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Effect of Sowing Depth on Seedling Emergence and Some Growth Parameters of *Acacia seyel* Del

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ABSTRACT

The research was conducted to assess the effect of sowing depth on seedling emergence, seedling height and diameter of *Acacia seyel*. The research was conducted at college Nursery, Audu Bako College of Agriculture Dambatta in the year 2013. The pot experiments involved a factorial combination of six sowing depth (0.5, 1.0, 1.5, 2.0, 2.5, 3.0)cm. the experiment was arranged in a randomized complete block design (RCBD) and replicated three times. Data were taken on number of days from planting to emergence and on some growth parameters were recorded (seedling height and stem diameter). Findings from the experiment were subjected to analysis of variance using SAS and means were separated using S.E. It was observed that increase in the sowing depth at varying depth affect the seedling emergence, height as well as the stem diameter. The result shows that sowing *Acacia seyel* seed at 0.5 and 1.0cm though statistically similar significantly $p=0.05$ reduced days to seedling emergence. Good seedling emergence was obtained at sowing depths 0.5, 1.0 and 1.5cm and delayed emergence was observed most at 3.0cm though 1.5 and 2.0 were statistically similar was found to be better than 3.0cm. Increase in seedling height was observed at 1.0 and 1.5cm and 2.5cm at 2 and 3 MAS respectively. Similarly at 2 MAS sowing depth of 0.5cm though resulted in statistically comparable stem diameter to other sowing depth significantly $p=0.05$ reduced the diameter. Similar result was obtained at 3MAS. However, no significance difference was observed at 4MAS on seedling height and stem diameter. The result showed that the increase in sowing depth is proportional to the increase in days to emergence of the seedling and in the other hand results in the increase in seedling height and diameter. Based on these findings 1.0cm and 1.5 sowing depth can be used as optimum sowing depth of *Acacia seyel* and nursery men and foresters can improve seedling emergence by sowing *Acacia seyel* at the depth of 1.0.

Introduction

Acacia seyel Del. also known as shittim wood is a deciduous prickly small to medium sized shrub or tree. It reaches up to 17m after 8-10 years (Ecocrops, 2011). The trunk is 20-60cm diameter covered by a rust colour powdery bark.

Shittim wood has a thin top flattened crown similar to that of *Acacia totilis*. It may be sparsely branched and the branches are horizontal or ascending (Orwe et al., 2009). Sharp straight spines occur on the branches and smaller curved thorns are present near the tips of the branches.

The epidermis of the twigs becomes reddish and shed annually. The leaves are dark green bipinnate with 3-7 pinnae which bear 11-20 pairs of leaflets, the leaflets are 3-8m long×0.5mm wide. Shittim wood fruits are 6-10 seeded curved pods 7-20cm long and 0.5-0.9cm broad and contain elliptic seeds (Orweet,*al.* 2009).

Shittim wood is wide spread in the semi-arid zones of tropical Africa from Senegal east ward to Somalia and the red sea and from the Nile valley south to Zambia. It is normally found in areas with 560-1200mm. lowest temperature within its natural range is 5- 10°C at high altitude, but the pattern of distribution indicates a frost sensitive specie. Shittim wood grow well on deep heavy soil with high p^H (6.8) especially variety pistula is tolerant waterlogged (Dorthe 2000).

Shittim wood is a multipurpose tree. It is a nitrogen fixing specie that is excellent for silvipastoral system. The bark provide valuable forage for cattle and games and leaves pod are used for podder and it is considered the best podder tree in the sahelian zones(Ecocrop 2011). The dry matter net energy contents of both varieties are high 6.8 MJ kg⁻¹ (Foliage) and 4-7 MJ kg⁻¹ (fruits) and the digestible protein content is 8-12% in leaves and 13-15% in fruits (Dorthe 2000). *Acacia seyel* also provides a valuable dense firewood that burns rather quickly producing a fragrant smoke (Orweet,*al.* 2009).

The specie along with other species of acacia is important source of gum Arabic a natural polysaccharides, the exodus from damaged stem which solidifies. Part of the tree have tannin content about 18- 20%. The bark and seed pods have a tannin contents of about 20% (Feedipia 2002).*Acacia seyel*

has some medicinal values which is used in the treatment of haemorrhage, cold, diarrhea, gastrointestinal disorder, jaundice, biliary disease, syphilis, emollient, astringent, burns, ophthalmic bark is also used as stimulants and the gum is used to ward off arthritis and bronchitis (Aliyu2006). This paper is aimed at investigating the effect of sowing depth on seedling emergence, height and stem diameter.

