5TH WEST AFRICAN ORGANIC CONFERENCE

WAfrONet

Growth and Yield Response of Maize (*Zea Mays*) Varieties to the Time of Cow Dung Application in Minna, Southern Guinea Savanna of Nigeria

[1]Saidu*A., [2]Afolabi, S.G. [1]Osuwa, F.O. [1]Mohammed, A. and [3]Usman, I.

[1]Department of Crop Production, Federal University of Technology Minna, Nigeria.

[2]Department of Soil Science and Land Management, Federal University of Technology Minna, Nigeria.

[3]Niger State Agricultural and Mechanisation Development Authority Minna, Nigeria

*Corresponding Author
E-mail: saiduadamu08@yahoo.com
Tel: +2347036083435

Keywords:
Cow dung, Maize, SAMMAZ 17, SAMMAZ 18 and SAMMAZ 34

Access online at:
www.waoc.bio OR
www.noara.bio

Abstract

Maize is the most important cereal crop in Sub-Saharan Africa along with rice and wheat. Field experiment was conducted at Teaching and Research Farm of Federal University of Technology Minna, Gidan Kwano to determine the growth and yield response of maize varieties to time of cow dung application. The experiment was designed as 3x4 factorial in a Randomised Complete Block Design (RCBD) and replicated three times. Four application times of cow dung: 4 weeks before sowing (WBS), 2 WBS, at sowing (AS) and control. Three varieties of maize used were SAMMAZ 17, SAMMAZ 18 and SAMMAZ 34. The data collected included plant height, number of leaves, number of cobs, cob length, cob weight and grain yield. Data collected were subjected to analysis of variance(ANOVA).Results revealed that SAMMAZ 34 and application of cow dung at 2WBS produced higher yield while SAMMAZ 18 and application of cow dung at 2WAS produced higher number of leaves which can be used for animal feed. The application of cow dung 2 WBS and cultivation of SAMMAZ 18 and SAMMAZ 34 maize varieties are hereby recommended for farmers in the area for human consumption and animal feed.

Introduction

Maize is gradually replacing millet and sorghum in the traditional farming systems of northern Nigerian since the last decade and rated as the third most important crop in the world that has contributed greatly to economic growth of many developing countries (Chude, *et al.*, 2003).The crop covers nearly 17% of the estimated 200 million ha cultivated land in Sub-Sahara Africa, and is produced in diverse production environments and consumed by people with varying food preferences and socio-economic backgrounds. Maize is most efficient plant capturing the energy of the sun and converting it to food hence major source of calories in Nigeria as well as other parts of the world. It is a versatile crop grown over a range of agro climatic zones. Maize grow successfully in northern part of Nigeria, the grain contains 72.2% starch, 10.4% protein, 2.5% fiber, 1.4% ash, 3.0%

Published by
NOARA
Network of Organic Agriculture Researchers in Africa

sugar, 4.8% oil and is important in the context of nutrition for humans and livestock and as raw materials for industries (Nuss and Tanumihadjo, 2010). The production of maize in Nigeria have been a long farming practice with the local farmer. The continuous cultivation of this crop on the same piece of land over years might have led to serious depletion of the plant nutrient level, therefore in order to achieve maximum yield there is need to improve soil organic matter with application of organic fertilizer which also substitutes for inorganic fertilizer which its use over time and lead to increases in soil acidity. Manures help to provide all necessary micro and macro nutrients available forms which improve the physical and biological properties of the soil (Abou El Magd *et al.*, 2006). The organic matter of the soil can be enhanced and maintained by the application of animal manures. Cow dung is an important source of nitrogen for crop production in the small holder sector. It helps farmers reduce inputs of commercial fertilizer, thereby increasing the profit margin of the farmer. The poor performance of crops under continuous cropping is caused by the low fertility status of the soil. The continuous use of inorganic fertilizer has also led to reduced crop yield and increased soil acidity. The aim of this study is to determine the effects of time of Cow dung application on growth and yield of Maize.

