EFFECT OF ORGANIC MANURE ON SEEDLING GROWTH AND DEVELOPMENT OF *TETRAPLURA TETRAPTRA* (TAUB)

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Abstract

A study was carried out on the effect of organic manure on growth and development of Tetraplura tetraptera seedling in the Teaching and Research Farm of the forestry and Wildlife Department, Delta State University, Asaba campus, Delta State. The statistical design used for the experiment was randomized completely block design with three replicates. The treatment used was cow dung, poultry droppings, piggery manure and topsoil. The samples of each organic manure were analysed for total Nitrogen, phosphorus and potassium. The soil analysis reveals a higher Nitrogen concentration of 0.13% in poultry droppings while the least (0.8%) was found in top soil. The effect of organic manure on T. tetraptetra seedling height was significant ($p < 0.05$). However collar character of T. Tetraptera seedling was not significantly affected by application of the organic manure. At 12 WAT, the height growth value were 23.12 in >22. 7cm>2>21.08cm>20.10cm for poultry manure, piggery, cow dung and top soil respectively. The result for leaf number and leaf area and collar diameter followed the same trend. These results suggest that soil amendment is still necessary for the establishment of T. Tetraptera seedling. Poultry manure was recommended as the most suitable organic manure for growth and development of this species.

Introduction

Forest plays a significant role in economic development. In addition to their important influence on the environment, they provide innumerable product of vital uses to man. The ecological usefulness of forest is most readily observed in their beneficial effect on water catchments areas, where they protect soil from erosion and silting of dams and canals. They have produced micro- climatic effects that are of benefit to humans and livestock; they provide a habitat for wildlife and attractive places for recreation (World Bank, 1988). Forest products are extensively used in most societies, they provide food, fuel fibre, building materials and industrial product such as gums, resins, oil, transmission poles, newsprints and other papers, textile and clothing. Almost every modern industry is to some extent depending on forest products in one or more of its processes (Leakey, 1999). However, our concern in this study is basically on fruit trees one of which is *T. tetraptera*. Fruit trees play an essential role in forestry because of their demand by man due to the benefit obtainable from them. The species is highly sought for because of its pods which contain seeds utilized for soup preparation. The problem facing a lot of these fruit trees is the inability of the local farmers to engage in their cultivation which is due to dearth of information on their germination. Furthermore, the rapid exploitation due to pressure of demand and their low-germination rate and growth in the natural forest has

necessitated the domestication of the species. The paper is to examine the influence of organic manure on the growth and development of *Tetraplura tetraptera* seedlings.

Materials and Methods Study Area

The experiment was conducted at the teaching and research farm of the department of forestry and wildlife, delta state university, Asaba campus. Asaba is located at $06^{o}14^{1}$N and $06^{o}49^{1}$E of the equator. Asaba lies in the tropical rain forest zone. Rainy season is between April – October, with annual rainfall of 1,500mm-1,849.3mm. The mean temperature is 23.3^{o}C with a maximum temperature of 37.3^{o}C. The mean monthly soil temperature at 100cm depth is 4.8bars (Asaba Meteorological station 2008).

Seed Colleection

T. Tetraptera fruits were purchased from Oyioka market in Ika south local government area of Delta State and seedlings raised from seeds were used for the study.

Sources of Organic Manure

The top soil was collected from the campus premises while the cow dung was collected from an abattoir in Asaba. Piggery manure was obtained from university piggery.

Soil Analysis

Representative samples of the top soil utilized were collected and analyzed. They 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 the Nava spec spectrophotometer. The exchangeable cat-ions were extracted with ammonium acetate (Jackson 1962). The exchangeable potassium was evaluated using flame photometer.

Procedure

Seeds of *T. tetraptera* were sown on a germination bed after being extracted from the fruit pulp. Germination of the seeds occurred three weeks later. All the germinated seedlings were transplanted into poly pots containing the growth media. Ten (10) seedlings were transplanted into the poly pots. There were four treatments in all replicated three times. The statistical design adopted was completely randomized design. They were watered daily and the experiment lasted for 10 weeks. The growth parameters measured were plant height, leaf number, collar diameter and leaf area. Dry weight was determined at the end of the trail. This involves harvesting of the seedlings and separating them into leaves, stems and roots. They were weighed (Fresh weight) and oven-dried at 105^{o}C for 18 hours.

