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Eggplant (*Solanum sp*) performance in organic and inorganic systems in South-Eastern Nigeria

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Key words: Poultry manure, Solanum sp, egg plant fruit yield, gross returns, fish effluent.

Abstract

The problem of rural-urban migration in Nigeria has resulted in very dense urban populations. The location of poultry and aquaculture enterprises in urban and peri-urban areas of the country has exacerbated the problem of pollution. However, these wastes can be a valuable resource for use in agriculture. The aim of this study was to examine the effects of fibre glass fish tank effluent, poultry manure, NPK and control on two eggplant varieties and weeds. The response of eggplant fruit yield to poultry manure was significant and greater than the response to fish effluent, which also gave higher yield than NPK fertilizer or control. Kaduna variety produced yield that was higher by 71% and had lower weed density compared to Ngwa local. The highest gross monetary returns were obtained from application of poultry manure, followed by fish effluent while Kaduna variety had higher returns than Ngwa local.

Introduction

The eggplant (*Solanum* sp) is an important vegetable crop in Nigeria. Species that are more popularly grown for their fruit and, in some cases also, the leaves and tender shoots exist. The crop has great potential for income generation as the fruits are consumed almost on daily basis by urban families.

Manuring and choice of variety are amongst the most practical ways of raising yields of vegetables. Increasing urban populations have resulted in a growing tendency for poultry and aquaculture enterprises to be located in urban and peri-urban areas in Nigeria. Apart from increasing poultry population, aquaculture in Nigeria has recently expanded with the potential of producing about 2.5 million metric tons of fish annually, which suggests that huge amount of fish effluent will be discharged into the environment (Osaigbovo *et al*, 2010). This study investigated the effects of poultry manure, fish effluent and NPK fertilizer on eggplant in south eastern Nigeria.

Material and methods

The field experiment was conducted between January and July, 2013 at the Michael Okpara University of Agriculture, Umudike, Nigeria Research Farm. Umudike is situated at latitude 05^0 29'N, longitude 07^0 33'E, 122m altitude. The soil is a sandy loam ultisol (sand 69%, silt 14%, clay 17%, N 0.14%, P 0.62% and K 0.45%).

Treatments comprised four manure sources and two eggplant genotypes laid out as factorial in randomized complete block with four replications. The eggplants were *Solanum gilo* cv Kaduna (round green with medium sized fruit) and Ngwa local (green striped with medium sized fruit) while the manure sources were poultry manure at 10t/ha, fibre glass fish tank effluent ($1m^3$ volume stocked with 250 *Heterobranchus longifilis* fingerlings), NPK (20:10:10) at 300kg/ha and control (no manure). The chemical characteristics of the poultry manure were pH (water) 7.06, %N3.38, % P1.27 and % K 0.67. The fish effluent had pH of 6.14, % N of 0.03, % P of 0.11 and % K of 0.24. Each plot measured 1.2m X 1.2m.

The seed was sown in nursery beds on 11 January, 2013 and transplanted in the field plots (sunken beds) on 12 February, 2013. Poultry manure was thoroughly worked into appropriate plots to incubate for 1 week before the seedlings were transplanted at a spacing of 40cm X 30cm. After transplanting, plots that did not receive fish effluent as treatment were irrigated with water from borehole. Hoe weeding was done at 6 weeks after transplanting (WAT). Insect pest control was done with Decis at 1L/ha. Data were collected on weed density and dry matter at 6 WAT. Records were taken on number and weight of fruits and gross returns (₦160 = $1). The data collected were subjected to analysis of variance.

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Results

Weed density and dry weight

Although the manurial treatments had no obvious effects on weed density, there was significant difference among the cultivars in their ability to reduce weed population (Fig. 1). Weed density was reduced significantly by 61% under Kaduna variety compared to Ngwa local.

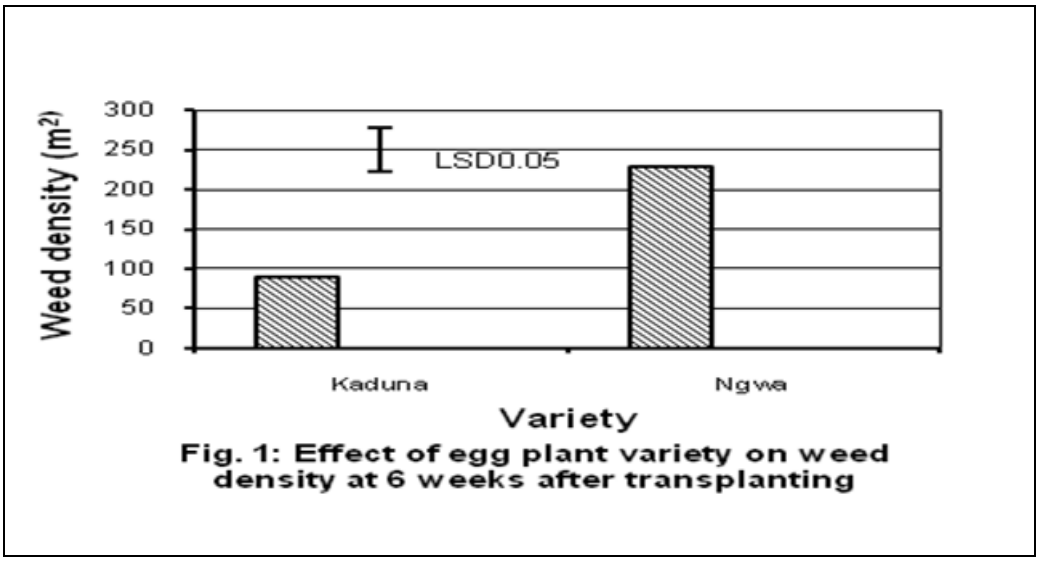

Fig. 1: Effect of egg plant variety on weed density at 6 weeks after transplanting

Weed dry weight was reduced significantly by 44% in fish effluent and 27% in NPK compared to poultry manure application (Fig.2). Variety and interaction effects were not significant.

