EFFECT OF STEM DIAMETER ON SPROUTING POTENTIAL OF GLIRICIDIA (*Gliricidia sepium*) IN SUB-HUMID NIGERIA

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ABSTRACT
In order to evaluate the effect of stem cutting diameters on vegetative propagation of Gliricidia sepium, a trial was carried out during the dry season of year 2023. Four different cutting diameters of G. sepium designated as treatments: T1: 3.6 – 4.5 cm; T2: 4.6 - 5.5 cm; T3: 5.6 - 6.5 cm and T4: 6.6 - 7.5 cm, with average lengths of 60 cm were planted into polyethene bags at the depth of 18 cm. The treatments were laid out in a complete randomized design (CRD). The data collected were subjected to one way analysis of variance (ANOVA). The results showed a significant effect (P<0.05) of the stem cutting diameters on establishment of G. sepium. Higher values of sprouts growth and survival percentages were found in T3 (5.6 - 6.5 cm) and T4 (6.6 - 7.5 cm). It was concluded that for successful establishment of G. sepium, cuttings with diameters between 5.6 and 7.5 cm should be used in order to get vigorous growth and early establishment of G. sepium plantation.
Keywords: Stem cutting, Diameter, *Gliricidia sepium*, Sprouts, Fodder

INTRODUCTION

Gliricidia sepium (Jacq) Walp is believed to be the most widely used cultivated multipurpose tree after *Leuceana. Leucocephala* (Grygier *et al.,* 2022). It is used in many parts of the tropics for live fences, fodder, soil improvement, fuel wood, and plantation shade. The leaves by their chemical composition have a high potential for use as animal feeds and have better nutrient digestive values than grasses (Grygier *et al.,* 2022). It grows in a wide variety of soils and climates up to 1000 m altitude (Braga *et al.,* 2022). *G. sepium* has been identified as a very important browse plant. Though introduced into Nigeria many years ago, it has naturalised and is receiving attention as a very promising browse species for livestock feeding, particularly during the most critical long dry season when the much needed high quality, fresh livestock feeds are very scarce (Amodu *et al*. 2007). One of the major limitations to full exploitation of *G. sepium* seems to be mainly attributable to its establishment process (Amodu *et al*. 2007).

Despite the ecological and economic importance of *Gliricidia sepium,* limited research addresses the relationship between stem diameter and sprouting potential. This knowledge gap hinders the efficient cultivation of these species (Ruenes-Morales *et al*., 2010). In order to contribute to solving the problem of low regeneration of repeatedly pruned fodder species as they are no longer able to produce enough seeds, a series of leafy stem cutting experiments were carried out. Therefore, this study was carried out to investigate the effect of stem diameter on the sprouting potential of *Gliricidia sepium* in the sub-humid zone of Nigeria.

MATERIALS AND METHODS

Experimental Site

The experiment was conducted in the months of October to December, 2024 at the Teaching and Research Farm, College of Agriculture and Animal Science, Division of Agricultural Colleges, Ahmadu Bello University, Mando-Road, Kaduna. The area is situated at Latitude 10.58°N and Longitude 7.42°E, southern guinea savannah zone of Nigeria. It is characterized with tropical dry-and-wet climate. The wet season lasts for about 6 to 7 months (April to October) with an average annual rainfall of about 1323 mm, with the month of August being the peak of the wet season (Abaje and Oladipo, 2019; Shu'aibu *et al*., 2023; Shu'aibu *et al*., 2024). The highest average air temperature of about 28.9°C normally occurs in April, while the lowest (22.9 to 23.1°C) occurs in December through January (NiMet, 2017). The mean atmospheric relative humidity ranges between 70 - 90% and 25 - 30% for the rainy and dry seasons respectively (Abdulkarim and Sarki, 2013).

Source of the Experimental Materials

The stem cuttings of *Gliricidia sepium* were obtained from the Range Unit of the College of Agriculture and Animal Science, DAC, ABU, Mando – Road, Kaduna. Leafy stems were harvested early in the morning from the basal branches of 12 matured naturally regenerated *G. sepium* trees of unknown age and placed in water to prevent drying before being taken to the nursery for planting.

Treatments and Experimental Layout

The entire leaves on the harvested stems were trimmed, cut to a length of 60 cm each. Vernier calliper was used to select stem cuttings into four different diameters (Table 1) and designated into four treatment groups (T1, T2, T3 and T4). Each treatment has 12 stem cuttings. The experiment was laid out in a completely randomized design (CRD) in which each treatment had 3 replicate containing 4 cuttings per replicate.

