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EFFECT OF DIFFERENT RATES OF POULTRY MANURE ON THE GROWTH AND YIELD OF SWEET CORN (*Zea mays sacharata*)

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ABSTRACT

Trials were conducted in 2010 and 2011 cropping seasons at the teaching and research farm of Ibrahim Badamasi Babangida University, Lapai to evaluate the effect of different rates of poultry manure on the growth and yield of sweet corn. The experiment consisted of two varieties of sweet corn viz; white and yellow and four levels of poultry manure viz; 0, 5, 10, and 15 tones ha^{-1}. Compound fertilizer NPK (15:15:15) was applied at the rate 100 kg N ha^{-1} and 50 kg ha^{-1} each of P and K as check. The result showed that yellow sweet corn significantly produced more leaves at 12 weeks after planting (WAP) compared with white sweet corn. However, the white sweet corn had significantly higher number of cobs, fresh and dry weight of cobs and grain yield (1.6 t ha^{-1}) compared with yellow sweet corn. The effects of inorganic fertilizer and poultry manure at 15 t ha^{-1} on the performance of the two varieties of sweet corn were statistically the same.

KEY WORDS: Sweet corn, poultry manure

Maize is an important cereal crop in Nigeria with a total production of about 7.3 million metric tones in 2009 (FAO, 2011). The use of inorganic fertilizers alone has not been helpful under intensive agriculture because it aggravates soil degradation (Sharma and Mittra, 1991). The degradation is brought about by loss of organic matter which consequently results in soil acidity, nutrient imbalance and low crop yields (Ayoola and Makinde, 2007). Response of crops to applied fertilizer depends on soil organic matter. The quantity of soil organic matter depends on the quantity of organic material which can be introduced into the soil either by natural returns through roots, stubbles, sloughed-off root nodules and root exudates or by artificial application in the form of organic fertilizer such as manure (Agboola and Omueti, 1982). Application of organic fertilizer is an important means of maintaining soil fertility status and it is also environmentally friendly. This is because nutrients contained in organic manures are released more slowly and are stored for a longer time in the soil, thereby ensuring a long residual effect (Sharma and Mittra, 1991). Inorganic fertilizer on the other hand have high concentration of nutrients and readily available to crops but its use is hampered by its inaccessibility to majority of the farmers due to high cost and infrastructural problems in developing country like Nigeria (Webber, et al., 2001)

There are different types of manure including cow dung, compost, green and farm yard manure etc. Poultry manure had been reported to improve growth and yield of maize (Ezeibekwe et al., 2009) and improves the chemical and biological qualities of the soil which increases crop productivity than chemical fertilizers (Obi and Ebo, 1995). The objective of this research therefore is to determine the growth and yield of sweet corn as influenced by poultry manure in Southern Guinea savanna of Nigeria.

MATERIALS AND METHODS

The trials were conducted in 2010 and 2011 cropping seasons at the teaching and research farm of Ibrahim Badamasi Babangida University, Lapai, latitude $9^0$2'N and longitude $6^0$34'E in the Southern Guinea savanna agroecological zone of Nigeria. The soil was an alfisol with a sandy clay loam surface texture. The pH (H_2O) of the soil was 5.3 (pH meter), 24.4 g kg^{-1} organic carbon (Walkley and Black), 0.40 g kg^{-1} total N (Kjeldahl), 12 mg kg^{-1} P (bray PT) and 0.35 cmol kg^{-1} K (in NH_4OAC). The poultry manure used contained Nitrogen 3.5%, P 1.2% and K 0.25%.

The treatments were two varieties of sweet corn and four rates of poultry manure. The sweet corn varieties were yellow and white while the poultry manure rate were 0, 5, 10 and 15 t ha^{-1}. An inorganic fertilizer, NPK (15:15:15) was

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applied at the rate of 100 Kg N ha^{-1}, 50 kg P_2O_5 ha^{-1} and 50 Kg K_2O ha^{-1} which served as check. Thus it is a factorial experiment fitted in to randomized completed block design (RCBD) and replicated three times. The land was manually ridged at 75 cm wide and 4 m long. Each plot was made up of four ridges on which maize seeds were planted at a spacing of 50 cm within the row at rate four seeds per hole. The seedlings were later thinned to two plants per stand at 2 weeks after planting (WAP). Weeding was done twice, at 3 and 6 WAP manually. The poultry manure was applied in to the soil one week before planting.

