

## EFFECTS OF POULTRY DROPPINGS AND HOUSE HOLD WASTE ON THE YIELD AND NUTRITIONAL QUALITY OF TOMATO FRUITS (*Solanum lycopersicum*)

BY

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### ABSTRACT

A field experiment was conducted at the Teaching and Research Farm of the Federal University of Technology Minna, Gidan Kwanu Campus. The experiment was to determine the effects of poultry dropping and house hold waste on the yield and nutritional quality of tomato fruits. The experiment was 2×2 factorial in a Randomized Complete Block Design (RCBD). The treatments which were each replicated thrice consisted of poultry dropping and house hold waste at 5t/ha. There were two varieties of tomato (Roma VF and UC82B). Tomato seedlings were raised in the nursery and transplanted to the experimental site after four weeks and spaced at 50cm×50cm. Poultry droppings and house hold waste were incorporated into the soil two weeks before transplanting. Five plants were randomly selected and tagged for data collection. Data collected include plant height, number of leaves, number of branches, days to 50% flowering, number fruits, fruit girth and fruit weight. Harvested fruits were also subjected to proximate analysis. The result showed that Roma VF recorded the highest plant height, number of leaves, and number of branches, throughout the study period while UC82B recorded the lowest. There were no significant interaction effects on plant height, number of leaves, and number of branches. The result also indicated that the application of poultry dropping resulted in the highest plant height while lowest plant heights were observed where there was no soil amendment (the control). Interaction effects were also observed on number of leaves. Significant interaction effects were also observed on the number of branches at eight weeks after transplanting. The findings from this study showed that poultry dropping can be applied at 5t/ha to Roma VF for quality tomato fruit and high yield.

**Key words:** poultry dropping, house hold waste, plant height, number of branches, number of fruits

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### INTRODUCTION

Tomato (*Solanum lycopersicum*) is a short-lived perennial plant, grown as an annual plant, in the Solanaceae or nightshade family, typically growing to 1-3 m tall, with a weak woody stem that usually scrambles over other plants. The fruit is an edible, brightly colored (usually red, from the pigment lycopene) berry, 1-2 cm diameter in wild plants, commonly much larger in cultivated forms. Though it is botanically a berry, a subset of fruit, the tomato is nutritionally categorized as a vegetable.

Poultry manure is an excellent organic fertilizer, as it contains high nitrogen, phosphorus, potassium and other essential nutrients (Brady 2001). In contrast to chemical fertilizer, it adds organic matter to the soil which improves soil structures, nutrient retention, aeration, soil moisture holding capacity and water infiltration (Deksissa *et al.*, 2008). Animal oriented manure has a salutary effect on soil fertility besides improving the soil conditions and plant growth. Poultry manure in this regard occupies the pride of place as it is rich in nutrients than the other manures. But, much of the manure now produced under modern methods of rearing poultry contains no litter and contains 70 % moisture making the process of application



difficult. At the same time, if stored to reduce the moisture content, nutrient losses occur (Mohamed *et al.*, 2007). Poultry manure is rich organic manure since solid and liquid excreta are excreted together resulting in no urine loss.

Waste is defined as anything that is no longer useful and needs to be disposed of. Furthermore, waste may be defined by the type and place in which it is produced, such as agricultural, household, industrial and mining (Ministry of Local Government, Lands and Housing, 1998). The major sources of nutrients to be recycled to soils are household wastes, industrial wastes, crop residues and animal manures (Brady 2001). Waste is an unavoidable by-product of human activity and its production maintain positive relation with increasing population. These are responsible for increasing the global pollution (Rathi, 2006). Waste management is considered to be one of the most serious environmental problems confronting urban areas in Nigeria. Large quantities of organic wastes such as poultry manure, household waste are available especially in urban centres and are an effective source of nutrients for vegetables such as tomato (Rathi, 2006).

Organic farmers often use composts as soil amendments (particularly in intensive vegetable production systems) to improve soil fertility and quality, and sustain productivity. Composts improves the biological, chemical and physical properties of amended soils and can provide effective biological control of diseases caused by plant pathogens. They may also reduce the severity of diseases caused by foliar plant pathogens (Mohamed *et al.*, 2007). Using organic fertilizers, composts and additions of rock minerals not only supplies plant nutrients but increases tolerance and resistance to insects and diseases, helps control weeds, retains soil moisture, and ensures high produce quality (Zhang *et al.*, 1998).

