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RESEARCH ARTICLE

Effects of Poultry Manure Fertilization and Weed Control Method on Leaf Chlorophyll and Other Indices of Three Maize (*Zea mays*) Cultivars in Kano Sudan Savanna, Nigeria

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ABSTRACT

The present study was conducted in 2016 and 2017 rainy seasons to determine the responses of poultry manure (PM) on chlorophyll and other indicates in three maize cultivars. The experiment consists of SAMMAZ 15, 21, and 35 in the main plot, PM (0, 4, 8 and NPK) in sub-plot and weed control method in sub-sub plots. Results showed that effective weed control method and PM/NPK significantly increased all indices. The Interaction of variety and poultry manure indicate that SAMMAZ 21 and 35 had the highest value of higher chlorophyll, dry matter and grain yield using NPK or 8 tha^{-1} PM. Thus, it can be suggested that planting SAMMAZ 21 or 35 with 8 tha^{-1}PM or NPK using Metolachlor + Terbuthylazine + Mesotrione at 2.5 kg a.i ha^{-1} *fb* Bentazone at 2.5 kg a.i. ha^{-1} improve maize production.

Keywords: Chlorophyll content; maize cultivars; weed control; Grain yield; Poultry manure

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INTRODUCTION

Maize is a widely spread food crop and widely cultivated tropical countries (Abubakar et al.,2000 and FAO, 2011a). Increasing maize production is one of the world's top priorities to deal with rising human and animal populations. Maize is a versatile crop that supplies sustenance for humans, cattle, and fowl. The maize grain is strong in nutrients, with 68% carbohydrate (Abubakar et al., 2000; FAO, 2011b).

The yield was reduced due to weed infection vary greatly globally based on weed species, population density, crop competitiveness, and weed infestation length (Mahadiet al., 2012). According to Khan et al. (2003), weed competition is more damaging to maize during the early growth period (3–4 WAS) when nodal roots and root hairs are developing. Weeding consumes about 50% of farm labour time, preventing children from attending school and women from attending to household duties and small business. Inadequate and unsuitable crop residue management strategies lead to increased soil degradation, decreased water and nutrient retention capacity, and decreased maize production.

Insufficient quantities of fertilisers used due to lack of availability has resulted in low crop yields. NH3 volatilization, denitrification, and NO3 leaching processes lose 30 to 70% of nitrogen provided to maize crops, needing several fertiliser treatments to achieve high yield. Numerous applications of fertilisers are neither inexpensive nor safe for farmers, and are certainly not beneficial to the soil or the environment. Using effective management strategies can maximise maize yields. One of the successful techniques is to grow new high yielding cultivars using the best cultural practises such as nutrient treatment. Variety, nitrogen fertiliser, and weed management methods all influence maize output.

Nitrogen is a vital component it has photosynthetic activity and crop productivity. Cathcart et al. (2003) state that its lack is one of the key yield-limiting variables in maize cultivation. The relative concentration of chlorophyll indicates the crop's N status and yield level. Blackmer, et al (1995). Leaf area index affects solar radiation absorption and usage by maize crop canopies, affecting yield. Varieties, nutrition, and weed management methods all affect leaf area index.

MATERIALS AND METHODS

The experiments were combined in a split–split plot and sub-plots were assigned to poultry manure, and sub-sub plots to weed control methods. There were six rows of three rows each in the gross plot and two rows each in the net plot. A 1.5 m and 0.5 m alley was left between the main plots and subplots. The ground was ploughed and harrowed twice a year. The field was then levelled, ridged, and plotted.

Prior to sowing, maize seeds were dressed with Metalaxyl M 20%, Difenoconazole 2%, and

Thiametoxam 20% at a rate of 10 g/3 kg of seed. 2 WAS before sowing, poultry manure was added to the soil. Sowing was done with two seeds per hole at 75 cm X 25 cm spacing. 2 WAS were thinned leaving one plant par stand. During layout, a base dose of 60 kg ha-1 N, P2O5 and K2O (15:15:15) was applied to the soil. The remaining divided dosage of 60kg N ha-1 (46%) was applied at 5WAS. Weeds were controlled by hand hoeing the affected plots at 3 and 6 WAS. Each net plot's crop was manually picked by cutting at the base near to the ground and drying in the sun. The seeds were then winnowed, cleaned, and weighed. Table 2 shows the physical and chemical parameters of chicken manure utilised in BUK, Dangora, and Doka in 2016 and 2017.

