EFFECT OF CUTTING LENGTH, THICKNESS AND PLANTING TIMES ON THE SUCCESS OF VEGETATIVE PROPAGATION OF JIGA (*Garuga pinnata*)

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ABSTRACT

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An experiment was conducted to find out suitable planting time and cutting size (length and thickness) on the success of vegetative propagation of Jiga (*Garuga pinnata*) at the Agroforestry Farm, Department of Agroforestry, Bangladesh Agricultural University, Mymensingh, during the period from March to September, 2004. The treatments were three planting times viz. third week of March, April and May, three different cutting lengths viz. 50, 25 and 12.5 cm and thickness viz. thick stem cuttings of 2.75 cm diameter ranging from 2.5 to 3.0 cm in thickness and thin stem cuttings of 1.5 cm diameter ranging from 1.0 to 2.0 cm in thickness. The highest percent survivability and effective branches (56.9% and 1.21, respectively) was found with 50 cm long cuttings. Thick cuttings gave the highest percent survivability and effective branches (38.90% and 0.75, respectively). March plantation gave the highest percent survivability and effective branches (59.20% and 1.46, respectively). The interaction effects between the cutting length, cutting thickness and planting time showed a very clear and decisive result of 100% survivability with 50 cm long and thick cuttings in March plantation. The highest 3.78 number of branches was observed with 50 cm long, thick cutting in March plantation. Both survivability and branch development of this study showed that March plantation had better effects compared to the April plantation.

Key word: Cutting length, planting times, vegetative propagation

INTRODUCTION

In Bangladesh Jiga (*Garuga pinnata*) is a type of tree that is well suited as living poles along the hedges and can be used for fodder production also. Jiga is a Burseraceae tree species belonging to the genus *Garuga*. It grows very fast and has considerable potential for supplying fodder, live posts and other products. It is a multipurpose tree. It is mostly used as living poles along the fence around the homestead and farm lands by the farmers in our country. It also grows in home garden as timber yielding tree and produces scarcity fodders for the farmers. The farmers and villagers in our country usually plant very thick and larger stocks/poles/cuttings to serve them as living poles and are selectively kept for growing them as trees for future uses. In this method, they need a huge quantity of plant materials when needed to fence the whole homestead, garden or crop fields. However, although these thick and tall stocks are needed for stronger fencing, it may be unnecessary for the case of fodder production as well as for multiplication of the stems for future uses. Again tall stocks usually branch in upper region. Apart from live posts combination of live fencing and fodder production system is not effectively used at present with *G. pinnata*, unless combined with other species. This problem may be solved using stem cuttings technique in this species, enhancing branching from the whole area of the cuttings. Like many other species, it is thought that *G. pinnata* especially the regenerated plants from cuttings do not grow well in flooding or heavy raining condition. Therefore, suitable planting time is should be identified. These were focussed in the present experiment with a view to find out suitable planting time for propagation through cutting techniques and the suitable size (length and thickness) of cutting as planting materials.

MATERIALS AND METHODS

The experiment was conducted at the Agroforestry Farm, Department of Agroforestry situated on the central area of agricultural farm of Bangladesh Agricultural University, Mymensingh, during the period from March to September, 2004. The experimental area was located (AEZ-9) at 24.75°N latitude and 90.50°E longitude at a height of 18 m above the sea level (UNDP and FAO 1988). *Garuga pinnata* Roxb was used for the present study. The experiment was laid out in Randomized Complete Block Design with three replications. There were three factors involved in the experiment. The treatments were three planting times (third week of March, April and May), three different cutting lengths (50, 25 and 12.5 cm) and thickness (thick stem cuttings of 2.75 cm diameter ranging from 2.5 to 3.0 cm in thickness and thin stem cuttings of 1.5 cm diameter ranging from 1.0 to 2.0 cm in thickness). Well decomposed cowdung @ 16 kg/plot of 3.5 m × 4.5 m size were used by mixing to soil as basal dose during final spading and leveling before plantation for the experiment. No chemical fertilizer was used in plot prior to plantation. However, only urea @ 211.64 kg/ha were applied topdressing at mid stage of the study. The recorded parameters were percentage of survivability and number of effective branches. The recorded data were analyzed statistically to find

out variation resulting from experimental treatments according to Gomez and Gomez, 1984. The mean for all treatments was calculated and analysis of variance under study was performed by F-variance test at 5% level of significance. Duncan's Multiple Range Test (DMRT) separated the means of the parameters.

