Pak. J. Agri. Sci., Vol. 44(2), 2007

SPROUTING PERCENTAGE AND GROWTH BEHAVIOUR OF *Morus alba* AS AFFECTED BY SIZE OF CUTTINGS AND POLYTHENE TUNNEL

Ghulam Sarwar Khan, Irfan Ahmad and Muhammad Farrakh Nawaz
Department of Forestry, Range Management and Wildlife, University of Agriculture, Faisalabad

A research study to find out the best size of cutting for propagation of *Morus alba* was conducted in the experimental area, Department of Forestry, Range Management and Wildlife, University of Agriculture, Faisalabad during the year 2005. Two, four, six and eight inch long cuttings were planted in polythene tubes of 3.5"x7". The effort was also made to compare the performance of cuttings in open air and in polythene low tunnel. Sprouting percentage and number of leaves were found maximum in T_4 (eight inch long cuttings) and height of plants was maximum in T_3 (six inch long cuttings) But when we compare these with T_1, which was too small just like a seed, it also showed good results. These parameters performed well in polythene tunnel as compared to open air.

Keywords: *Morus alba*, cutting sizes, growth behaviour, open and polythene sheet.

INTRODUCTION

Propagation is a common practice employed in all plants in order to obtain healthy and resistant plants. Propagation of trees has a lot of importance because trees are the lungs of the world. So if trees are healthy and disease resistant, it is a good sign for environment. In 1974, only three cutting propagation systems existed in the world. Since that time the amount of programs has increased dramatically with an increased realization of potential grains in growth and quality of trees. It was realizes in 1937 that "It is essential to find cheaper methods of vegetative propagation if selected hybrids or strains to be multiplied and utilized immediately" (Ritchie 1991). Within the past few decades, genetic improvement of tree species 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. This method of reproduction is fast becoming a very important nursery management tool (Hudson 1997). Cuttings are probably the most important method for starting new plants. A cutting is any detached plant part that, under favourable conditions for regenerations, will produce a new plant identical to parent plant (David 2003). Age and size of planting material stock is important for initial survival and establishment of seedlings (Haq 1992). Length of cuttings may vary depending on the species (Edson, 1991). Even if the cuttings were taken properly, they would not grow well if the environmental conditions were not correct (David 2003). The presence of viburnum cover is an advantage for initial establishment and survival of seedlings. *Morus alba* is a multipurpose tree, its propagation by saplings is a widely used and popular method (Yýldýz and Koyuncu, 2000).

Significant research work has been carried out by different research workers to observe the effect of various cuttings 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 early survival and growth. *Morus alba* is an important tree for sericulture and other purposes like 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 open air and under polythene sheet.

MATERIAL AND METHODS

The proposed research was carried out in the experimental area, Department of Forestry, Range Management and Wildlife, University of Agriculture, Faisalabad during the year 2005. The site is located at the latitude of 36°-26'N and longitude of 73°-06'E. Altitude of site is 184.4m. Different sized cuttings of *Morus alba* were prepared from two- year old plants of *Morus alba* from the nursery of the Department of Forestry, Range management and wildlife, University of Agriculture, Faisalabad. After filling the bags with soil, cuttings were planted in the bags in the last week of September 2005. After planting the cuttings, bags were placed in the experimental area. Half number of bags were placed in open air and half under polythene sheet. Cuttings were irrigated properly immediately after planting. Potting medium was identified as sandy clay loam soil.

The experiment was laid out in Randomized Complete Block Design. There were two factors, 3 blocks under each factor and 20 plants under each treatment. As there are 4 treatments in each block so each block contained 80 plants while a subtotal of 240 plants were under each factor while whole experiment involved a total of 480 plants for keeping under observation for two months.

The following treatments were applied to *Morus alba* in open air and under polythene sheet

T_1: 2" length of cuttings
T_2: 4" length of cuttings
T_3: 6" length of cuttings
T_4: 8" length of cuttings

Sprouting percentage, height of plants and number of leaves were measured after each 15 days after planting. The data collected from experiment were subjected to statistical analysis using analysis of variance in randomized complete block design. The comparison among the treatments means were made by Least Significant Difference Test at 5% probability level. (Steel and Torrie, 1980).

