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THE EFFECT OF DIFFERENT TIMES COLLECTING CUTTING AND AUXIN TREATMENTS OF THE ROOTING IN *PLATANUS ORIENTALIS* L. (ORIENTAL PLANE TREE - CINAR)

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ABSTRACT

This study was carried out to determine the effects of different times of collection of cuttings and different auxins (IBA-NAA) concentrations on the propagation of *Platanus orientalis* L. by cutting. Rooting (%), the number of roots per cutting and primary root length were seen, the best results obtained in November, December and October, respectively. In addition, relatively lower values were determined during spring (March and April) and summer (June and July) periods. On the other hand, it was found out that auxin applications were not effective on rooting of cuttings.

Key words: *Platanus orientalis* L., auxin, cutting collection time, propagation.

INTRODUCTION

Platanus orientalis L. is a tree species belonging to the Platanaceae. Fossil records indicate that Platanaceae have been an element of the northern hemisphere since the mid-Creraceous period. Most of the species diversity and taxonomic complexity resides in North America (where *P.occidentalis* L. is present) and northern Latin America. Differently, natural standings of *P.orientalis* L. are present in the Mediterranean region of south-Europe and south-western Asia (especially Turkey and Iran). It is likely that *P.orientalis* originated in geological times from divergences involving the intercontinental disjunction and other barriers (Sert *et al*. 2008; Pilotti *et al*. 2009).

P .orientalis L. can be found naturally in almost all forestlands, inside the streams, and river bottoms in Turkey. They are monumental, long-lived trees that can grow taller up to 25-35 meters with a trunk diameter of more than 5 m and live for 2000 years. Trunks and branches are light grey or greenish-grey. The trunk is covered by a whitish-grey bark. The barks in the older trunks flake off in the form of small plates and gradually fall off. The light green colored leaves deeply have 5-7 lobed, broadly cuneate or truncate at base, lobes longer than broad, coarsely toothed or entire, glabrous or sub glabrous at maturity. Petiole is quite long and length ranges between 3 and 8 cm. Fruits are sphere-shaped, compound, and 2 to 6 of them are found on a long leafstalk. The situation of compound fruit is descriptive characteristics of *P.orientalis* L. Compound fruit in *P.occidentalis* L., which is quite similar to *P.orientalis* L., are found individually or a few of them take place on a single axis (Davis 1982; Mataracı 2002; Anşin and Özkan 2006).

It is widely used in landscape design in our country (urban open green spaces – parks- arboretum etc., water fronts, industrial areas, shade bearer, street tree) and has numerous examples protected as natural monumental trees (Zencirkiran 2010).

Platanus species can be propagated by means of generative and vegetative methods. The reactions against the propagation methods used vary from species to species. Propagation through seeds is a commonly used method. However, when propagated through seeds, there exists a possibility some of the small and delicate seeds not to germinate, because of the negative influence of external natural factors. Other factors that hamper the seed propagation of sp. *Platanus* are: treatment of the seeds before sowing and special care for the young and fragile germs. Along with this, rate of germination in seeds differs among the species and this rate ranges between 30-40 % in *P.orientalis* (Anonymous 2003; Dirr and Heuser 2006; Hartman *et al*. 2011).

The studies carried out about the propagation of *Platanus* species by cutting were particularly intensive on the species of *Platanus acerifolia* Willd. and it was stated that the factors such as genotype, type of cutting (basal, median), the position of the cutting - donor shoot on the mother plant, cutting stem diameter humidity and temperature of the rooting medium, and time of collection of the cuttings were effective on rooting (Grolli *et al*. 2005). It was found that there is limited information about the propagation of *Platanus orientalis* L. by cutting (Dirr and Heuser 2006; Khosrojerdi *et al*. 2006).

Application of auxin, particularly indole – 3 – butyric acid (IBA), is one of the most common and effective means to enhance rooting of cutting (Blazich 1988; Dirr ve Heuser 2006; Hartman *et al*. 2011).

On the other hand, auxin treatments have been produced contradictory results of *Platanus* species. In some cases, auxin were effective at increasing rooting; while in others, auxin-treated cuttings rooted as well as the untreated controls (Myers and Still 1979; Panetsos *et al*. 1994; Schmidt 1998; Nicoloso *et al*. 1999; Santini 2001; Grolli *et al*. 2005; Dirr and Heuser 2006; Khosrojerdi *et al*. 2006; Hartman *et al*. 2011).

