 100 % and in the different IBA concentrations and in the perlite environment. Rooting rate revealed a significant increase with the hormone applications. The highest rooting rate was obtained from a 1500 ppm dose application (83.3 %) with 85 – 90 % humidity level (Kalyoncu et al. 2008b). It was determined that softwood top cuttings of the cornelian cherry trees (*Cornus mas* L.) which were cut in early June were experienced a rooting rate of approximately 100 % in the two air relative humidity environment and in darkly IBA concentrations and in the perlite rooting environment. Rooting rate of the cuttings increased significantly with the hormone applications. They obtained the lowest rooting rate in the control group (93.3 %) ,having humidity level of 85-90 % and also obtained a rooting rate of 100 % for the other dose applications (Kalyoncu et al. 2008c). Kalyoncu et al. (2009) carried out a study on the effects of 85-90 % air relative humidity and IBA doses on the rooting rates of the softwood top cuttings cut from the two black mulberry trees (Type 1 and Type 2) and one white mulberry tree (Type 3). Cuttings were cut in early June and different IBA doses were applied to them. In the experiment they determined that the highest rooting rate was reached at the Type 1 with IBA doses applications of a 2000 ppm and a 3000 ppm (100 %). The lowest rooting rate was obtained in the control group at the Type 2 having no roots. In the study made by Babaoğlu and Kalyoncu (2010a) in the misting system they

investigated the effects of two different air relative humidity levels, a darkly IBA hormone dose and a perlite rooting environment on the rooting capability and root formation of the softwood top cuttings of a seedling parent apple tree which were cut in early June. At the end of the research the highest rooting rate of 59.52 % was obtained at the relative humidity level of 95-100 % with the 8000 ppm dose and the other highest rooting rate of 62.50 % was obtained in the control group at the relative humidity level of 85-90 %. The lowest rooting rate of 4.76 % was obtained in the control group at the relative humidity level of 95-100 % and the other lowest rooting rate of 12.50 % was obtained at the relative humidity level of 85-90 % with a 2000 ppm IBA application. Babaoğlu and Kalyoncu (2010b) made a study on the effects of the two air relative humidity environments, darkly IBA concentrations and perlite rooting environment on the rooting of the softwood top cuttings cut from cloned MM106 apple rootstock in early June. They obtained the highest rooting rate of 95 % at the humidity level of 95-100 % with a 500 ppm IBA dose application. And they also obtained the other highest rooting rate of 91 % at the humidity level of 85-90 % with a 1500 ppm dose application. Babaoğlu and Kalyoncu (2011) also made another study on the M9 dwarf cloned apple rootstock. In this study they investigated the effects of relative humidity levels of 85-90 % and 95-100 %, IBA hormone doses (control, 2000, 4000, 6000, 8000 and 10000 ppm) and perlite rooting environment on the rooting capability and root formation of softwood top cuttings. They obtained the highest rooting rate of 80.95 % at the relative humidity level of 85-90 % with a 2000 ppm dose application.

3.2. Root Number

Relations between the hormone doses in terms of root number were found statistically significant ($P < 0.05$). The highest root number of 28.90 (unit/cutting) between the hormone dose applications was obtained with a 5000 ppm dose application. The lowest root number of 18.62 (unit/cutting) was obtained in the control group (Table 1). An increase in the root number was observed in the applications in parallel to the incremental dose application. In other words, the root number increased with the dose increment.

Rooting possibilities of softwood top cuttings, cut from a cherry tree (*Prunus avium* L.) in early June, were investigated at the air relative humidity levels of 85-90 % and 95-100 % and in the IBA (0, 500, 1500, 2500 ppm and 3500 ppm) concentration and perlite environment. In the study it was determined that the cuttings rooted in various rates. They determined that the highest value in terms of the root number of 10.0 unit/cutting was obtained at the humidity level of 85-90 % with a 1500 ppm dose application (Kalyoncu et al., 2008b). Kalyoncu et al. investigated the effects of (85-90 % and 95-100 %) air relative humidity environment, IBA concentration applications (0, 500, 1500, 2500 ppm and 3500 ppm) and perlite rooting environment on