RESULTS AND DISCUSSION

Sprouting Percentage (%age)

The results pertaining to mean value for sprouting percentage are given in (Table1). The comparison of treatment means (Table-1) revealed that statistically maximum sprouting percentage was obtained under polythene sheet (93.22) while in open air it was (64.16). Treatment means revealed that average sprouting percentages of treatments T_1, T_2, T_3 and T_4 were 74.37, 77.91, 80.41 and 80.83 respectively (Table-4). From these values it is very clear that there is not much difference in sprouting percentages of 2", 4", 6" and 8"cuttings. From treatment means it is clear that sprouting percentage obtained after thirty days in open air was (65.83) and under polythene cover was (95.00). After thirty days there is negligible increase in sprouting percentage, so we can say that thirty days are maximum for counting the sprouting percentage. The results of present study revealed that the cutting size and polythene cover influence the sprouting and growth of tree cuttings at nursery stage. These findings are in line with those of Haq (1992), Mebrahtu *et al*. (1990), Mitchell (1998) and Trujillo (2002).

Height of Plants (cm)

The results pertaining to mean values for height of plants are given in (Table-2) and (Table 4). The comparison of treatments mean (Table-4) revealed that statistically maximum average mean plant height was (11.73) in T_3, which was followed by (10.39) inT_4. The minimum average plant height (8.75) was the result of T_1. From (Table-2) it is clear that treatment T_3 showed best results both in open air (7.58) and under polythene sheet (15.88). The comparisons of treatments mean (Table-2) revealed that value for height of plants in T_3 under polythene sheet, after 15 days was 3.45, 1.62 and 0.5 greater than T_1, T_2 and T_4, respectively. While after 60 days, difference of height was 11.3, 8.4 and 8.1 respectively, which showed more rapid increase in height in T_3 as compared to other treatments with the passage of time. From comparison of means it is clear that under polythene tunnel height was more (13.45cm) as compared to open, which was (6.98cm). The results that cuttings length and polythene sheet or shades significantly affect the height of cuttings are in line with the findings of Cobbina (1990), Xiaoshan *et al*. (1997) and Trujillo (2002).

Table 1. Sprouting %age affected by cutting size and polythene tunnel

Time intervals	Treatments										Mean
	Open					Covered					
	T1	T2	T3	T4	MEAN	T1	T2	T3	T4	MEAN	
15 Days	43.33	56.66	51.66	58.33	52.50	71.66	81.66	95.00	98.33	86.66	69.58b
30 Days	68.33	61.66	66.66	66.66	65.83	91.66	93.33	95.00	100.00	95.00	80.41a
45 Days	68.33	70.00	71.66	66.66	69.16	91.66	95.00	95.00	100.00	95.41	82.28a
60 Days	68.33	70.00	71.66	66.66	69.16	91.66	95.00	96.66	100.00	95.83	82.50a
Mean	62.08	64.58	65.41	64.58	64.16B	86.66	91.25	95.41	97.08	93.22A	**78.60**

Table 2. Height of plants (cm) affected by cutting size and polythene tunnel

Time intervals	Treatments										Mean
	Open					Covered					
	T1	T2	T3	T4	MEAN	T1	T2	T3	T4	MEAN	
15 Days	1.88	2.43	2.94	3.44	2.67F	4.25	6.08	7.70	7.20	6.30E	4.49d
30 Days	5.13	5.46	5.36	5.23	5.30E	10.75	12.83	11.01	13.23	11.96C	8.62c
45 Days	8.73	10.76	10.15	8.06	9.42D	14.16	16.83	18.55	15.46	16.25B	12.84b
60 Days	10.11	10.96	11.88	9.25	10.55CD	14.98	17.78	26.23	18.11	19.28A	14.91a
Mean	6.46D	7.40D	7.58D	6.49D	6.98b	11.04C	13.38B	15.88A	13.51B	13.45a	**10.22**

Number of Leaves

The results pertaining to mean value for number of leaves are given in Tables-3 and 4. The comparison of treatment means (Table-4) revealed that maximum average for number of leaves were (7.43) in T_4, followed by (6.52) in T_3 (5.46) in T_2 and (5.46) in T_1. The comparison of means for number of leaves revealed that (Table-3) under plastic sheet there were more number of leaves (8.91) as compared to open air (3.52). Time factor is also important, with the passage of time number of leaves increased. After 15 days in open air the mean number of leaves of T_1, T_2, T_3 and T_4 were 0.65, 0.41, 0.61 and 0.88, respectively while under polythene sheet were 2.88, 3.81, 5.61 and 8.35 respectively and after 60days in open air were 6.76, 4.90, 4.78 and 4.68 while under polythene sheet were 6.59, 7.62, 9.78, and 11.74, respectively. From treatment means it is clear that there is a significant difference in the number of leaves after 15 days (2.90) and after 60 days (8.53) in all treatments. The results showed that six inches length of cuttings and plastic cover increases the number of leaves are in line with findings of Kirk *et. al.* (2002) and Trujillo (2002).