Materials and Methods

Field experiment was conducted during the 2016 cropping season at the Teaching and Research Farm of Federal University of Technology Minna, Gidan Kwano, Minna (latitude 09° 37.86'N and longitude 06° 33.28'E in sub-humid tropical climate, southern Guinea savanna of Nigeria. Minna has a mean annual rainfall of about 1284 mm and a distinct dry season of about 6 months duration occurring from November to April. The mean maximum temperature remains high throughout at about 33.5 °C, particularly in March and June.

The plot size was 54 m × 12 m, it was divided into twelve treatments of 3m × 4m. The plot size was prepared manually before planting and the rate of cow dung applied was 6 tons/ha, weeding was carried out at regular interval. Soil were collected from twelve points along diagonal transects at the depth of 0 – 15 cm at Teaching and Research Farm prior sowing, surface soil sample were bulked together to form a composite sample. Soil samples were air-dried, gently crushed and passed through 2-mm sieve. The processed soil samples were analyzed for some physical and chemical properties following the procedures outlined by Agbenin, (1995).

The treatment consisted of four time of cow dung application control, 4 weeks before sowing (WBS), 2WBS, at sowing (AS) and three varieties of maize Sammaz 17, Sammaz 18, Sammaz 34. The experimental design was a 4 x 3 factorial arrangement filted to Randomized Complete Block Design with three replicates. The following data were collected: plant height, number of leaves, number of cobs, cob length, cob weight, grain weight. All the data obtained from the experiment were subjected to analysis of variance (ANOVA) using the SAS. The treatment means were compared using duncan multiple range test.

Results and Discussion

The results of some physical and chemical properties of the soil before sowing are shown in Table 1. The soil texture was sandy clay loam, slightly acidic in H_2O which was suitable for plant growth as most plant nutrients available for plant uptake at pH 5.5-6.5 (Brady and Weil, 2002), low in organic carbon, available phosphorous and medium in total nitrogen.

The main effect of maize varieties to time of cow dung application on the plant height is shown in Table 2. The effect of time of cow dung application on plant height was significant ($P \leq 0.05$) at 3, 6, and 9 weeks after sowing (WAS). The application of cow dung at 2 weeks before sowing (WBS) produced the tallest plant height than control which was similar to application of cow dung at 4 WBS and at sowing (AS). The

Table 1: Some Physical and Chemical Properties of the Soil Before Sowing

Parameters	Values
Sand (g kg^{-1})	752
Silt (g kg^{-1})	15
Clay (g kg^{-1})	233
Textural classes	Sandy clay loam
pH in H_2O (1:2.5)	6.34
Total Nitrogen (g kg^{-1})	0.20
Available P (mg kg^{-1})	8.00
Organic Carbon (g kg^{-1})	7.20
Exchangeable Cation (cmol kg^{-1})	
Mg^{2+}	1.03
Ca^{2+}	2.16
K^{+}	0.41
Na^{+}	0.29
Exchangeable Acidity (cmol kg^{-1})	0.01
ECEC (cmol kg^{-1})	3.90

Table 2: Response of Maize Varieties to Time of Cow Dung Application on Plant Height

Treatments	Plant Height (cm)		
	3WAS	6WAS	9WAS
Time of application (T)			
Control	41.89b	124.67b	202.89b
4WBS	48.33ab	137.00ab	199.33b
2WBS	54.67a	147.44a	234.89a
AS	49.89ab	144.33ab	227.44a
SE±	3.34	6.98	4.98
Variety (V)			
Sammaz 17	42.08b	124.83b	210.25a
Sammaz 18	54.08a	144.17a	220.25a
Sammaz 34	49.92a	146.08a	217.17a
SE±	2.76	5.93	3.34
Interaction			
TxV	NS	NS	NS

Means with the same letter (s) in a column of a treatment group are not significantly different at 5 % level of probability. WBS-weeks before sowing, AS-at sowing, SE±-standard Error, NS-not Significant, WAS- weeks after sowing.