RESULTS AND DISCUSSION

The highest percent survivability of the cutting was found 56.9% with 50 cm long cuttings followed by 30.6% and 9.6% for 25 cm and 12.5 cm long cuttings, respectively. Thus percent survivability was reduced significantly due to the reduction of cuttings lengths (Table 1). The highest number of effective branch per cutting was found 1.21 for 50 cm long cutting followed by 0.45 and 0.096 per cutting for 25 cm and 12.5 cm long cuttings, respectively. Thus number of effective branch was observed to be significantly reduced due to the reduction of cutting length. The significant variation in percent survivability was also noticed between the cuttings with different thickness (Table 1). The survivability was the highest of 38.9% and 25.9% for thick and thin cuttings, respectively. The significant variation in number of effective branch was also noticed between the cuttings with different thickness such as the highest 0.75 and 0.42 per cutting was found for thick and thin cutting respectively. When only the planting time was considered, the percent survivability was the highest 59.3% in March plantation followed by April (48.1%) and then by May (22.2%) (Table 1). June plantation was found to be unsuccessful. This remarkable and significant variation in percent survivability is clearly due to the seasonal effect. The number of effective branch was the highest 1.46 in March plantation followed by April (0.63) and then by May (0.24). June plantation was found to be unsuccessful (Table 1). This remarkable and significant variation in number of effective branch is clearly due to the seasonal effect.

The interaction effects on percent survivability was observed 61.1% in 50 cm x thick treatment followed by 52.8% in 50 cm x thin treatment then followed by other treatment (Table 2). The interaction effects on number of effective branch was observed 1.47 for 50 cm x thick treatment followed by 0.95 effective branch per cutting for 50 cm x thin treatment, then followed by other treatments were the lowest 0.0 was for 12.5 cm x thin treatment. These also showed significant difference at 1% level of probability. The interaction of cutting length with planting time showed a great increase in percent survivability with the highest 94.5% in March plantation followed by 83.3% in April plantation (Table 2). Similar to these, the other results were also significantly reduced. The interaction of cutting length to planting time showed a great increase in number of new branches with the highest (3.06) in March plantation followed by (1.23) in April plantation. Similar to the interaction with length, cutting thickness also showed gradual and significant reduction in number of branches in cutting materials of *G. pinnata*. The interaction between cutting thickness to planting time showed lower percent survivability of the species with the highest figure of 77.7% compared to the highest of 94.5% by the longest cuttings of 50 cm in length and showed lower number of branches with the highest figure of 1.96 compared to the highest number of 3.06 for longest cuttings of 50 cm in length. Similar to these, the number of branches in other treatments was also significantly reduced. Similar to the interaction with length, cutting thickness also showed gradual and significant reduction in percent survivability of cutting materials in *G. pinnata* (Table 2).

The interaction among these parameters of study with cutting length, cutting thickness and planting time showed very clear and decisive results on percent survivability in G. pinnata cuttings (Table 3). Hundred percent survivability was observed with 50 cm long thick cutting in March and April plantation followed by only 88.9% with 50 cm, thin cutting and 25 cm thick cuttings in March plantation. Others were significantly reduced in comparison of above treatments. Thus March plantation showed the better effects compared to the April plantation. The results also indicate that propagation through cutting should be avoided after the month of April in Mymensingh region of Bangladesh. The highest number of branches was 3.78 per cutting observed for 50 cm long, thick cutting in March plantation, followed by only 2.33 per cutting for 50 cm long, thin cutting in March plantation. Other treatments produced significantly lower number of branch per cutting comparative to above-mentioned result (Table 3). The March plantation showed the better effects compared to April plantation. The results also indicate that propagation through cuttings should be avoided after the month of April in Mymensingh region of Bangladesh.