The following parameters were strictly measured during the study. They include plant height, number of leaves at 3 and 12 WAP as well as number of cobs. Both fresh and dry weights of cobs as well as grain yield were also taken. The data collected were subjected to analysis of variance and means separated using Duncan Multiple Range Test at 5% level of probability.

RESULTS

Number of Leaves

The number of leaves produced differed significantly among the corn varieties and rates of poultry manure at 12 weeks after planting (WAP) only (Table, 1). The yellow sweet corn variety produced significantly higher number of leaves compared with white variety in the two years (Table, 1). Application of poultry manure at 15 t ha^{-1} supported significantly similar number of leaves compared with application of 0, 5 and 10 t ha^{-1} of poultry manure. Also, the rates of poultry manure application produced number of leaves significantly following the order 10 t ha^{-1} > 5 t ha^{-1} > control in both 2010 and 2011 (Table, 1).

Plant Height

The height of sweet corn among the varieties was not significantly different at 5% probability but differed significantly among the rates of poultry manure applied at 12 WAP in the two years of the trial (Table,1). Poultry manure at 15 t ha^{-1} supported significantly same plant height compared with synthetic fertilizer but significantly higher compared with no fertilizer application and application of 5 and 10 t ha^{-1} of poultry manure in both years (Table 1). In both years, application of 10 t ha^{-1} supported significantly taller plants of sweet corn compared with the control but it is so with 5 t ha^{-1} in 2011 only (Table, 1).

Number of Maize Cobs

White sweet corn produced significantly higher number of cobs compared with yellow variety in the two years (Table, 2). Application of 15 t ha^{-1} of poultry manure supported significantly similar number of cobs compared with the application of synthetic fertilizer. They however supported significantly higher number of cobs compared with 0, 5 and 10 t ha^{-1} application of poultry manure (Table, 2). Also, in 2010 application of 10 t ha^{-1} of poultry manure supported similar number of cobs compared with 5 t ha^{-1} application but was significantly higher compared with no application. The supported for higher number of sweet corn cobs significantly followed the order 10 t ha^{-1} > 5 t ha^{-1} > no fertilizer application in 2011.

Sweet Corn Fresh and Dry Weight

The white sweet corn had significantly higher fresh and dry weight compared with the yellow variety in 2010 and 2011 (Table, 2). The rates of poultry manure in this study supported significantly in the fresh and dry weight of cobs following the order 15 t ha^{-1} of poultry manure = synthetic fertilizer > 10 t ha^{-1} > 5 t ha^{-1} > no fertilizer application in both years.

Grain Yield of Sweet Corn

Also, white sweet corn produces significantly higher grain yield compared with the yellow variety in the two years (Table, 2). The significantly differences among the poultry manure on the yield of sweet corn differed following the order 15 t ha^{-1} = synthetic fertilizer > 5 t ha^{-1} > no application in both years except in 2011 where 5 t ha^{-1} supported significantly similar grain yield when compared with no application (Table, 2).

