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Response of Local Tomato Varieties to Application of Poultry Manure, Cow dung and Inorganic fertilizer

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Abstract
Continuous application of inorganic fertilizer causes problems such as deterioration of soil structure, environmental and ground water pollution. A trial was conducted on the field to investigate the effect of poultry manure, cow dung and inorganic fertilizer on growth and yield performance of tomato. There were two (2) factors consisting of fertilizers (10t ha^{-1} poultry manure, 10t ha^{-1} cow dung and 100kg Nha^{-1} N.P.K fertilizer and control) as well as local tomato varieties (Hausa oval, Hausa round and Beske). The treatments were laid out using Randomized Complete Block Design (RCBD) in split plot replicated four times. Growth and yield data taken are plant height (cm), stem girth (cm) number of branches, fruit weight (kg), fruit diameter (cm) and fruit t ha^{-1} as well as the dry matter accumulation.Results showed that growth and yield components were significantly affected by treatments. Hausa oval variety performed better in terms of growth and yield parameters which made it the most desirable variety among the varieties used across the sampling period. At the first trial, application of N.P.K fertilizer was better than any other treatments but the growth and yield parameters were significantly comparable with those obtained with poultry manure at 10t ha^{-1}. However, increase in growth and yield parameters were observed with application of poultry manure at the second trial, this was followed by cow dung while the least was produced by unfertilized plants. The study showed that organic manure had better residual effects on performance of tomato with the application of poultry manure and cow dung at 10t ha^{-1} respectively.
Keywords: Cow dung, Inorganic fertilizer, Poultry manure, tomato varieties

INTRODUCTION

Tomato is the most important vegetables in most regions of the world, ranking second in importance to potatoes. It can be cooked or eaten raw. It can be used to produce soup, ketchup paste and majorly used in canning industries. One major problem militating against tomato production in Africa is low soil fertility (Mbah, 2006). Continuous deforestation, over application of fertilizer, erosion and loss of soil humus through harvesting are some of the causes of soil fertility depletion. However, in order to increase tomato production in Nigeria, there is need to improve soil fertility management to reduce food scarcity and enhance food availability.

Soil fertility, especially in the tropics, can be improved for optimum tomato production with the use of inorganic fertilizer in form of N.P.K and urea. The use of inorganic fertilizer as soil amendments for tomato production has been on for sometimes because farmers and other land users recognized the need to improve soil fertility for optimum production.; However, there are many demerits in the use of inorganic fertilizers such as leaching, increased acidity, high cost of purchase (Tanimu *et al.,* 2007) and hazardous effect on man and his environments among others. Therefore, with all these negative effects of inorganic fertilizer on agricultural land and environment, there is need to explore alternative ways to improve soil fertility and ensure food security. Over the years, farmers and researchers are shifting to the use of organic fertilizers like compost, cow dung and poultry manure (Ngugen, 2010). It is an age long practice, it is generally accepted, technically feasible, commercially viable, relatively cheap, improves soil physical properties and soil microbial population (Belay *et. al.,* 2001). It also increases soil nutrients, has little or no adverse effects on man and environment (Relf *et al.,* 2002). Nutrients contained in organic manures are released more slowly and are stored for long time in the soil; thereby ensuring residual effects on the succeeding crops (Ginting *et al.,* 2003). A lot of research work has been done on different improved tomato varieties but little or no work has been done local varieties. However, this study was conceived to compare the yield response of different local tomato varieties using organic fertilizer and synthetic fertilizer and also to investigate the residual effect of the fertilizer on tomato performance.

MATERIALS AND METHODS

Experimental site

Field experiments were conducted on the experimental site of the Institute of Agricultural Research and Training (I.A R&T), Moor Plantation, Ibadan, *latitude at 07^0 30''N, 3^0 54''E), in the rainforest agro-ecology* during the planting seasons of 2011-2012. The mean annual rainfall is 1800mm and annual temperature of 18-34^0c. The major soil order of the experimental site is alfisol.