Table 1: Treatment composition

	Stem Cuttings		
Treatments	Diameter (cm)	Quantity	Length (cm)
T1	3.6 – 4.5	12	60
T2	4.6 – 5.5	12	60
T3	5.6 – 6.5	12	60
T4	6.6 – 7.5	12	60

Planting Procedure and Management

Gliricidia sepium stem cuttings were planted at the depth of 18 cm in a rooting medium consisting of fine-grained soil in polyethene bags. To minimise fungal attacks, cuttings were prior to planting, soaked for 10 minutes in a solution of Ivory 80 WP, a fungicide containing 80% Mancozeb. After planting, cuttings were regularly watered manually using a sprayer, twice a day around 7:30 am and 5:30 pm to avoid desiccation. The experiments ran for ten weeks.

Data Collection

Data collection started twenty sixth day after planting when the first sprouted bud emerged. The data collected include: the number of sprouted buds per cutting, the number of sprouted stem cuttings, the length of sprouts, and the number of leaves per sprout. For each individual cutting, growth data were collected every seven days throughout the experimental period.

Statistical Analysis

The data collected were checked for normality, and for the two variables (the number of sprouted buds, and percent number of sprouted stems), descriptive statistics were computed to determine the average values. Summary of the results are illustrated by line graph and bar chart. While the data for the number of leaves per sprout, and the length of sprouts were subjected to analysis of variance (ANOVA) using the GLM procedure of Statistical Analysis System 9 software (SAS, 2008). Means that exhibited significant differences ($p<0.05$) were further compared using Duncan multiple range tests (DMRT) of the same statistical package.

RESULTS AND DISCUSSION

Number of sprouted buds

The first sprouted bud emerged 26 days after planting of the *G. Sepium* cuttings. Thereafter, a week after the emergence of the first sprout (WAEFS) T3 had the higher number of sprouted buds (0.7) which was closely followed by T1 (0.3). Whereas, no bud sprout was found in T2 and T4. At 2 WAEFS, higher numbers of sprouted buds were observed in T3 (5.3) which were closely followed by T2 (4.0) (Figure 1). As from 4, 5 and 6 WAEFS, T1 exhibited consistently higher number of sprouted buds (7, 8, and 8 buds respectively). These were closely followed by T3 having 6.7 buds. While the least numbers of buds at 4, 5, and 6 WAEFS were discovered in T2 with 5.7 buds (Figure 1). *Gliricidia sepium* is a browse Plant that grows in wet and warm weather conditions (Chadhokar, 1982). Although the plant is easily established either from cuttings or seeds, choice of material depends on how the plants is to be used (Amodu *et al*, 2007). In a situation where establishment is to be carried out by stem cuttings, it is very pertinent to know the right size of the stock length, diameter, planting depth, and planting angle (Amodu *et al*, 2007).

Percent number of sprouted stems

The results of the percentage number of sprouted stems from 1 to 6 weeks after the emergence of the first sprout (WAEFS) is presented in Figure 2. At 1 WAEFS, T1 had the higher percentage number of sprouted stems (16.7%) which was closely followed by T1 (8.3%). However, no sprouted stem was recorded in T2 and T4. At 2 WAEFS, higher percentage numbers of sprouted stems were observed in T3 (58.3%) which was closely followed by T2 (4.0) (Figure 1). As from 3, 4, 5 and 6 WAEFS, T3 and T4 exhibited consistently higher number of sprouted buds (100 % each). These were closely followed by T1 having 33.3% buds. Moreover, at 8 WAEFS the least percentage number of sprouted stems were discovered in T1 and T2 with 33.3% (Figure 2). It was observed that percentage number of sprouted stems increase with the increase in stock diameter. The low percentage number of sprouted stock found in thinner cuttings may be due to low carbohydrate reserves in immature stocks. These findings are in conformity with what was reported by (Amodu *et al*, 2007). Chadhokar (1982) prescribed using mature stocks of about six months old or more.

Length of Sprout and Number of Leaves

The results on Table 2 shows that, at 6 WAEFS, significantly ($p<0.05$) higher sprout length (7.3 cm) occurred in T4. There was no significant ($p>0.05$) difference in the value (5.0 cm) observed in T3. The least sprout length was observed in T2 (2.33 cm) which was statistically similar with what obtains in T1 (2.6 cm). The lengths of *G. sepium* stem cuttings used in the present study (60 cm) were lower than 1.5 m reported by Anonymous (2020). However, the best performing cuttings were found to have thicker (diameter of between 5.6 and 7.5 cm) than what was stated by the same author. In his report, Anonymous (2020) also stated that *G. sepium* trees are normally established from cuttings, using stakes of 5 – 6 months of age, 1.5 m long and with a diameter of 3.5 – 4.0 cm. If the moisture is adequate, foliage will appear in 4 weeks.

