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Effects of Poultry Manure and NPK (23:10:5) Fertilizer on Tomato Variety Tanya Grown on Selected Soil of Morogoro Region, Tanzania

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ABSTRACT

This study was convened because of low levels of tomato produced in soils of Tanzania with poor fertility status. It compared effects of poultry manure and NPK (23:10:5) fertilizer to the performance of tomato (*Lycopersicon esculentum* Mill). Poultry manure was applied at 2, 4 and 8 t ha^{-1} and NPK fertilizer at 20, 40 and 80 kg ha^{-1}. Results showed that the highest number of leaves (70) and shoot length (93 cm) were recorded at 8 t ha^{-1} and lowest (46 and 57 cm, respectively) at 2 t ha^{-1} of poultry manure. These variables were far small (18 and 55 cm, respectively) for absolute control. In addition, 40 kg NPK ha^{-1} recorded the highest shoot length (91 cm) and 20 kg NPK ha^{-1} lowest (60 cm). Many tomato fruits (31) were produced at 8 t ha^{-1} poultry manure compared with 22 in 40 kg NPK ha^{-1} and differed significantly ($p<0.001$) with absolute control (5) and among treatments. The smallest (823 g) and highest (2338 g) weights of fruits recorded per plant at 2 and 8 t ha^{-1} poultry manure, respectively, differed significantly ($p<0.01$) among treatments and absolute control (341 g). The smallest (676 g) and highest (1668 g) weights recorded at 20 and 40 kg NPK ha^{-1}, respectively, also differed significantly ($p<0.01$). It was concluded that poultry manure at 8 t ha^{-1} and NPK (23:10:5) fertilizer at 40 kg ha^{-1} are sufficient for tomato plants but the former outweighs the latter.

Key words: Tomato, manure, NPK, growth, yield

INTRODUCTION

Tomato is one of the most important vegetable fruit crops grown in Tanzania whose production is widespread in the country with a total annual production of more than 145,000 tons (Mushobozi, 2010) and it is cultivated mainly in rural and partly in urban areas (Putter *et al*., 2007).

Vegetables production in most parts of the Africa, Tanzania inclusive, has been a backyard garden operation inherited to different generations for a long time whereby farmers produce for their family subsistence (Williams *et al*., 1980). Because of increased demand for tomatoes, among other vegetables in Tanzania, for local and export markets, most smallholder farmers have expanded and diversify vegetable production, resulting in increased hectare planted (Minja *et al*., 2011). Tomato in eastern Tanzania covering mainly the coastal belt of the country, Morogoro inclusive yields 2.2 to 3.3 t ha^{-1} (Minja *et al*., 2011). This is far below the world average of 27.5 t ha^{-1} (FAO, 2005). Minja *et al*. (2011) reported that low production of tomato is caused by salinity, drought, excessive heat, declining soil fertility. In addition, this is related to incidences of pests and diseases; poor crop management and shortage or lack of well-adapted and high yielding varieties.

Tomato plants have high requirement, are heavy feeders, for macro-nutrient elements including potassium (K) and Calcium (Ca) and some micronutrients such as iron (Fe), manganese (Mn) and zinc (Zn) (Abbasi *et al*., 2002). A study by Hinman *et al*. (2012) revealed that without adequate supply of K and Ca for tomato plant uptake and utilization, tomato fruits will not accumulate soluble solids content (sugars) and will be susceptible to physiological disorders such as blossom end-rot. According to Jones (2008), smaller requirements of the elements Nitrogen (N), Magnesium (Mg), Phosphorus (P), Boron (B) and Copper (Cu) are also important for dry matter partitioning and fruit setting of tomato plant.

Low soil fertility along with some of other environmental factors such as temperature, precipitation, humidity, solar radiation, wind are reported to affect tomato performance, hence its overall production (Akanni and Ojeniyi, 2008).

Application of fertilizers as soil amendment is inevitably pertinent in increasing crop turnout in impoverished soils. However, recommendations given for each fertilizer type are dictated by soil type and its nutrient levels, type of crop and its stage of growth (Kisetu and Teveli, 2013). According to Almulla *et al*. (2012), the general principle is to apply phosphate fertilizer as basal dressing (during planting) for root development. Diammonium phosphate (DAP) $(NH_4)_2\ HPO_4$) or Triple Superphosphate (TSP) $(Ca\ (H_2PO_4)_2)$ can be used at a rate of 150 kg ha^{-1}. In addition, after planting, fertilizer urea $(CO(NH_2)_2)$ or Calcium Ammonium Nitrate (CAN) $(5Ca(NO_3)_2.NH_4NO_3.10H_2O)$ can be used for leaf establishment of tomato plants. It is recommended to apply urea after 2-3 weeks or CAN in the 5th week and both should be applied at a rate of 200 kg ha^{-1}.