Results

Plant Height

The effect of organic manure on plant height of *T. tetreptera* is shown in Table 1. The plant height of this species generally increased over the period of monitoring. From week 2 onward, the seedling height of *T. tetraptera* grown in soils treated with poultry droppings was higher than the other four treatments. By week 5, 14.30cm height which was the highest was given by poultry droppings and the difference was far more than the rest of the treatments. The lowest height (13.50cm) was recorded for cow dung and top soil. This trend persisted throughout the duration of the experiment. Analysis of variance indicated that poultry dropping treatment significantly differed from cow dung and control treatment ($p<0.05$) but was not significantly different from piggery manure treatment. By week 12 the maximum mean plant height was 23.12cm, given by poultry dropping treatment while the lowest (20.10cm) was produced by the control treatment.

Leaf Number

The effect of organic manure on leaf number of *T. Tetraptera* seedlings is presented in Table 2. The number of leaves increased with weeks after transplanting. The pattern of leaf growth showed that seedlings grown in poultry manure treatment consistently had higher number of leaves than other seedlings grown in soil amended with other organic manures (including the control treatment) throughout the period of observation. Analysis of variance revealed that seedlings from poultry manure treatment and pig manure differed significantly from the cow dung and the top soil. Mean value of 61.32 and 60.18 leaves per plant were recorded for poultry manure and piggery manure respectively. The highest number of leaves was obtained from seedlings grown in soil amend with poultry droppings (61.32) while the least was obtained from seedlings grown in top soil. Analysis of variance revealed significant differences ($p<0.05$) among the treatments.

Leaf Area

Leaf area increased with weeks after transplanting throughout the period of the experiment. Poultry manure had a positive effect on leaf area of *T. Tetraptera*. The highest leaf area was obtained from seedlings in poultry manure treated soil and least in top soil with value of 2460.14cm^2 and 1800.10cm^2 respectively. (Table 3). Generally, seedlings in poultry manure treated soil were significantly superior to those in other treatment except piggery manure. The difference between cow dung and top soil treatment were not pronounced most especially at week 9. The mean values obtained at this period were 1284.02 and 1282.02cm^2 respectively.

Collar Diameter

Collar diameter also increased with weeks after planting but was negligible. As a matter of fact no increase was observed from 2nd week to the third week for all treatment except poultry manure treatment. Slight increases were observed as from the seventh week to week 12. In spite of these increment no significant difference was observed ($p>0.05$) among the treatments. The mean values ranged between 2.0mm and 2.6mm at 12 WAP. The minimum value of 2.0mm was obtained from seedlings sown on top soil while the maximum value of 2.6mm was recorded for seedlings grown in soil treated with poultry manure.

Discussion

Poultry droppings gave the best performance with regards to plant height of *T. Teteraptera* seedlings and this was significant at $P<0.05$. The reason for this is not unconnected to higher nutrient released by this soil amendment than the rest. This finding is in agreement with the studies by Opeke (1997) and Imobighe (2004). Similar trend was observed for leaf numbers; however the pig manure and cow dung treatment exerted the same influence on leaves of *T. Teteraptera* seedlings. The higher concentration of nutrient in those soil amendment or organic manure must have been responsible for this as earlier stated. As regards leaf area values of *T. Tetraptera* seedlings; the performance was not different from the aforementioned parameters. It is pertinent to state here that cow dung and top soil treatments were not statistically significant on their influence on leaf area of seedlings of *T. Tetraptera*. This result was also true for collar diameter values. No significant difference was observed among the treatments. This could be attributed to the higher aeration and humus component of the top soil which is a repository of plant nutrients for plant growth (Table 1). Nwoboshi (2000), asserted that for optimum tree growth, essential nutrient element particularly the macro nutrient, must be present. The findings of this study agree with the above assertion.

Conclusion

It has been demonstrated that organic manure application is important for growth and development of *T. Tetraptera* seedlings. This is very pertinent in this part of the country where fertilizers are either unavailable or the cost is highly prohibitive. The local farmers can therefore avail themselves of the opportunity provided by these soil amendments to improve their crop yield. The study has shown that among these organic manure, poultry manure gave the best performance. The highest height of 23.12cm was recorded under this treatment for seedlings of *T. Tetraptera*. The result corroborates the assertion or strengthens the position that scientific application of manure has significant effect on seedling growth.