## MATERIALS AND METHODS

The experiment was conducted at the Teaching and Research Farm of Crop Production Department, Federal University of Technology Minna (33° 82' N and 11° 30'E) in the Southern Guinea Savannah of Nigeria. The experiment was 2×2 factorial in Randomized Complete Block Design (RCBD). Each treatment was replicated three times. The land was cleared and ridges were made. Each plot consisted of five ridges. Tomato seedlings were raised in the nursery and transplanted to the experimental site after four weeks. Transplanting was done at 50cm×50cm spacing. Poultry dropping and house hold waste were incorporated into the soil at 5t/ha two weeks before transplanting. Weeding was carried manually. Five plants were randomly selected and tagged for data collection. Data collected include plant height, number of leaves, number of branches, number of fruits, fruit weight. Fruit girth, days to 50% flowering and fruit yield. Harvested fruits were also subjected to proximate analysis. Data collected were subjected to analysis of variance (ANOVA) using SAS (2002) statistical package and means were separated by Duncan's Multiple Range Test (DMRT) at 5% level of probability.

## RESULTS AND DISCUSSION

The result in Table 1 revealed that UC828 recorded highest fruit length while Roma VF recorded the lowest fruit length. However, Roma VF recorded highest number of fruits, fruit weight and fruit yield. The result also revealed that the application of poultry droppings recorded highest number of fruits, fruit weight and fruit yield while the lowest yield was observed where house hold waste was applied and where there was no soil amendment (control). Significant



interaction effects were also observed among the variety and nutrient source. The interaction effects were observed in number of fruits, fruit weight and fruit yield. However, no significant interaction effects were observed between the fruit length and fruit girth. This shows that poultry manure encourages more photosynthesis and carbohydrate synthesis which resulted in more number of fruit and ultimately, more tomato yield which is the primary objective of the farmer. Thus, suggesting the importance of poultry dropping application in improving the fertility of the soil and growth of tomato plants. This is in line with findings of Najafvan *et al.* (2008) and Ewulo *et al.* (2008) who reported significant increase in number of fruits with manure application.

**Table 1: Effect of organic nutrient sources and variety on yield parameters of tomato**

Treatment	F.Lt (cm)	F.g (cm)	Nf	F.Wt (g)	F.y (kg ha <sup>-1</sup> )	D.T50% (%)
<b>Variety (V)</b>						
Roma VF	3.86 <sup>b</sup>	2.83 <sup>b</sup>	44.00 <sup>a</sup>	7734.4 <sup>a</sup>	6450.00 <sup>a</sup>	32.11 <sup>a</sup>
UC82B	4.26 <sup>a</sup>	4.10 <sup>a</sup>	5.00 <sup>b</sup>	2421.1 <sup>b</sup>	2017.6 <sup>b</sup>	32.67 <sup>a</sup>
SE±	0.13	0.34	3.24	600.6	504.14	0.24
<b>Nutrient(N)</b>						
Control(0tha <sup>-1</sup> )	4.12 <sup>a</sup>	3.98 <sup>a</sup>	18.00 <sup>b</sup>	3395.00 <sup>b</sup>	2829.2 <sup>b</sup>	34.00 <sup>a</sup>
PD(5tha <sup>-1</sup> )	4.00 <sup>a</sup>	3.22 <sup>a</sup>	39.00 <sup>a</sup>	8267.00 <sup>a</sup>	6888.9 <sup>a</sup>	32.00 <sup>b</sup>
HW(5tha <sup>-1</sup> )	4.05 <sup>a</sup>	3.20 <sup>a</sup>	16.00 <sup>b</sup>	3572.00 <sup>b</sup>	2983.3 <sup>b</sup>	32.00 <sup>b</sup>
SE±	0.16	0.42	3.96	735.60	613.77	0.29
<b>Interaction</b>						
N x V	NS	NS	**	**	**	**

Means with different superscript in the same column are significantly ( $P \leq 0.05$ ) different.

