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Effect of Organic Manure on Seedling Growth and Development of *A. Senegal*

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Abstract: A study on the effect of organic manure on seedling growth and development of *Acacia Senegal* was conducted at the Teaching and Research Farm of Faculty of Agriculture, Delta State University. There were 4 treatments in all namely poultry droppings, cowdung, piggery manure and topsoil (control treatment). The design adopted was completely randomized design with three replicates. Three months old seedlings of *A. Senegal* were transplanted into polypots containing representative samples of all the organic manure mix with topsoil according to treatments. The seedlings were assessed for height, leaf number and collar diameter. Total fresh and dry weights of the seedlings were also, determined at the end of the experiment. Analysis of variance revealed significant difference in the height growth, leaf number and collar diameter at 5% level of probability. Seedlings treated with cowdung had the highest average height of 17.15cm poultry droppings had the highest leaf number value of 21.20 and collar diameter value of 0.95cm. The highest leaf fresh weights (14.70g), Stem (34.00g) and Root (87.75g) were given by poultry droppings and were significantly different from the rest of the treatments at $p<0.05$. Poultry dropping similarly produced 1.69 and 9.01 g for leaf, stem and root dry weights of *A. Senegal* seedlings, respectively. This study has demonstrated that poultry dropping is the most suitable for *A. Senegal* seedlings and in term of mineralization of the manure it is relatively fast when compared with cowdung and piggery. It is recommended that our local farmer should adopt the organic manure for ease of establishment of this species.

Key words: Organic manure, seedling growth, higher performance, significant difference

INTRODUCTION

Tropical rain forests have been adjudged as the most biologically diverse ecosystem on earth. They account for only 6% of the earths land surface, but contain at least half the earths species (Lebel and Kane, 1989). Rainforest has been managed mainly for timber; however ethnobotanically important plants, for example wild edible fruits, medicinal plants, sponges, etc. and wildlife were given little or no consideration in management options (Oguntala, 1997). One of these relatively unknown species that produce edible fruit when the conventional staple foods are scarce is *Acacia Senegal*. This species belongs to the family Mimosoidae. It is a legume, a deciduous shrub tree. The wood of *A. Senegal* is good for fuel and the leaves and pods are eaten by herbivores. The leaf fall is mineralized to build up the fertility of sandy soils for ensuring good crops of groundnuts, sorghum, bulrush millet and sesame. Strips of bark are slashed from the branches in November and in January the gum exudates is collected and sold as gum Arabic. The bark, leave and gum, are used as medicine in human treatment (South gate, 1983).

This species is very common and widely cultivated in the northern part of this country. However, in the Southern part of Nigeria, little or no attempt has been made to establish plantation of this species due majorly to unavailability of information vis-à-vis its growth and development. This study is therefore, set out to accomplish this purpose. Furthermore, farmers mostly use inorganic fertilizers. The population and domestication of *Acacia senegal* can be increased through the use of organic manure as farmers and interested individuals can now plant the species using local technologies and in a short time start to harvest and extract its fruit and seeds. It will also help to spread the species from its natural habitat to farmlands, degraded lands and home gardens. The usual unavailability and difficulty of getting chemical

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fertilizers alongside its high price and potential polluting ability places organic manure as a veritable alternative above inorganic fertilizer.

MATERIALS AND METHODS

Three months old seedlings of *A. senegal* were transplanted into polypots. The size of the pots used was 15cm by 30cm which was bottom perforated to prevent water-logging. Representatives samples of the organic manure were mixed with topsoil and the mixtures were prepared as follows: One kilogram of topsoil was mixed with 10 g of poultry droppings, cowdung and piggery manure and a control with 1 kg of topsoil only. The poultry droppings and piggery manure were incubated for two weeks so as to prevent nutrient loss especially ammonia. The cowdung and the topsoil were later passed through a 2 mm sieve. The germinated seedlings were transplanted into polypots containing the organic manure. One seedling was transplanted into each polypot. The experiment was completely randomized design with three replicates.

Soil analysis: Representative samples of the organic manures and topsoil utilized were collected and taken to University of Ibadan for analysis. The samples were passed through 2mm sieve for phosphorus, potassium and total nitrogen determination. Total Nitrogen was determined using micro-kjedhal method. Available phosphorus was extracted using the Bray-P extracting solution and determined using Navaspic spectro-photometer. The exchangeable potassium was evaluated using flame photometer (Jackson, 1962).

RESULTS AND DISCUSSION

The results indicated that cowdung gave the best performance in plant height (17.15cm at 12WAP). This was however not significantly different from the other treatments. This finding is in agreement with the studies carried out by Opeke (1997), Imobighe (2004) and Oknuomo *et al.* (2006). Poultry droppings gave the second best performance of 13.18cm followed by control (10.13 cm) and piggery manure (8.50 cm) (Table 1and 2).