Table 3. Number of leaves affected by cutting size and polythene tunnel

Time intervals	Treatments										Mean
	Open					Covered					
	T1	T2	T3	T4	MEAN	T1	T2	T3	T4	MEAN	
15 Days	0.65	0.41	0.61	0.88	0.64	2.88	3.81	5.61	8.35	5.16	2.90c
30 Days	3.90	2.98	3.13	2.83	3.21	6.75	7.16	6.85	12.06	8.20	5.71b
45 Days	6.01	4.90	4.78	4.10	4.95	8.03	9.03	12.03	13.00	10.52	7.73a
60 Days	6.76	4.90	4.78	4.68	5.28	8.70	10.50	14.38	13.53	11.77	8.53a
Mean	4.33D	3.30DE	3.32DE	3.12E	3.52B	6.59C	7.62C	9.72B	11.74A	8.91A	**6.22**

Table 4. Average effect of treatments on the growth behaviour of *Morus alba* cuttings.

Average mean	Treatments			
	T_1	T_2	T_3	T_4
Sprouting percentage (%age)	63.12	77.91	80.41	80.83
Height of plants (cm)	8.75	10.39	11.73	9.97
Number of leaves	5.46	5.46	6.52	7.431

LITERATURE CITED

Cobbina, J. 1990. Effect of direct sun rays on the growth of *Leucaena leucocephala* and *Gliricidia sepium* seedlings in the nursery. Luceana Res. Reports, 11:88-90.

David, F. Hamilton and James T. Midcap. 2003. Propagation of Woody Ornamentals by Cuttings. Institute of Food and Agricultural Sciences. University of Florida.

Edson, J.L., Wenny David L. and Fins Lauren. 1991. Propagation of western larch by stem cuttings. Western J. Applied Forestry 6(2): 115-125.

Hudson, K. 1997. Overview of cutting propagation. University of Auburn FY 614, 3/7/97.

Kirk W. Pomper, Desmond R. Layne and Snake C. Jones. 2002. Incident Irradiance and Cupric Hydroxide Container Treatment Effects on Early Growth and Development of Container-grown Pawpaw Seedlings. J. Amer. Soc. Hort. Sci. 127(1): 13–19.

Mebrathu, T. and J.W. Hanover. 1990. The effect of root cutting size on time of sprouting of Black locust. Nitrogen fixing trees research reports, 8:156-158.

Mitchell, A K. 1998. Acclimation of Pacific yew (*Taxus brevifolia*) foliage to sun and shade. Tree physiol. 18(11):749-757.

Haq, R. 1992. Effect of light and weed competition on the survival and growth of Abies pindrow seedlings of various ages in different soils media in the moist temperate forests of Pakistan. Pak. J. Forestry 42(3):148-162.

Ritchie, G.A. 1991. The commercial use of conifer rooted cuttings in forestry: a world overview. New Forests 5: 247-275.

Steel, R., J.H. Torric and D. Dickey. 1980. Principles and Procedures of Statistics. A biometrical approach. 3rd Ed. Mc Graw Hill Book Co Inc. New York.

Trujillo, F. U. 2002. *Mulberry for rearing dairy heifers.* In: Sánchez, M.D. (ed.) 2002. *Mulberry for Animal Production* FAO Animal Production and Health Paper 147. Rome, p. 203-206.

Xiaoshan, W., W. Jianhua, W. Youcai, D. Xiaoguang, C. Guishu, C. Zhenli, W. XS, Wang YC, Dong XG, Chang GS and Cui ZL. 1997. Effect of cutting length on rooting and growth of two year old plants of Larix kaempferi in the nursery. Forest Research 10(6): 659-662.

Yýldýz, K. and F. Koyuncu. 2000 Karadutun (*M. nigra* L.) odun çelikleri ile çoðaltýlmasý üzerine bir araştýrma. Derym. 17(3): 130-135.