This study was conducted to determine the effects of different times of collection of cuttings and different auxins (IBA - NAA) and doses about the propagation of *Platanus orientalis* L. by cutting.

MATERIALS AND METHODS

The study was carried out at Atatürk Garden Cultures Central Research Institute-Yalova - Turkey greenhouses during 2010 and 2011. The cuttings of *Platanus orientalis* L. were collected from selected stock plants growing at the Atatürk Garden Cultures Central Research Institute Yalova, Turkey. Cuttings were taken from vigorous shoots about 0.5 - 1 cm in diameter and 20-30 cm length.

In order to determine whether times of collecting cuttings were effective on rooting, the cuttings were prepared in January, February, March, April, May, June, July, October, November and December. The cuttings prepared were kept in fungicide containing 2 gl^{-1} Benomyl for a 1 minute (Grolli *et al*. 2005), and then dried for 5 minutes. After this process, the cuttings were randomly divided into groups and applied Indole-3-Butyric acid (IBA) and Naphthalene Acetic acid (NAA) for 5 seconds. Doses of 1000, 2000, 3000 and 4000 ppm were used during the applications. Control group cuttings which were not exposed to application were kept in distilled water within the same time period.

Cuttings were planted (within the first week of each month) in mist propagation which were found in glasshouse, contained perlite as rooting medium and whose under floor heating was arranged to 21 - 22ºC (Fig. 1). Misting was provided for 10 s every 15 min during the day (06^{00}-18^{00} h) and for 10 s every 20 min at night (18^{00}-06^{00} h) (Hunt *et al*. 2011).

The experiment was established using randomized plots in a factorial experimental design with three replicates comprised of 25 cutting each.

Analyses of variance, least significant difference (LSD) tests among means were performed on the measured data using the MINITAB (Minitab, Inc. USA, Minitab Release, 12.1). Statistically significant means were separated by the LSD test at the 0.05 level.

Data on percent rooting were transformed by the arcsine square root transformation before performing the statistical analysis.

Figure 1. Cuttings planted in mist propagation

RESULTS AND DISCUSSION

Rooting (%): Different times of collection of cuttings were effective on the rate of rooting, the highest rooting was seen in November (36.40%) and December (23.47%), it was followed by the cuttings prepared in October (22.53%). It was noticed that the cuttings prepared in April failed to root (Table 1).

Table 1. Rooting % of *Platanus orientalis* L. cuttings collected at different times.

Cutting collection time	Rooting (%)
January	8.27^{c*}
February	2.27^{d}
March	2.13^{d}
April	0.0^{d}
May	10.67^{c}
June	1.87^{d}
July	3.46^{d}
October	22.53^{b}
November	36.40^{a}
December	23.47^{b}

* Values in the same group are not different according to LSD test at the 0.05 significance level.

Although the auxin types did not statistically important effect on the rooting percentage, IBA treatment have a positive effect on rooting percentage than NAA and highest value of rooting percentage was obtained in the these group cuttings (Table 2).

At the same time, hormone doses also did not have a positive effect on rooting, the highest rooting rate was obtained in the control group cuttings (14.67 %) (Fig. 2).

Root Number and Primary Root Length: It was determined that different times of collection of cuttings were effective on the mean root number and primary root length. The mean root number was found to be highest in

the cuttings prepared in October; it was followed by those prepared in November. The primary root length was found to be the longest in the cuttings prepared in December and November (Table 3).

Table 2. Rooting % of *Platanus orientalis* L. cuttings treated with different auxin types.

Auxin type	Rooting (%)
IBA	11.33[a*]
NAA	10.88[a]

* Values in the same group are not different according to LSD test at the 0.05 significance level.

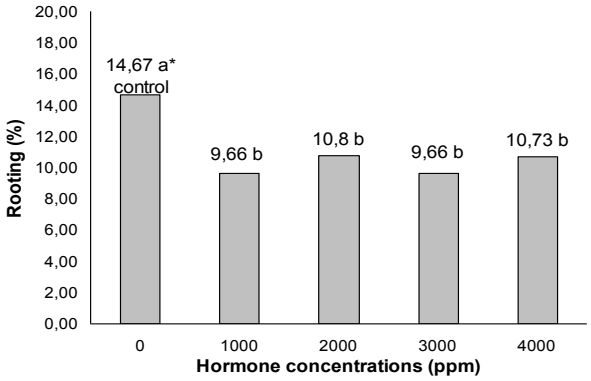

Figure 2. Rooting % of *Platanus orientalis* L. cuttings treated with different hormone concentrations (* Values in the same group are not different according to LSD test at the 0.05 significance level.).