RESULTS AND DISCUSSION

Plant dry weight at BUK and Dangora in 2016, Days to 50% tasselling at BUK and Dangora in 2017, 100-kernel weight across all seasons and locations except DOKA 2017 and grain yield at Dangora 2016 all differed substantially (Table 7).

Table 1. Physiochemical properties of the soil at BUK, Dangora and Doka locations in 2016 and 2017 rainy season

Soil Properties	BUK 2016	Dangora 2013	BUK 2017	Dangora 2017
Physical properties (g kg^{-1})				
Sand	790	620	820	630
Clay	60	180	80	190
Silt	150	200	100	180
Textural Class	Sandy loam	Sandy-clay-loam	Sandy loam	Sandy-clay-loam
Chemical properties of soil				
pH (H_2O)	6.07	5.60	4.89	5.40
Organic Carbon (g kg^{-1})	0.44	2.10	0.23	2.98
Total Nitrogen (g kg^{-1})	0.64	0.80	0.08	1.40
Available P (mg kg^{-1})	14.10	16.70	13.34	15.30
Exchangeable base (cmol (+) kg^{-1})				
Ca	4.54	0.40	2.67	0.36
Mg	0.65	0.41	0.59	0.42
K	0.31	0.22	0.32	0.20
Na	0.32	0.61	0.43	0.70
CEC	7.31	8.70	6.27	9.30

Table 2. Physiochemical properties of poultry manure used at BUK, Dangora and Doka in 2016 and 2017 rainy season

Poultry Manure Properties	2016	2017
Total Nitrogen (g kg^{-1})	24.7	27.3
Available P (mg kg^{-1})	1.65	2.13
Organic Carbon % (g kg^{-1})	18.4	24.9
Ca	1.13	1.58
Mg	0.86	1.41
Na	0.11	1.00

K	0.29	1.01

The data also showed that SAMMAZ 21 and 35 had the greatest mean values of leaf chlorophyll, with strong significant differences from the other types. Mehasen and Alfageh obtained similar results (2004). Moreover, SAMMAZ 21 and 35 variations surpassed SAMMAZ 15 types in leaf chlorophyll (nmol cm-1) and plant dry weight (g) (g plot-1). There were no significant differences in maximum leaf chlorophyll (48.7 SPAD-units with SAMMAZ 21 and 35) or minimum leaf chlorophyll (15.9 SPAD-units with SAMMAZ 15). Also, SAMMAZ 21 and 35 have the largest (367 g/plot) and minimum (50.3 g/plot) plant dry weight.

The SAMMAZ 21 and 35 achieved maximum yields of 3.2 and 3.1 t ha-1 for the aforesaid cultivars in both seasons and locations (Table 7). The study found that increasing LAI resulted in larger plant dry weight and increased assimilate translocation for higher grain yields. The crop injury score was not significant across all sampling stages, locations, and study years.

The recommended rate of NPK fertiliser and 8 t ha-1 poultry manure had a significant effect on leaf chlorophyll content, plant aspects, plant dry weight, days to 50&tasselling, 100-kernel weight and grain yield. The greatest leaf chlorophyll concentration (64.6 SPAD-units) and minimum leaf chlorophyll content (10.7 SPAD-units) were observed in both sampling stages and control plot locations. Application of poultry manure may have improved soil fertility, increasing nutrient availability for improved plant growth character, and hence boosted crop grain output. Varvel et (1997), Added that N fertiliser increased SPAD. Throughout the growing season, Unagwu (2014) found that soil media supplemented with complementing organic or inorganic fertilisers generated taller, greener, higher aspect, and heavier plants.

The NPK fertiliser and or 8 tha-1 poultry manure rates must have provided a faster release of required nutrients, especially nitrogen. The results showed the importance of N in plant life and its role in enhancing grain yield. These findings showed that N is required for cell division, elongation, root growth, and dry matter synthesis in maize plants. Studies (Ogundareet al., 2012; Ojeniyiet al., 2013) showed that organic fertilisers improved soil physical and chemical characteristics, nutrient uptake, and porosity (Ogundareet al., 2012).

