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RESEARCH PAPER

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Effect of Farm-Yard Manure and Inorganic Fertilizer Application on the Coppicing Ability of *Moringa oleifera* (Lam.) Plantation at Gaya, Kano, Nigeria

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ABSTRACT

The need to increase the yield of Moringa oleifera under plantation conditions owing to increased demand for its various products, occasioned by media campaigns on its medicinal and nutritional values, necessitated the investigation on the effect of applying Farmyard manure(FYM) and inorganic fertilization(NPK15:15:15) on its vegetative growth. The experiment was laid out in Randomized Completely Block Design (RCBD). Four treatments where used and replicated five times. Leaf yield data were obtained by taking leaf count for (8) eight weeks. The data obtained was subjected to analysis of variance (ANOVA). The result revealed that Moringa oleifera plant responded to the application of manure (7,6) and perform better than inorganic fertilization (2.8) and a combination of manure and NPK 15:15:15 (5.1) the control (4.7)is even more promising than inorganic fertilization. The results showed that the treatment differences are highly significant (P= 0.05). The findings of this research should be disseminated to farmers through extension services and media campaign. However, there is need for further research to identify the optimum levels of FYM per stand needed to promote vegetative growth of Moringa oleifera.
Key words: Moringa oleifera, vegetative growth, inorganic fertilization, farmyard manure

INTRODUTION

Origin and Distribution of Moringa oleifera

According to Nadkarni, (1976) and Ramachandrain et al., (1980) Moringa *Oleifera, (*widely known as the drumstick tree or the horse radish tree is one of the most widely distributed and naturalized species of the monogeneric family moringaceae.. It includes 13 species of trees and shrubs distributed in sub-Himalayan ranges of India, Sri Lanka, North Eastern and South Western Africa, Madagascar and Arabia. It has now naturalized in many locations in the tropics a nd is now cultivated in most parts of Africa, South-East Asia and the middle east(Fahey, 2005). Moringa was introduced into Nigeria by Arab traders and the plant has several names in Arabic some of which are Alim and Halis). It is found growing in most parts of Nigeria and has acquired many local names; it is called Zogale, Zogale Gandi or Bagaruwar Makka in Hausa; Kabije, Gawara, namarade or Rinin Makka in Fulfulde; Ewe ile in Yoruba Ikwe Oyinba in Oyibo in Igbo (Auwalu, 2009).

Botany of *Moringa Oleifera*

Julie, (1991) described *Moringa oleifere* as a fast growing deciduous shrub or small tree that grows up to 12m tall and 30cm in diameter with an umbrella-shaped open crown (unless repeatedly coppiced). It is a softwood tree with (timber of low quality. leaves are alternate, oddly (not divisible exact by 2) bi-or tri-pinnate compound, triangular in outline and 20-70cm long Each pinna has 3-9 pairs of 1-2cm long ovate leaflets, soft dark green above and whitish below. Farse, (2006) described the white, fragrant flowers as obliquely mono symmetric and papilionoid with five stamens are in axillaries pendulous panieles 1-5-2cm long from leaf corners). The fruit pods, called “Drumstick” are 1-45cm long. The hull is brownish semi-permeable and has three white wings that run from top to bottom. A tree can produce 15,000-25,000 seeds per year according to Palada and change,(2003). All parts of the Moringa tree are edible and the roots are used as a condiment in the same way as horseradish (Fuglie, 1999).

Duke (1983) reported that Moringa tolerates annual precipitation of 4.8 to.3 decimeter, annual temperature of 18.7 to 28.5^{0}C and pH of 4.5 to 8 Moringa thrives in subtropical and tropical climates, flowering and fruiting freely and continuously. Similarly, Hensliegh and Holaway (1992) reported that Moringa is found up to 1000m altitude and in areas with annual rainfall of 750-2250mm. it grows best in dry sandy soil, and is adaptable to various sandy soil conditions from 4.5-8 pH, but does not tolerate water logging and freezes or frost. Moringa can easily adapt to varied ecosystems and farming systems and it is resistant to drought.