Pre-cropping soil analysis

Top soil samples (0-15cm depth) were randomly taken from the experimental plots to determine the properties. The samples were air-dried, crushed, sieved through a 2mm sieve and routine analysis was carried out. Soil samples were analysed for nitrogen, phosphorus, potassium organic carbon, soil pH. Total Nitrogen by microkjeldahl method (Bremmer, 1996), available phosphorus using Bray's method according to Olsen and Sommers, 1982. Soil pH with the use of pH meter and soil organic carbon determined by Walkey-Black method (Nelson and Sommers, 1992). Exchangeable cation (Ca and Mg) were extracted using IM NH_4OAC and determined on atomic absorption spectrophotometer. The potassium(K) was determined using a flame photometer.

Experimental Procedures and Treatments

The experimental site was cleared, mechanically ploughed twice at two weeks interval and harrowed a week after second ploughing. The experiment was laid out using Randomized Complete Block Design (RCBD) replicated four times. It consisted of two factors arranged in split plot design. Fertilizer was the main factor while tomato varieties were in the sub plots. Fertilizer treatments used were as follows: F1: poultry manure (10t ha^{-1}), F2: Cow dung (10t ha^{-1}), F3: N.P.K 15:15:15(100kgN ha^{-1}), F4: No fertilizer application (Control). The plot size was 5m x 4m (20m^2).Three local tomato varieties (Hausa oval, Hausa round and Beske) were used which were purchased from a market in Ibadan, Nigeria.

In the nursery, tomato seeds were sown on the flat bed for one month before transplanting. Watering was done lightly every morning and evening for 10 days, then heavily till transplanting with the use of watering can to prevent wilting. Shade was provided using palm fronds with poles erected over nursery bed to protect seedlings from hot sun and heavy rain. On the field, poultry manure and cow dung were applied to the appropriate plots two weeks before transplanting and inorganic fertilizer two week after transplanting. Seedling were transplanted one plant per hole at a spacing of 30cm x 90cm

Management Practices

Weeding was done whenever necessary after transplanting to prevent rodent attack and to reduce competition that may occur between the plants (tomato) and weeds. Staking was done to prevent plants from crawling on the ground which my lead to destruction of fruit and spread of diseases.

Data Collection

Five tomato plants were randomly selected and tagged per plot for data collection. The parameters taken included plant height stem girth and number of branches which were collected at one week interval from the second week of planting

Matured and ripe fruits were harvested twice a week, fruit weight was recorded against each treatments. Some yield parameters taken include number of fruits and fruits girth. Immediately after harvesting, the root of the harvested tomato plant was washed inside water until all the soil particles were removed. The tomato plant was partitioned into root and shoot (containing the leaves and the stem). They were oven-dried at a temperature of 60ºC for 48 hours and their weights recorded as total dry matter accumulation.

Residual Trial

Residual trial experiment was carried out in late season. The treatments and the experimental design were the same with first trial. The same data collected for first planting was also collected for the residual experiment.

Data Analysis

Data collected were subjected to statistical analysis of variance (ANOVA) using SAS (2003) package. The treatments means were separated for significant difference using Duncan multiple range test (DMRT) at 5% level of probability *(Duncan, 1955).*

RESULTS AND DISCUSSION

The soil had 82.3% sand, 11.3% clay and 15.5% silt. It was alkaline (6.13) with total Nitrogen (N) of 1.25%, Available Phosphorus (P) of 5.81%, exchangeable potassium (K) 0.77cmol/kg, while Ca, Na and Mg were 3.63, 1.30 and 1.72 cmol/kg respectively .

Table 1 shows the nutrient analyses for poultry manure and cow dung used. The routine analysis reveals that poultry manure used was richer in all elements analysed compared to cow dung except for the sodium content.

Table 1: ***Chemical composition of Poultry manure and Cow dung used for the experiment***

Parameters	Poultry manure	Cow dung
pH (H2O)	6.20	7.50
N%	5.30	4.30
Org C %	15.73	11.23
Available P %	3.40	1.70
K (%)	2.67	1.37
Ca (%)	2.30	1.15
Na (%)	2.10	2.37
Mg (%)	2.78	2.11
Fe (%)	2.11	1.97

Effect of Poultry manure, Cow dung and Inorganic fertilizer on Plant Height, Number of branches and Stem girth of Different tomato varieties.

