



EFFECTS OF ORGANIC MANURE ON GROWTH PERFORMANCE OF *Azadirachta indica* (A. JUSS) SEEDLINGS DURING EARLY GROWTH IN THE NURSERY

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ABSTRACT

Seedling production in the forest nursery is very inevitable; therefore, there is need to examine fertilizer on seedlings growth in preparation for plantation in the growing season. A research investigated the effect of poultry manure treatment at different levels on the growth and early performance of *Azadirachta indica* (Neem) seedlings. Soils used for the experiment were collected from study area. The seeds collected on the ground were distributed and planted at the same proportion of sand but different ratio of poultry manure. Experiment had four (4) treatments in which each them had the same proportion of river and top soil but different ratio of poultry manure: T₁(1:1:2), T₂(1:1:3), T₃(1:1:4) and T₄(1:1) control respectively. Complete Randomized Design (CRD) was used for this research with four (4) treatments and five (5) replications making twenty (20) samples all together. The growth parameters measured include: number of leaves, stem diameter and growth height. Analysis of variance showed that there were no significant difference (p<0.05) among the growth of Neem subjected to poultry manure at different treatments sown in all parameters. T₃ had the highest growth height with mean value of 25.40cm followed by T₂ with 23.70cm. Also, T₁ had the best mean value of stem diameter with 4.38mm followed by T₂ with 4.36mm while the least is the control. The treatments with highest mean number of leaves were T₁ and T₃ with 76.60 followed by T₂ with 69.00. T₄ had the lowest value with 54.80. The result showed the slight variation in shoot height of seedlings of mixture with river sand top soil and poultry manure compared to mixture of river sand and top soil in which the seedling sown.

Keywords: Organic manure, early performance, *Azadirachta indica*, nursery stage and effect

INTRODUCTION

Neem tree (*Azadirachta indica*) is an evergreen tree in the mahogany family Meliaceae and grows rapidly in the tropic and semi-tropic climates (Ajala *et al.*, 2014). It is one of two species in the genus. The species is native to the Indian sub-continent. It is evergreen but in severe drought it may shed most of its leaves or nearly all leaves. Normally, it thrives in areas with sub-arid to sub-humid conditions with an annual rainfall of 400mm-1200mm (Salami and Lawal, 2018). It can grow in regions with an annual rainfall below 400mm but in such cases it depends largely on ground water levels. Neem can grow in many different types of soil but it thrives best on well drained deep and sandy soils. It is a typical tropical to subtropical trees at annual mean temperatures of 21-32°C (70-90°F) the trees are not at all dedicate about water quality and thrive on the nearest tickle of water and whatever the quality. The fairly tense crown is roundish and may reach a diameter of 20-25m. The Neem tree is very similar in appearance to its relative, the China berry (*Melia azedarach*). The flowers are arranged in more or less drooping auxiliary panicles which branch up to the third degree, bear from 250 to 300 flowers (www.m.wikipedia.org/wiki). Fruit is a smooth (glabrous), plive-like drupe which varies in shape and when ripe is 1.4-2.8cm. The fruit skin is thin and the bitter-sweet

pulp is yellowish-white and very fibrous. Neem was introduced into Nigeria over 78 years ago and has been used in different afforestation programme in the savanna region of the country since then with very good result (Salami and Lawal, 2018). It has been dominant species used for afforestation programme in the more dry parts of the country, where it is used for the establishment of shelterbelts and woodlots as well as grown in homesteads to provide the much needed shade for human and livestock comfort. It is a multipurpose tree species which produces good timber. It is completely deciduous and remains green through the year; hence it provides the much as a medicinal plant. The leaf extract is used by farmers to protect cowpeas from insect pests on the field (Otegbeye, 2007). The tree also produces copious seeds from which useful oils are now been extracted by National Research Institute for Chemical Technology. Moreover, it has been found that an admixture of 1 to 3g of dry ground Neem seed with 20g cowpea seeds protects the cowpea from brucid insect damage for 4 months (Ivbijaro, 1983). In recent times, Neem has been observed to be affected by the Neem scale insects in most parts of the Nigeria savannah region. Also, plantation of five years old and below in the arid parts of the country suffer from Neem decline a phenomenon that is locally referred to as "giraffe neck" and only occurs in

