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GROWTH RESPONSE OF SWEET DATTOCK (*DETARIUM MICROCARPUM* GUILL AND PERR) TO SELECTED FORMS OF POULTRY MANURE

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ABSTRACT: *A research on growth response of Detarium microcarpum to different forms of poultry manure was conducted in the screen house of the Federal College of Forestry (FCF), Ibadan which lies on Latitude 7º 23¹ N and Longitude 3º 51¹E. Completely Randomized Design with eighteen seedlings was used. Poultry manure was collected from FCF Poultry farm. Fifty kilogram of poultry manure was thoroughly mixed in 120litre capacity drum with 85litre of water. The mixture was covered for 24 hours, and 25 litre of the supernatant layer was collected afterward. The liquid collected was referred to effluent representing Treatment A – Poultry Manure Effluent (PME), the sediment was referred to sludge representing Treatment B – Poultry Manure Sludge (PMS) and Control then represent Treatment C – No manure (CTL). Fifty centiliter of PME was administered weekly to a seedling of six as Treatment A, 0.2Kg of PMS was administered to a seedling of six as Treatment B and last set of six seedlings representing Treatment C served as Control. Parameters measured were leaf production, number of branches, seedling height, leaf area and collar diameter. Data was collected for sixteen weeks, and analyzed using SAS. Mean separation was used to show the relationship among the D. microcarpum seedlings. The result showed that there is significant difference among the three treatments. PME showed the greatest effect on growth response of Detarium microcarpum seedlings in all the parameters considered. Poultry manure is then recommended for combating slow growth in Detarium microcarpum with PME as outstanding form.*

KEYWORDS: *Detarium microcarpum*; Poultry manure; Effluent; Sludge; Supernatant layer

INTRODUCTION

Many are the plant resources in the wild that are valuable in the areas of rejuvenating the economy, improving socio-economy of the people and fixing the cultural values of the community but are yet to be fully utilized in term of research findings towards improvement for domestication, among which is *Detarium microcarpum* Guill & Perr. Among many of these forest trees within Nigeria noted for its multipurpose uses is *Detarium microcarpum* Guill & Perr.

Detarium microcarpum, commonly known as sweet detar, sweet dattock or tallow tree, is an under-utilized leguminous tree that grows naturally in the drier regions of West and Central Africa [1]. It is abundant in Guinea Savanna, Southern Sudan Savanna and Derived Savanna areas of Nigeria. It is a multipurpose species, with a wide range of uses due to its medicinal properties. This makes it a valuable

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and appreciated species to local communities, but further research and efforts are needed for its domestication.

In Nigeria, the plant is known as "Taura" by Hausa tribe, in Igbo, it is called "Ofo", Kanuri calls it "Gatapo" while among Yorubas, it is called "Ogbogbo" [2].Forest trees within Nigeria of indigenous species mostly suffer from both man in the area of exploitation and natural disasters in the areas of pathogenic and genetic instability. These and other factors contribute to the species scarcity, deterioration and slow growth among others. To combat slow growth in this plant species, manure needs to be added to the soil to enhance the growth. Manure is organic matter, mostly derived from animal feces except in the case of green manure, which can be used as organic fertilizer in agriculture. Manures contribute to the fertility of the soil by adding organic matter and nutrients, such as nitrogen" [3] remarked that Chicken manure is the feces of chickens used as an organic fertilizer, especially for soil low in nitrogen. Chicken/Poultry manure has the highest amount of nitrogen, phosphorus, and potassium of all animals' manure reported [4].

Despite the great importance of this savanna forest tree species, the growth is slow and the seedling is susceptible to caterpillar attack when it is 5 to 12 weeks old. Also, the seedling under ex situ plantation experiences leaves spot, yellowish and purple colour which amount to disease declaration. Effects of these growth defects may lead to slow growth because physiological and photosynthetic ability of the plant will be delayed and affected. [5] reported that *Detarium microcarpum* is a valuable tree species for fuel-wood, timber, food and medicine in sub-Saharan Africa. However, its population is dwindling due to overexploitation, its seedlings' low survival rate and slow growth. In like manner, natural regeneration of *Detarium microcarpum* is often established as a mixture of seedlings and suckers [6], [7], but seedlings have a low survival rate [6], [8]. Response to this, organic manure of poultry nature in the forms of effluent and sludge was considered to be used in order to assess the growth response of *Detarium microcarpum* to poultry manure application and to identify the form of manure with outstanding effects on growth of *Detarium microcarpum*.

MATERIALS AND METHODS

Source of Planting Materials

Fifty fresh seeds of *Detarium microcarpum* were collected from parent trees at Federal College of Wildlife Management, New Bussa in Northern Guinea Savanna Zone of Nigeria and raised to seedlings for the research work.

Experimental Site for the Field Work

The experiment was carried out at the Plant Screen House of Federal College of Forestry, Jericho, Ibadan. The College is situated at Jericho area in Ibadan South West Local Government of Oyo State, The area lies on Latitude 7^{o} 23^{1} N and Longitude 3^{o} 51^{1}E. The climate condition of the area is tropically dominated by rainfall pattern from 1200mm-1250mm. The average temperature is about 32ºC, average relative humidity of 80-85% and the climate of the area experience rainfall with two distinct seasons, dry season usually from November-March and raining season usually from April - October [9].