The number of leaves per sprout recorded no significant ($p<0.05$) difference between the entire treatments. However, the value (58.3) observed in T4 was numerically higher than what obtains in other treatments. This was closely followed by T3 (37.5), while the least number of leaves was found in T1.

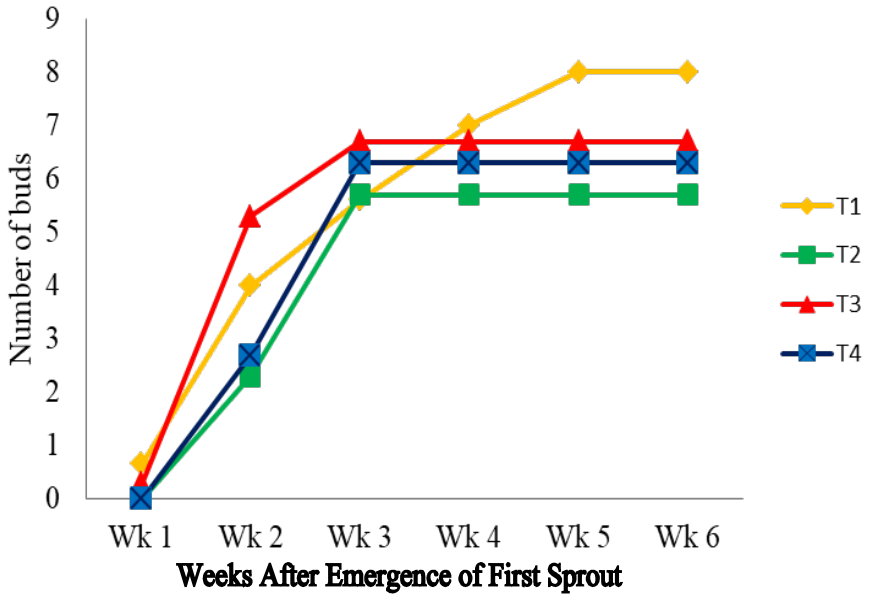

Figure 1: Number of sprouted buds weeks after the emergence of the first sprout

Table 2: Sprout length and number of leaves per sprout

	Treatments					
Parameter	T1	T2	T3	T4	SEM	LS
Sprout length	2.6^{b}	2.3^{b}	5.0^{ab}	7.3^{a}	1.50	*
Number of leaves	25	33.3	37.5	58.3	0.80	NS

^{ab}Means on the same row with different superscripts are significantly ($p<0.05$). SEM = Standard error of the mean. LS = Level of significance. * Significantly differed. NS = No significant difference

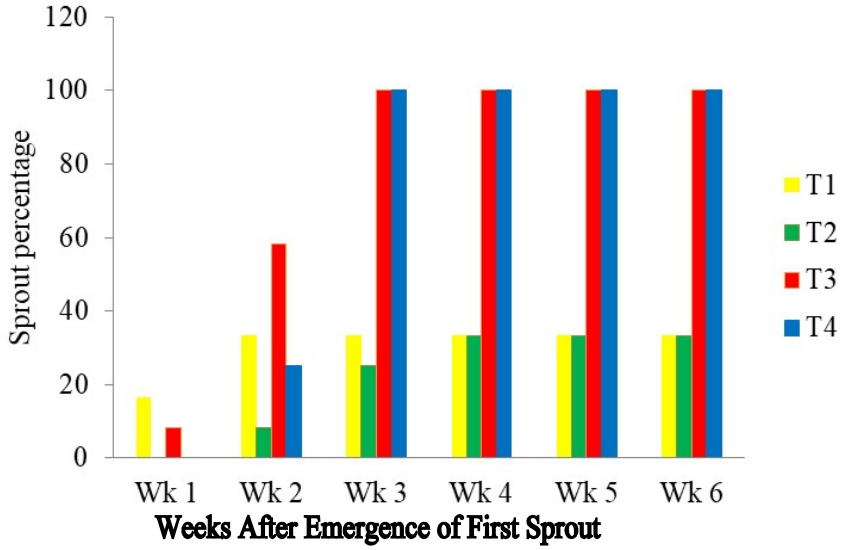

Figure 2: Percentage Number of sprouted stems weeks after the emergence of the first sprout

CONCLUSION AND RECOMMENDATION

This study revealed that *Gliricidia sepium* can be vegetatively established with ease through the use stem cuttings. However, cutting diameters have significant effects on sprouting potential and successful establishment of *G. sepium*. Higher values on sprout growth, and survival percentages were found in T3 and T4 (between 5.6 and 7.5 cm diameters). It was therefore recommended that;

i. For ease and successful establishment of *G. sepium,* its stem cuttings with diameters of between 5.6 and 7.5 cm should be used in order to get early sprouting and vigorous growth.

ii. Further investigation on appropriate cutting length and planting depth are required.

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