the softwood top cuttings, cut from a cornelian cherry tree (*Cornus mas* L.) in early June. In the study they concluded that the cuttings rooted approximately at a rate of 100 %. They also determined that the root number increased significantly in the hormone dose applications in comparison to the control group. They obtained the highest root number of 56.133 unit/cutting at the humidity level of 85-90 % with a 3500 ppm hormone dose application. Kalyoncu et al. (2009) investigated the effects of air relative humidity level of 85-90 % and IBA doses on the rooting of the softwood top cuttings from two black mulberry trees (Type 1 and Type 2) and one white mulberry tree (Type 3) in early June. They stated that the highest root number of 21.73 unit/cutting was obtained from the Type 3 white mulberry and also the highest root number of 16.42 unit/cutting was obtained from the Type 1 black mulberry but the lowest root number of 0.00 unit/cutting was obtained from the Type 2 black mulberry in the control group. Babaoğlu and Kalyoncu (2010b) investigated the effects of the air relative humidity environment (95-100 % and 85-90 %), IBA concentrations (0, 500, 1500, 2500 ppm and 3500 ppm) and perlite rooting environment on the rooting of the softwood top cuttings, cut from MM106 cloned apple rootstock in early June. In the study the highest value of 12.67 unit/cutting in terms of rooting number at the humidity level of 95-100 % was obtained with a 3500 ppm dose application and also the highest value of 13.50 unit/cutting at the humidity level of 85-100 % was obtained with a 500 ppm dose application. In another study, Babaoğlu and Kalyoncu (2011) also investigated the effects of two different humidity conditions, six different hormone doses and perlite rooting environment on the rooting capability and root formation of the softwood top cuttings from M9 cloned dwarf apple rootstock. In the study they obtained the highest cutting root number of 16.05 unit/cutting at the humidity level of 95-100 % with a 4000 ppm dose application.

3.3. The longest root

When Table 1 is considered, relations between the averages of hormone dose applications were found statistically insignificant. The longest root (5.39 cm) and the shortest root was obtained from 1000 ppm IBA hormone dose application. The effect on the root length of the increase of hormone dose showed that fluctuations. A linear increase or decrease was not found. Kalyoncu et al. (2008b) investigated rooting possibilities of the softwood top cuttings, cut from a cherry tree (*Prunus avium* L.) in early June, with two misting systems, various IBA hormone dose concentrations and perlite environment. In the study they obtained the longest planted cutting root of 3.628 cm at the humidity level of 85-90 % with a 1500 ppm dose application and they obtained the shortest root of 0.092 cm at the humidity level of 95-100 % with a 3500 ppm dose application. In another study, Kalyoncu et al. (2008c) investigated effects of the two different air relative humidity

environments, five different IBA concentrations and perlite rooting environment on the rooting of softwood top cuttings, cut from a type of cornelian cherry (*Cornus mas* L.) in early June. In the study they obtained the longest cutting root of 1.287cm at the humidity level of 85-90 % with a 2500 ppm dose application and also they obtained the shortest cutting root of 0.067cm at the humidity level of 95-100 % in the control group. Kalyoncu et al. (2009) investigated the effects of the air relative humidity of 85-90 % and IBA doses (0, 1000, 2000, 3000 ppm and 4000 ppm) on the rooting of the softwood top cuttings from two black mulberry trees (Type 1 and Type 2) and one white mulberry tree (Type 3). They stated that the cuttings were taken in early June and planted in the perlite environment under the “misting system” of the greenhouse then they were left for rooting for 48 days and the longest root of 11.23 cm was obtained from the Type 1 with a 3000 ppm dose application. Babaoğlu and Kalyoncu (2010b) investigated in a study the effects of two different humidity environments, various IBA concentrations and perlite rooting environment on the rooting of the softwood top cuttings, cut from a MM106 cloned apple rootstock in early June. They obtained the longest cutting root of 7.05cm at the humidity level of 95-100 % and with a

1500 ppm dose application. Babaoğlu and Kalyoncu (2011) investigated in an another study the effects of two different air relative humidity conditions, various IBA hormone doses and perlite rooting environment on the rooting capability and root formation of the softwood top cuttings from M9 cloned dwarf apple rootstock. They stated that the longest cutting root of 3.80cm was obtained at the 95-100 % humidity level with a 8000 ppm IBA dose application and the shortest cutting root of 1.14 cm was obtained at the humidity level of 85-90 % with a 6000 ppm dose application.

3.4. Rooting Surface Length

When Table 1 is considered in terms of rooting surface length, relations between the hormone dose applications were found statistically significant ($P < 0.01$). When the rooting surface length was examined in terms of applications, the longest rooting surface of 13.26 cm was obtained with a 5000 ppm hormone dose application but the shortest rooting surface of 6.62 cm was obtained in the control group. It was observed an increase in the rooting surface length of the cuttings in parallel to the incremental applications of the hormone doses.