In the first trial, it was observed that plants treated with inorganic fertilizer produced the highest plant height mean values and these differed significantly from all treatments applied except at 8 weeks after transplanting where no significant difference was recorded for plants amended with poultry manure and N.P.K fertilizer. Plants treat with N.P.K fertilizer had the highest height mean value of 69.15cm. Contrary to what was observed at the first trial, it was observed that organic manure (poultry manure and cow dung) produced the tallest plants at the second trial, and they differed significantly from plants treated with N.P.K fertilizer across the sampling periods.

Application of N.P.K produced the highest number of branches at 2WAT in the first trial and it differed significantly compared to other treatments. This was followed by poultry manure (6.25) and cow dung (4.16) with control producing the least number of branches (1.83). At 4 and 6 WAT for the first trial, it was observed that no significant differences were recorded for plant amended with poultry manure and the application of N.P.K fertilizer. Although N.P.K fertilizer produced more branches compared to poultry manure but at 8WAP. Poultry manure produced plants with the highest number branches.

At the second trial, increases in number of branches were noticed with the application of poultry manure and cow dung. Poultry manure produced the highest number of branches compared to other treatments. This was followed by cow dung, inorganic fertilizer and the control. Though no significant differences were noted at 6 and 8 weeks after transplanting between plants amended with cow dung and poultry manure there were reductions in the number of branches in plants treated with inorganic fertilizer and the control across the sampling periods for the residual trial.

In the first trial, application of N.P.K fertilizer had the highest stem girth mean values at 2 and 4 Weeks after transplanting and these differed significantly compared to all treatments. While at 6 and 8 weeks after transplanting, no significant differences were observed for tomato plants treated with poultry manure and N.P.K fertilizer but N.P.K fertilizer application had the highest stem girth mean value. It was observed that application of poultry manure and cow dung had the highest stem girth mean values across the sampling periods at the second trial.

Effect of Poultry manure, Cow dung and Inorganic fertilizer on Yield components of Different tomato varieties.

Application of N.P.K fertilizer produced the highest number of fruit/ha and fruit girth values at the first trial and it differed significantly from other treatments. Total fruit weight were not significantly different with plants amended with poultry manure and N.PK fertilizer, although the highest mean value was recorded (51.85kg) for N.P.K fertilizer.

The unfertilized plants produced the least mean values for the number of fruit girth and fruit weight. Increases in fruit weight, number of fruit and fruit girth values were observed with application of organic manure (poultry manure and cow dung) while reduction in values of fruit weight, number of fruit and fruit girth were observed with application of N.P.K fertilizer at the second trial. Amelioration of soil with poultry manure produced the highest mean values of fruit weight and number of fruit but there were no significant difference in fruit girth values with poultry manure and cow dung.

Effect of Poultry Manure, Cow Dung and Inorganic Fertilizer on Dry Matter Accumulation of Different Tomato Varieties.

Dry matter accumulation was significantly affected by all treatments applied. Application of N.P.K fertilizer produced the highest dry matter for root fresh weight, root dry weight, shoot fresh weight as well as the shoot dry weight at the first trial. This was followed by poultry manure and cow dung. At the second trial, a reduction in dry matter accumulation was observed with the application of N.P.K fertilizer whereas, an increase in dry matter production was well pronounced in plants amended with poultry manure and its differs significantly compared to other treatments. This was followed by cow dung. All treatments applied produced more dry matter accumulation than the control plants.

Effect of Treatments on Tomato Varieties

Hausa oval local variety produced the tallest plant as well as the highest number of branches and stem girth mean values across the sampling periods. Similarly, the highest mean values for yield, growth and dry matter parameters were recorded for the same variety except for the fruit weight at the second trial where no significant differences were recorded for all the varieties used.