Table 1: Effects of varieties and rate of poultry manure on number of leaves and plant height of sweet corn at Lapai, 2010 and 2011 cropping season

Treatment	Number of leaves/12 m2				Plant height (cm)			
	3 WAP1		12WAP		3 WAP		12WAP	
	2010	2011	2010	2011	2010	2011	2010	2011
Variety (V)								
White	212.3	227.0	744.3b2	756.0b	30.1	29.8	99.6	97.2
Yellow	244.5	239.0	903.6a	812.1a	30.3	29.7	98.4	98.6
S ±	14.32	13.44	12.77	10.64	0.57	0.31	0.98	0.76
Poultry manure (P)								
0 t ha-1	224.6	228.2	571.3d	564.5d	28.6	29.7	80.1c	72.8d
5 t ha-1	230.3	231.5	692.8c	690.7c	29.0	29.7	86.6bc	85.4c
10 t ha-1	233.2	232.7	793.7b	793.3b	29.4	29.9	92.6b	93.2b
15 t ha-1	237.4	235.3	942.6a	930.3a	29.9	29.8	120.4a	117.5a
I/fertilizer	239.1	237.3	953.3a	941.3a	30.1	29.9	121.6a	120.6a
S ±	9.63	8.44	10.76	11.22	0.47	0.44	2.21	1.97
Interaction								
V x P	NS3	NS	NS	NS	NS	NS	NS	NS

1= WAP; weeks after planting
2= Means followed by same letter(s) within the same column are not significantly different at 5% Probability (DMRT)
3= NS; Not significant at 5% probability (DMRT).

Table 2: Effects of varieties and rate of poultry manure on leaf area and number of cobs at Lapai, 2011

Treatment		Cobs yield t ha-1							
		Number of cobs (t ha-1)		Fresh		Dry		Grain yield t ha-1	
		2010	2011	2010	2011	2010	2011	2010	2011
Sweet corn variety (V)									
White		23.7b1	22.9a	3.5b	3.7a	2.9a	2.9a	1.5a	1.6a
Yellow		20.4b	21.3b	3.1b	3.2b	2.7b	2.6b	1.4b	1.4b
SE ±		0.36	0.12	0.08	0.10	0.04	0.05	0.02	0.03
Poultry manure (P)									
0	t ha-1	11.2c	13.4d	1.6d	2.9d	1.1d	2.2d	0.8d	1.1c
5	t ha-1	16.1b	15.6c	2.5c	3.1c	2.0c	2.4c	1.0c	1.2c
10	t ha-1	16.4b	19.2b	3.6b	3.4b	2.9b	2.8b	1.5b	1.4b
15	t ha-1	32.1a	31.0a	4.2a	4.0a	3.3a	3.2a	2.1a	1.9a
I/fertilizer		32.5a	31.2a	4.3a	4.0a	3.3a	3.3a	2.2a	2.0a
SE ±		0.31	0.42	0.04	0.03	0.05	0.04	0.04	0.04
Interaction									
V x P		NS2	NS	NS	NS	NS	NS	NS	NS

1= Means followed by same letter (s) within the same column is (are) not significantly different at 5% level of probability
2= NS; Not significant at 5% level of probability (DMRT)

DISCUSSION

Despite the fact that yellow sweet corn produced more leaves at 12 WAP compared with white type, the later had higher number of cobs, fresh and dry cobs weight and grain yield compared with yellow type. This might be due to varietal differences among the sweet corn varieties. Isah et al., (2009) and Lagoke and Isah, (2010) had observed differential reaction of maize varieties among maize varieties given the same fertilizer rate. The application of synthetic fertilizer supported similar sweet corn performance viz; plant height, number of leaves produced, number of cobs, fresh and dry weight of cobs and grain yield

comparable to the application of 15 t ha^{-1} of poultry manure in this study. This is an indication that sweet corn may require up to 15 t ha^{-1} of poultry manure for good performance. Termer and Warman ,(1994) earlier reported that maize was found to respond significantly to higher yields with higher doses of fertilizer. However no application of fertilizer supported the shortest plant, lower number of leaves, number of cobs, cob's fresh and dry weight and grain yield. This is an indication that the crop requires fertilizer for good performance. Hussain et al., (2002) reported that under no fertilizer application in very poor soil, zero yields of sweet corn might result.

CONCLUSION

This study showed that poultry manure is valuable fertilizer whose application needs to be encouraged for both sustainable soil fertility maintenance and optimum plant growth. An application of poultry manure at 15 t ha^{-1} is comparable to inorganic fertilizer and significantly better than control.

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