

Root Growth of *Morus alba* as Affected by Cutting Size and Low Polythene Tunnel

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An effort carried out to find out the smaller size of cuttings for propagation of *Morus alba* in Experimental area, Department of Forestry, Range Management and Wildlife, University of Agriculture, Faisalabad, 2005. Different size of cuttings i.e. 5 cm, 10 cm, 15 cm and 20 cm were planted in polythene tubes of 9 cm x 18 cm. The attempt was also made to compare the performance of cuttings outdoor and indoor at polythene low tunnel. Root length, number of root branches, root diameter and root fresh and dry weight were found maximum in 5 cm cuttings while minimum in 10 cm cuttings. Root growth was found maximum in outdoor as compared to under polythene sheet.

Abstract

Keywords: Cutting sizes, *Morus alba*, Root growth.

INTRODUCTION

Mulberry (*Morus sp.*) has been cultivated over thousands of years and adapted to a wide area of tropical, subtropical, and temperate zones of Asia, Europe, North and South America, and Africa (Özgen *et al.*, 2009). Propagation is a common practice employed in all plants in order to obtain healthy and resistant plants. Different modes of propagation of trees are important to cultivate in large scale. With the passage of time planting techniques and methods of trees have been modified in order to improve the growth and quality. Since 1937 to now, it is essential to find cheaper methods of vegetative propagation if selected hybrids or strains are to be multiplied and utilized immediately (Ritchie, 1991). Improvement of trees species through genetics has caught fire within the forest industry. Asexual propagation has been one answer because of the shortened time requirement for cuttings of superior trees to root and grow. Clonal propagation is fast becoming a very important nursery management tool (Kevin and Hudson, 1997). Cuttings are probably the cheapest and effective method for propagating new plants. A cutting is any detached plant part that, under favorable conditions will produce a new plant identical to parent plant (David, 2003). Clonal plants produced true to type and disease free plants (Afzal *et al.*, 2006). Use of cuttings is one of the possible techniques for vegetative propagation of trees and it was observed that cuttings play important role in the rooting of important timber species (Awang *et al.*, 2009). Age and size of planting stock is important for initial survival and establishment of cuttings (Raza-ul-Haq, 1992). Cutting length, node position and leaf area were important factor affect the root growth (Tchoundjeu, 1996). Traditional propagation methods like seeds and stem cuttings have been used for mulberry trees and have obtained marvelous monetary importance. Different factors like genotype, environment and physiological state of the cuttings play a significant role in determination of success of rooting (Lu, 2002). Propagation by seeds is undesirable owing to a long juvenile period (Vijaya Chitra and Padmaja, 2005). Usually grafting and cutting propagation methods are used in *M. alba* (Hartmann *et al.*, 1990; Guo *et al.*, 2007).

Cutting length affected the successful rooting in *Morus alba* but there was no relationship between diameter and rooting ability (Jeff McCormack, 2006). Conducive environmental conditions are very important for the growth of cuttings (David, 2003). The presence of cover is an advantage for initial establishment and survival of saplings. *M. alba* is a multipurpose tree, its propagation by saplings is a widely used and popular method (Yıldız and Koyuncu, 2000). Jones (2009) reported that humid environment is suitable for rooting of mulberry cuttings and for this purpose, cutting beds or containers should be covered with plastic or glass. Trujillo., (2002) also recommended the plastic cover for proper growth of cuttings in nursery.

A considerable research work has already been carried out by different research workers to observe the effect of various cutting diameters on the growth and survival rate of seedlings of different trees. But not much work is done on checking the effect of various lengths of cuttings on the root growth. *Morus alba* is an important tree for sericulture and other purposes like timber, fruit, shade etc. So keeping in view the importance of Mulberry tree a research work was conducted to compare the growth patterns of *Morus alba* cuttings under different cutting lengths and their comparison in outdoor and under polythene sheet.