plantations and shelterbelts (Otegbeye, 2007). Fertilizer is very important for plant growth and productivity. One example, of fertilizer is cow dung which is obtained from cow, which is environmental friendly, is easily used and compared with chemical fertilizer which increases the environmental problems. Organic fertilizers are used easily from locality products and livestock wastes and cost effective than chemical fertilizer (Solomon, 2012). Use of suitable growing medium or substrate is essential for the production of quality crop or tree. It directly affects the development and later maintenance of the extensive rooting system. A good growing medium would provide a sufficient anchorage to the plant serve as a reservoir for nutrient water allowing oxygen diffuse to the root allowing gaseous exchange between the root and atmosphere outside the substrate. Nursery potting mixture influence the quality seedling produce the quality of seedling obtain from nursery influence the re-establishment in the field and eventually the productivity of the stand. Farms and nurseries use various seedling and potting media in the production of field transplants, container plants, and greenhouse crops. Such media may contain a wide range of natural and synthetic materials. In certified organic production, there are limitations on the materials that may be used, either as base substrates or for supplemental fertilization. The present study aimed to determine the effect of organic fertilizer on the early growth performance of *Azadirachta indica* at nursery stage on the physical characters or growth parameters (shoot height, stem diameter and number of leaves) in order to prescribed for the nursery officers and plantation establishment.

MATERIALS AND METHOD

Description of study area

The study carried at forest nursery in the Department of Forestry and Wildlife Management, Federal University Dutse, Jigawa. It is situated in the North-Western geopolitical zone of the town. It lies between latitudes 11.00°N to 13.00°N and longitudes of 8.00°E to 10.15°E. It covered by Sudan savanah, also area characterized by hot wet summer and cool dry winter with average raining season of 3-5 months (644 mm) (Salami and Lawal, 2018). The location makes the study site vulnerable to drought and unfavorable weather condition. Sunshine hours indicate that the town enjoys 10-11 hours of sunshine depending on the season (JARDA Metrological data, 2015) and the total

population of 153,000 at 2006 census (Jigawa State Ministry of Agriculture and Natural Resources, 2016). It has two major distinct seasons, raining seasons from April to October and dry season November to March. Farming is one of the most crucial land use types in the study area (Usman, 2018). The vast majority of the population of the area engaged in agricultural activities and a substantial percentage of the land area is under agricultural uses. The major agricultural activities carried out include cropping, grazing, and wood chopping, among others. Most of the crops grown are pearl millet, groundnut, sorghum, cowpea, sesame and date palm seed. The vegetation of the study area is mainly shrubs such as Acacia, Baobab, Neem and Date Palm (Dabino). The primary economic activities include farming, grazing, wood chopping and mining of rocks (Usman, 2018).

Plant materials and Sampling procedure

The seeds of *Azadirachta indica* were collected from mother Neem tree at the ground around the nursery of Forestry and Wildlife Management, Federal University Dutse. Soil used for the experiment was also collected from the same hotspot. The seeds collected on the ground were distributed and planted at the same proportion of sand and poultry manure of all the samples. The proportions of the potting mixture are stated below:-

T₁: Top soil (1 portion), river sand (1 portion) and poultry manure (2 portions) (1:1:2)

T₂: Top soil (1 portion), river sand (1 portion) and poultry manure (3 portions) (1:1:3)

T₃: Top soil (1 portion), river sand (1 portion) and poultry manure (4 Portions) (1:1:4)

T₄: Top soil (1 Portion), river sand (1 portion) (1:1) control.

Key: 1 portion = 1 head pan

Potting mixture and planting

The potting mixture was prepared using the above proportion on 16th April, 2018. Potting mixture was watered for a week before the planting. On 23th April of the same year, the seeds were planted early in the morning based on the below arrangement.