Interaction Effect of Varieties and Treatments on Growth and yield Components of Different tomato varieties

All parameters were significantly influenced by the interaction effect of treatments and varieties as hausa oval with the application of N.P.K fertilizer produced the highest mean value for plant height, number of leaves and stem girth respectively (72.70cm, 19.25cm and 3.47cm) at the first trial while interaction of poultry manure and hausa oval variety produced the highest Plant height, no of branches and stem girth at the second trial respectively.

Table 2: Effect of Organic Manure and Inorganic Fertilizer on Plant Height (cm) of Different Tomato Varieties.

	2WAP		4 WAP		6 WAP		8 WAP	
Tomato varieties	1st	2nd	1st	2nd	1st	2nd	1st	2nd
Hausa round	33.16^{a}	51.08^{a}	43.33^{b}	47.73^{b}	54.55^{ab}	51.08^{ab}	59.18^{b}	62.25^{ab}
Hausa oval	38.08^{a}	59.28^{a}	45.01^{a}	52.88^{a}	56.53^{a}	54.28^{a}	69.91^{a}	70.68^{a}
Beske	30.52a	50.61^{b}	43.23^{ab}	46.56^{ab}	52.61^{c}	50.61^{ab}	57.25^{ab}	60.06^{b}
Fertilizers								
Poultry manure	40.78^{b}	56.82^{a}	50.78^{b}	60.61^{a}	63.73^{b}	69.99^{a}	69.15^{a}	74.41^{a}
cow dung	33.05^{c}	54.30^{a}	42.16^{c}	58.34^{a}	52.32^{c}	64.28^{b}	55.36^{b}	73.47^{a}
Inorganic fertilizer	47.48^{a}	40.22^{b}	57.35^{a}	45.29^{b}	67.31^{a}	48.70^{c}	69.75^{a}	52.17^{b}
No fertilizer	9.06^{d}	7.55^{c}	23.87^{d}	23.99^{c}	34.51^{d}	25.95^{d}	41.31^{c}	28.86^{c}

Means followed by the same letter in a column are not significantly different from each other at P≤0.05 by DMRT

WAP = Weeks after Transplanting

Table 3: Effect of Organic Manure and Inorganic Fertilizer on Number of Branches of Different Tomato Varieties.

	2 WAP		4WAP		6WAP		8WAP	
Tomato varieties	1st trial	2nd trial	1st trial	2nd trial	1st trial	2nd trial	1st trial	2nd trial
Hausa round	5.43^{a}	6.06^{a}	8.81^{b}	8.18^{ab}	10.31^{a}	11.93^{a}	15.43^{b}	13.37^{b}
Hausa oval	6.81^{a}	6.25^{a}	10.00^{a}	8.62^{a}	13.81^{a}	12.50^{a}	18.37^{a}	15.25^{a}
Beske	3.50^{b}	5.68^{b}	6.06^{c}	7.43^{b}	7.06^{b}	10.20^{b}	10.62^{c}	12.25^{b}
Fertilizers								
Poultry manure	6.25^{b}	7.50^{a}	10.00^{a}	11.83^{a}	13.75^{a}	16.83^{a}	18.50^{a}	18.00^{a}
cow dung	4.16^{c}	6.75^{ab}	6.91^{b}	10.33^{b}	10.83^{b}	15.91^{a}	12.83^{b}	17.00^{a}
Inorganic fertilizer	7.41^{a}	6.00^{b}	10.58^{a}	6.08^{c}	14.75^{a}	8.75^{b}	17.50^{a}	11.25^{b}
No fertilizer	2.40^{d}	3.75^{c}	5.66^{c}	4.08^{d}	6.25^{c}	4.75^{c}	9.08^{c}	6.00^{c}

Means followed by the same letter in a column are not significantly different from each other at P≤0.05 by DMRT

WAP Weeks after Transplanting

Table 4: Effect of Organic Manure and Inorganic fertilizer on Stem Girth (cm) of Different Tomato Varieties.