maize variety "Sammaz 18" produced the tallest plant height which was significant different ($P \leq 0.05$) than Sammaz 17 at 3 and 6 WAS. The main effect of maize varieties to time of cow dung application on the number of leaves is shown in Table 3. The effect of time of cow dung application on the number of leaves was significant ($P \leq 0.05$) at 9 WAS. Highest number of leaves was recorded when cow dung was applied 2 WBS. Significant difference was also recorded on number of leaves between varieties Sammaz 18 produced the highest number of leaves which was significant different ($P \leq 0.05$) than Sammaz 17 at 3, 6

and 9 WAS but only significant different than Sammaz 34 at 9 WAS. There were no interactive effects between maize varieties and time of cow dung application on plant height and number of leaves.

The increased in the plant height through application of cow dung at 2 WBS, indicates that the essential nutrients was released at appropriate time. Adelekan *et al.* (2010) observed increased in plant height, leaf area, cob number and weight of maize and also improved soil structure when manure was added to the soil. Similar results was reported by Ihuoma *et al.*(1996) that application of cattle manure increased plant growth. These growth rates indicate the availability of different nutrients at various levels in organic manure. Diklnya and Mufwanzala (2010) reported that application of organic manure increased soil fertility and crop production.

Table 3: Response of Maize Varieties to Time of Cow Dung Application on Number of Leaves

Treatments	Number of Leaves		
	3WAS	6WAS	9WAS
Time of application (T)			
Control	8a	12a	13b
4WBS	8a	12a	13b
2WBS	8a	12a	14a
AS	8a	12a	13b
SE±	0.29	0.45	0.61
Variety (V)			
Sammaz 17	7b	11b	13b
Sammaz 18	8a	12a	14a
Sammaz 34	8a	12a	13b
SE±	0.52	0.60	1.3
Interaction			
TxV	NS	NS	NS

Means with the same letter (s) in a column of a treatment group are not significantly different at 5 % level of probability. WBS-weeks before sowing, AS-at sowing, SE±-standard Error, NS-not Significant, WAS- weeks after sowing.

Table 4: Response of Maize Varieties to Time of Cow Dung Application on Number of Cobs, Cob Length and Cob Weight

Treatments	Number of cobs	Cob length(cm)	Cob weight (kg)
Time of application (T)			
Control	1a	16a	110.00c
4WBS	1a	16a	132.22b
2WBS	1a	15b	182.89a
AS	1a	16a	181.11a
SE±	0.75	0.22	6.85
Variety (V)			
Sammaz 17	1a	16a	144.17a
Sammaz 18	1a	15b	127.50b
Sammaz 34	1a	16a	142.50a
SE±	0.35	0.45	11.5
Interaction			
TxV	NS	NS	*

Means with the same letter (s) in a column of a treatment group are not significantly different at 5 % level of probability. WBS-weeks before sowing, AS-at sowing, SE±-standard Error, NS-not Significant, *=significant at $p<0.05$.

The main effect of maize varieties to time of cow dung application on the number, length and weight of cob were shown in Table 4. The effect of time of cow dung application on the cob length was significant ($P \leq 0.05$). Heavier cob weight was recorded when cow dung was applied 2 WBS which was significant difference from the cob weight of other treatments. At 2 WBS the grain and total grain weight of maize was significant different ($p<0.05$) from other treatments. Significant difference was also recorded on grain weight between the time of application and varieties. Sammaz 34 produced the heaviest grain weight which was significant different ($P \leq 0.05$) from Sammaz 18 but similar to Sammaz 17 (Table 5).

Table 5: Response of Maize Varieties to Time of Cow Dung Application on Grain Weight and Total Grain Weight

Treatments	Grain Weight (kg/ha)
Time of application (T)	
Control	855.6b
4WBS	866.7b
2WBS	1455.6a
AS	855.6b
SE±	52.4
Variety (V)	
Sammaz 17	1066.7a
Sammaz 18	875.0b
Sammaz 34	1083.3a
SE±	70.7
Interaction	
TxV	*

Means with the same letter (s) in a column of a treatment group are not significantly different at 5 % level of probability. WBS-weeks before sowing, AS-at sowing, SE±-standard Error, NS-not Significant, *=significant at $p<0.05$.