The seed yields 38-40% of non drying oil, known as Ben oil, used in arts and for lubricating watches and other delicate machinery for its little tendency of deteriorating and becoming stick. The oil is clear sweet and odorless. Wood yields blue dye, leaves and young branches are relished by Livestock (Duke 1983). Moringa is a fast growing tree being planted in India on large scale as a potential source of wood for the paper industry (Verma et al. 1976). Moringa trees are well-suited for use in Alley cropping systems because of their rapid growth, long taproot, few lateral roots, minimal shade and large production of high protein biomass, leaves are readily eaten by cattle, sheep, goats, pigs and rabbits ;leaves can also be used as food for fish. The seed cake could be used as animal feel if it is pre-treated to remove its alkaloid and saponin content.

Moringa leaves provide an excellent material for the production of biogas. Crushed leaves are used in some parts of Nigeria to scrub cooking utensils or to clean walls. A common use of moringa trees is as living supports for fencing around gardens. The seed cake can be used as a protein-rich plant fertilizer; Juice extracted from the leaves can be used to make a foliar nutrient capable of increasing crop yields by up to 30%. Cultivated intensively and then ploughed into the soil. Moringa can act as a natural fertilizer for other crops. The gum produced from a cut tree trunk has been used in calico printing in making medicines and as a bland-tasting condiment powdered seeds can be used to clarify honey without boiling. Seed powder can also be used to clarify sugar cane juice. Flowers are a good source of nectar for honey producing bees (Fuglie, 2001). After oil extraction of Moringa *Oleifere* seeds. The left press cake contains water soluble protein that act as effective coagulants for water purification (Palada and Change, 2003). One to two seeds per liter are required for water purification. Seed powders are mixed with water. After hours, the water is filtered to get purified water. The charged protein molecules can serve as non toxic natural polypeptide to settle mineral practices and organics in the purification of drinking water, vegetable and oil depositing (Foild et al., 2001). Current studies report that Moringa seeds and pods are capable of removing heavy metals and volatile organic compounds from aqueous systems (Akhtar et al., 2006) Moringa seeds help to clean dirty water and are a useful source of medicine.

According to (WHO 2001) *Moringa olefera* contains more than 92 nutrients and 46 types of antioxidants. Moringa is said to cure about three hundred diseases and it almost have all the vitamins found in fruits and vegetables. Even in larger proportions. With all the health benefits of this miracle herb, it can easily be termed as the most nutritious herb on Earth. Today, millions world over started using Moringa based products in porridge, pastas, bread and to reap the everlasting health benefits of the extraordinary 'Moringa' herb. Moringa seed powder is being assessed for its potential to make river water potable. Research showed that filtering with seed powder may reduce water pollution and bacteria counts. Moringa has been used in folk medicine, including Ayurvedic traditional medicine and in the Philippines. In Africa and Indonesia, Moringa leaves are given to nursing mother in the belief that they increase lactation.In Jamaica, the sap is used for a blue dye. Peter (2008).

The most common pests are grasshoppers, caterpillars. These insects bite and chew parts of the plant, causing destruction of leaves buds, flowers, shoots fruits or seed as well as the interruption of sap flower Diatta and Freitas (2001) these outbreaks are frequent in dry zones where Moringa leaves strongly attract insects. It seems that these out breaks occur at the beginning of the dry season when insects can not find other tender green materials to feed. The solution in this case is to cut back of the tree leaving no green part apparent. Fungal diseases are by far the most serious in Moringa farming. Brown sports can on the leaves and then spread to cover them entirely tuning the leaves yellow and killing them Gopalan and Rama (1989. Termite attacks also cause damage to Moringa plantations. But some organic solution exists for termite control by either Applying neem seed cakes to the soil, applying caster oil plant leaves or mahogany chips around the base of the trunk or heaping ashes at the base of the trunk.