Awareness to tomato growers in Tanzania is very scarce on nutrient composition of poultry manure and associated growth and yield responses of tomato plants. In addition, there is limited documentation on the easily available, affordable and suitable nutrient sources to use. Furthermore, the information given by stockists who in most cases are not trained agriculturists originates from the labels and many assumptions (Maerere *et al*., 2006). Therefore, this study was undertaken to assess and determine usefulness of poultry manure as opposed to industrial fertilizer inputs in tomato production in acid soils. The immediate impact of the positive output to be generated from this study is to explore smallholder farmers in nearly similar soil types. This will also provide knowledge on the alternative sources of nutrients to optimally increase tomato production along with sustaining soil fertility.

MATERIALS AND METHODS

Description of the study area: The study area is located between latitude 6°85' South and longitude 37°64` East and at an elevation of 568 m above mean sea level. The field site is located at the Sokoine University of Agriculture (SUA) Farm at the foot slopes of the Uluguru Mountain in Morogoro urban, Tanzania (Kisetu *et al*., 2013). The rainfall distribution is bimodal with the first season (normally with short rains) lasting from November to January while the second season (long rains) lasting from February to May. The annual rainfall ranges between 800 and 950 mm. The area is characterized by kaolinitic clay soils, which are well drained. The physiographic feature of the area is characteristically an undulating convex land and the slope is about 4% (Kisetu *et al*., 2013).

Materials used for the study: The study was conducted at the Crop Museum, SUA Farm–Morogoro Tanzania. Tomato var. Tanya seeds were obtained from Tanganyika Farmers Association (TFA) shop located in Morogoro town. The NPK (23:10:5) fertilizer was obtained from retail shops in Morogoro town. In addition, poultry manure was collected from locally raised poultry units in Misufuni Street, Morogoro municipality.

Layout of the experimental plots and experimental design: The experiment was laid down in a Randomized Complete Block Design (RCBD) whereby poultry manure and NPK (23:10:5) fertilizer formed the treatments and tomato var. Tanya was the experimental unit.

Nursery preparation and establishment of tomato seedlings: Seedlings were raised in a nursery by sowing seeds and covered with fine-sand and some banana straws. The seedbed was watered twice a day to ensure sufficient moisture for seed germination. As soon as the seeds germinated, banana straws were removed to allow proper seedlings establishment.

Decomposing poultry manure and their application with NPK fertilizer: Four weeks before transplanting tomato seedlings, poultry manure was decomposed in one confined pit. Thereafter, the compost was incorporated into experimental subplots at rates of 216, 432 and 864 g, equivalent to 2, 4 and 8 t ha^{-1}, respectively. Then, 14 days after transplanting the seedlings NPK (23:10:5) fertilizer was applied at rates of 2.16, 4.32 and 8.64 g, equivalent to 20, 40 and 80 kg ha^{-1}, respectively. All treatments' levels in the experimental subplots were treated in three replications.

Transplanting of tomato seedlings: Tomato seedlings were transplanted to the experimental plot 21 days after sowing when the seedlings had 3 true leaves. Transplanting was done in the evening in order to reduce transplanting shock. One seedling was planted per hole at a spacing of 75×60 cm and each subplot comprised 10 tomato plants; the seedlings were watered immediately after being transplanted.

Management of tomato plants in the experimental plots: Hand weeding, pruning of some leaves and emerging twigs and staking of tomato plants were among the managerial activities done in the experimental plots. Pesticide used to control whiteflies was Mukpar-Dimethoate 40 EC, Dimethoate 400 g L^{-1}. In addition, Folicure EC 250, Tebuconazole 250 g L^{-1} was used to control foliar diseases caused by fungus.

Data collection: The composite soil sample constituted 15 spots in 1 ha field encompassing the experimental site was collected at depths of 0-30 cm, air-dried, finely-grounded and sieved through 2 mm wire mesh sieve for lab routine analysis (Okalebo *et al.*, 2002). Furthermore, the data collected from tomato plants were shoot length measured using a metre rule, leaf number (excluding cotyledons) by physical counting, number of tomato fruits and weight of tomato using a spring balance.