Apart from providing major and micronutrients, organic fertilisers, according to Mahadi et al. (2012), promote crop growth and retain soil organic matter. The results showed that zero poultry manure (0 t ha-1) resulted in higher wounded plants; this indicated non-availability of nutrients in those plots and higher competition by weeds.

Lant dry weight days to 50% sampling 100- kernel weight: and grain yield were significantly different across all sampling stages, localities, and years. Plant dry weight, plant aspect, 100-grain weight, and grain yield were all influenced. Bentazone at 2.5 kg a.i ha-1, two hoes weeding and Metolachlor + Terbuthylazine + Mesotrione at 2.5 kg a.i ha-1, resulting in higher growth and yield components throughout both sites, seasons, and years of study. The results matched those of Chikoyeet al. (2009), who found that suppressing weeds with Paraquat plus Extavon and Ametryn increased maize dry weight and increased maize growth.

Using Metolachlor + Terbuthylazine + Mesotrione at 2.5 kg a.i. ha-1 fb Bentazone at 2.5 kg a.i. ha-1 and two hoe weeding at 3 and 6WAS reduced days to 50% tasselling. The weedy check (control) had statistically higher crop injury throughout all sampling periods and locations than the other treatments. This conclusion matched Ishaya et al's findings that higher densities of weed pose major obstacles to agricultural plant growth and development (2008).

Two hoe weeding at 3 and 6 WAS gave the highest chlorophyll SPAD-units and heavier plants that were statistically the same when applying NPK fertiliser with two hoe weeding at 3 and 6 WAS (Table 7). Perhaps the enhanced metabolism and meristematic activity of N in poultry dung or NPK fertiliser improved these features. In a less weedy environment, crops can grow a better canopy with more leaves per plant (Lagoke et al., 1991).

Table 8 shows the effect of variety and poultry manure on grain yield at Dangora 2016. P0.01), and SAMMAZ 21 with 8 t ha-1 poultry manure led with a statistically higher grain production than SAMMAZ 21 and 35 combined with two-hoe weeding at 3 and 6 WAS. SAMMAZ 15 plus no poultry manure (control plot) resulted in lower grain output than other feasible combinations.

This may be owing to the enhanced metabolism and meristematic activity of N in poultry manure. El-Gizawy (2009) observed that the yield of all three maize cultivars examined increased with increasing N rate, but that the Korduna cultivar produced significantly greater yield at all three N levels than the other types tested (Table 8). Effects of chicken manure and weed management on grain yield in Dangora in 2017 (Table 9).

Table 3. Effect of weed control methods poultry manure and varieties on leaf chlorophyll of at BUK, Dangora and Doka locations, 2016 and 2017 rainy seasons