METHODOLOGY

Study Area

The research was carried out at the one year old moringa plantation at the research farm of Kano University of Science and Technology Wudil located at Gaya town which is situated at latitude 11^{0}52'5N and longitude 9^{0}0'40E. The area has an average annual rainfall of 890mm with an average temperature of 26^{0}C (Olafin 2008).

Experimental Design

The experiment was laid out in a randomized completely block design (RCBD). The treatments where randomly allocated to the sixty plots and replicated five times. Moringa plantation was coppiced at the same level of height and demarcated into 8Mx10M plots. A total of sixty plots containing twenty plants of Moringa per plot were laid. Four treatments where applied;

T_1 Manuring (FYM)

T_2 fertilizer (NPK) NPK 15: 15:15

T_3 Manuring (FYM) plus fertilizer (NPK) 15:15:15

T_4 No NPK 15:15:15, No FYM (control)

Data Collection

Data collection involved the counting of leaf for the period of eight weeks

Statistical Analysis

Data obtained was subjected to Analysis of Variance (Anova) using the SAS Anova procedure (SAS institute 1988). Duncan's multiple range test (Duncan 1955) was used to compare differences among treatment means. (P< 0.005)

RESULTS AND DISCUSSION

Table 1 Yield

WEEKS	I	II	III	IV	V
1	36.90	38.00	36.10	38.10	37.10
2	39.70	41.60	39.70	41.00	36.10
3	43.10	45.30	43.90	41.2	43.80
4	65.20	58.00	65.70	58.90	60.01
5	68.10	64.30	69.00	68.00	68.14
6	77.30	72.30	73.80	71.80	72.44
7	80.60	73.80	77.50	76.11	78.00
8	88.80	84.20	83.90	83.10	86.10

Source: Field Research

The result of the above table reveals that *M. oliefera* yield better under the effect of organic manure (FYM) within the period of eight weeks.

LAYOUT OF THE PLOTS
BLOCKS

I	II	III	IV	V
T2	T3	T4	T3 T4 T2 T1 T4 T2 T3 T1 T4 T2 T1 T3	T4 T3 T2 T1 T3 T4 T1 T4 T3 T2 T2 T1
T3	T4	T3		
T4	T2 T1	T1		
T2 T1 T3 T4 T1		T2		
	T4	T2		
	T3	T4		
	T1	T1		
	T2	T3		
T3	T1 T4	T3		
T1 T4		T4 T2		
	T3			
T2	T2	T1		

Table 2 Yield

WEEKS	I	II	III	IV	V
1	14.06	18.00	21.40	20.10	16.10
2	24.20	28.00	25.30	23.14	28.00
3	27.90	26.80	30.80	26.70	28.19
4	34.10	32.90	37.00	31.30	32.80
5	38.40	41.10	40.41	39.80	40.80
6	41.90	44.00	45.20	41.50	40.80
7	45.30	47.00	49.00	41.50	43.80
8	48.00	50.18	51. 04	49.00	48.90

Source: Field Research

The above table shows *M. oliefera* yield do not respond much to inorganic fertilizer (N.P.K).

Table 3 Yield

WEEKS	I	II	III	IV	V
1	21.90	22.50	23.90	21.80	22.00
2	28.20	27.06	27.30	28.00	28.90
3	32.20	30.90	31.13	32.00	30.40
4	44.30	41.70	41.20	44.00	41.30
5	48.90	43.60	46.00	48.00	43.18
6	52.30	47.60	49.70	52.10	47.00
7	55.90	50.70	48.60	55.00	50.00
8	57.20	55.90	53.20	56.80	54.10

Source: Field Research

The above table indicates the yield of *M. oliefera* under organic manure (FYM) and inorganic fertilizer (NPK 15:15:15).