MATERIALS AND METHODS

The proposed research was carried out in the experimental area, Department of Forestry, Range Management and Wildlife, University of Agriculture, Faisalabad during 2005. The site is located at the latitude of 36°-26°N and longitude of 73°-06°E altitude of site is 184.4m at sea level. Different sized cuttings were prepared from two- year old plants of *Morus alba*. After filling the bags with soil/sand mixture (1:2 ratio), cuttings were planted in the bags in the last week of september 2005 and were placed in the experimental area. Half out of total were placed in outdoor and remaining under polythene sheet. Cuttings were irrigated properly immediately after planting.

Two experiments were laid out in Randomized Complete Block Design (RCBD) with three blocks. For each experiment (indoor and outdoor) similar cutting sizes were used. There were 4 treatments in each block with 80 plants giving rise to a subtotal of 240 plants under each experiment. As a whole, there were a total of 480 plants for both experiments for a period of two months.

Detail of the treatment used is as under;

T1: 5cm length of cuttings

T2: 10cm length of cuttings

T3: 15cm length of cuttings

T4: 20cm length of cuttings

Root length, root diameter, number of root branches and root fresh and dry weight were measured after uprooting the plants at the end of experiment. The data collected were subjected to statistical analysis using analysis of variance in randomized complete block design. The mean comparison was done by Least Significant Difference Test (LSD) at 5%. (Steel and Torrie, 1980).

RESULTS AND DISCUSSION

Root Length (cm)

Root length was found maximum 22.187 cm under T₁ followed by 19.245 cm, 17.348 cm and 16.607 cm for T₂, T₃ and T₄, respectively. Mean length of roots under plastic sheet (18.545cm) was less than in outdoor (19.098cm) plants (Table 1). Data revealed that 5cm cuttings in *M. alba* can be developed into healthy plants. It indicates that 2 inches cutting is just like sowing of seed, which can easily be developed in polythene tubes. Less root growth under polythene sheet is the result of more vegetative growth as compared to root growth. Almost similar results were obtained by Kwon *et al.* (1997), Wang *et al.*, (1997), Foster *et al.*, (2000), David (2003) and Khan *et al.*, (2007) in their studies.

Root Diameter (mm)

Statistically mean maximum root diameter was (1.50mm) found in 5cm cuttings, which was followed by (1.41mm) 10cm, (1.40mm) 15cm and (1.35mm) 20cm cuttings as shown in Table-1. From these results it is clear that more the length of cutting, less will be the diameter of roots so there will be less amount of food reserves. The comparison of treatment mean regarding to open and covered factor revealed that maximum root diameter (1.557 mm) was in outdoor as compared to under plastic sheet (1.275mm). Difference in root diameter was due to easy and direct access to the sunlight of the cuttings in the open as compared to the ones under plastic sheet. Similar results have been reported by Jain *et al.*, (1990), David (2003) and Marie *et al.*, (2003).

Number of Root Branches (Rootlets)

Maximum mean number of root branches were (25.30 rootlets) under 5cm, which was followed by (24.4 rootlets) 15cm, (24.38 rootlets) 10cm and (24.21 rootlets) 20cm cuttings. In case of open and polythene cover factor T₁ (5cm cutting) produced maximum branches (28.90 rootlets) in outdoor as compared to under polythene sheet (21.63 rootlets). Results are in conformity of the earlier studies reported by Kwon *et al.* (1997), Zaczek *et al.*, (1997) and Foster *et al.*, (2000).

Root Fresh weight (g)

The results (Table 1) showed that maximum root fresh weight was in 5cm (1.27 g) followed by 10cm (1.16 g), 15cm (1.08 g) and 20cm cuttings (0.89 g). Root fresh weight is almost 1/3 in T₄ as compare to T₁. From these values it is clear that mean maximum root fresh weight was in treatment T₁ (5cm cuttings). The reason might be that the (5cm) smaller cuttings get more space in the polythene bags. In case of factor related to outdoor and covered maximum fresh weight was in outdoor (1.17g) as compared to under polythene cover (1.03g). These results are

in lined with findings of Driscoll (1990), Groninger *et al.*, (1996), Foster *et al.*, (2000) and David (2003).

