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PERFORMANCE OF OKRA (*Abelsomoschus esculentus* L. Moench) AND TOMATO (*Lycopersicum lycopersicum* Kart) MIXTURES AS INFLUENCED BY POULTRY MANURE

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ABTRACT

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Field experiment was conducted at the Teaching and Research Farm of Crop Production Department, Federal University Technology Minna, Gidan Kwanu Compus to determine the performance of okro and tomato mixtures as influenced by poultry manure. The experiment was arranged in a randomized complete block design (RCBD) with three replications. The treatments consisted of four planting patterns, sole cropping with poultry manure, sole cropping without poultry manure, okro intercropped with tomato in ratio 2:1 with poultry manure and okro intercropped with tomato in ratio 2:1 without poultry manure. There was significant differences ($p<0.05$) in the plant height among sole and inter cropped. Intercropped okro and tomato that was supplied with poultry manure produced highest plant height. Highest number of fruits and fruit weight were recorded in okro intercropped with tomato and supplied with poultry manure over sole crops. In terms of land use efficiency, intercropped okro and tomato resulted in highest Land Equivalent Ratio (LER).The result showed that, the application of poultry manure produced the best yield in okro and tomato intercrop over sole cropping and could be recommended for farmers in Guinea savannah agro-ecological zones of Nigeria.

Keywords: Poultry manure, Okra, Tomato, Plant height, Number of fruits

INTRODUCTION

Okra (*Abelmoschus esculentus* L Moench) is of the family Malvaceae. It is widely cultivated fruit vegetable fruit crop by subsistence farmers of guinea and Sudan savannah of West Africa. The production of okra as vegetable in Nigeria has rapidly increases in recent years. The seasonal supply of this vegetable to a large extent determines how much of it is being consumed by the majority of the people. Okra contains proteins, carbohydrate and vitamin C (Lamont *et al* 2004; Goplan *et al.*, 2007, Arapitas 2008, Dilruba *et al.*, 2009). Okra plays a vital role in human diet (Kahlon *et al.*, 2009). Consumption of young immature okra pods is important as fresh fruits, and it can be consumed in different forms (Ndunguru and Rajabu, 2004). Fruits can be boiled, fried or cooked (Akintoye *et al.*, 2011). Tomato consumption is believed to benefit the heart, among other body organs (Hosseini *et al.*, 2011). Tomato has medicinal properties in the sense that its consumption has been associated with decreased risk of breast cancer (Cheng *et al.*, 2009). Tomato consumption might be beneficial for reducing cardio-vascular risk associated with type 2diabetes. (Hosseini *et al.*, 2011)

Research has shown that intercropping is an efficient soil conservation practice due to the increased ground cover that it provides as well as the exploitation of different soil layers due to the different depth of root systems of the two species being intercropped (Jarenyama *et al.*, 2000).Through more effective use of water, nutrient and solar energy intercropping can significantly enhance crop productivity compared with the growth of sole crops (Hussaini *et al.*, 2001). Studies have shown the utility of intercropping as one of the crop contingency strategies against any sole cropping failure. Furthermore, intercropping has a great potential for pests, and diseases reduction (Baumann *et al.*, 2000). It has been acclaimed internationally as the most reliable approach to safeguard the sustainability of crop production (Ayoola and Agboola, 2001). Manures provide a source of all necessary macro- and micro-nutrients in available forms, thereby improving the physical and biological properties of the soil (Abou El-Magd *et al.*, 2006). Sustainability in agro-ecosystems involves environmentally-friendly techniques based on biological and non- chemical methods (Ridray and Bonato, 2007). Tomato is grown by using conventional as well as organic fertilizers. However, fertilizer sources can have a significant effect on tomato quality (Toor *et al.*, 2006). On the other hand, there is growing interest in using organic amendments and compost extracts to improve soil conditions and prevent crop diseases in tropical, arid and temperate climates (Litterick *et al.*, 2004).

They may also reduce the severity of diseases caused by foliar plant pathogens (Abbasi *et al.*, 2002). 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 produce quality. Animal manures have been used for plant production wood shavings, grass cuttings, banana leaves or rice effectively for centuries. Chicken manure has long been hulls. This combination provide an excellent source of recognized as perhaps the most desirable of these natural nitrogen (N), phosphorus (P), potassium (K) and sulfur (S) fertilizers because of its high nitrogen content (Ghanbarian *et al.*, 2008). Organic existence of a primitive

nearly wild form where it was first matter in soil improves moisture and nutrient retention cultivated. The existence of this form suggests that it and soil physical properties.

MATERIALS AND METHODS

A field experiment was conducted during the 2012 cropping season at the Research Farm of Crop Production Department, Federal University of Technology Minna, Gidan Kwanu Campus located at Latitude 6^0 33 E and Longitude 9^0 37 N in the Southern Guinea Savannah Zone of Nigeria. The average rainfall ranges between 750mm-1250mm. The soil textural class of the experimental site was sandy loam. The experiment consisted of two sources of nutrients(poultry manure at 5.2 t/ha and no soil amendment) and three cropping patterns(sole cropping of tomato, sole cropping of okra and okra intercropped with tomato). Tomato variety (UC-82B) and okra variety (LD88-1) were used. The plastic buckets were filled with sandy loam top soil. The tomato seeds were sown into perforated plastic buckets by broadcasting method and watered daily. The seedlings were transplanted to the field 30 days after sowing at 50cm×75cm inter row and 75cm intra spacing. Okra seeds were sown directly to the field seven days after transplanting. Tomato plants were staked using wooden poles to provide support for the tomato plants. Weeding was done manually at 2,4.6 and 8 weeks after sowing. Five stands of okra and tomato were randomly selected and tagged from each plots for data collection. Data collected included day s to 50% flowering, plant height, number of leaves , fruit diameter, number of fruits and fruit weight. Data Analysis: All data collected were subjected to analysis of variance (ANOVA) and means were separated using least significant difference (LSD) at 5% level of probability.