Table 4 Yield

WEEKS	I	II	II	III	IV	V
1	21.00	25.00	23.00	21.00	24.44	24.44
2	27.00	26.40	28.50	27.00	28.10	28.10
3	30.40	31.30	32.80	31.45	30.00	30.00
4	35.40	34.90	38.00	35.00	34.44	34.44
5	40.90	59.70	41.70	41.10	40.80	40.80
6	44.90	43.70	45.10	44.10	44.80	44.80
7	49.30	47.70	55.20	49.00	44.80	44.80
8	53.90	53.00	39.40	54.40	43.00	43.00

Source: Field Research

This table shows the amount of the moringa oliefera yield produce with out any application of organic or inorganic fertilizer.

SUMMARY TABLE FOR T1-T4

Blocks	T_1 FYM	T_2 NPK	T_3 FYM+NPK	T_4 control
C_1	7.80	4.28	5.33	4.73
C_2	7.50	4.49	5.00	4.71
C_3	7.65	4.69	5.01	4.74
C_4	7.48	4.34	5.28	4.73
C_5	7.53	4.49	4.95	4.56

TREATMENTS MEANS TABLE

	Treatment				**Block Totals**	**Block Means**
Blocks	T_1	T_2	T_3	T_4		
C_1	7.80	4.28	5.33	4.73	22.14	5.5
C_2	7.50	4.49	5.00	4.71	21.70	5.4
C_3	7.65	4.69	5.01	4.74	22.09	5.5
C_4	7.48	4.34	5.28	4.73	21.83	5.5
C_5	7.53	4.49	4.95	4.56	21.53	5.4
Treatment Totals	37. 96	22.29	25.57	23.47		
Treatment Means	7.6	2.8	5.1	4.7		

The Hypothesis

Null hypothesis (Ho) There is no significant difference among the treatments

Alternative hypotheses (Ha) there are significant difference among the treatments.

The computation

A – Correction factor

C f = $\frac{(GT)}{n}$ where n = t x b

t = number of treatments

b = number of blocks

This Cf = $\frac{(7.80 + 7.50 + \ldots\ldots\ldots 4.56)^2}{4x5}$

Cf = $\frac{(109.29)^2}{20}$ = 597.22

=

[(7.80)^2+ (7.50)^2+----------+ (4.56^2 - cf

= 31.59

C) (= $\frac{\sum Tj^2}{b}$ - cf

Where = $\frac{\sum Tj^2}{b}$ = sum of square of treatment totals/no of blocks

= $\frac{(37.96)^2 + (22.29)^2 + (25.57)^2 + (23.47)^2 - cf}{5}$

62.8 49 -597.22

31.27

D - =

T

Where $\sum B^2{}_I$ Is the sum of squares of blocks/ no of treatments

= (22.14)^2+ (21.70)^2+ (22.09)^2+(21.83)^2+ $\frac{(21.53)^2}{T}$ – cf

= 0.06

= (– **-**

= 31.59 – (31.27 + 0.062)

ANOVA TABLE

		(SS)	(MS)	(F-Cal)
Treatment (t-1)	3	31.27	10.42	521
Block (b-1)	4	0.06	0.01	0.5
Error (b-1)(t-1)	12	0.26	0.02	
Total (bt-1)	19	31.59		

The f-tabulated for treatment 3 and 12 degrees of freedom, and at 0.005 is 3.49.

Testing For Significance and Making Relevant Conclusion

The variance ratio is the f – calculated whose significance need to be verified by comparing the value with critical (f-tabulated) at the desired level of significance.

Since the f calculated is greater than the f-tabulated at (p > 0.005) level of significance, the null hypothesis is rejected.

It is therefore concluded that the treatment differences are highly significant (P 0.05).

SUMMARY

From the result it was observed that moringa Oliefere perform best under manuring.

CONCLUSIONS

The study indicated that the does not respond significantly to inorganic fertilizer (NPK15:15:15), hence it performs well even on poor soils. The research revealed that, *Moringa oleifera* perform better with application farmyard manuring compared to inorganic fertilizer (NPK15:15:15).

The findings of this research should be disseminated to farmers through extension services and media campaign. However, the need for further research to identify the uptimum levels of FYM per stand needed to promote vegetative growth of *Moringa oleifera.*

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