Kolawole (2014) reported that application of organic manure at 2 WBS increased the corn production and level of phosphorus in the soil. An increase in the number of maize leaves was reported by Makinde *et al.* (2001) when cattle manure was incorporated into the soil before sowing and this also agrees with the result of this research work. Cob length and cob weight were significantly affected by the application of cow dung. Similar observation was reported by Falaki *et al.* (1992) who observed significant increases in maize yield components with the application of organic manure.

Conclusion and Recommendation

Base on the results from this study, it can be concluded that application of cow dung 2 WBS and cultivation of SAMMAZ 18 and SAMMAZ 34 maize varieties are hereby recommended for farmers in the study area for human consumption and animal feed.

References

Abou El-Magd,M.M Hoda, A. Mohammed, and Fawzy, Z.K. (2006). Relationship, growth and yield of broccoli with increasing NP or K ration in a mixture of NPK fertilizers. *Annals Agriculture science Moshtohor* 43 (2): 791-805.

Adelekan, I.O., Akinrinade, O.E. and Azeaz, J.O. (2010). Influence of combined applicationof cattle manure and NPK fertilizer on soil chemical properties, growth and yield of Okra (*Abelmoschus esculentum*) in Alfisol. *Proceedings of the 29th Annual Conference of the Soil Science Society of Nigeria*, December 6-10, 2004, University of Agriculture, Abeokuta, Nigeria Pp. 143-146.

Agbenin, J.O. (1995). Laboratory manual for Soil and Plant Analysis. (Selected Method and Data Analysis). Published by the author. 140pp.

Brady, N.C. and Weil, R. (2002). The Nature and Properties of Soils. 13th edition. Singapore, Pearson Education. 976pp.

Chude, V.O., Iwuafor, E.N.O., Amapu, I.Y., Pam, S.O. and Yusuf, A.A. (2003). Response of maize (*Zea mays*) to zinc fertilization in relation to Mehlich III extractable zinc. Badu-Apraku, B., Fakorede, M. A. B., Ouedraogo, M., Carsky, R. J. and Menkir, A.(eds). Maize revolution inWest and Central Africa. Proceedings of a Regional Maize Workshop, IITA-Cotonou Benin Republic, 14 – 18 May, 2001. WECAMAN?IITA,. pp201 – 207.

Dikinya, O. and Mufwanzala, N. (2010). Chicken manure-enhanced soil fertility and productivity: Effects of application rates. *Journal of Soil Science and Environmental Management*. 1:46-54.

Falaki, A.M., Mike, S. and Abubakar, I.U. (1992). Fertilizer use, practice under irrigation. A paper presented at the 3rd National fertilizer workshop, Ibadan, Nigeria. pp12.

Hyunju J, Seong YJ, Gap KJ and Eluisu J, (1996). Effect of cattle manure application on the soil properties, yield and quality of silage cultivated on paddy land. *Journal of the Korean Society of Grassland Science*. 16(1): 81-86

Kolawole GO, (2014). Effect of time of Poultry manure application on the performance of Maize in Ogbomoso, Oyo State, Nigeria. *Journal of Applied Agricultural Research*. 6: 253-258

Makinde EA, Agboola AA and Oluwatoyinbo FI, (2001). The effects of organic and inorganic fertilizers on thegrowth and yield of maize in a maize/melon intercrop. *Moor Journal of Agricultural Research*. 2:15-20.

Nuss, E.T and Tanumihardjo, S.A. (2010) Maize: a paramount staple crop in the context of global nutrition. *Comprehensive Reviews in Food Science and Food Safety*. 9:417–436.

Published by

NOARA

Network of Organic Agriculture Researchers in Africa

شبكة الباحثين في زراعة العضوية بإفريقيا