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Effect of cutting length, cutting thickness and planting time on effective branch formation in cutting of *Garuga pinnata*

M.H.A. Khanam[1], M.A. Hossain[2], M.O. Islam [3] and M.N.A. Chowdhury[4]

[1]A H Z Biotech. Ltd, Padma Residential Area, Vadra, Rajshahi, Bangladesh, [2]Department of Agroforestry, [3]Department of Crop Botany, Bangladesh Agricultural University, Mymensingh, Bangladesh, [4]Spices Research Center, BARI, Shibganj, Bogra, Bangladesh

Abstract: An experiment was conducted to find out suitable planting time and cutting size (length and thickness) on the number of new and effective branch formation in cutting of Jiga (*Garuga pinnata*) at the Agroforestry Farm, Department of Agroforestry, Bangladesh Agricultural University, Mymensingh during the period from March to September, 2004. The experiment was laid out in Randomized Complete Block Design with three replications. 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. It was observed that the highest effective branches 1.21 were found with 50 cm long cuttings. Thick Cuttings gave the highest effective branches 0.75. March plantation gave the highest effective branches 1.46. The interaction effects between the cutting length, cutting thickness and planting time showed very clear and decisive results. The highest 3.78 number of branches was observed with 50 cm long, thick cutting in March plantation. The branch development of this study showed that March plantation had better effects compared to the April plantation.

Key words: Cutting length/ thickness/ planting time/branch

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 fodder's 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 focused 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. *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 using MSTAT package programme. 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

Effect of the cutting length and thickness: The highest number of effective branch per cutting was found 1.21 for 50 cm long cutting when only the length was considered. This was 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 (Table 1).

Table 1. Single effect between cutting length and cutting thickness on number of branches per cutting of *G. pinnata*

Treatments	Number of branch per cutting
Cutting length	
50 cm	1.21 a
25 cm	0.45 b
12.5 cm	0.096 c
Level of significance	**
LSD (0.05)	0.037
Thickness	
Thick	0.75
Thin	0.42
Level of significance	**
LSD (0.05)	0.02

Table 2. Interaction effect between cutting length and cutting thickness on number of branches per cutting of *G. pinnata*

Treatments	Number of branch per cutting
Cutting length x thickness	
50 cm × thick	1.47 a
50 cm × thick	1.47 a
50 cm × thin	0.95 b
25 cm × thick	0.59 c
25 cm × thin	0.31 d
12.5 cm × thick	0.19 e
12.5cm × thin	0.00 f
Level of significance	**
LSD (0.05)	0.052

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The significant variation in number of effective branch was also noticed between the cuttings with different thickness such as the height 0.75 and 0.42 percent cutting was found for thick and thin cutting respectively (Table 1). However, the interaction effects on number of effective branch was observed 1.47 for 50 cm x thick treatment to followed by 0.945 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 (Table 2).

Table 3. Single effect planting time and interaction effect between cutting length and planting time on number of branches per cutting of G. pinnata

Treatments	Number of branch per cutting
Planting time	
March	1.46 a
April	0.63 b
May	0.24 c
June	0.00 d
Level of significance	**
LSD (0.05)	0.042
Cutting length xplanting time	
50 cm × March	3.06 a
50 cm × April	1.23 b
50 cm × May	0.56 d
50 cm × June	0.00 g
25 cm × March	1.12 c
25 cm × April	0.56 d
25 cm × May	0.11 f
25 cm × June	0.00 g
12.5 cm × March	0.22 e
12.5 cm × April	0.11 fg
12.5 cm × May	0.05 f g
12.5 cm × June	0.00 g
Level of significance	**
LSD (0.05)	0.074

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Effect of planting time and interaction with cutting length and thickness: When only the planting time was considered, 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. This remarkable and significant variation in number of effective branch is clearly due to the seasonal effect (Table 3).

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* (Table 3).

The interaction of cutting thickness to planting time showed lower number of branches with the highest figure of 1.96 (Table 4) compared to the highest number of 3.06 (Table 3) for longest cuttings of 50 cm in length. Similar to these, the number of branches in other treatments was also significantly reduced (Table 4).

Table 4. Interaction effect between thickness and planting time on number of branches per cutting of *G. pinnata*

Treatments	Number of branch per cutting
Thickness x Planting times	
Thick × March	1.96 a
Thick × March	1.96 a
Thick × April	0.82 c
Thick × May	0.22 e
Thick × June	0.00 f
Thin × March	0.96 b
Thin × April	0.45 d
Thin × May	0.26 e
Thin x June	0.00 f
Level of significance	**
LSD (0.05)	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

The interaction among parameters under the present study with cutting length, thickness and planting time showed very clear decisive results on number of effective branch in *G. pinnata* (Table 5) cuttings. 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. 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.

Table 5. Interaction effect between cutting length, cutting thickness and planting time on number of branches per cutting of *G. pinnata*

Interaction of cutting length, cutting thickness and planting time	Number of branch per cutting
50 cm × thick × March	3.780 a
50 cm × thick × April	1.560 d
50 cm × thick × May	0.55 g
50 cm × thick × June	0.00 j
50 cm × thin × March	2.33 b
50 cm × thin × April	0.89 e
50 cm × thin × May	0.56 g
50 cm × thin × June	0.00 j
25 cm × thick × March	1.67 c
25 cm × thick × April	0.67 f
25 cm × thick × May	0.00 j
25 cm × thick × June	0.00 j
25 cm × thin × March	0.56 g
25 cm × thin × April	0.45 gh
25 cm × thin × May	0.22 i
25 cm × thin × June	0.00 j
12.5 cm × thick × March	0.44 h
12.5 cm × thick × April	0.22 I
12.5 cm × thick × May	0.11 j
12.5 cm × thick × June	0.00 j
12.5 cm × thin × March	0.00 j
12.5 cm × thin × April	0.00 j
12.5 cm × thin × May	0.00 j
12.5 cm × thin × June	0.00 j
Level of significance	0.01
LSD (0.05)	0.104

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

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 1/4 エラー! ブックマークが定義されていません。 to 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 Jauharind Rahman (1924) rooting in cutting of sweet lime planted in the month of February had 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, this 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.

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