Treatment	Chlorophyll (nmol cm^{-1})											
	2016 (WAS)						2017 (WAS)					
	BUK			DGR			DOKA			DGA		
	6	8	10	6	8	10	6	8	10	6	8	10
Poultry Manure (PM) (t ha^{-1})												
0	11.1^{c}	20.3^{c}	10.7^{c}	13.1^{c}	22.7^{c}	13.9^{c}	13.5^{c}	14.3^{c}	16.8^{c}	20.3^{c}	24.7^{c}	23.3c
4	18.3^{b}	26.5^{b}	18.5^{b}	20.1^{b}	28.8^{b}	19.6^{b}	21.9^{a}	26.7^{b}	33.6^{b}	37.8^{b}	47.1^{b}	54.3b
8	24.5^{a}	32.6^{a}	26.3^{a}	23.7^{a}	29.2^{b}	22.4^{ab}	26.2^{a}	33.1^{a}	41.7^{a}	43.8^{a}	55.6a	63.9a
NPK	24.3^{a}	32.8^{a}	28.2^{a}	26.0^{a}	36.5^{a}	25.9^{a}	25.8^{ab}	31.1^{a}	40.2^{a}	44.0^{a}	55.7a	64.6a
SE ±	1.10	1.61	1.56	1.15	1.572	1.338	1.209	1.028	1.374	1.154	1.211	1.158
Weed Control Method (WCM)												
T_1	17.2^{b}	26.8^{c}	15.9^{b}	20.2^{b}	28.7^{b}	17.5^{d}	21.1^{c}	25.2^{c}	29.8^{c}	34.5^{b}	44.1^{c}	50.8^{c}
T_2	17.4^{b}	24.3^{c}	17.7^{b}	19.8^{b}	27.4^{b}	18.6^{d}	21.5^{c}	25.5^{c}	33.4^{b}	36.0^{b}	44.6^{c}	51.0^{c}
T_3	23.8^{a}	33.9^{ab}	25.5^{a}	23.7^{a}	35.6^{a}	26.2^{b}	24.5^{b}	30.5^{b}	39.8^{a}	43.7^{a}	52.7^{b}	59.6^{b}
T_4	24.1^{a}	37.2^{a}	28.6^{a}	25.1^{a}	33.2^{a}	33.0^{a}	29.7^{a}	35.6^{a}	42.5^{a}	45.8^{a}	57.2^{a}	64.7^{a}
T_5	26.6^{a}	32.7^{b}	2 9.8^{a}	25.2^{a}	35.8^{a}	22.3^{c}	26.1^{b}	31.8^{b}	42.8^{a}	45.1^{a}	58.1^{a}	65.9^{a}
T_6	8.3^{c}	13.3^{d}	7.9^{c}	10.1^{c}	15.1^{c}	5.09^{e}	8.0^{d}	9.1^{d}	10.1^{d}	13.8^{c}	17.8^{d}	17.0^{d}
SE ±	0.99	1.24	1.37	0.20	1.45	1.07	0.95	0.95	1.14	1.25	1.42	1.63
Variety (V)												
SAMMAZ 15	17.6	27.1	15.9b	21.3	32.3	19.8	23.0	26.6	31.3b	34.9	43.1b	49.2
SAMMAZ 21	21.6	28.9	22.0a	21.5	27.6	20.6	20.4	25.6	30.5b	35.8	45.4ab	51.2
SAMMAZ 35	19.5	28.9	24.8a	19.4	27.9	20.9	22.1	26.7	37.3a	38.7	48.7a	54.0
SE ±	1.37	1.27	1.18	0.87	1.97	2.08	1.41	1.88	1.14	0.81	1.06	2.12

Table 4. Effect of weed control method, poultry manure and varieties on plant aspect of maize at BUK, Dangora and Doka, 2016 and 2017 rainy seasons.

Treatment	Plant Aspect (Scale 1-9)											
	BUK (2016) (WAS)			DGR (2016) (WAS)			DOKA (2017) (WAS)			DGR (2017) (WAS)		
	6	8	10	6	8	10	6	8	10	6	8	10
Poultry Manure (PM) (t ha^{-1})												
0	3.6^{c}	4.5^{d}	4.6^{c}	3.1^{b}	3.2^{b}	3.7^{b}	3.3^{c}	4.3^{b}	4.1^{c}	3.7^{b}	2.6^{c}	3.1^{c}
4	2.8^{b}	3.5^{b}	3.9^{b}	2.9^{b}	2.7^{a}	3.4^{bc}	2.5^{b}	3.4^{a}	3.3^{b}	2.9^{a}	1.7^{b}	2.3^{b}
8	2.2^{a}	3.1^{a}	3.2^{a}	2.5^{a}	2.3^{a}	3.1^{a}	2.1^{a}	3.1^{a}	2.6^{a}	2.6^{a}	1.3^{a}	2.0^{ab}
NPK	3.0^{b}	4.0^{c}	4.5^{c}	3.0^{b}	2.5^{a}	3.4^{b}	2.6^{b}	3.1^{a}	2.9^{a}	2.7^{a}	1.6^{ab}	1.9^{a}
SE ±	0.11	0.11	0.10	0.07	0.13	0.09	0.10	0.13	0.11	0.10	0.09	0.13
Weed Control Method (WCM)												
T_1	3.0^{c}	4.0^{d}	4.3^{c}	2.8^{b}	2.9^{c}	3.4^{b}	2.8^{c}	3.5^{b}	3.3^{c}	3.2^{c}	1.9^{b}	2.6^{c}
T_2	2.9^{bc}	3.8^{c}	4.4^{c}	2.8^{b}	2.8^{c}	3.4^{b}	2.8^{c}	3.5^{b}	3.2^{bc}	3.2^{c}	1.9^{b}	2.5^{c}
T_3	2.6^{b}	3.2^{b}	3.4^{b}	2.3^{a}	2.5^{b}	3.2^{b}	2.5^{b}	3.1^{b}	3.0^{ab}	2.8^{b}	1.5^{a}	2.0^{b}
T_4	2.2^{a}	2.7^{a}	2.8^{a}	2.2^{a}	2.0^{a}	2.7^{a}	2.1^{a}	2.8^{a}	2.7^{a}	2.3^{a}	1.5^{a}	1.7^{a}
T_5	3.0^{c}	4.2^{d}	4.5^{cd}	3.4^{c}	2.0^{a}	3.0^{a}	2.4^{b}	2.9^{a}	2.7^{a}	2.4^{a}	1.3^{a}	1.6^{a}
T_6	3.4^{d}	4.6^{e}	4.7^{d}	3.9^{d}	3.7^{d}	4.5^{c}	3.3^{d}	5.0^{c}	4.4^{d}	3.8^{d}	2.7^{c}	3.6^{d}
SE ±	0.10	0.09	0.09	0.07	0.08	0.08	0.08	0.10	0.11	0.09	0.07	0.10
Variety (V)												
SAMMAZ 15	3.0	3.8	4.1	3.0b	2.7	3.3	2.7	3.5	3.3	3.0	1.9	2.5
SAMMAZ 21	2.9	3.9	4.1	2.6a	2.6	3.5	2.6	3.7	3.1	3.0	1.8	2.4
SAMMAZ 35	2.7	3.6	3.9	2.2b	2.6	3.3	2.5	3.1	3.2	2.8	1.7	2.1
SE ±	0.08	0.13	0.09	0.05	0.08	0.07	0.26	0.24	0.17	0.14	0.14	0.13