Key;

F.Lt: fruit length, F.g: fruit girth, Nf: number of fruit, F.Wt: fruit weight F.y: fruit yield DT50%: days to 50% flowering, PD: Poultry dropping, HW: House hold waste, NS: Not significant  
\*\*.:Significant.

The result on the effect of nutrient source and variety also showed that UC82B recorded the highest fruit length, fruit girth and number of fruits. However, highest fruit weight, fruit yield was observed in Roma VF (Table 2). The application of poultry dropping recorded highest number of fruits. Significant interaction effects were also observed in number of fruits, fruit weight, and fruit



yield. The result of the interaction effect revealed that Roma VF recorded the highest number of fruits where poultry dropping and house hold waste were applied. The varietal effect on plant height, number of leaves and number of branches of tomato plant as period of growth progressed may be attributed to genetic characteristics of Roma VF. This is also in line with the report of Gudugi *et al* (2011) who reported that tomato varieties produced comparable better growth parameters irrespective of the fertilizer treatment. The interaction effect of variety and type of organic manure applied resulted in significant higher number of fruits, fruit weight and fruit yield with application of poultry dropping. This might be attributed to the combined influence of soil enriching properties of poultry dropping, vigor and high yielding attributes of Roma VF which resulted in better yield. However, the interaction of variety and type of organic nutrient prolonged the number of days to flowering and fruiting on the non fertilized soils for both varieties. This might be attributed to the poor chemical properties of the unfertilized soil (Olaniyi *et al.*, 2010).

**Table 2: Interaction effect of nutrient sources and variety on growth parameters of tomato.**

Variety	Control	PD	HW
<b><u>Number of Fruits.</u></b>			
Roma VF	33.07 <sup>b</sup>	72.07 <sup>a</sup>	27.37 <sup>b</sup>
UC82B	3.27 <sup>c</sup>	6.50 <sup>c</sup>	4.33 <sup>c</sup>
SE±	5.61		
<b><u>Fruit Weight (g).</u></b>			
Roma VF	5503.12 <sup>b</sup>	13087.01 <sup>a</sup>	4613.01 <sup>bc</sup>
UC82B	1287.02 <sup>c</sup>	3447.01 <sup>bc</sup>	2530.01 <sup>bc</sup>
SE±	1040.29		
<b><u>Fruit Yield (kg ha<sup>-1</sup>).</u></b>			
Roma VF	4586.01 <sup>b</sup>	10906.01 <sup>a</sup>	3853.01 <sup>bc</sup>
UC82B	1072.01 <sup>c</sup>	2872.01 <sup>c</sup>	2108.01 <sup>bc</sup>
SE±	1040.29		
<b><u>Days to 50% Flowering (%).</u></b>			
Roma VF	34.00 <sup>a</sup>	31.00 <sup>b</sup>	31.00 <sup>b</sup>
UC82B	33.00 <sup>a</sup>	33.00 <sup>a</sup>	32.00 <sup>b</sup>
SE±	0.42		

Means with different superscript a, b, c in the same column are significantly ( $P \leq 0.05$ ) different.

Key: PD: Poultry dropping, HW: House hold waste, NS: Not significant



The result (Table 3) of effect of organic nutrient sources and variety on nutritional quality of tomato showed that Roma VF recorded the highest crude protein, moisture content, crude fiber and ash content while UC82B recorded the highest fat content, and nitrogen free extract. Similarly, the application of poultry droppings resulted in highest crude protein, fat content and nitrogen free extract while the application of house hold waste recoded highest moisture content, crude fiber, and ash. The result of interaction effect also showed that there were significant effects on crude fiber, crude protein, ash content, and nitrogen free extract. However, no significant interaction effects were observed in moisture content and fat. The significantly low crude protein value of tomato plants sown in unfertilized soil (control) is an indication that fertilizer application significantly enhanced the nutrient status of tomato. The significantly higher protein value of tomato recorded with application of poultry dropping agreed with the findings of Ewulo *et al* (2008). The authors reported that application of poultry dropping at the rate of 20tha<sup>-1</sup> translated to a higher nutrient contents in tomato when compared with house hold waste, market and farm waste.