References

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Table 1
Nutrient Status of the Treatments Utilized

Treatment	Total nitrogen	Phosphorus	Potassium
Top soil	0.6%	0.05%	0.08%
Cow dung	0.12%	0.23%	0.19%
Poultry dropping	0.13%	0.20%	0.14%
Piggery manure	0.10%	0.17%	0.13%

Table 2
Effect of Organic Manure on Plant Height (CM) of Tetrapleura Tetraptera Seedlings

Treatment	Weeks after Transplanting											
	1	2	3	4	5	6	7	8	9	10	11	12
Cow dung	11.80a	12.30a	12.70a	13.10a	13.50b	13.90b	14.05b	15.27b	16.18b	18.10b	19.18b	21.18b
Poultry manure	11.80a	12.37a	13.00b	13.65b	14.30a	14.30a	15.13a	16.10a	17.20a	19.21a	21.28a	23.12a
Pig manure	11.6a	12.17b	12.36a	13.67b	13.67b	13.67b	14.21b	15.34b	16.42a	19.14a	20.12a	22.09a
Top soil	11.80a	12.30a	12.70a	13.10a	13.10a	13.50b	14.00b	15.11b	15.58b	17.10b	19.10b	20.10b

Means b of the same letters are not significantly different at ($P \leq 0.05$)

Table 3
Effect of Organic Manure on Leaf Number of Tetrapleura Tetraptera Seedlings

Treatment	Weeks After Transplanting											
	1	2	3	4	5	6	7	8	9	10	11	12
Cow dung	16.33b	19.33b	23.00b	27.33b	29.67ab	32.33ab	40.08b	43.41b	45.62b	49.01b	51.08b	54.32b
Poultry manure	19.00a	25.00a	30.00a	34.00a	34.00a	41.00a	46.12a	48.28a	54.60a	57.82a	61.32a	68.01a
Pig manuren	19.00a	24.67a	28.67	33.67a	33.67a	40.00a	46.02a	49.12a	54.12a	57.01a	60.18a	67.32a
Top soil	17.67ab	20.33b	24.67b	28.33b	28.33b	32.00b	38.09b	40.08b	43.80b	48.20b	50.08b	53.01b

Mean of the same letters are not significantly different at ($P \leq 0.05$)

Table 4
Effect of Organic Manure on Leaf Area of Tetrapleura Tetraptera Seedlings

Treatment	Weeks After Transplanting											
	1	2	3	4	5	6	7	8	9	10	11	12
Cow dung	452.67b	535.8b	637.6b	757.6b	822.5b	896.2b	911.02b	1142.0b	1284.b	1491.1b	1672.1ab	1800.1ab
Poultry manure	526.8a	693.0a	818.1a	942.5a	1081.1a	1136.5a	1300.0a	1400.3a	1562.1a	1681.2a	1847.2a	2162.0a
Piggery manure	526.3a	683.0a	794.7a	933.3a	1025.64a	1108.8b	1206.0a	1382.2a	1541.3a	1602.1a	1812.3a	2641.0a
Top soil	471.3b	542.2b	658.6b	755.6b	840.6b	942.b	1112.0ab	1200.1b	1281.0b	1382.1b	1508.04b	1758.2b

Mean of the same letter are not significantly different at ($P \leq 0.05$)

Table 5

Treatment	**Weeks after Transplanting**											
	1	2	3	4	5	6	7	8	9	10	11	12
Cow dung	1.00a	1.00a	1.10a	1.10a	1.10a	1.20a	1.30a	1.40a	1.50a	1.70a	1.90a	2.0a
Poultry manure	1.00a	1,10a	1.10a	1.20a	1.30a	1.30a	1.40a	1.50a	1.60a	1.80a	2.10a	2.30a
Piggery manure	0.90a	1.00a	1.00a	1.10a	1.10a	1.20a	1.30a	1.40a	1.50a	1.80a	2.00a	2.20a
	1.00a	1.00a	1.00a	1.10a	1.10a	1.20a	1.30a	1.40a	1.50a	1.60a	1.80a	1.90b

mean of the same letter are not significantly different at ($P \leq 0.05$)