Statistical data analysis and management: The MS-Excel was used to organize the data generated from the study and then subjected to Analysis of Variance (ANOVA) using two-way in randomized blocks design and effects of treatments means was compared following factorial approach. The Least Significance Difference (LSD) at 5% level of statistic was used to carry-out all-pair-wise comparison of treatments means which differed significantly and summarized by Duncan's Multiple Range Test. Statistical software used was GenStat Discovery 4th Edition (Wim *et al*., 2007).

RESULTS AND DISCUSSION

Characterization of the soil and poultry manure: The lab analysis data of the soil from the area where this study was conducted and poultry manure are presented in Table 1.

Properties of the soil: The findings of this study reflect interesting pH value within a multi-universal nutrient range (5.5-7.0) which is medium (Table 1) and suits tomato production (FAO, 2008). The slightly acid (pH 6.4) condition of the study soil indicates presence of nutrients but their availability to plants is subject to soil moisture, chemistry, nutrients transformations, plant type and age. According to Marinari *et al*. (2006), slight acid (6.1-6.5) is the optimal range of pH for most crops. Similar authors consider soil pH as one of the most important indicator of soil fertility because of its effects on plant nutrients in the soil. The solubility of soil micronutrients such as Fe, Mn, Zn and Cu is optimal at pH ranges of 5.0-7.0 and decreases at pH>7.0 (Kisetu *et al*., 2013). However, pH of the study soil indicates that Mn toxicity is likely if present in high quantities, which was beyond the scope of this study. In addition, this pH seems to favour soil microorganisms because acid soils can slow the formation of nitrate through microbial nitrification in soils. Jones (2008) reported that low soil pH (<6.0) is coupled with low Ca, blossom end-rots of tomatoes and their tests are high in P and pH levels. However, in similar soils Zn might become insoluble, resulting in Zn deficiency symptoms in tomatoes such as cupped leaves and splotchy chlorosis.

The total N was low hence deficiency which could be attributed to low levels of organic matter and nature of soil parent material along with lack of regular fertilizer application. Soil's available P was medium indicating possible positive influences to crop performance, such as tomato plants, but calls for the addition of P from none acid forming soil amendments.

Exchangeable K and Mg in the study soil were medium and low, respectively, indicating a need for their replenishment. Uptake of Mg by plants is dependent on the soil pH, level of soil Mg, Ca

Table 1: Physical and chemical properties of the study soil and poultry manure

		Sources of the parameters assessed			
		Soil		Poultry manure	
Parameters assessed	Units	Value	Rating	Value	Rating
pH (H_2O)		6.46±0.02	Medium	7.4±0.060	High
Total N	%	0.19±0.08	Low	1.9±0.060	Very high
Organic carbon	%	1.02±0.04	Low	9.2±0.040	Very high
Organic matter	%	1.8±1.600	Medium	15.8±0.040	Very high
Available P	mg kg^{-1}	19.4±0.060	Medium	1.7±0.040	Very low
Exchangeable K	cmol$_{(+)}$ kg^{-1}	1.02±0.04	Medium	0.7±0.060	Medium
Exchangeable Ca	cmol$_{(+)}$ kg^{-1}	1.09±0.12	Very low	1.7±0.040	Low
Exchangeable Mg	cmol$_{(+)}$ kg^{-1}	1.01±0.02	Low	2.03±0.06	Medium

Rating columns were rated based on Landon (1991)

Fig. 1(a-d): Deficiency symptoms of some nutrient elements in tomato plants, (a) K and P deficient tomato plants received 40 kg NPK ha^{-1}, (b) K and P deficient tomato plants received 80 kg NPK ha^{-1}, (c) N, Mg, P and Zn deficient tomato plants, These plants received 4 t ha^{-1} of poultry manure and (d) N, Mg, P and Zn deficient tomato plants, These plants received 8 t ha^{-1} of poultry manure

and K levels (Brady and Weil, 2008). In general, Mg uptake by plants increases as the soil pH and soil test Mg levels increase. Exchangeable Ca was low, which might result in unfilled pods in peanuts and blossom end rot disease in peppers and tomatoes.

Properties of poultry manure compost: The pH of the manure used was slightly alkaline in reaction (Table 1). This indicates an availability of most nutrients for crop utilization if other soil and plant factors do not interfere the process. Available P and exchangeable bases were low but this manure suggests that it would serve to increase fertility status of nutrients' depleted soils. The nutrient value of poultry manure varies considerably depending on the conditions under which it is processed or decomposed. Muhammad *et al.* (2007) report similar observation.