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TABLE 1: MATERIALS AND USES

S/N	MATERIALS	USES
1.	Seeds	It served as planting stock
2.	River sand	To raise the seeds to transplanting stage.
3.	Electric oven	To sterilize the river sand at steady temperature.
4.	Germination baskets	To raise the seeds to transplanting stage.
5.	Top soil	Soil medium to raise the seedlings in the buckets.
6.	Buckets	To raise the seedlings with applied treatments.
7.	120litre Plastic drum	To prepare the manure treatment.
8.	Water	As a solvent for mixing.
9.	Wooden stirrer	To stir the mixture evenly.
10.	Graduated ruler	To measure the seedling height.
11.	Vernier caliper	To measure the seedling girth.
12.	White plain paper	To calculate the area by tracing.
13.	Electronic Sensitive scale	To measure the traced and cut paper weight.
14.	Measuring scale	To measure the manure quantity for treatment preparation.
15.	White plastic spoon	To tag the experimental units.

Experimental Design

Experimental design used was Completely Randomized Design with three replicates.

Planting Methods

Fifty seeds of *Detarium microcarpum* after seed viability test using water-floatation method were planted in germination baskets containing sterilized river sand. The river sand was collected from stream between Forestry Research Institute of Nigeria (FRIN) and Federal College of forestry, Jericho, Ibadan. The sand was washed, sterilized at 82^0C for 24 hours in an electric oven at Soil Laboratory Unit of FRIN. The sterilized sand was spread lightly and aerated, and filled into germination baskets on cooling. The seeds were sown directly into the sand. The experimental units were watered twice daily; early in the morning (between 8a.m and 10a.m) and in the evening (between 5p.m and 6:30p.m).

The seedlings were pricked when two first true leaves emerged, and transplanted into buckets filled with loamy soil and watering continued.

The seedlings were left for one week to overcome the shock after which the treatments were applied and growth parameters taken.

Mixing of Treatment (Manure preparation)

Fifty kilogram of Poultry manure was mixed thoroughly in a plastic drum of 120 liter capacity with 85 liters of water using wooden stirrer.

The mixture was covered and left undisturbed for twenty four hours. After this, 50 litre of the supernatant layer was collected with the help of funnel into a container with lid. The liquid collected was referred to as effluent while the remaining sediment was called the sludge.

Treatment A: Poultry Manure Effluent (PME)

Treatment B: Poultry Manure Sludge (PMS)

Treatment C: Control (No Manure)

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Treatment Application:
Treatment A: 50cl of PME was administered to an experimental unit (a seedling of 6) weekly.
Treatment B: 0.2kg of PMS was administered to an experimental unit (a seedling of 6) weekly.
Treatment C: 6 seedlings were left alone without any manure application to serve as Control.

Data Collection
Eighteen seedlings with observable growth vigour were selected for the experiment and sorted into three making six seedlings per treatment.
Readings were taken on number of leaves, seedling height, number of branches, seedling girth and leaf area.

Data Analysis
Data collected was analyzed using SAS 2002 package. ANOVA was used to test the significant difference among the treatments. Mean separation was conducted to show the significant relationship among the *Detarium microcarpum* seedlings placed under the three treatments through the parameters considered.

RESULT AND DISCUSSION

Table 2 showed the mean separation among the seedlings of *D. microcarpum* grown and observed under the application forms of poultry manure, effluent and sludge at probability level of 5%. In plant height, leave production, number of branches and leaf area except stem girth, there is no significant relationship among the three treatments, Poultry Manure Effluent (PME), Poultry Manure Sludge, (PMS) and Control, (CTL) used on D. *microcarpum* seedlings. Among all the treatments used, PME has the highest value. Leaf production, leaf area and number of branches form major parameters that mostly determine the plant growth due to their essentiality in photosynthetic capability of plant. The increment of these parameters results to the direct increase in height, diameter and biomass accumulation of plants. From the value shown, seedlings treated with PME performed best in the parameters discussed. This may be due to quick release of nutrients to the soil by PME which support the work of [10] that since it is liquid; it seeps down deep into the soil to nourish the plants where they need it and that it is a wonderful compliment to the benefits that manure adds to the soil and also agreed with the work of [11] which stated that liquid manure has been shown to aid the growth of vegetables, fruit, flowers and ornamental plants, trees and shrubs.

In stem girth trait among the treatments used, there is significant relationship between PMS and CTL but which are significantly different from PME. With this record, there is no statistical difference on the effect of PMS and CTL on stem girth of the plant species at seedling stage. The relationship in significance between PMS and CTL may be due to the fact that stem girth increases gradually and that the suited manure form should be the one that releases nutrient gradually like PMS. In value, PME has the highest among the three treatments used. This may be as a result of liquid form of the treatment, PME that has greatest ability to release the nutrients quickly and easily to the reach of the seedlings' roots over other treatments which have slower release of nutrients. This is in line with the report of [10] that liquid manure is quick, and unlike compost pile, which can takes months to break down, liquid

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manure can be made in a matter of a few days, or a couple of weeks, tops and since it is in liquid form, it is easy for soil to absorb, and plants can use it right away.

TABLE 2: MEAN SEPARATION SHOWING THE RELATIONSHIP AMONG THE *Detarium microcarpum* PLACED UNDER THE THREE TREATMENTS

Poultry Manure	Plant Height	Leave Production	Stem Girth	Numberof Branches	Leave Area
PME	9.78±0.47^{b}	10.77±0.07^{c}	0.46±0.02^{b}	9.23±0.01^{c}	0.74±0.00^{c}
PMS	9.25±0.10^{ab}	9.17±0.04^{b}	0.36±0.00^{a}	7.24±0.00^{a}	0.72±0.00^{b}
CTL	8.60±0.00^{a}	8.47±0.05^{a}	0.34±0.01^{a}	7.65±0.07^{b}	0.45±0.00^{a}

Mean±SE with different alphabet in columns are significantly difference (P≤0.05)

CONCLUSION

The result of this research work concluded that use of poultry manure has observable effects on the seedling growth of *Detarium microcarpum*. And that Poultry Manure Effluent was identified as the best among the three treatments used in relation to growth parameters considered.

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