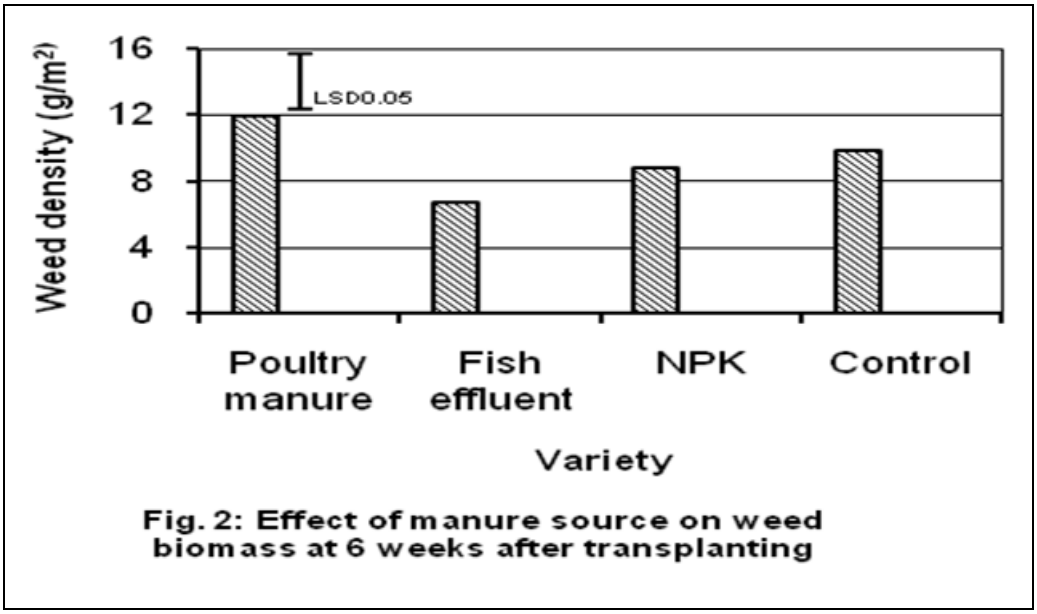

Fig. 2: Effect of manure source on weed biomass at 6 weeks after transplanting

Yield and gross returns

On average, poultry manure gave significantly the highest number of fruits per plant while NPK or the control gave the lowest number of fruits (Table 1). Variety and interaction effects were not significant.

Application of poultry manure gave significantly highest eggplant fruit yield, followed by fish effluent which gave higher yield, than did the application of NPK or control.On average, Kaduna variety gave 71% significantly higher fruit yield than Ngwa local. Interactions were not significant.

Similarly, application of poultry manure generated the highest gross monetary returns, followed by fish effluent. Kaduna variety also gave higher gross returns than Ngwa local. Interactions were not significant.

Discussion

The lower weed density in the Kaduna variety was attributable to the broader leaves which reduced light penetration down the crop canopy. On the other hand, the application of poultry manure encouraged greater weed growth due probably to more availability of water and nutrients as reported by Amanullah *et al* (2010). Okpara *et al* (2011) made a similar observation in which the application of manure increased weed biomass at 6 weeks after planting.

The higher fruit yields and gross returns obtained from manure applications (Poultry manure followed by fish effluent) were ascribed to the probable effects of organic manures in improving soil chemical and physical characteristics (Mbah and Mbagwu, 2003; Mbagwu, 1989). Among the cultivars, Kaduna variety gave higher yield and gross returns than Ngwa local, due mainly to an increase in average weight per fruit in the former. This finding is of interest from both the economical and ecological points of view.

Table 1. Effect of Manure Sources and Eggplant Varieties on Number of Fruits/Plant Fruit Yield and Gross returns.

Varieties	Manure Source				
	PM	FE	NPK	Control	Mean
Number of Fruits/Plant					
Kaduna	21.8	13.5	6.6	7.1	12.3
Ngwa	14.9	9.9	8.6	7.7	10.1
Mean	18.4	11.7	7.6	7.1	
Fruit Yield (t/ha)					
Kaduna	51.9	34.5	15.1	21.8	30.8
Ngwa	30.2	16.5	14.5	11.1	18.0
Mean	41.0	25.5	14.8	16.5	
Gross returns ($/ha)					
Kaduna	202892	134606	58817	85296	120403
Ngwa	117775	64475	56462	43288	70500
Mean	160333	99540	57639	64292	

		Number of Fruits	Fruit Yield	Gross Returns
LSD (0.05) for manure (M)	Means =	46.6	10.4	40443.6
LSD (0.05) for variety (V)	Means =	NS	7.3	28597.9
LSD (0.05) for M X V	Means =	NS	NS	NS

PM = Poultry manure, FE = fish effluent, NPK = inorganic fertilizer.

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