Visual assessment of tomato plants: Figure 1 presents pictorial assessment of tomato plants at 75 days after transplanting in some experimental plots.

Tomato plants showed obvious deficiency symptoms of essential nutrient elements such as Zn, Fe, Mg, P, K and N, of which some were deficient to support crop performance because they ranged from very low to medium in the study soil and as well as in poultry manure compost (Table 1). The pictorial assessment of the colour changes in leaves and variation in fruit size with respect to a deficient nutrient element was based on a guide given in Brady and Weil (2008).

Symptoms of K and P deficient tomato plants: Figure 1a and b showed symptoms of K and P deficiency in tomato plants which received 40 and 80 kg ha^{-1} of NPK fertilizer, respectively. Yellow or purple leaf-tints with browning at the leaf edge and poor fruiting attributed to poor flowering of tomato plants received 80 kg ha^{-1} of NPK fertilizer is a common deficiency symptom of K (Fig. 1b). In addition, the intense purplish colour observed in the surfaces of mature/lower leaves of the tomato plants is caused by P deficiency (Fig. 1a). These findings indicate that NPK fertilizer applied did not meet K and P requirements of tomato plants.

Symptoms of N, Mg, P and Zn deficient tomato plants: Tomato plants which received 4 and 8 t ha^{-1} of poultry manure showed some symptoms of N, Mg, P and Zn deficiency, respectively, among other nutrient elements. Fig. 1c and d showed yellowing or chlorotic leaves due to N deficiency and its severity was shown by necrotic in most old leaves, which was also supported by low quantities of N in the studied soil. These findings suggest that the amount of N contained in manure was not enough to meet N requirements of the tomato plants. In addition, N released from manure might have been transformed into forms which were not easily taken by tomato plants. Yellowing and necrosis between the leaf veins, with some reddish brown tints and are the symptoms of Mg. Magnesium deficiency is common in tomatoes, apples, grape vines, raspberries, roses and rhododendrons (Brady and Weil, 2008). Furthermore, P deficiency symptoms were observed by dull yellow and brown netted veining of the leaves in some old leaves of the tomato plants (Fig. 1c and d). Some leaves (Fig. 1d) also showed an advanced case of interveinal necrosis in the upper (young) leaves caused by Zn deficiency. In addition, Zn deficiency symptoms were also indicated by pitting and an intense interveinal necrosis developed in the upper surfaces of the old (lower) leaves (Fig. 1d).

In addition, most tomato plants seemed to be stressed by variation in surrounding temperature, soil moisture conditions and increased susceptibility to disease and destructive pests such as fungus and white aphids, respectively.

Salam *et al.* (2010) reported that at the onset of flowering, top dressing with NPK at 200 kg ha^{-1} is necessary to supply N, P and especially K needed for flowering. According to Almulla *et al.* (2012), incorporation of organic manures increased chlorophyll in leaves, number of fruits and plant height. Similar results are also reported in tomato plants received NPK fertilizer. Salam *et al.* (2010) reported that application of zinc sulphate ($ZnSO_4$), copper sulphate ($CuSO_4$) and ammonium molybdate $(NH_4)_2(MoO_4)$ stimulates chlorophyll synthesis and fruit quality of tomato. Furthermore, Prativa and Bhattarai (2011) reported that application of Farmyard Manure (FYM) at 25 t ha^{-1}+150% NPK (150:112:82.5 kg ha^{-1} NPK) in tomato was the best for obtaining higher values in respect of growth, yield and quality of tomato fruits.

Effects of poultry manure and NPK fertilizer to tomato performance

Growth parameters of tomato plants: The results of the effects of poultry manure and NPK fertilizer to the growth parameters of tomato var. Tanya are presented in Table 2.

Number of leaves per tomato plant: The results showed that the highest number of leaves 70 per plant was recorded for the tomato plants which were treated with poultry manure at 8 t ha^{-1} and the lowest number of leaves 46 was recorded for plants treated with the lowest rate (2 t ha^{-1}) of poultry manure (Table 2). However, the lowest number of leaves per plant recorded at the lowest rate of poultry manure applied was relatively higher than that of the absolute control 18.