Table 5. Effect of weed control method, poultry manure and varieties on crop injury scores of maize at BUK, Dangora and location, 2016 and 2017 rainy seasons

Treatment	Crop Injury Scores (Scale 1-9)											
	BUK (2016) WAS			DGR (2016) WAS			DOKA (2017) WAS			DGR (2017) WAS		
	6	8	10	6	8	10	6	8	10	6	8	10
Poultry Manure (PM) (t ha^{-1})												
0	3.5^{a}	5.0^{a}	5.3^{a}	3.6^{a}	3.8^{a}	4.1^{a}	3.3^{a}	5.0^{a}	5.4^{a}	2.9^{a}	2.7^{a}	3.9^{a}
4	2.8^{abc}	3.2^{b}	4.1^{c}	3.0^{b}	3.3^{b}	3.4^{b}	2.6^{b}	4.1^{b}	4.6^{b}	1.8^{b}	2.3^{b}	3.1^{b}
8	2.9^{ab}	3.6^{ab}	3.6^{c}	2.9^{b}	3.1^{bc}	2.8^{c}	2.6^{b}	3.8^{b}	3.9^{c}	1.9^{b}	2.1^{bc}	2.8^{b}
NPK (120:60:60)	2.1^{b}	2.5^{c}	4.6^{b}	2.4^{c}	2.6^{c}	3.3^{b}	2.1^{c}	3.9^{b}	4.6^{b}	2.0^{b}	1.9^{c}	2.8^{b}
SE ±	0.22	0.20	0.14	0.14	0.17	0.12	0.14	0.10	0.14	0.09	0.10	0.13
Weed Control Method (WCM)												
T_1	2.6^{bc}	3.1^{c}	4.3^{c}	3.5^{ab}	3.6^{ab}	3.6^{b}	2.8^{b}	4.3^{b}	4.5^{b}	2.4^{b}	2.3^{b}	3.4^{b}
T_2	2.9^{b}	3.4^{bc}	4.3^{c}	3.0^{bc}	3.4^{ab}	3.4^{bc}	2.8^{b}	4.1^{b}	4.5^{b}	2.3^{b}	2.2^{b}	3.4^{b}
T_3	2.6^{bc}	3.2^{c}	3.3^{d}	2.6^{cd}	2.8^{c}	2.8^{d}	2.4^{c}	3.6^{b}	3.8^{c}	2.0^{c}	2.0^{b}	2.9^{c}
T_4	2.0^{d}	2.4^{d}	2.7^{e}	2.2^{d}	2.3^{d}	2.1^{e}	1.9^{d}	3.2^{d}	3.5^{c}	1.5^{c}	2.0^{b}	2.5^{c}
T_5	3.1^{b}	3.7^{b}	5.3^{b}	2.9^{bc}	3.2^{bc}	3.2^{c}	2.4^{c}	4.0^{b}	4.7^{b}	1.4^{d}	2.2^{b}	2.4^{d}
T_6	3.7^{a}	4.1^{a}	6.5^{a}	3.7^{a}	3.9^{a}	5.5^{a}	3.6^{a}	5.7^{a}	6.9^{a}	3.2^{a}	2.8^{a}	4.3^{a}
SE ±	0.17	0.13	0.14	0.17	0.17	0.12	0.11	0.11	0.13	0.08	0.10	0.09
Variety (V)												
SAMMAZ 15	2.9	3.4	4.6	3.3	3.3	3.5	2.7	4.2	4.8	2.1	2.4	3.3
SAMMAZ 21	2.8	3.4	4.4	2.9	3.2	3.4	2.8	4.4	4.8	2.3	2.1	3.0
SAMMAZ 35	3.4	2.8	3.1	4.0	2.8	3.1	2.4	4.0	4.3	2.1	2.3	3.1
SE ±	0.07	0.27	0.17	0.10	0.09	0.14	0.14	0.07	0.16	0.14	0.22	0.08

