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Effects of Rates of Cow Dung and Poultry Manure On Maize Reaction To *Striga hermonthica* Parasitism At Lapai In The Southern Guinea Savanna of Nigeria

Isah, K.M.[1], Kumar, N.[1], Abdulmaliq, S,Y.[1],and Abubakar, A.L.[1]

[1]Department of Crop Production, Faculty of Agriculture, Ibrahim Badamasi Babangida University, Lapai, Niger State, Nigeria.

Abstract

The trials were conducted at crop farm of Ibrahim Badamasi Babangida (IBBU) Lapai(09°-02[1]N; 06° 34[1]E) in 2013 and 2014 cropping seasons. The objective was to evaluate the effect of the rates of cow dung and poultry manure on maize reaction to Striga hermonthica parasitism at lapai in the southern guinea savannah of Nigeria. The experiments were laid out in a Randomized Complete Block Design (RCBD). The treatments were 5, 10 and 15 tonnes each of poultry manure and cow dung as well as no application and synthetic fertilizer at 120kgN-60kg $P_2$05-60Kg $K_2$0 /ha . Each plot consisted of 4 ridges at 75cm wide and 4m long. All the treatments were replicated 4 times. The results revealed that the application of N P K fertilizer, 10 and 15 tones/ha of poultry manure consistently supported taller plants, lower reaction to Striga parasitism, higher Striga emergence which resulted in the production of higher maize grain yield.

KEY WORDS: *Striga hermonthica, Maize, poultry manure, cow dung*

Introduction

There are different types of manure including cow dung, compost green and farm yard manure and soon poultry manure had been reported to improved growth and yield of maize (Ayoola and Makkinde, 2007). The quantity of solid organic matter depend 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 solid fertility status and it is also environmental soil fertility status and it is also environmental friendly. This is because nutrients contained in organic manure are released more slowly and are stored for a longer time in the soil there by ensuring a long residual effect (Sharma and Mittra, 1991)

S*triga* was recognised to be a major problem in soghum and millet field in Africa and less in maize fields since limited areas was previously devoted to the later crop in the savanna. However, the rapid increase in maize cultivation has increased the problem of parasitic weed, *Striga* on the crop in the area (Lagoke *et al*., 1999). Under heavy infestation, maize is more vulnerable to *Striga* parasitism than sorghum and millet with high yield losses caused up to between 10- 100 % cereal loss depending on the incidence, level of infestation and distribution of the parasitic weed, the crop variety, location and cultural practice in use (Lagoke *et al*., 2010). Mannsfield (1982) reported that when organic manure sunnhemp was grown for one and two years followed by a maize crop the efficacy in control of weed in the subsequent maize crops was satisfactory. Plots under sunnhemp for two years gave highest yields followed by plots under one year's sunnhemp cropping compared to half recommended rates of FYM and inorganic fertilizers (30 kg N + 5 t ha-1 FYM/compost) and farmers' practice.

The traditional way of supplying extra nutrient to the crop is by applying the waste from plants and animals which are refers to as manure (organic fertilizer) and still much in used is the application of chemical fertilizer (inorganic fertilizer) have over ride the organic fertilizer because of some considerable advantages. Although dried animal dung from domestic livestocks such as cattle, goat, and poultry is a most valuable soil enriched (Komolafe *et al*.,

2008). It is not only feed the soil being a nitrogenous substance but it also improves the texture of the soil. It is obtained by collecting the accumulation of animal dung and litter from the sheds where the animals are kept and allowing it to dry out in the open.

Steve and George (2001) reported that there is not sound evidence whether organic and inorganic fertilizer has any effect on the quality of the crop but influence on the plant nutrients available at appropriate concentration at a given time of growth. Walz. (2004) also explained that application of organic manure increase yield of crop immensely on cereal

There are many forms of fertilizer which farmers used without appropriate recommendation as to the type or rates. Such in appropriate practices tend to create nutrient in balance in the solid, which negatively affects productivity of the soil (Anonymous, 1995). Aliyu (2003) and Amanullahi *et al.* (2007) reported that between 5-15 tones of organic manure is required for maize production in any part of savannah agro-ecological zones. Therefore, there is need to find the out appropriate and recommend rates of organic fertilizer that would be used in *Striga hermonthica* on infested area by maize (*Zea mays L*)

Materials and Methods

The trials were conducted at Ibrahim Badamasi Babangida University crop research and teaching farm, Lapai during 2013 and 2014 cropping seasons. It lies on latitude 09^0 02'N and longitude 06^0 34'E of the equator. The area is located at the Southern Guinea Savannah agro ecological zone of Nigeria. The experiments were conducted under natural *Striga* infested fields.