Materials and Methods

Experimental Site

The experiment was conducted at the college nursery, Department of Forestry Technology Audu Bako College of Agriculture Dambatta, Kano state in the year 2013. The site was selected because it has a good source of water supply, protected from animals and direct sunrays.

Seed Collection and Viability Test

Acacia seyal seeds were collected from herbarium of the Department of Forestry Technology AuduBako College of Agriculture Dambatta, Kano State. The seeds collected for the experiment were subjected to viability test to rid them of seeds that were not viable. The test involved immersing the seeds into water in a container; the seeds that were observed to float were immediately removed as they were considered not viable. The viable seeds were then immediately dried for further action (Usman *et, al.*, 2010)

Experimental Design and Treatment

The polypots used measured 7.8cm x 23cm x 200 microns. The potting mixtures consisted of topsoil, river sand and well decomposed cow dung manure. They were mixed in ratio of 2 parts of topsoil: 2 parts river sand: 1 part cow dung). The experiment was laid out in a Randomized Complete Block Design replicated three times (Odeyeleet *al.*, 2006).

Each treatment consisted of 20 polythene bags with 30cm X 50cm spacing between treatment and replications, respectively. Seed were sown at the depths 0.5, 1.0, 1.5, 2.0, 2.5 and 3.0cm respectively.

Data Collection

Emergence count was determined at two days after sowing up to 30 days. Seedlings height and diameter were determined monthly up to four months after sowing (MAS) starting from 2 MAS. Stem diameter was measured at the soil line (root collar) with Vanier Caliper. Seedlings height was determined using measuring tape (Olatunji *et al.*, 2012).

Routine Nursery Maintenance Operations

Pot Filling

It is the filling of polythene bags with potting materials (Fine river sand, top soil and cowdung manure) in a ration 2:2:1 (NAERLS 1996). Stacking of filled polythene bags was the next operation after pot feeling. As soon as stacking operation were completed, the filled polythene bags were watered for 2-3 day. The stacked polythene bags were watered thoroughly for three days prior to sowing using watering can (Usman *et al.*, 2010)

Pre- Treatment

Pre- germination treatment was done by soaking seeds in tap water for 48 hours at room temperature before sowing (Ibrahim, 2000). The pre-treatment seeds were selected and poured into 2.5 liters plastic container containing water leaving about 4cm space to the brim of plastic container at the ambient temperature and kept for 48hours. After which the seeds were removed and rinsed in tap water before sowing.

Weeding

The nursery was kept weed free throughout the experiment. Weed control was carried out by hand picking the weeds

(pulling) throughout the period of the experiment so that the seedlings could be free from weed as weed complete with plants for air, light, nutrient, space and water. Weeding is necessary in *Acacia seyal* production because the crop is very sensitive to weed competition particularly at the preliminary growth stages (Saikonand Kabura (2008).

Data Analysis

Data collected were subjected to statistical analysis of variance using SAS and means were separated using SE (Duncan 1955). The data were analyzed using the general linear model procedure of statistical analysis system software version 9.0 (S A S institute, 2000).

RESULTS

Effect of sowing depth on seedling emergence

Days to emergence of *Acacia seyal* seeds as affected by varying sowing depths is presented in Table 1. Sowing seeds of *Acacia seyal* sown at 0.5 and 1.0 cm depths though statistically similar significantly reduced days to seed emergence compared to the other sowing depths. Nonetheless 1.5 – 2.5cm sowing depths were better than 3.0cm that delayed seed emergence most.

Effect of sowing depth on seedling height and stem diameter

Seedlings height and stem diameter of *Acacia seyal* as affected by varying sowing depths is presented in Table 2. At 2MAS seedlings of *Acacia seyal* at 0.5cm sowing depth though statistically comparable to other sowing depths significantly reduced seedling height. compared to other sowing depths where similar result was obtained at 3MAS. However, 1.0cm and 2.5cm sowing depths produced the tallest seedlings at 2 and 3 MAS, respectively.