Table 1

Effects of 90-100% humidity level and different IBA hormone dose applications on cutting properties of *Cotoneaster horizontalis* Dcne. softwood apical cuttings

Humidity (%)	Plant species	Cutting properties	IBA hormone doses (ppm)					
			Control (0)	1000	2000	3000	4000	5000
90-100	<i>Cotoneaster horizontalis</i> Dcne.	Rooting (%)	100	100	100	100	100	100
		Root number (number/cutting)	18.62 ^B	24.38 ^{AB}	27.57 ^A	23.48 ^{AB}	28.90 ^A	28.38 ^A
		The longest root (cm)	5.04	5.39	4.5	5.19	4.76	5.20
		Rooting Surface Length (cm)	6.62 ^c	6.67 ^c	9.00 ^{bc}	8.97 ^{bc}	9.74 ^b	13.26 ^a
		Root Branching (Yes/No)	yes	yes	yes	yes	yes	yes
		Callused cutting (yes/no)	no	no	no	no	no	no
		Cutting diameter (mm)	2.12 ^A	1.95 ^B	2.14 ^A	2.11 ^A	2.12 ^A	2.09 ^A
		Cutting length (cm)	20.38 ^a	19.45 ^b	19.05 ^{bc}	18.00 ^{de}	18.48 ^{cd}	17.52 ^e

^{A,B,C,...}: Differences between the averages which are different letters in the same row are statistically significant ($P < 0.05$)

^{a,b,c,...}: Differences between the averages which are different letters in the same row are statistically significant ($P < 0.01$)

Babaoğlu and Kalyoncu (2010b) investigated the effects of two different air relative humidity environments, various IBA concentrations and perlite rooting environment on the rooting of the softwood top cuttings, cut from MM106 cloned apple rootstock in early June. They found out that the longest cutting root surface of 2.75 cm at the humidity level of 95-100 % was observed with a 3500 ppm dose application and also found out that the longest cutting root surface of 2.90 cm at the humidity level of 85-90 % was obtained with a 1500 ppm dose application. Babaoğlu and Kalyoncu (2011) investigated in an another study the effects of two different air relative humidity conditions, six different IBA hormone doses and perlite rooting environment on the rooting capability and root formation of

softwood top cuttings from M9 cloned dwarf apple rootstock. They obtained the longest rooting surface length of 2.61 cm at the humidity level of 95-100 % with a 4000 ppm dose application. Kalyoncu et al. (2009) investigated the effects of the air relative humidity of 85-90 % and IBA doses on the rooting of softwood top cuttings, taken from two black mulberry trees (Type 1 and Type 2) and one white mulberry tree (Type 3)

Cuttings were taken in early June and various doses of IBA (0, 1000, 2000, 3000 ppm and 4000 ppm) were applied. The cuttings were planted in the perlite environment under the “misting system” of a greenhouse and were left for rooting for 48 days. They stated that the longest rooting surface of 2.00cm was obtained from the Type 3 and the longest rooting surface of 1.92

cm was obtained from the Type 1 but the shortest rooting surface of 0.0cm was obtained in the control group of the Type 2. Kalyoncu et al. (2008b) investigated the rooting possibilities of the softwood top cuttings, taken from cherry trees (*Prunus avium* L.) in early June, at the air humidity levels of 85-90 % and 95-100 % with five different (0, 500, 1500, 2500 ppm and 3500 ppm) concentrations and in the perlite environment. They stated that the rooting surface length of the cuttings increased significantly in the dose applications in comparison to the control group. The higher the dose was, the longer the rooting surface was. The longest surface of 2.750 cm was obtained at the humidity level of 85-90 % with a 3500 ppm dose application. Kalyoncu et al. (2008c) examined the effects of two different air relative humidity environments, various IBA concentrations and perlite rooting environment on the rooting of softwood top cuttings, taken from cornelian cherry trees (*Cornus mas* L.) in early June. Rooting surface length of the cuttings significantly increased with the hormone dose applications in comparison to the control group. It was determined that the highest value of 4.667cm was obtained at the humidity level of 85-90 % with a 3500 ppm dose application. Özer and Kalyoncu (2007) investigated the rooting surface length at the rooting of softwood top cuttings from a gilaburu tree and they obtained the highest result of 14.0cm at the humidity level of 85-90 % with a 2500 ppm IBA dose application. Kalyoncu and Özer (2000) made an another study on the gilaburu and they stated that there were significant differences between the applications. They obtained the highest value of 12.342 cm at the humidity level of 95-100 % with 3500 ppm IBA application.

3.5. Root Branching

When Table 1 is reviewed in terms of cutting root branching, it is determined root branching in control and all the applications.