On the other hand auxin types and doses were not found to be effective on the mean root number and primary root length (Fig. 3 and 4, Table 4).

Table 3. Avarege root number and primary root length of *P.orientalis* L. cuttings collected at different times.

Cutting collection time	Average root number	Primary root length (mm)
January	2.25 [c*]	28.59 [bc*]
February	0.53 [e]	2.09 [d]
March	1.65 [cd]	5.99 [d]
April	0.0 [e]	0.0 [d]
May	3.71 [b]	33.99 [b]
June	0.90 [de]	5.77 [d]
July	1.64 [cd]	22.98 [c]
October	5.92 [a]	33.45 [b]
November	4.04 [b]	51.70 [a]
December	3.93 [b]	58.69 [a]

* Values in the same group are not different according to LSD test at the 0.05 significance level.

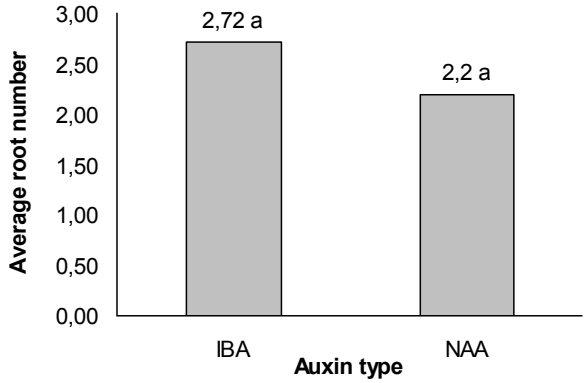

Figure 3. Average root number of *P.orientalis* L. cuttings of treated with different auxin types.

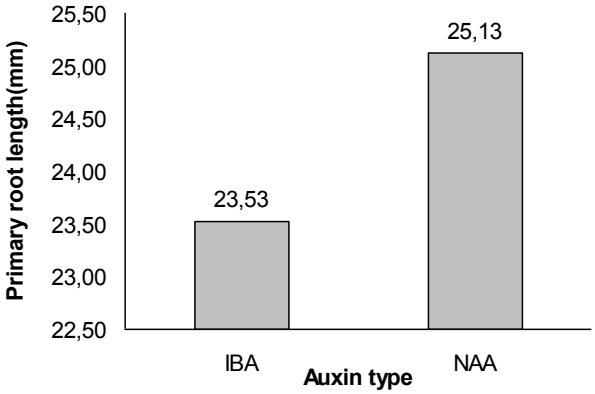

Figure 4. Primary root length of *P.orientalis* L. cuttings of treated with different auxin types.

Table 4. Average root number and primary root length of *P.orientalis* L. cuttings of treated different hormone concentrations.

Hormone concentrations (ppm)	Average root number	Primary root length (mm)
Control	2.53	24.03
1000	2.54	23.80
2000	2.64	26.15
3000	2.16	24.43
4000	2.41	23.20

As a result of this study carried out to determine the rooting performances of the cuttings of *Platanus orientalis* L.; the effects of different times of collection of cuttings were clearly seen. Rooting (%), the number of roots per cutting and primary root length were seen, the best results obtained in November, December and October, respectively. In addition, relatively lower values were determined during spring (March and April) and summer (June and July) periods. This situation conformed to the studies of Abou dahdah *et al*. (1975),

Grolli *et al*. (2005). These researches stated that cutting rooting was effected positively during the similar periods.

It was found out that auxin applications were not effective on rooting. No difference was found between auxin types and the doses used, more rooting was obtained in the control group cuttings that used no auxin. In the previous studies about *Platanus* species it was emphasized that auxin applications brought about conflicting results and auxins sometimes were effective and sometimes failed to show the effectiveness (Santini 2001; Grolli *et al*. 2005; Dirr and Heuser 2006).

Conclusions:

1. It was determined that rooting rate in cuttings of *Platanus orientalis* L. was not very high, change in rooting rate depends upon the season of taking cuttings and that the best rooting (36.40%) rate was observed in the cuttings those are prepared in November.
2. Generally, rooting of cuttings was reduced by hormone applications. In addition to this, there were differences in auxin types the effects on rooting. IBA applications on rooting were more effective than in term of NAA applications.
3. The decrease of rooting observed by hormone applications did not eliminated by increasing concentrations of hormone. It can be consider that auxins used for promotion of rooting may be toxic. Therefore the next researches should be planned considering this situation.

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