Table 2: Response of tomato plants to poultry manure and NPK fertilizer

Treatments	Rate (kg ha^{-1})	No. of leaves per plant	Shoot length (cm)
Control	0	18.0^a	57.0^a
Poultry	2000	46.0^b	70.0^a
Poultry	4000	55.0^b	53.0^a
Poultry	8000	70.0^c	93.0^b
NPK	20	43.0^b	60.0^a
NPK	40	68.0^c	83.0^b
NPK	80	54.0^b	91.0^b
s.e		7.1	1.7
CV (%)		15.2	2.5
F pr.	Treatments	NS	***
	Rates	***	***
	Interaction	*	***

F test: $p>0.05$ = NS: Not significant; *$p = 0.05$; ***$p<0.001$, Means in the same column bearing different letter(s) differ significantly at 5% level based on Duncan's Multiple Range Test (DMRT)

The results also showed that the highest number of leaves 68 was recorded for the tomato plants which were treated with 40 kg NPK ha^{-1} and the lowest number of leaves 43 was recorded for application of 20 kg NPK ha^{-1} (Table 2). Interestingly, tomato plants which were treated with 80 kg NPK ha^{-1} recorded reduced number of leaves 54 compared with the plants treated with 40 kg NPK ha^{-1} but these leaves were far many compared with the leaves recorded in absolute control 18.

The findings of this study suggest that soil amendments that is poultry manure compost and NPK fertilizer had exclusively insignificant ($p>0.05$) effects to the number of leaves per tomato plant (Table 2). However, the information generated from this study showed that the type of the soil amendment and the rates applied are very important to be considered during soil fertility replenishment. This study also revealed that the varying rates of poultry manure and NPK fertilizer applied to tomato plants significantly ($p<0.001$) influenced the number of leaves per plant compared with the absolute control. These findings are consistent with the findings of Aduloju *et al.* (2010) and Dada and Fayinminnu (2010) who in different studies report that nutrients from mineralization of organic matter promote growth performance.

Length of shoots of tomato plants: The results of the length of shoots of tomato plants showed that the highest (93 cm) length was obtained for the tomato plants which were treated with 8 t ha^{-1} of poultry manure compost and the lowest shoot length (53 cm) was recorded at an application of poultry manure at 4 t ha^{-1}, which was statistically at par with the absolute control (57 cm) (Table 2).

On the other hand, application of NPK fertilizer had almost similar influence to shoot length as that of poultry manure. Results showed that the highest shoot length (91 cm) was recorded for the tomato plants which were treated with 80 kg NPK ha^{-1} and the lowest length (60 cm) was recorded for the plants treated with 20 kg NPK ha^{-1}, which was statically at similar with the absolute control (57 cm) (Table 2). Egene (2011) and Ahmad *et al.* (1996) report similar findings.

The findings of this study suggest that higher rates of poultry manure compost and NPK fertilizer used as soil amendments significantly ($p<0.001$) increased the length of tomato shoots. In addition, each treatment differently affected the length of shoots and the variation envisaged

Table 3: Effect of poultry manure and NPK fertilizer on yield of tomato var. Tanya, data collected 60-90 days after transplanting

Treatments	Rate (kg ha^{-1})	Fruits per plant	Marketable fruits per plant	Weight of fruits (g)
Control	0	5.0^{a}	3.00^{a}	341.00^{a}
Poultry	2000	15.0^{b}	11.0^{b}	823.00^{bc}
Poultry	4000	20.0^{c}	16.0^{c}	1195.00^{c}
Poultry	8000	31.0^{d}	22.0^{d}	2338.00^{e}
NPK	20	14.0^{b}	9.00^{b}	676.00^{ab}
NPK	40	22.0^{c}	19.0^{c}	1668.00^{d}
NPK	80	15.0^{b}	10.0^{b}	772.00^{b}
s.e		2.1	1.70	230.60
CV (%)		13.3	14.8	22.70
	Treatments	***	**	**
F pr.	Rates	***	***	***
	Interaction	***	***	***

F test: p>0.05 = NS: Not significant; *p = 0.05; **p<0.01; ***p<0.001, Means in the same column bearing different letter(s) differ significantly at 5% level based on Duncan's Multiple Range Test (DMRT)

between poultry manure and NPK fertilizer could be associated with their varying nutrient compositions, which are not ascertained in manure materials. These findings are almost similar to the findings of Ayoola and Adeniyan (2006) who report that nutrients variation in the source-material particularly poultry manure might result in inconsistent lengths as growth and developmental plant variables such as fruit length.

Yield components of tomato plants: The results of the effects of NPK fertilizer and poultry manure to the yield of tomato are presented in Table 3. Fruits were the only targeted parameter at different market perspectives.