Kalyoncu et al. (2008b) investigated the rooting possibilities of the softwood top cuttings, taken from cherry trees (*Prunus avium* L.) in early June, at the two different air relative humidity levels with various IBA concentrations and perlite environment. The highest value of 2.208 unit/cutting in terms of cutting root branching was obtained with a 1500 ppm application. They stated that there was no branching at the humidity level of 95-100 % in the control group and with a 1500 ppm dose application (0 unit/cutting). Kalyoncu et al. (2008c) investigated the effects of two different humidity levels, IBA concentrations and the perlite rooting environment on the rooting of the softwood top cuttings, cut from cornelian cherry trees in early June. They didn't find out any cutting root branching. Kalyoncu et al. (2009) investigated effects of the air humidity level of 85-90 % and IBA doses on the softwood top cuttings, cut from two black mulberry types (Type 1 and Type 2) and a white mulberry type (Type 3) in early June. They obtained the highest root branching of 16.20 unit/cutting in the Type 3 (white mulberry tree)

with a 3000 ppm dose application. Babaoğlu and Kalyoncu (2010b) made a study on the effects of two different air relative humidity environments, different IBA concentrations and a perlite rooting environment in the misting system on softwood top cuttings, cut from MM106 cloned apple rootstock in early June. The highest root branching of 4.33 unit/cutting was obtained at the air humidity level of 95-100 % with a 3500 ppm dose application and the highest root branching of 5.13 unit/cutting was obtained at the air humidity level of 85-90 % with a 500 ppm dose application. Babaoğlu and Kalyoncu (2011) made an another study on the effects of two different air humidity conditions, different IBA concentrations and a perlite rooting environment on the rooting capability and root formation of the softwood top cuttings, cut from M9 dwarf cloned apple rootstock. The highest cutting root branching of 1.28 unit/cutting was obtained at the air humidity level of 95-100 % with a 4000 ppm dose application.

3.6. Callosity status of a cutting

When Table 1 is considered in terms of the cutting callosity, it was noticed that there wasn't any cutting callosity in the control group and all hormone dose applications. Babaoğlu and Kalyoncu (2011) made a study on the effects of two different air relative humidity, IBA applications (Control, 2000, 4000, 6000, 8000 and 10000) and a perlite rooting environment on the rooting capability and root formation of softwood top cuttings, cut from M9 dwarf cloned apple rootstock. They stated that the highest callosity level of 70.83 % was obtained at the humidity level of 95-100 % with a 8000 ppm dose application. Kalyoncu et al. (2009) investigated the effects of the air relative humidity of 85-90 % and IBA doses on the softwood top cuttings from two black mulberry trees (Type 1 and Type 2) and a white mulberry tree (Type 3). Cuttings were taken in early June and different IBA doses were applied. They obtained the highest callosity rate of 100 % in the Type 1 with a 2000 ppm and a 3000 ppm IBA dose application and the lowest callosity rate of 0.00 % in the control groups of Type 2 and Type 3. Kalyoncu et al. (2008c) investigated the effects of two different air relative humidity environments, five different IBA concentrations application and a perlite rooting environment on the rooting of softwood top cuttings, cut from a cornelian cherry (*Cornus mas* L.) tree in early June. The highest callosity rate of 66.7 % was obtained at the humidity level of 85-90 % in the control group. They obtained higher callosity rates in two humidity levels than the control groups. The highest cutting callosity rate of 75 % was obtained at the humidity level of 95-100 % with a 2500 ppm dose application and the highest cutting callosity rate of 71 % was obtained in the control group at the humidity level of 85-90 % (Babaoğlu and Kalyoncu, 2010b).

Initial roots usually develop from a callus. Because of that reason, it is believed that the callus formation is a must for rooting. A callus and root are developed at

the same time. Development of a callus and root require the similar internal and external conditions. A callus formation and root formation are two different events that don't depend on each other (Eriş 2003). A callus formation is useful for the plants having slower rooting rates. Protective layer formed by a callus prevents a cutting from the bottom rotting. In addition to this, a callus layer sometimes enables that the cutting absorbs water (Knight and Witt, 1926).

3.7. Cutting Diameter

When the cuttings were examined in terms of the cutting diameter, the difference between the hormone dose applications was found statistically significant ($P < 0.05$). The highest cutting diameter of 2.14 mm in terms of the hormone dose application average was observed with a 2000 ppm dose application and the lowest cutting diameter of 1.95 mm was observed with a 1000 ppm dose application (Table 1).

3.8. Cutting Length

Relations between the dose applications in terms of the cutting length were found statistically significant ($P < 0.01$). The highest cutting length of 20.38 cm was obtained from control group. The lowest cutting length of 17.52 cm was obtained with a 5000 ppm dose application (Table 1). The other studies were also revealed the similar results (Kalyoncu and Ecevit, 1995; Kalyoncu, 1996; Kalyoncu and Özer, 2000; Özer and Kalyoncu, 2007; Kalyoncu et al. 2007).

Rooting rate, root number, root length, rooting surface length and root branching of softwood cuttings from *Cotoneaster horizontalis* Dcne. trees changed in terms of IBA doses in the study. It was determined that the average values of all the examined characteristics' and IBA doses applications' effected the root number, quality, length and surface length increases. 100% rooting was obtained that applications of moisture and hormone doses. As a result, in this study, IBA and especially relative humidity was found to be effective parameters of propagation of *Cotoneaster* cuttings. This plant can be propagated 90-100 % air humidity conditions without hormone applications too.

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