Table 6. Effect of Poultry manure and weed control methods of maize varieties, on yield traits

Treatment	Plant Dry Weight (g/plot)				Days to 50%Tasselling				100-Kernel Weight (g/plot)				Grain Yield (t ha^{-1})			
	BUK	DGR	DOKA	DGR	BUK	DGR	DOKA	DGR	BUK	DGR	DOKA	DGR	BUK	DGR	DOKA	DGR
	2016		2017		2016		2017		2016		2017		2016		2017	
Poultry Manure (PM) (t ha^{-1})																
0	44.1^{b}	76.9^{c}	64.8^{b}	214^{b}	66.9	56.8b	60.2	64.4	19.0^{b}	17.3^{c}	14.4^{b}	21.5^{b}	0.9^{c}	1.3^{c}	0.8^{c}	1.9^{c}
4	63.1^{a}	95.6^{b}	108^{b}	384^{a}	65.8	51.4a	58.4	62.4	22.9^{a}	22.5^{b}	19.0^{a}	24.7^{a}	1.8^{b}	2.0^{b}	1.3^{b}	2.9^{b}
8	72.6^{a}	115^{a}	127^{a}	413^{a}	65.5	51.0a	59.4	61.7	23.1^{a}	22.9^{b}	19.6^{a}	26.7^{a}	2.1^{a}	2.2^{a}	1.6^{a}	3.4^{a}
NPK (120:60:60)	65.4^{a}	106^{ab}	129^{a}	395^{a}	67.6	51.6a	58.1	62.7	23.4^{a}	24.3^{a}	19.9^{a}	26.7^{a}	2.1^{a}	2.2^{a}	1.6^{a}	3.5^{a}
SE ±	3.04	0.89	7.33	11.03	0.68	0.99	1.01	0.82	0.360	0.45	0.73	0.70	0.05	0.07	0.07	0.09
Weed Control Method (WCM)																
T_1	55.7^{c}	84.9^{c}	94.8^{c}	337^{b}	67.8^{b}	54.2^{c}	60.0^{b}	63.5^{b}	22.2^{b}	21.4^{b}	18.2^{b}	24.3^{c}	1.5^{b}	1.8^{c}	1.2^{b}	2.9^{c}
T_2	59.3^{c}	90.1^{c}	98.5^{c}	353^{b}	66.2^{ab}	52.7^{bc}	59.1^{b}	62.9^{b}	22.3^{b}	22.4^{ab}	18.2^{b}	24.9^{c}	1.6^{b}	1.8^{c}	1.2^{b}	2.9^{c}
T_3	66.9^{b}	104^{b}	116^{b}	409^{a}	66.8^{ab}	52.8^{bc}	59.2^{b}	62.3^{b}	23.4^{ab}	21.2^{b}	19.2^{ab}	26.1^{b}	2.0^{a}	2.2^{b}	1.6^{a}	3.3^{b}
T_4	87.4^{a}	129^{a}	149^{a}	409^{a}	65.0^{a}	49.8^{a}	56.0^{a}	59.7^{a}	24.0^{ab}	23.0^{a}	20.0^{a}	26.3^{b}	2.1^{a}	2.3^{a}	1.6^{a}	3.6^{a}
T_5	68.3^{b}	121^{b}	143^{a}	413^{a}	66.1^{ab}	51.6^{ab}	58.7^{b}	62.0^{b}	24.1^{a}	23.0^{a}	20.38^{a}	27.3^{a}	2.1^{a}	2.4^{a}	1.6^{a}	3.7^{a}
T_6	30.1^{d}	57.6^{d}	41.1^{d}	182^{c}	68.4^{b}	56.5^{d}	61.4^{b}	66.4^{b}	16.49	19.5^{c}	13.5^{c}	20.5^{d}	0.8^{c}	1.1^{d}	0.5^{c}	1.2^{d}
SE ±	2.67	7.37	5.27	8.673	0.69	0.72	0.72	0.64	0.40	0.39	0.48	0.34	0.05	0.05	0.05	0.05
Variety (V)																
SAMMAZ 15	50.3^{b}	87.8^{b}	101	339	76.4^{b}	59.3^{b}	69.4^{b}	76.4^{b}	21.5^{a}	19.4c	17.0	23.2^{b}	1.5	1.6b	1.1	2.7
SAMMAZ 21	60.3^{b}	112^{a}	107	367	62.0^{a}	45.3^{a}	53.5^{a}	62.0^{a}	23.3^{a}	25.1a	18.8	28.2^{a}	2.0	2.1a	1.3	3.1
SAMMAZ 35	73.3^{a}	95.5^{b}	113	350	61.7^{a}	54.2^{b}	54.2^{a}	61.7^{a}	21.5^{b}	20.8b	18.8	23.3^{b}	1.6	2.0a	1.5	3.0
SE ±	3.20	3.23	5.54	12.16	0.81	1.56	0.74	0.81	0.37	0.34	1.14	1.05	0.74	0.06	0.09	0.13