The results of the present study on vegetative propagation are in good agreement with the reports of other researchers. An experiment was conducted by Naser and Abdel-Hamid (1971) to study the difference in regeneration of juvenile and mature stem cutting of sour orange and cleoptra mandarin. They reported that the rooting percentage of juvenile stem cutting taken from one year old seedlings was much higher than that of mature cuttings from 15 years old trees. Haque and Ahmed (1966) reported that cuttings are the best made from young wood and the latter should as far as possible be taken from shoots grown high up the tree or shrub. Some plants

strike quickly from cutting of very young wood even thin green shoots, whilst others succeed better from fully matured wood. Experience will show the more profitable methods but generally it is the safest to use for cutting some what wood of a years growth. Cutting can be vary from $\frac{1}{4}$ to $\frac{3}{4}$ in thickness, according to the age and type of wood selected (Gemell, 1975). In the present study, cutting with higher length showed better success than that of lower ones supporting the above findings. However, the present results differs with the reports of Gupta and Tripathy (1997), said that stump height of 15 cm showed less mortality than those of 15-22 cm and > 72 cm height classes. Untrimmed and improperly trimmed stumps exhibited more mortality and produced fewer coppice shoots. In the present study, March plantation was found to be the most successful period than other periods tested. According to Jauhari and Rahman (1924) rooting in cutting of sweet lime planted in the month of February gave good results than that of any other months. In November planting unringed cuttings failed to produce roots and 37.5% rooting was obtained with certain treatment in ringed cuttings respectively, where as Singh *et al.* (1973) claimed that sweet lime cuttings planted in the late summer rooted better than those planted in late winter. However, these results differ from that of Badji *et al.* (1991) who reported that only stem cutting collected during the rainy season gave roots and then hormonal treatments had a significant effect on the survival rate of the stem cutting during the two months observation period with other species.

Table 1. Single effect between cutting length, cutting thickness and planting time on per cent survivability and number of branches per cutting of *G. pinnata*

Treatments	Per cent survivability	Number of branch per cutting
Cutting length		
50 cm	56.90 a	1.21 a
25 cm	30.60 b	0.45 b
12.5 cm	9.60 c	0.096 c
LSD (P≥0.05)	0.036	0.037
Thickness		
Thick	38.90	0.75
Thin	25.90	0.42
LSD (P≥0.05)	2.02	0.02
Planting time		
March	59.20 a	1.46 a
April	48.20 b	0.63 b
May	22.20 c	0.24 c
June	0.00 d	0.00 d
LSD (P≥0.05)	0.042	0.042

In a column figures having similar letter(s) do not differ significantly whereas figures with dissimilar letter(s) differ significantly as per DMRT at 5% level of significance

Table 2. Interaction effect between cutting length, cutting thickness and planting time on per cent survivability and number of branches per cutting of *G. pinnata*

Treatments	Per cent survivability	Number of branch per cutting
Cutting length x thickness		
50 cm × thick	61.10 a	1.47 a
50 cm × thin	52.80 b	0.95 b
25 cm × thick	36.20 c	0.59 c
25 cm × thin	25.00 d	0.31 d
12.5 cm × thick	19.20 e	0.19 e
12.5cm × thin	0.00 f	0.00 f
LSD (P≥0.05))	0.051	0.052
Cutting length x planting time		
50 cm × March	94.50 a	3.06 a
50 cm × April	83.30 b	1.23 b
50 cm × May	50.00 d	0.56 d
50 cm × June	0.00 g	0.00 g
25 cm × March	61.00 c	1.12 c
25 cm × April	50.50 d	0.56 d
25 cm × May	11.00 f	0.11 f
25 cm × June	0.00 g	0.00 g
12.5 cm × March	22.00 e	0.22 e
12.5 cm × April	11.00 f	0.11 fg
12.5 cm × May	5.50 fg	0.05 f g
12.5 cm × June	0.00 g	0.00 g
LSD (P≥0.05)	0.073	0.074
Thickness x Planting times		
Thick × March	77.70 a	1.96 a
Thick × April	59.30 b	0.82 c
Thick × May	18.30 e	0.22 e
Thick × June	0.00 f	0.00 f
Thin × March	40.70 c	0.96 b
Thin × April	37.00 c	0.45 d
Thin × May	26.00 d	0.26 e
Thin x June	0.00 f	0.00 f
LSD (P≥0.05)	0.06	0.06