T ₁ R ₁	T ₄ R ₄	T ₃ R ₃	T ₄ R ₁	T ₂ R ₅
T ₂ R ₁	T ₂ R ₄	T ₄ R ₂	T ₄ R ₅	T ₁ R ₃
T ₃ R ₄	T ₄ R ₃	T ₁ R ₂	T ₂ R ₃	T ₃ R ₂
T ₁ R ₄	T ₂ R ₂	T ₃ R ₁	T ₃ R ₄	T ₁ R ₅

Layout of the experiment

DATA COLLECTION

The data was collected weekly by measuring the shoot height, stem diameter and number of leaves of the individual seedlings for all the replications of the individual treatment for twelve (12) weeks after the first germination. Shoot height was also measured at 7 days interval. Shoot height was measured from base to the shoot tip of seedling with a 1m ruler. Relative mean height increments were determined by (Aduradola *et al.*, 2014).

$$\text{Relative Growth rate} = \frac{\log_e W_2 - \log_e W_1}{T_2 - T_1} \dots \dots \dots 1$$

Where T₂ = Final time of harvesting, T₁ = Initial time of harvesting, T₂-T₁ = Time interval between initial time and final time, W₂ = Total dry weight of plant at T₂, W₁ = Total dry weight of plant at T₁

Experimental design

Complete Randomized Design (CRD) was used for this research with four (4) treatments and five (5) replications making twenty (20) samples all together.

DATA ANALYSIS

The data obtained in this work were analyzed by two ways Analysis of Variance (ANOVA) at 00.5 probability level of significant while difference between means were separated using Duncan Multiple Range Test (DMRT).

RESULTS AND DISCUSSION

The lines represent each treatment. Figure 1 showed that treatment 3 (1:1:4) had the highest shoot height growth followed by treatment 1. The fourth treatment (control) had the least growth at the termination of experiment.

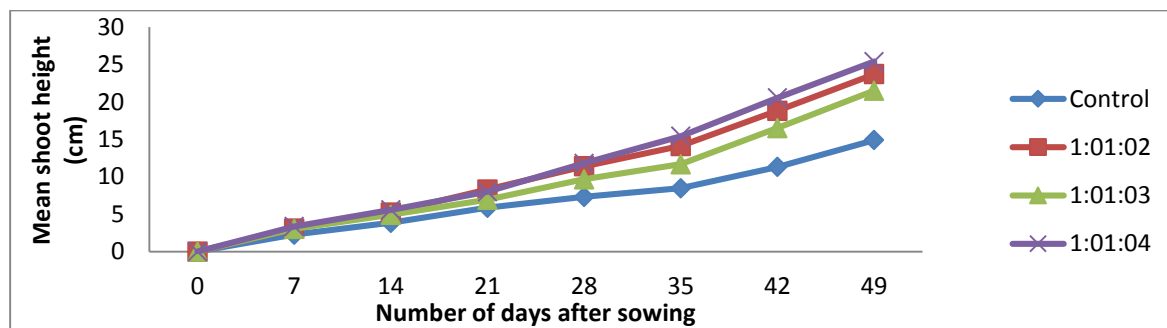


Fig 1: Chart showing the mean shoot height increment of all the treatments

Figure 2 showed that treatments 1, 2, 3 with (1:1:2) (1:1:3) (1:1:4) had a slight variation of stem diameter growth while fourth treatment (control) had the least growth at the termination of experiment.