**Table 3: Effect of organic nutrient sources and variety on nutritional quality of tomato.**

<u>Treatment</u>	<u>MC</u>	<u>CP</u>	<u>FC</u>	<u>CF</u>	<u>AC</u>	<u>NFE</u>
<b><u>Variety (V)</u></b>						
Roma VF	94.13 <sup>a</sup>	14.61 <sup>a</sup>	4.83 <sup>b</sup>	12.84 <sup>a</sup>	4.97 <sup>a</sup>	55.82 <sup>a</sup>
U82B	93.41 <sup>b</sup>	14.06 <sup>b</sup>	6.35 <sup>a</sup>	11.89 <sup>b</sup>	3.75 <sup>b</sup>	56.35 <sup>a</sup>
SE±	0.22	0.068	0.44	0.077	0.11	0.42
<b><u>Nutrient (N)</u></b>						
Control(0tha <sup>-1</sup> )	94.33 <sup>a</sup>	13.66 <sup>c</sup>	5.41 <sup>a</sup>	11.70 <sup>b</sup>	4.00 <sup>b</sup>	56.12 <sup>a</sup>
PD(5tha <sup>-1</sup> )	93.48 <sup>b</sup>	15.11 <sup>a</sup>	6.36 <sup>a</sup>	12.63 <sup>a</sup>	4.51 <sup>a</sup>	56.61 <sup>a</sup>
HW(5tha <sup>-1</sup> )	93.49 <sup>b</sup>	14.24 <sup>b</sup>	5.02 <sup>a</sup>	12.76 <sup>a</sup>	4.57 <sup>a</sup>	55.53 <sup>a</sup>
SE±	0.27	0.084	0.54	0.094	0.13	0.52
<b><u>Interaction</u></b>						
N x V	NS	**	NS	**	**	NS

Means with different superscript in the same column are significantly ( $P \leq 0.05$ ) different.

Key:PD: Poultry dropping, HW: House hold waste, NS: Not significant, Mc: Moisture content, Cp: Crude protein, FC: Fat content, CF: Crude fibre, AC: Ash content, NFE: Nitrogen free extract, \*\*:Significant.

Varietal effect on crude protein, crude fiber and ash content were also significant such that, Roma VF produced fruits with highest nutritional value (Table 4). This is probably due to the high



fertility status of soil fertilized with poultry droppings and the ability of the roots of the tomato variety to take up available nutrients in the soil. The interaction effect of variety and type of organic manure applied resulted to high nutritional quality in Roma VF fertilized with poultry droppings. The chemical property of any vegetable is dependent on the amount of nutrients it can take up from the soil in solution form ( Olaniyi *et al.* 2010). The authors reported that the variation in nutritive value of different varieties of tomato is probably due to the edaphic factors influencing the site in which they are grown.

The results from this study showed that the application of poultry droppings enhances the growth, yield, nutritional value of two tomato cultivars (Roma VF and UC82B) grown in the South Guinea Savannah of Nigeria.

**Table 4: Interaction effect of organic nutrient sources and variety on nutritional quality of tomato.**

Variety	Control	PD	HW
<b>Crude protein (%)</b>			
Roma VF	13.40 <sup>d</sup>	15.48 <sup>a</sup>	15.08 <sup>ab</sup>
UC82B	13.32 <sup>d</sup>	14.75 <sup>b</sup>	14.00 <sup>c</sup>
SE±		0.12	
<b>Crude fibre (%)</b>			
Roma VF	11.67 <sup>c</sup>	13.89 <sup>a</sup>	12.95 <sup>b</sup>
UC82B	11.73 <sup>c</sup>	11.37 <sup>c</sup>	12.58 <sup>b</sup>
SE±		0.13	
<b>Ash content</b>			
Roma VF	5.25 <sup>a</sup>	5.26 <sup>a</sup>	4.40 <sup>bc</sup>
UC82B	2.75 <sup>d</sup>	3.75 <sup>c</sup>	4.75 <sup>ab</sup>
SE±		0.19	
<b>Nitrogen free extract</b>			
Roma VF	55.86 <sup>ab</sup>	54.46 <sup>b</sup>	57.14 <sup>ab</sup>
UC82B	56.38 <sup>ab</sup>	58.76 <sup>a</sup>	53.92 <sup>b</sup>
SE±		0.73	

Means with different superscript in the same column are significantly ( $p \leq 0.05$ ) different.

Key:PD: poultry dropping, HW: House hold waste



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