Also, at 2MAS, sowing depths of 0.5cm though resulted in statistically comparable stem diameter compare to other sowing depths significantly reduced the stem diameter compare to 2.0 and 3.0cm sowing depths. Similar result was obtained

at 3MAS. However, at 4MAS, neither seedlings height nor stem diameter was affected regardless of sowing depths. As such no significance difference was observed to that effect.

Table 1: effect of sowing depth on the seedling emergence of *Acacia seyel*

Treatments	Days to seed emergence
Sowing Depth (cm):	means
0.5	6.33c
1.0	7.00c
1.5	11.00b
2.0	12.33b
2.5	12.67b
3.0	15.67a
SE±	0.738
Significance	**

Means followed by same letters within a column of a treatment group are not significantly different statistically at 5% levels of probability using DMRT. ** significant at 1%.

Table 2: Effect of sowing depth on the seedling height and diameter

Treatments	Months after Sowing					
	2	3	4	2	3	4
	Seedlings height (cm)			Stem diameter (cm)		
Sowing Depth (cm):						
0.5	25.66b	31.14bc	53.42	0.25b	0.35bc	0.45
1.0	28.71a	33.91ab	55.58	0.26ab	0.36ab	0.46
1.5	27.30ab	32.86ab	50.38	0.25b	0.36ab	0.44
2.0	25.41b	31.89b	53.25	0.28a	0.35ab	0.46
2.5	27.09ab	35.77a	82.42	0.26ab	0.37a	0.45
3.0	20.63c	28.69c	58.58	0.23c	0.33c	0.43
SE±	0.633	0.947	2.67	0.006	0.007	0.008
Significance	**	**	NS	**	*	NS

Means followed by the same letter within a column of a treatment group are not significantly different statistically at 5% level of probability using DMRT. *, ** significant at 5% and 1% levels, respectively. NS = not significant.

Discussion

Sowing depth is one among the major factors that affect germination and growth of many plant species including *Acasia* as it affects the availability of the proper amount of water and aeration in the soil, and also influences

seedling emergence and subsequent development of seedling (Nwoboshi, 1982)

Sowing depth greatly affect the seedling emergence and height as well as the diameter. From the experiment, serious delay in emergence was observed at 3.0cm.

This could be due to that germinated seeds at deeper soil depth may have require more energy to push the cotyledon above the soil for the seed to emerge hence the deeper the sowing depth the longer it took to emerge (Ibrahim 2000). Some measure of light may be required to drive metabolic and physiological processes necessary for the seed because available light get reduced with depth of soil (Nwoboshi 1982). Furthermore burial of seeds has been reported as one of the factors hindering the germination of woody species. Results shows that 0.5 1.0, 1.5cm reduced the days to emergence of seedlings, and deeper sowing (3.0)cm significantly $p=0.05$ increase the day to seedling emergence, this may have reduced the seedling vigor due to loss of energy in the course of pushing the soil. However, it has been reported that best germination was obtained in some acacia species sown at the depth of 2.0cm (Ibrahim, 2000). Similarly it was also reported that the emergence of *Acacia constricta* Benth. Was best at 1.0 and 1.5cm this actually correspond with this study. A significant difference was observed in seedling emergence in *Acacia seyel* as far the result obtained.

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Delay in seedling growth was observed at sowing depth of 0.5cm and this may be due to the impact of irrigation water which sometimes dislodge the root of tender seedling, thereby creating distortion in root expansion and shoot growth (Arnoth 2006). From the result it was observed that increase in seedling height and diameter was best at sowing depth of 1.0 and 2.5cm respectively 4 MAS. Meanwhile at 2MAS and 3 MAS. sowing depth of 1.0 and 2.5cm increase seedling height. The none significance response of seedling height and diameter to sowing depth could be that with the time when the seedlings became fully expanded and intercepting enough solar radiation, they were able to grow and attain similar morphological structure regardless of their sowing depth (Fakuta and Ojiekpon 2009).

Conclusion

From this study, it can be concluded that, sowing seeds of *Acacia seyel* at shallow depth tend to hasten seed emergence while deeper improved the growth of seedlings as well as the stem diameter. Based on the present findings, sowing of 1.0cm can be used as an optimum sowing depth which foresters and Nursery men can use to improve their seedling production.

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