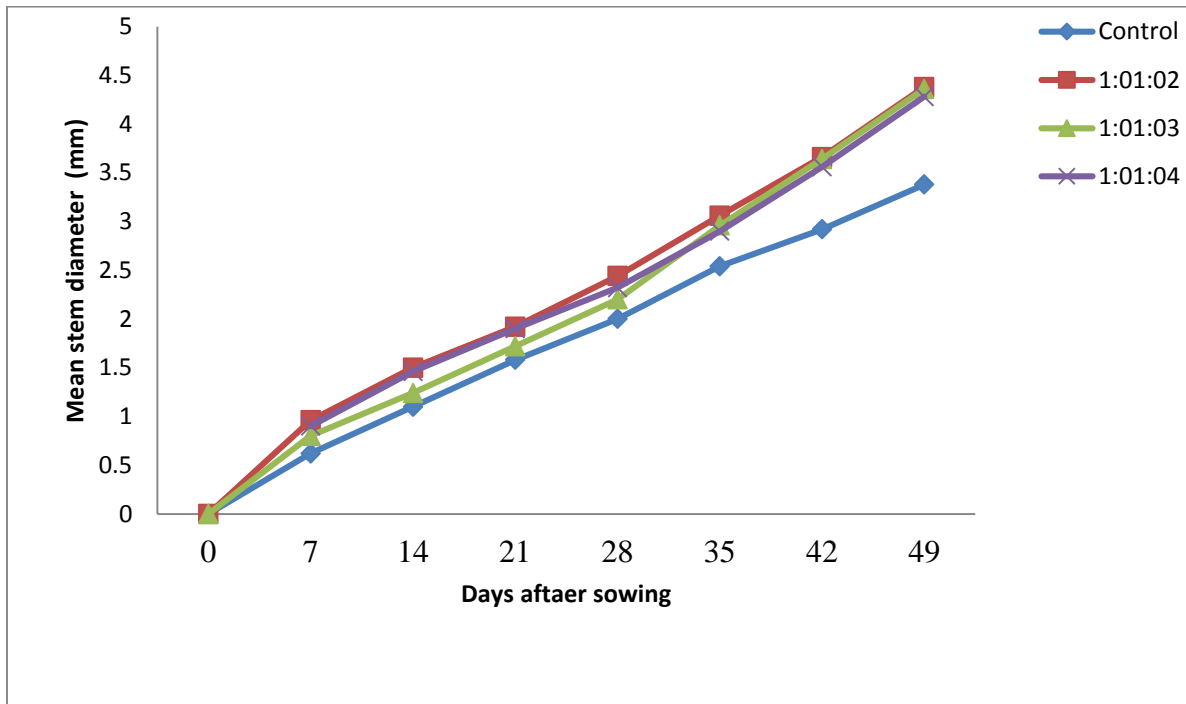


Fig 2: Chart showing the mean stem diameter increment for all the treatments

The lines represent each treatment. Figure 1 showed that treatment 1 and 3 had slight variation the number of leaf followed by treatment 2. The fourth treatment (control) had the least number of leaf at the end of experiment.