The experimental design used was a randomized complete block design (RCBD). The treatments were 5, 10 and 15 tonnes each of poultry manure and cow dung as well as no application and synthetic fertilizer at 120kgN-60kg $P_2$05-60Kg $K_2$0 /ha . Each plot consisted of 4 ridges at 75cm wide and 4m long and replicated 4 times.

The plot was ploughed, harrowed and ridged at 75cm wide using tractor mounted implements. The variety that was local 'Mokwa dzurugi' four seeds were per hole and thinned down to 2 per/stand at two (2) Weeks After Planting (WAP). The intra row spacing of 50cm was maintained.

Weeding was done twice at 3 and 6 WAP. It was done manually using local hoe there after other weeds rather than *Striga* were hand pulled. 5, 10 and 15 tonnes/ha of poultry manure and cow dung was applied to the respective plots a week before ridging. Synthetic fertilizer at 100kgN-50kg $P_2$05 – 50kg $k_2$0/ha was applied to the respective plots. The application of synthetic fertilizer was split applied, half dose of N and full doses of P and K was applied at 3 WAP using NPK 15-15-15 while the remaining N was applied at 6 WAP using urea.

Parameters measured includes plant height 6 and 12 WAP, *Striga* shoot count and maize reaction score at 9 and 12 WAP. Grain yield at harvest and expressed in tones/ha.

The data collected were subjected to analysis of variance (ANOVA) and means partitioned using Duncan's Multiple Range Test (DMRT) at 5% probability.

Results and Discussion

The height of maize plants were not significantly different among the types of fertilizer evaluated in this study at 6 and 12 WAP at 5% probability (Table 1). Synthetic fertilizer (N P K) at 6 WAP as well as 15 and 10 tonnes of poultry manure application at 12 WAP supported significantly taller plants of maize compared with all other types of fertilizer applied in the two years of the study. No application of fertilizer and application of 5 tones/ha of cow dung at 6 WAP and only zero application of fertilizer at 12 WAP supported shortest plants in the two years (Table 2).

The reaction of maize to *Striga hermonthica* among types of fertilizer are significantly different at 5% probability at 9 and 12 WAP in 2013 and 2014 (Table 2). Application of

Table 1: Maize height (cm) as influenced by organic manure under *Striga hermonthica* at Lapai, 2013 and 2014 cropping seasons.

TREATMENT	Plant height (cm)			
	2013		2014	
	6 WAP[1]	12 WAP	6 WAP	12 WAP
Poultry manure at 5 tons/ha	61.48c[1]	140.26b	66.31c	142.57b
Poultry manure at 10 tons/ha	79.91b	154.14a	80.86b	156.42a
	80.11b	156.31a	80.75b	156.02a
Poultry manure at 15 tons/ha				
Cow dung at 5 tons/ha	58.67d	99.84e	60.90d	118.42e
Cow dung at 10 tons/ha	78.59b	118.53d	79.60b	121.97d
Cow dung at 15 tones /ha	78.73b	131.95c	79.30b	133.35c
N P K	87.26a	155.78a	88.20a	156.70a
Zero fertilizer	58.14d	94.78f	60.81d	91.90f
SE±	0.966	0.919	0.937	0.904

1-*WAP – Weeks After Planting*

1- Means followed by the same letter(s) within a column are not significantly different at 5% level of probability (DMRT)

Table 2: Maize reaction score as influenced by organic manure under *Striga hermonthica* at Lapai, 2013 and 2014 cropping season

Treatments	Maize reaction score[1]			
	2013		2014	
	9WAP	12WAP	9WAP	12WAP
Poultry manure at 5 tones/ha	3.25c[3]	5.05c	3.35c	4.25c
Poultry manure at 10 tones/ha	1.75e	1.90e	1.45e	2.00e
Poultry manure at 15 tones/ha	1.00e	1.70e	1.33e	2.00e
Cow dung at 5 tones/ha	4.25b	6.35b	4.25b	5.30b
cow dung at 10 tones/ha	2.75d	3.31d	2.50d	3.25d
Cow dung at 15 tones/ha	1.25e	2.00e	1.00e	2.00e
N P K	1.25e	1.70e	1.00e	2.00e
Zero fertilizer	5.00a	7.75a	5.45a	6.50a
SE±	0.301	0.403	0.201	0.310

1-Using scale 1 to 9, where 1indicated no chlorosis, no blotching, no leaf scorching and normal plant growth while 9 was assigned to complete leaf scorching causing premature death of host plant and no ear formation.