In a column figures having similar letter(s) do not differ significantly whereas figures with dissimilar letter(s) differ significantly as per DMRT at 5% level of significance

Table 3. Interaction effect between cutting length, cutting thickness and planting time on per cent survivability and number of branches per cutting of *G. pinnata*

Interaction of cutting length, cutting thickness and planting time	Per cent survivability	Number of branch per cutting
50 cm × thick × March	100.00 a	3.780 a
50 cm × thick × April	100.00 a	1.560 d
50 cm × thick × May	44.43 e	0.55 g
50 cm × thick × June	0.00 i	0.00 j
50 cm × thin × March	88.90 b	2.33 b
50 cm × thin × April	66.67 c	0.89 e
50 cm × thin × May	55.57 d	0.56 g
50 cm × thin × June	0.00 i	0.00 j
25 cm × thick × March	88.90 b	1.67 c
25 cm × thick × April	55.57 d	0.67 f
25 cm × thick × May	0.00 i	0.00 j
25 cm × thick × June	0.00 i	0.00 j
25 cm × thin × March	33.30 f	0.56 g
25 cm × thin × April	44.47 e	0.45 gh
25 cm × thin × May	22.20 g	0.22 i
25 cm × thin × June	0.00 i	0.00 j
12.5 cm × thick × March	44.43 e	0.44 h
12.5 cm × thick × April	22.20 g	0.22 I
12.5 cm × thick × May	11.10 h	0.11 j
12.5 cm × thick × June	0.00 i	0.00 j
12.5 cm × thin × March	0.00 i	0.00 j
12.5 cm × thin × April	0.00 i	0.00 j
12.5 cm × thin × May	0.00 i	0.00 j
12.5 cm × thin × June	0.00 i	0.00 j
LSD (P≥0.05)	4.82	0.104

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REFERENCES

Badji, S., Ndiaye, I. Danthu, P. and Colonna, J.P. 1991. Vegetative propagation studies of gum arabic trees. Propagation of *Acacia Senegal* (L.) wild. using lignified cutting of small diameter with eight nodes. Centre ORSTOM. BP 1386. Dakar, Senegal. Direction des Eauxet Forest, Dakar Senegal. 1991. Kluwer Acad Publ., The Netherlands. No. 14 pp. 183-191.

Gemmell, A. 1975. The Penguin Book of Basic Gardening. First Ed. Penguin Book Ltd., Harmondohworth, Midlesex, England, pp. 164-169.

Gomez , K.A and Gomez, A.A. 1984. Statistical procedures for Agricultural Research, Int. Rice Res. Inst. John Willy and Sons, New York, Chickester, Brisbane, Torento, Singapore, 643.

Gupta, H.S. and Tripathy, K.K. 1997. Study on natural regeneration in forest of Garhwa (Bihar). Indian J. Forest. 20 (4): 324-327.

Haque, M.A. and Ahmad, K. 1966. Propagation of some citrus species by stem cutting with growth regulations. Pakistan J. Biol. Agric. Sci. 9 (3): 35-40.

Jauhari, O.S. and Rahman, S.P. 1924. Investigation on rooting in cuttings of sweet lime (*Citrus limettoides*). Tanaka Sci. Cult. 23: 615.

Naser, T.A. and Abdel-Haimid, F.I. 1971. Regeneration of juvenile and mature stem cuttings of sour orange and eleoptramandarin. Alexandria J. Agril. Res. 19(2): 331-341.

Singh, K.K. Bakshi, J.C. and Singh, S. 1973. Effect of Callusing and seredix treatment on rooting of sweet lime cutting. Indian J. Hort. 17: 193-197.

UNDP (United Nations Development Program) and FAO (Food and Agricultural Organization). 1988. Land Resource Appraisal of Bangladesh for Agricultural Development. Report No. 1. Agroecol. Reg. Bangladesh. UNDP and FAO, pp. 212-221.