As regards collar diameter, poultry droppings gave the highest performance with mean value of 0.95cm at 12WAP. However no significant difference was observed among the treatments as this period. Similar trend was also noticed in the first 6WAP. Ether (1971) observed that newly germinated conifer seedlings contain adequate nutrients and show little response to external nutrient supply up to 6WAP (Table 3).

The highest leaf number of *A. senegal* seedling recorded under poultry droppings revealed a better performance of these seedlings (Table 4), due largely to the application of the organic manure. This is also confirmed by Edmeades and Lafitte (1993). The performance was in this order. Poultry dropping > cowdung > control > piggery manures. The reason for higher performance by the topsoil is attributable to higher Nitrogen concentration as shown in Table 1.

The fresh and dry weight of *A. senegal* seedlings were greatly enhanced by the organic manure applied. For instance, poultry droppings gave relatively high fresh weight values of leaf (14.70g), stem (34.00g) and root (87.75g) that were significantly different from other treatments (Table 5 and 6).

The mean dry weight values also followed similar trend that no significant differences was observed among them. This confirmed the importance of these organic manure for good growth and development of these seedlings.

Finally, among the organic manure treatments adopted in this study, poultry droppings appeared most suitable for *A. senegal* seedlings and in terms of mineralization, it is faster than cowdung and piggery manure.

Table 1: Soil nutrient status of few essential elements

Treatments	Total Nitrogen	Phosphorus mg kg^{-1}	Potassium Cmol kg^{-1}	Calcium Cmol kg^{-1}	Magnesium
Topsoil	0.14	9.36	0.09	1.42	1.24
Poultry Dropping	0.12	9.21	0.21	1.81	1.42
Piggery Manure	0.13	9.20	0.17	1.72	1.38
Cowdung	0.11	8.60	0.19	1.82	1.45

Table 2: Mean height values of *Acacia senegal* seedlings as influenced by organic manures

	Weeks after planting (cm)					
Treatments	2	4	6	8	10	12
Poultry dropping	7.11bc	8.90b	9.61b	10.23bc	12.13b	13.18b
Piggery manure	6.27c	7.25bc	7.86bc	8.05b	8.30a	8.50a
Cowdung	11.80c	13.55bc	13.90bc	14.70ab	15.81a	8.50a
Control	6.80c	7.18bc	8.60ab	9.11ab	10.17a	17.13a
LSD	1.28	1.50	1.35	1.46	1.61	1.90

Means of the same letters are not significantly different at p = 0.05

Table 3: Mean collar diameter values of *Acacia senegal* influenced by organic manure

	Weeks after planting (cm)					
Treatments	2	4	6	8	10	12
Poultry dropping	0.30c	0.52bc	0.57bc	0.72ab	0.90a	0.95a
Piggery manure	0.22c	0.35bc	0.40bc	0.43ab	0.49a	0.52a
Cowdung	0.33c	0.35bc	0.39bc	0.41ab	0.43a	0.46
Control	0.23c	0.28bc	0.32bc	0.41ab	0.66a	0.77a
LSD	0.03	0.05	0.05	0.08	0.011	0.11

Means of the same letters are not significantly different at= 0.05

Table 4: Mean leaf of *Acacia senegal* seedlings as affected by organic manure

	Weeks after planting (cm)					
Treatments	2	4	6	8	10	12
Poultry dropping	9.60b	10.23bc	12.76bc	14.42bc	18.15a	23.30a
Piggery manure	3.00a	4.00b	4.50b	4.90bc	5.50b	5.59b
Cowdung	18.00c	19.00a	19.40ab	19.40ab	19.80a	20.40a
Control	9.30c	10.16bc	11.18bc	14.16c	16.24a	18.16a
LSD	3.08	3.09	3.06	3.09	3.32	3.92

Means of the same letters are not significantly different at p = 0.05

Table 5: Mean fresh weight values of *A. senegal* seedlings as affected by organic manure

Treatments	----------Weeks after planting (cm)----------		
Poultry dropping	14.70c	34.00b	87.75a
Cowdung	9.45b	8.85c	30.45a
Control	8.80c	14.43b	40.23a
LSD	1.87	7.64	17.72

Table 6: Mean dry weight values (g) of *Acacia senegal* seedlings as affected by organic manure

Treatments	----------Weeks after planting (cm)----------		
Poultry dropping	1.69c	9.01b	87.75a
Cowdung	0.79	7.21b	30.45a
Control	1.42c	5.95b	40.23a
LSD	0.27	0.89	1.30

CONCLUSION

This study showed that organic manure positively influenced the growth and development of *A. senegal*. In terms of plant height and fresh weight, cowdung performed better than the other treatments; while poultry droppings performance vis-à-vis dry matter accumulation, collar diameter and leaf numbers was far better than the rest of the treatments.

It is therefore recommended, that farmers or tree farmers who are not financially buoyant to purchase the inorganic fertilizer should adopt these organic manure which has been demonstrated in this study to be a viable alternative or substitute. Consequently, this will encourage more local farmers who previously have little or no knowledge about the growth and development of this species to embark on its cultivation.

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