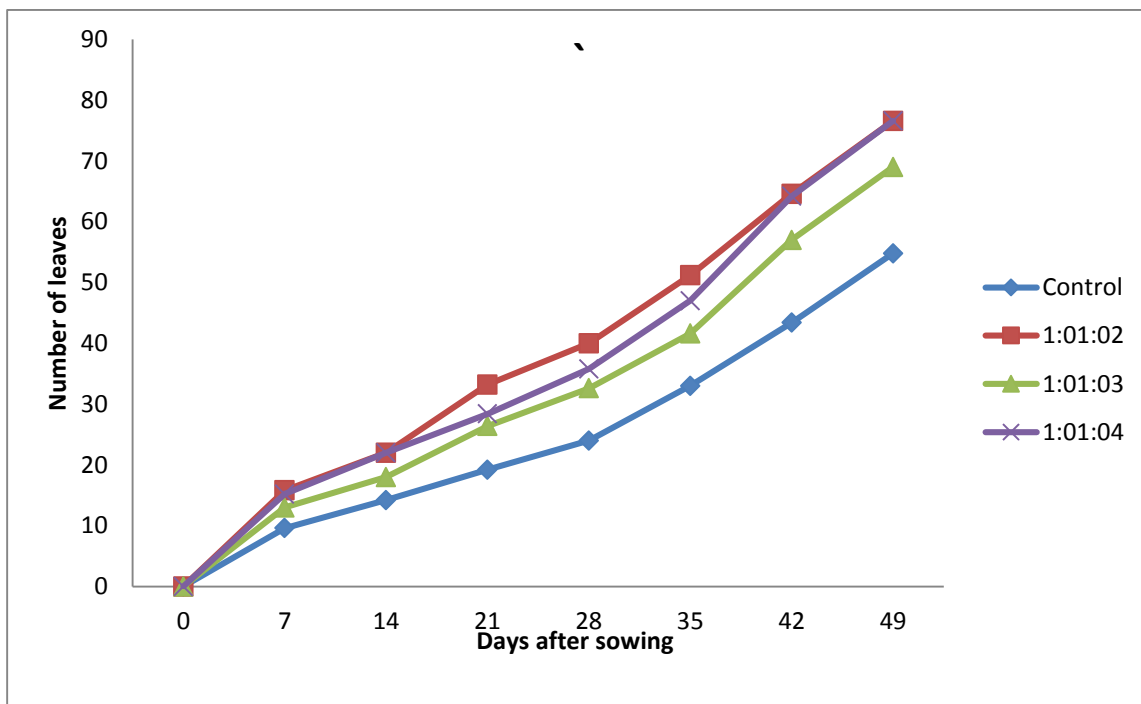


Fig 3: Chart showing the mean number of leaves increment of all the treatments

The result in table 1 showed the effect of poultry manure on shoot height of Neem at 7, 14, 21, 28, 35, 42 and 49 days after sowing (DAS). There is no significant difference among the treatments in the sample with differences in the control. T₄ (1 portion top soil 1 portion river sand and 4 portion of poultry manure is superior in shoot height followed by T₂ with T₃ portion of poultry manure in the potting mixture control has least mean of the shoot height which is in disagreed with (Salami *et al.*, 2018). Similar results were reported for wheat (*Triticum*

aestivum L.), barley (*Hordeum vulgare L.*), Oats (*Avena sativa L.*), and rye (*Secale cereale L.*) (Roe *et al.*, 1993). This study therefore conforms to the work of Salami and Lawal (2018) who stated that treatment of spondia seedlings with 3gpot⁻¹ of NPK 15:15:15 had the highest mean value of 10.0cm. This study therefore conforms to the work of Jonathan and Jeff (1994) who stated that *Spondias purpurea* tree seedlings grow best in fertile well drained soils but can be grown satisfactorily in a variety of poorer soil if they are given adequate nutrition

Table1: Effect of poultry manure and days after sowing for shoot height of seedlings

Treats	Days after sowing							Std. Error
	7	14	21	28	35	42	49	
T ₄	2.260 ^a	3.840 ^a	5.580 ^a	7.300 ^b	8.640 ^b	11.300 ^b	14.900 ^a	±0.598
T ₁	3.040 ^a	5.200 ^a	8.200 ^a	11.400 ^a	14.100 ^a	18.800 ^{ab}	23.700 ^a	±1.345
T ₂	3.020 ^a	4.900 ^a	6.920 ^a	9.660 ^{ab}	11.660 ^{ab}	16.500 ^{ab}	21.500 ^a	±1.821
T ₃	3.340 ^a	5.580 ^a	8.000 ^a	11.800 ^a	15.400 ^a	20.540 ^a	25.400 ^a	±1.780
	NS	NS	NS				NS	

Trt: Treatment; NS: Means No Significance difference

From the result of the Table 2 above shows the effect of poultry manure on stem diameter of neem at 7, 14, 21, 28, 35, 42 and 49 days after sowing (DAS). T₁ (1 portion of top soil, 1 portion of

river and 2 portion of poultry manure) recorded the highest mean stem diameter growth while control had the lowest mean stem diameter growth which is in contrast with (Salami, 2015).

Table 2: Effect of poultry manure and days after sowing for stem diameter of seedlings.