	2 WAP		4WAP		6WAP		8WAP	
Tomato varieties	1st trial	2nd trial	1st trial	2nd trial	1st trial	2nd trial	1st Trial	2nd trial
Hausa Round	1.61[a]	1.80[ab]	1.86[ab]	2.19b	2.90[ab]	2.91[b]	3.00[ab]	3.25[b]
Hausa Oval	1.64[a]	1.96[a]	2.00[a]	3.20[a]	3.87[a]	3.90[a]	3.28[a]	4.00[a]
Beske	1.50[a]	1.70[b]	1.83[b]	2.35[b]	2.68[b]	3.86[b]	3.00[b]	3.12[b]
Fertilizers								
Poultry manure	2.10[b]	2.55[a]	2.31[b]	3.06[a]	3.56[a]	3.95[a]	3.89[a]	4.09[a]
cow dung	1.11[c]	2.40[a]	1.58c	2.97[a]	2.80[b]	3.74[b]	3.18[b]	3.94[b]
Inorganic fertilizer	2.37[a]	1.63b	2.70[a]	2.03[b]	3.40[a]	2.53[c]	4.21[a]	2.65[c]
No fertilizer	0.84[d]	0.70c	0.99[d]	0.93[c]	1.64[c]	1.33[d]	2.31[c]	1.32[d]

Means followed by the same letter in a column are not significantly different from each other at P≤0.05 by DMRT
WAP: Weeks after transplanting

Table 5: Effect of Organic manure and Inorganic fertilizer on Yield Components of Different Local Tomato Varieties.

	Fruit Weight (kg)		No of fruit ha^{-1}		Fruit Girth (cm)	
Tomato varieties	1st trial	2nd trial	1st trial	2nd trial	1st trial	2nd trial
Hausa Round	41.54[a]	36.73[a]	1578.64[b]	1688.80[a]	24.20[b]	23.68[b]
Hausa Oval	31.91[b]	39.76[a]	1708.42[a]	1699.73[a]	29.86[a]	28.40[a]
Beske	40.85[a]	35.24[a]	1560.16[b]	1559.00[b]	20.50[c]	22.99[b]
Fertilizers						
Poultry manure	49.46[a]	79.56[a]	2127.76[a]	2394.45[a]	25.95[b]	33.52[a]
cow dung	40.97[b]	54.79[b]	1321.85[b]	2268.80[b]	22.47[c]	30.76[a]
Inorganic fertilizer	51.85[a]	29.86[c]	2200.84[a]	1530.47[c]	33.52[a]	21.30[b]
No fertilizer	10.12[c]	6.86[d]	545.83c	525.47[d]	16.12[d]	10.50[c]

Table 6: **Interaction Effect of Varieties and Treatments on Growth Parameters of Different Local Tomato Varieties**

	PH at Harvesting		No of Branches at harvesting		Stem girth at harvesting	
INTERACTION	1st trial	2nd trial	1st trial	2nd trial	1st trial	2nd trial
Hausa round X control	41.07	28.55	9.75	5.50	1.90	1.40
Hausa round x Poultry manure	70.44	72.65	16.25	19.25	3.37	4.07
Hausa round X cow dung	56.27	71.40	14.35	17.50	2.92	2.47
Hausa round x N.P.K fertilizer	71.85	51.85	16.25	13.00	2.47	2.45
Hausa oval x control	42.80	31.45	7.00	5.50	1.57	1.22
Hausa oval x Poultry manure	68.87	79.02	18.00	19.50	3.72	4.10
Hausa oval x cow dung	55.12	72.12	7.00	13.00	2.95	3.65
Hausa oval x N.P.K fertilizer	72.70	51.35	19.25	13.00	3.47	2.47
Beske x control	40.72	26.60	9.75	8.25	1.45	1.37
Beske x poultry manure	69.95	72.47	19.00	21.00	3.50	4.00
Beske x cow dung	54.70	69.82	7.00	10.50	2.55	3.50
Beske x N.P.K fertilizer	62.87	53.42	18.50	14.75	3.25	2.67
S.E	1.28	2.73	0.75	0.76	0.1	0.16

PH: Plant Height
S.E: Standard Error

Table 7: Interaction Effect of Varieties and Treatments on Yield Components of Different Local Tomato Varieties