Table 7. interaction between poultry manure and weed control methods

Poultry Manure	Weed Control Methods (WCM)					
(PM) (t ha^{-1})	T_1	T_2	T_3	T_4	T_5	T_6
			Leaf Chlorophyll Content(nmol/cm)			
			At Doka 2017 at 10 WAS			
0	14.92^{ij}	13.39^{j}	20.70^{hi}	24.96^{gh}	21.04^{hi}	5.44^{k}
4	31.32^{fg}	35.73^{ef}	40.92^{cde}	40.64^{cde}	42.91^{cd}	10.03^{jk}
8	35.73^{ef}	43.21^{cd}	51.40^{ab}	50.^{62ab}	52.60^{a}	14.34^{ij}
NPK	37.33^{def}	41.04^{cde}	46.10^{bc}	53.62^{a}	54.61^{a}	10.33^{jk}
SE ±	2.201	2.621	2.720	2.501	2.421	1.420
			At DGR 2017 at 8 WAS			
0	23.62^{jkl}	21.42^{kl}	29.10^{ijk}	33.73^{i}	31.30^{ij}	9.21^{m}
4	47.28^{h}	48.41^{h}	52.99^{gh}	57.38^{efg}	59.31^{d-g}	16.93^{lm}
8	51.60^{gh}	53.70^{gh}	66.59^{a-d}	64.83^{b-e}	68.83^{abc}	27.87^{ijk}
NPK	53.71^{gh}	54.78^{fgh}	61.99^{c-f}	72.68^{ab}	72.94^{a}	17.23^{l}
SE ±	2.724	2.753	2.932	2.864	3.210	1.962
			At DGR 2017at 10 WAS			
0	23.38^{ghi}	20.02^{hij}	26.59^{gh}	31.45^{g}	30.98^{g}	6.44^{k}
4	55.69^{f}	56.43^{f}	60.37^{ef}	66.39^{cde}	69.72^{bcd}	16.90^{ij}
8	59.54^{ef}	61.73^{def}	77.79^{ab}	76.47^{ab}	77.56^{ab}	30.38^{g}
NPK	64.44^{def}	65.59^{cde}	73.61^{bc}	84.26a	85.24^{a}	14.08^{jk}
SE ±	3.021	3.102	3.150	3.194	3.204	3.194
			Dry Matter Accumulation (g/plant)			
			2016 Rainy season			
0	66.6^{hij}	77.5^{ghi}	97.9^{c-g}	89.4^{efg}	82.6^{fgh}	47.2^{j}
4	83.0^{fgh}	81.9^{fgh}	96.81^{defg}	135.3^{ab}	117.6^{bcd}	58.6^{ij}
8	106.5^{cde}	107.2^{cde}	119.3^{bc}	148.9^{a}	138.3^{ab}	66.0^{hij}
NPK (120:60:60)	83.2^{fgh}	93.7^{efg}	103.6^{c-f}	145.9^{a}	149.2^{a}	58.4^{ij}
SE ±	5.484	4.215	7.840	6.211	7.240	5.214
			2017 Rainy season			
0	204.7^{fg}	213.8^{fg}	244.6^{f}	240.2^{f}	243.8^{f}	137.9^{h}
4	371.8^{e}	411.2^{bde}	445.2^{a-d}	461.8^{abc}	413.3^{b-e}	204.0^{fg}
8	406.8^{de}	392.4^{de}	482.5^{a}	497.5^{a}	497.6^{a}	200.9^{fg}
NPK (120:60:60)	363.0e	393.3^{de}	462.9^{ab}	475.0^{a}	494.7^{a}	183.1^{gh}
SE ±	17.521	18.425	19.29	19.452	19.347	14.256