Treats	Days after sowing							Std. Error
	7	14	21	28	35	42	49	
T ₄	0.620 ^b	1.100 ^b	1.580 ^b	2.000 ^b	2.540 ^a	2.920 ^a	3.380 ^b	±0.114
T ₁	0.960 ^a	1.500 ^a	1.920 ^a	2.440 ^a	3.060 ^a	3.660 ^a	4.380 ^a	±0.198
T ₂	0.800 ^{ab}	1.240 ^{ab}	1.720 ^{ab}	2.200 ^{ab}	2.960 ^a	3.640 ^a	4.360 ^a	±0.159
T ₃	0.900 ^{ab}	1.460 ^a	1.900 ^a	2.320 ^{ab}	2.900 ^a	3.560 ^a	4.280 ^a	±0.163
			NS	NS	NS	NS		

Trt: Treatment; Means NS: Means No Significance difference

The result in table 3 showed the effect of poultry manure on number of leaves of Neem at 7, 14, 21, 28, 35, 42 and 49 days after sowing (DAS). There is no significant difference among the treatments in the sample except the control in T₁ (1 portion of top soil, 1 portion of river and 2 portion of poultry manure)

recorded the highest mean number of leaves growth while control has the lowest mean stem diameter growth which is similar with (Shiralipour *et al.*, 1993) and in contrast with (Clap *et al.*, 1986 and Mc Connell *et al.*, 1993) on experiment conducted.

Table 3: Effect of poultry manure and days after sowing for number of leaves of seedlings

Treatments	Days after sowing							Std. Error
	7	14	21	28	35	42	49	
T ₄	9.60 ^b	14.20 ^b	19.20 ^b	24.00 ^b	33.00 ^c	43.40 ^b	48.14 ^b	±2.884
T ₁	15.80 ^a	22.00 ^a	33.20 ^a	40.00 ^a	51.20 ^a	63.40 ^a	76.60 ^a	±2.425
T ₂	13.00 ^{ab}	18.00 ^{ab}	26.40 ^a	32.60 ^a	41.60 ^b	57.00 ^a	69.00 ^{ab}	±3.500
T ₃	15.20 ^a	22.00 ^a	28.40 ^a	35.80 ^a	47.00 ^{ab}	64.20 ^a	76.60 ^a	±2.915
			NS	NS		NS		

Trt: Treatment; NS: Means no significance difference

DISCUSSION

The research was conducted to determine the effect of poultry manure on the growth and early performance and response on *Azadirachta indica* seedlings at the nursery stage. The height growth was measured, stem diameter and number of leaves were also determined. This result showed slight improvement between the treatments and the control. T₃ (1:1:4) with 25.40cm had the highest mean height growth followed by T₁(1:1:2) with followed by T₂ (1:1:3) with 23.70cm. This disagreed with the observation of (Salami *et al.*, 2018) that the application of 3gpot⁻¹ of NPK 15:15:15 will increase shoot height growth of *Treculia africana* seedlings. Also, T₁ (1:1:2) had the best mean value of diameter growth with 4.38mm followed by T₂ (1:1:3) with 4.36 while the least is the control with 4.28. This supports the observation of (Salami, 2015) that application of urea and single super phosphate at the rate of 15.0g and 3.33g is beneficial to the growth of cotton plant. The treatment with highest mean number of leaves was T₁ and T₃ with 76.60 followed by T₂ with 69.00 control had the lowest with 54.80 at (p<0.05) showed no significant differences in all the parameters measured. The best potting mixture obtained is T₁ (1 portion of top soil, 1 portion of river sand and 2 portions of poultry manure). Poultry manure improved the mean growth of stem diameter, shoot height and number of leaves.

CONCLUSION

The seeds of *Azadirachta indica* cannot grow effectively in river sand because of the variations in the stem diameter, shoot height and leaf production of seedlings. It lowered the rate of growth in leaf count, stem diameter and height. It was observed that there is a slight variation in shoot height of seedlings of potting mixture with river sand and top soil compared to potting mixture river sand, top soil and poultry manure in which the seedling sown.

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