RESULTS

The result (Table 1) showed that there was no significant difference statistically in plant height of sole okra and inter planted okra at 3,6, and 9 weeks after sowing (WAS). However, application poultry manure produced highest plant height in intercropped okra. Plants from control in both sole and intercropped produced similar heights. Significant difference was observed in plant height between sole tomato and intercropped tomato at 3,6, and 9 WAS. The highest plant height was observed where poultry manure was applied to tomato sole crop while the lowest plant height was recorded in both sole and intercropped where there was no soil amendment. Days to 50% flowering, fruit length, fruit diameter of okra and tomato mixtures. The result (Table 2) revealed that there was no significant difference in the number of days it took plants both for both sole and intercropped okra to attain 50% flowering. However, plants supplied with poultry manure attained 50% flowering in lesser days. Significant difference was recorded in fruit length and fruit diameter of sole and intercropped tomato. Highest fruit length and fruit diameter were recorded in plants supplied with poultry manure while the lowest fruit length and diameter was observed where there was no soil amendment.

There was significant difference in the number of fruits and fruit yield in sole and intercropped okra (Table 3). Number of fruits and yield from plants supplied with poultry manure in intercropped okra were significantly higher than those of sole okra. However, similar numbers of fruits were produced in intercropped where there was no soil amendment. Significant difference was also recorded in number of fruits and yield in sole and intercropped tomato.

Table 1: Effects of poultry droppings on plants height (cm) of okra and tomato crop mixture

	Plant height (cm)					
	Okra			Tomato		
Treatment	3 WAS	6 WAS	9 WAS	3 WAS	6 WAS	9 WAS
Sole + C	8.4	31.1	86.4	23.7	40.3	49.7
Sole + PD	8.1	33.8	85.7	23.2	43.9	58.5
Inter + C	8.5	30.4	88.6	17.7	27.5	46.2
Inter + PD	8.3	38.7	97.2	17.5	29.0	50.4
SE±	0.8	3.3	3.4	1.7	4.2	1.8
LSD (0.05)	2.9	11.4	11.8	5.9	14.6	6.4

C –control, PD – poultry dropping at 5.2 t ha^{-1}, Inter – inter-planting

DISCUSSION

Nutrient source is one of the most important inputs contributing to crop production because it increases productivity and improves yield and quality (Akande *et al.*, 2010). Plant height was not significantly difference between sole and inter- planted okro. However, plants supplied with poultry manure had greater vegetative performance in okro intercropped over sole okro. This finding is in agreement with (Akande *et al.*, 2010) who reported that application of organic base fertilizer, poultry dropping, enhanced plant growth and development. The fruit yield was higher in intercropped than in sole okro. This result agreed with the findings of Adeniyi and

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Table2. Effects of poultry dropping on 50% flowering, fruit length (cm) and fruit diameter (cm) in okra tomato mixtures

	Okra			Tomato		
Treatment	50 % flowering (Days)	Fruit length (cm)	Fruit diameter (cm)	50 % flowering (Days)	Fruit length (cm)	Fruit diameter (cm)
Sole +C	68.3	6.5	2.4	45.7	5.1	3.7
Sole +PD	69.3	7.5	2.7	44.3	5.3	3.9
Inter +C	66.0	6.7	2.7	44.7	4.7	3.1
Inter +PD	60.8	7.7	3.0	44.7	4.7	3.2
SE±	3.9	0.3	0.1	1.2	0.1	0.1
LSD(0.05)	13.4	0.9	0.3	4.3	0.3	0.5

C-Control, PD-Poultry dropping at 5.2 t ha^{-1}, Inter-Inter-Planting

Table3. Effects of poultry on the number of fruits and yield of okra and tomato (t ha^{-1}) mixtures

Treatment	Okra		Tomato		LER
	Number of fruits $plant^{-1}$	Yield (t ha^{-1})	Number of fruits $plant^{-1}$	Yield (t ha^{-1})	
Sole +C	5.1	2.9	1.8	2.4	-
Sole +PD	6.8	3.1	2.4	3.5	-
Inter +C	5.2	3.2	1.5	2.2	2.02
Inter +PD	8.1	4.2	1.9	2.4	2.05
SE±	0.3	0.2	0.2	0.2	
LSD(0.05)	1.1	0.8	0.8	0.7	

C-Control, PD-Poultry dropping at 5.2 t ha^{-1}, Inter-Inter-Planting

Omotunde (2011) who reported that best response was obtained in okro-tomato intercrop. The author also reported that application of poultry resulted in higher yield. The significant effect of poultry dropping on the number of fruits and yield could be attributed to the improvement of the soil fertility by poultry dropping through the addition of macro and micro nutrients (Adeniyan and Oyeniyi 2005). Their findings were also in line with the work of Akande *et al.*, 2010 who attributed higher in okro to application of organic manure. Adenawoola and Adejoro (2005) also reported that organic and soil nutrients increases with the application of poultry manure. Adenawoola and Adejoro (2005) also affirmed that poultry manure contains organic matter, N, P, Ca, and Mg which are also release into the soil. The authors also went further that depletion of organic matter under intensive cropping can be amended by proper addition of poultry manure into the soil. However, component of crop proportion significantly affected plant height and vegetative growth. The low performance of intercrop tomato could be traced to the presence of inter specific competition and okro being more competitive in terms of resource utilization than tomato (Tunku *et al.*, 2010)

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