INTERACTIONS	Fruit weight (kg)		No of fruit/ha		Fruit girth (cm)	
	1st trial	2nd trial	1st trial	2nd trial	1st trial	2nd trial
Hausa round X Control	9.77	6.77	532.50	585.00	10.25	9.25
Hausa round X Poultry manure	53.67	58.50	2135.30	2280.92	25.4	34.70
Hausa round x Cow dung	44.80	57.70	1373.67	2265.65	24.72	31.55
Hausa round x N.P.K fertilizer	55.25	30.35	1992.20	1659.35	27.00	19.50
Hausa oval x Control	10.94	5.10	577.50	503.40	17.05	12.00
Hausa oval x poultry manure	53.36	58.82	2218.05	2325.25	27.55	34.02
Hausa oval x cow dung	46.80	56.35	1307.40	2409.3	22.75	26.55
Hausa oval x N.P.K fertilizer	55.07	26.67	2398.70	1517.3	27.50	15.00
Beske x Control	9.66	8.73	527.50	488.00	15.05	9.77
Beskex Poultry manure	41.35	49.36	2029.9	2185.2	24.00	32.15
BeskeX Cow dung	31.40	50.32	1284.5	2148	33.47	22.47
Beske X N.P.K fertilizer	45.25	32.66	2211.6	1414.7	34.07	22.25
S.E±	2.59	3.03	104.27	108.67	1.00	1.46

S.E Standard Error

Table 8: Interaction Effect of Varieties and treatments on Dry Matter Accumulation of Different Local Tomato Varieties

INTERATION	First trial		Second trial		First trial		Second trial	
	SFW	SDW	SFW	SDW	RFW	RDW	RFW	RDW
Hausa round x Control	68.8	17.37	36.27	9.77	20.72	2.57	18.2	1.52
Hausa round x Poultry manure	121.15	39.87	140.25	59.17	41.1	6.67	52.77	11.00
Hausa round x cow dung	114.05	36.77	129.85	48.57	32.97	4.90	45.4	10.55
Hausa round x N.P.K fertilizer	141.7	47.85	120.40	37.57	49.47	9.52	39.00	5.77
Hausa oval x Control	83.17	21.32	50.57	14.37	26.45	3.35	20.57	2.07
Hausa oval x poultry manure	125.07	41.97	143.92	59.27	43.72	7.00	54.97	11.25
Hausa oval x cow dung	119.27	33.57	136.00	50.85	35.55	5.47	49.95	8.85
Hausa oval x N.P.K fertilizer	150.57	51.87	114.27	42.05	49.97	10.75	42.67	6.50
Beske x Control	62.57	13.57	33.85	8.90	19.15	2.25	15.07	1.30
Beskex Poultry manure	117.97	40.9	135.75	56.27	39.87	7.00	50.40	10.82
Beske X cow dung	103.92	36.8	126.57	56.00	31.07	4.65	47.95	9.30
Beske X N.P.K fertilizer	139.05	48.35	116.25	34.62	40.72	10.00	39.92	6.42
S.E±	4.08	1.78	5.93	2.70	1.58	0.40	2.02	0.55

SFW: Shoot fresh weight; SDW: Shoot Dry weight; RFW: Root fresh weight; RDW: Root Dry weight

Discussion

Across the sampling period, N.P.K fertilizer performed better compared to other types of fertilizer applied while at the later stage (residual trial) increases in growth and dry matter accumulation were noticed in plots augmented with poultry manure and cow dung . This may be due to slow rate of nutrients commonly attributed to organic manure unlike the mineral fertilizer which releases nutrient immediately to plants at the time of its application, resulting to spontaneous increase in plant growth and developments. Mineral fertilizers are water soluble, easily absorbed and utilized by crop such that preceding crop could use all the available nutrient, leaving little or no nutrient in the soil for succeeding crop which is one of the disadvantages of the use of mineral fertilizer (Lampkin, 1997). Cooke (1970) reported that initial application of manure leaves residues of nitrogen, phosphorus and potassium in soil that benefit following crops. He further indicated that the residues of inorganic nitrogen fertilizers usually last only for a season, but the residual effects of manure last for many years (Akande *et. al.,* 2005).