Number of fruits per individual plant: The application of poultry manure compost and NPK fertilizer significantly ($p<0.001$) posed variation in number of tomato fruits per plant and the highest number of tomato fruits 31 was recorded for the plants which were treated with 8 t ha^{-1} of poultry manure compost (Table 3). In addition, the lowest number of tomato fruits was recorded for the plants which were treated with 2 t ha^{-1} of poultry manure compost, which was statistically at par with the number of fruits 14 obtained when NPK fertilizer is applied at 20 kg ha^{-1}. This indicates the significance of poultry manure compost and NPK fertilizer inputs as plant nutrient sources. This is in line with Babajide and Salami (2012) who report that tomato responded best to integration of 30 kg N ha^{-1} of urea and 2.5 t ha^{-1} of tithonia compost as reflected in best growth rate and fruit yield.

Furthermore, the results showed that application of NPK fertilizer had almost similar influence to the number of tomato fruits with that of poultry manure compost. Results indicated that the highest number of fruits 22 was recorded for tomato plants which were treated with 40 kg NPK ha^{-1}, which was statistically in line with that obtained when poultry manure compost was applied at 4 t ha^{-1}. In addition, the lowest number of tomato fruits 14 was recorded for the tomato plants treated with 20 kg NPK ha^{-1}, which was however, statistically similar with the number of fruits 15 obtained at 80 kg NPK ha^{-1} but larger than that of the absolute control 5. Similar findings to these are also reported by Adebooye and Oloyede (2006).

Number of marketable fruits per individual plant: These consistently followed similar trend to that of the number of fruits recorded for individual tomato plant. The results showed that the highest number of marketable fruits 22 was recorded from tomato plants which were treated with 8 t ha^{-1} of poultry manure compost and the lowest number 11 was recorded from plants treated with poultry manure compost at a rate of 2 t ha^{-1} (Table 3). In addition, tomato plants which were treated with 40 kg NPK ha^{-1} produced the highest number of marketable fruits 19 whereas the lowest number 9 was recorded from plants treated with 20 kg NPK ha^{-1} but this was far higher than the absolute control 3. Chandra *et al.* (2003) report similar findings.

These findings suggest that tomato plants which were treated with 80 kg NPK ha^{-1} produced relatively low number of marketable fruits 10 probably because of nutrients imbalance. This observation indicates that increase in rates of poultry manure compost significantly ($p<0.001$) increased fruit yield per plant. This is in line with the study of El-Shakweer *et al.* (1998) who report that elevated rates of poultry manure among other soil amendments increased tomato yield. In addition, Idowu *et al.* (2013) report similar findings that P significantly increased growth, yield and yield components that is number of leaves, number of flowers length of main vine etc., of snake tomato at 15 kg ha^{-1} up to 30 kg P ha^{-1}, beyond which there was a reduction.

Weight of marketable fruits: The results of the weight of marketable tomato fruits showed that the highest weight (1668 g) was recorded for the fruits from tomato plants which were treated with 40 kg NPK ha^{-1} and the lowest weight (676 g) was recorded from tomato plants treated with 20 kg NPK ha^{-1} but more than the absolute control (341 g) (Table 3). These findings suggest that productivity of tomato plants was positively influenced by the treatments but more to poultry manure compost than it was for the NPK fertilizer attributed probably to the high organic matter contents and nutrient potential of poultry manure. Tonfack *et al.* (2009) report similar findings in tomato var. Rio grande and Rossol VFN. In respect to poultry manure compost, results showed that in marketable tomato fruits the largest weight (2338 g) was recorded for the fruits harvested from tomato plants which were treated with 8 t ha^{-1} and the smallest weight (823 g) was recorded for fruits obtained from tomato plants which were treated with 2 t ha^{-1}, which was however, greater than the absolute control (341 g) (Table 3). Similar findings are also reported by Mehdizadeh *et al.* (2013) in tomato var. Rio grande treated with municipal waste, compost, poultry, cow and sheep manures.

CONCLUSION

Based on the findings of this study, it was realized that fields with Chromic Acrisols intended for tomato plants an application of 4 to 8 t ha^{-1} and 20 to 40 kg ha^{-1} poultry manure compost and NPK (23:10:5) fertilizer, respectively, is practically feasible for optimum yield. However, poultry manure compost is comparably better than NPK fertilizer in improving soil fertility status for tomato plant.

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