Table 8. Interaction between variety and poultry manure on grain yield (t ha^{-1}) at Dangora 2016 rainy season

Variety (V)	Poultry Manure (M) (t ha^{-1})			
	0	4	8	NPK (120:60:60)
		At DGR 2016 Grain Yield		
SAMMAZ 15	1.05^{9h}	1.692^{ef}	1.795^{de}	1.757^{e}
SAMMAZ 21	1.224^{gh}	2.285^{bc}	2.600^{a}	2.446^{ab}
SAMMAZ 35	1.430^{fg}	2.050^{cd}	2.263^{bc}	2.465^{ab}
SE ±	0.089	0.090	0.092	0.084

Table 9. Interaction between poultry manure and weed control method on grain yield (t ha^{-1}) at Dangora 2017 rainy seasons.

Poultry Manure (M) (t ha^{-1})	Weed Control Methods (WCM) at DGR 2017 Grain Yield					
	T_1	T_2	T_3	T_4	T_5	T_6
0	1.68^{o}	1.67^{o}	2.10^{n}	2.40^{lm}	2.38^{m}	0.97^{q}
4	2.85^{k}	2.76^{kl}	3.25^{hj}	3.56$^{f\text{-}j}$	3.74^{efg}	1.17^{pq}
8	3.28^{hij}	3.53$^{g\text{-}j}$	3.85^{def}	4.12^{bcd}	4.28^{abc}	1.34^{op}
NPK (120:60:60)	3.53f$^{\text{-}j}$	3.57^{fgh}	3.9^{cde}	4.29^{ab}	4.51^{a}	1.25^{pq}
SE ±	0.143	0.142	0.130	0.124	0.134	0.136

Weedy check plots had lower grain yields in all sample seasons with nil poultry manure. Changes in light interception and light utilisation due to maintenance of green leaf and leaf photosynthesis during crop growth and development led to greater grain filling and higher grain yield by the potential combinations (table 9). The results resemble Mahadi et al (2012).

CONCLUSION

Using chicken manure has good impacts on chlorophyll content, plant dry matter accumulation, plant aspect, 100-kernel weight of maize cultivars in the current experiment. The SAMMAZ 21 and 35 cultivars yielded the highest and similar yields at 8 t ha-1 poultry manure or NPK fertiliser rates. SAMMAZ 21 and 35 have better promise for several features. To improve yield and other features, use SAMMAZ 21 and 35 cultivars with 8 t ha-1 poultry manure or NPK fertilizer.

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