Similar observation was reported by Eghball (2002) that residual effects of manure application can maintain crop yield level for several years after manure application ceases since small amount of nitrogen and other nutrients in manure become available to plants in the first year after application (Ginting *et al.,* 2003). Gradual release of nutrients with its long term residual effects in poultry manure might have contributed to its ability to supply enough nutrients to plant from growth stage through physiological stage to maturity (Adediran *et.al.,*1999). This could be the reason for higher fruit weight, fruit diameter and total fruit yield observed at the second trial than the N.P.K fertilizer.

The comparative effect of poultry manure with mineral fertilizer at the initial stage of growth could be as a result of high amount of Nitrogen in poultry manure and also ability to supply all essential nutrients in appropriate forms. This finding is in agreement with the finding of Hirzer *et al.* (2007) when evaluating the effect of poultry manure on maize yield. The authors concluded that poultry manure is an effective alternative to mineral fertilizer for optimum yield of maize. Also, Sudhu and Kapoor (1999) in their findings concluded that organic manure could substitute for mineral fertilizer to sustain productivity on alluvial soil.

A number of factors are responsible for low yield in crops but inappropriate crop nutrition managements and poor fertility are the most important factors. Soil fertility can be improved if rates of nutrients are managed because adequate quantity of nutrients in the soil increases soil organic matter, nutrient availability and water retention (Syed, *et al.,* 2009). Application of poultry manure and cow dung at 10t ha^{-1} increased the growth of tomato, biomass and the yield. This could be due to the fact that adequate manure rate (10t ha^{-1}) was supplied which helped to improve the soil fertility, thereby improving the growth of the succeeding crops without fresh application. Ayeni *et al.,* 2010 observed that poultry manure enhanced the production of maize by 39-43% at the first time of application and the yield of maize was increased by 91-93% at the residual trial. Mehta and Shaktawat (2002) reported that application of manure at 10 t ha^{-1} recorded higher grain yield and was economical.

Plant height is one of the major factors directly affecting yields of tomato which is determined by the genetic trait as well as the environment. Application of treatments significantly affects plant height across the sampling period. At the second trial, application of poultry manure statistically differs from other treatments reason being that poultry manure was an effective source of Nitrogen for tomato production. High concentration of Nitrogen in poultry manure might have contributed to taller plants in plots receiving poultry manure since nitrogen is an essential constituent of amino acid necessary for cell division in plants which is responsible for plant growth resulting into taller plants (Chung *et.al.,* 1992)

Higher yield obtained in plots augmented with NP.K fertilizer poultry manure and cow dung could be as a result of higher number of branches than the unfertilized plants because tomato bears most of its fruits on the branches because the higher the number of branches, the higher the number of fruit obtained. Furthermore, higher numbers of branches indicated better plant growth and developments since most leaves are borne on the branches which increase the photosynthetic area of the plant resulting to higher fruit yield. This might have contributed to higher dry matter accumulation observed with plots receiving fertilizers than unfertilized plots.

Aside from the nutrients in organic manure, it has been discovered that organic manure contain some plant hormones such as cytokinnis, gibberllin and auxin (Miezah et al., 2008) which might have catalysed rate of growth and development of tomato. Organic manure also inoculates the soil with vast numbers of beneficial microbes (bacteria, fungi, etc.) that promote biological activity of the soil. These microbes are able to extract nutrients from the mineral part of the soil and eventually pass the nutrients to plant (Johnson, 1996)

Conclusion

Hausa oval local variety performed better in term of growth, yield and dry matter accumulation parameters followed by hausa round and Beske varieties. This implies that hausa oval has the ability to withstand the environmental condition it was subjected to. Therefore, hausa oval varieties can be recommended as the best tomato for farmers' production. Application of N.P.K fertilizer significantly improved tomato growth and development but due to the long lasting attribute of organic manure which could last for several years even when its application ceases makes it more desirable than the conventional method of improving soil fertility. It could be concluded that poultry manure and cow dung at 10t ha^{-1} had a carry- over benefit on the succeeding crops.

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