2-WAP – Weeks After Planting

3- Means followed by the same letter(s) within a column are not significantly different at 5% level of probability (DMRT).

Table 3: *Striga* shoot count as influenced by organic manure under *Striga hermonthica* at Lapai 2013 and 2014 cropping seasons

Treatments	*Striga* shoot count/12m^2			
	2013		2014	
	9WAP	12WAP	9WAP	12WAP
Poultry manure at 5 tones/ha	1.50d	3.59d	3.01d	3.25d
Poultry manure at 10 tones/ha	0.75de	1.53e	0.61e	1.75ef
Poultry manure at 15 tones/ha	0.25e	1.40e	0.22e	0.75f
Cow dung at 5 tones/ha	4.50b	12.01b	4.95b	6.75c
cow dung at 10 tones/ha	2.25c	9.85c	4.01c	8.00b
Cow dung at 15 tones/ha	1.50d	3.55d	3.10d	2.50de
N P K	1.45d	3.45d	2.91d	2.50de
Zero fertilizer	6.74a	13.47a	5.70a	10.75a
SE±	0.271	0.312	0.213	0.342

1-WAP – Weeks After Planting

2- Means followed by the same letter(s) within a column are not significantly different at 5% level of probability (DMRT).

Table 4: Grain yield as influenced by organic manure at harvest under *Striga hermonthica* at Lapai 2013 and 2014 cropping seasons

Treatment	Grain yield at harvest (Kg/ha)	
	2013	2014
Poultry manure at 5 tones/ha	2661b[1]	2330b
Poultry manure at 10 tones/ha	3013a	2768a
Poultry manure at 15 tones/ha	3011a	2994a
Cow dung at 5 tones/ha	1615d	1321d
Cow dung at 10 tones/ha	2320c	1947c
Cow dung at 15 tones/ha	2360c	1840c
N P K	3701a	2906a
Zero fertilizer	1092e	574e
SE±	100.31	99.72

1-- Means followed by the same letter(s) within a column are not significantly different at 5% level of probability (DMRT).

fertilizer causes significant depression following the order zero fertilizer > cow dung at 5t > poultry manure at 5t > cow dung at 10t > poultry manure at 10t = poultry manure at 15t = cow dung at 15t = application of NPK in the two years

Striga hermonthica counts among types of fertilizer are significantly different at 5% probability at 9 and 12 WAP in 2013 and 2014 (Table 3). No fertilizer application supported significantly higher number of *Striga* compared with other treatments. Application of 15 tones/ha of poultry manure supported the least number of *Striga* emergence in both years.

Maize grain yield followed significantly the order poultry manure at 10 = 15 = N P K > 5 tones/ha > cow dung 10 = 15 > 5 tones/ha > zero fertilizer application (Table 4).

Application of N P K fertilizer and application of 10 and 15 tones/ha of poultry manure consistently supported taller plants, lower reaction to *Striga* parasitism, higher *Striga*

emergence which resulted in the production of higher maize grain yield. This is in line with the findings of Anonymouns (2002) that maize crop producing 5 to 6 tonnes/ha of grain was estimated to remove 100 to 150 Kg N, 18 to 20 KgP and 83 to125 KgK/ha. N P K fertilizer rate of 120-26-50 NPK Kg/ha significantly enhance plant height, days to 5o% tasselling, 1000-grain yield of quality protein maize (Ananymous, 2003). Also Termer and Warman, (1994) had earlier reported that maize was found to respond significantly to higher yields with10 and 15t/ha of poultry manure and NPK fertilizer. However, no application of fertilizer supported the shortest plant, higher reaction to *Striga* parasitism, lower *Striga* emergence which resulted in the production of lower maize grain yield. This is an indication that maize requires fertilizer for growth. Hussaini *et al*., (2002), reported that under no fertilizer application in a very poor soils zero yields of maize might resulted. Application of N P K fertilizer, application of 10 and 15 tones/ha of poultry manure was the best, based on this study and hence be used *Striga* endemic areas.

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