Root Dry Weight (g)

The root dry weight is an important factor for evaluation of root growth and biomass production. Based on results (Table 1), maximum root dry weight was obtained under 5cm cuttings (0.71g) followed by 10cm (0.57g), 15cm (0.59g) and 20cm cuttings (0.47g). Maximum root dry weight outdoor was (0.62g) and under plastic sheet it was (0.55g). In outdoor maximum root dry weight was obtained in 5cm cuttings (0.82g). It has been observed by different scientists that root growth will be more if the cutting size is small and dry matter of the cuttings under polythene cover would be less as compare to outdoor cuttings. e.g., Driscoll (1990), Groninger *et al.*, (1996), Tchoundjeu *et al.*, (1996), Foster *et al.*, (2000) and Kirk *et al.*, (2002).

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Tables

Table 1. Root growth of mulberry as affected by size of cuttings and polythene low tunnel

Outdoor and Covered	Treatments				Mean
	T1	T2	T3	T4	
i. Root Length (cm)					
Outdoor	24.17	20.11	15.90	16.21	19.09a
Covered	20.20	18.38	18.79	17.00	18.54a
Mean	22.19a	19.24b	17.35c	16.61c	
ii. Root Diameter (mm)					
Outdoor	1.84	1.47	1.40	1.50	1.56a
Covered	1.16	1.34	1.29	1.29	1.27b
Mean	1.50a	1.41ab	1.40b	1.35b	
iii. Number of root branches					
Outdoor	28.90	24.46	17.00	22.90	23.33a
Covered	21.63	24.30	31.80	25.53	25.85a
Mean	25.30a	24.38a	24.40a	24.21a	
iv. Root fresh weight (g)					
Outdoor	1.4	1.12	1.10	1.01	1.17a
Covered	1.09	1.19	1.06	0.78	1.03a
Mean	1.27a	1.16a	1.08ab	0.89b	
v. Root dry weight (g)					
Outdoor	0.82	0.58	0.55	0.52	0.62a
Covered	0.59	0.55	0.62	0.42	0.55a
Mean	0.71a	0.57b	0.59b	0.47c	

T1= 5cm length

T2= 10cm length

T3= 15cm length

T4= 20 cm length

Figures

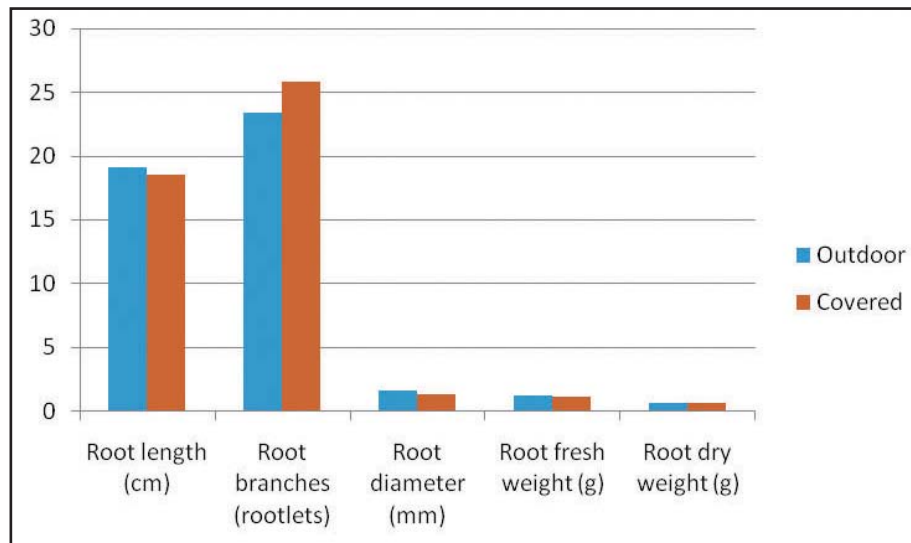


Fig. 1. Mean chart for outdoor and covered cuttings of *Morus alba*

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