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The effect of three organic amendments on early growth of yellow passion fruit (passiflora edulis var. Flavicarpa)

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Abstract: *Yellow passion fruit has a brightfuture in Nigeria, but Low soil fertility in the tropics which Nigeria is inclusive presently posesa problem of adequate agronomic package for highly successful cultivation. Soil fertility therefore can be improved and maintained by the application of organic ammendments which are essential factors for improvement of crop yields.Field investigations were carried out on the effects of some organic ammendment (solid (kitchen) waste, cowdung and poultry droppings)on early growth of yellow passion fruit at the teaching and research farm, University of Ibadan. After a week oftransplant (WAT), data on vine length, number of leaves and number of branches were collected over a period of seven weeks (at a weeks interval). Data collected were analysedusing ANOVA and means were separated using Duncan Multiple Range Test (DMRT) at 5 % probability level. Results obtained indicated significant response of yellow passion fruit plant to the various organic manure applications compared to control (no organic ammendment). However application of solid kitchen waste(SW) was found to be the most superior over other organic ammendmentwith respect to all the variables investigated. Completion of this investigation to the yield stage will confirm the effect of the manure applied on the fruit of the plant. This will help to make a more in-depth recommendation for passion fruit farmers.*

Key Words: *Cowdung,Growth, Poultry droppings,Solid Waste, Yellow Passionfruit*

I. Introduction

The yellow passion fruit**,** whose origin has been linked to southern Brazil, was introduced into Nigeria in the 1980s and its majorly grown in some parts of Northern Nigeria (Alegbejo, 2004). This crop has a brightfuture in Nigeria, but presently faces the problem of adequate agronomic package for highly successful cultivation (Ani and Baiyeri, 2008). This includes majorly low soil fertility in the tropics which Nigeria is inclusive. Soil fertility therefore can be improved and maintained by the application of organic and inorganic fertilizers which are essential factors that will enable the world to feed billions of people of its population (Brady and Weil, 1999 : Okigbo, 1985). The use of inorganic fertilizers can improve crop yields, soil pH, total nutrient content and nutrient availability (Akande *et al*., 2010), most especially in the tropics where soils are inherently low in fertility(Obi and Ebo, 1995), as a result of constant exposure of soil in this region to forces of degradation which causes rapid deterioration in their physical, chemical and biological properties. However, More than 50% of inorganic fertilizer applied to remedy the problem of low soil fertility in the tropics polluted the environment (Ladha *et al*., 1998) through acidification of soil (Kennedy and Tchan, 1992) and NO_3 pollution of ground water through leaching (Shrestha and Ladha, 1998).When excessively used, it also has a depressing effect on yield. This causes a reduction in number of fruits, delays and reduces fruit setting (John *et al*., 2004). The use of organic manures as a potential means of maintaining and increasing soil fertility and crop yields has been advocated (Titiloye, 1982; Agboola and Adeoye, 1990; Anikwe, 2000).Soil organic matter is the natural reservoir which furnishes large portions of soil with nitrogen, phosphorus and sulphur and protectsit against erosion. Desirable aggregate formation substances are also supplies by organic matter which helps to loosens up the soil for easy movement of air and water(Donahue et al., 1983). Research has recorded the importance of organic matter to maintain soil condition and productive capacity in cereal growing areas and pasture lands of Australia.Aitken et al. (1990) and Fenton and Helyar (2007), reported that the presence of soil organic matter can buffer against strong acidification caused by nitrate leaching and the removal of exchangeable cations such as Ca and Mg in agricultural produce. Soil health and soil condition is important and the management of soil organic matter is an important part of managing soil health and maintaining soil condition. Therefore the aim of this work is to evaluate the effect of some organic ammendments (poultry dropping (PM) Cowdung (CD) and Solid waste (SW) and no treatment (CT)) on early growth of yellow passion fruit.

II. Materials And Methods

This study was carried out at inthe teaching and research farm department of Agronomy, University of Ibadan in collaboration with the center for Environment renewable Natural Resources Management Research and Development (CENRAD), where the yellow passion fruit seedlings were collected at the age of 12weeks.

2.1 Collection of soil sample

The soil samples were randomlycollected at a depth of 0 - 15cm, because the passion fruit plant is a shallow rooted woody vine. The samples were bulked, air dried and passed through a 2mm sieve before physical and chemical analyses were carried out on the soil. The soil physical and chemical characteristics were as follows: 692 g/kg Sand, 74 g/kg Silt, 234g/kg Clay; pH in (H_20) 6.8; 11.8g g/kg organic carbon; 2.86 mg/kg Extractable P (Bray 1) soils; 2.3g/kg total N and Exchangeable Ca, Mg, K were 0.80, 0.16, 0.09Cmol/kg respectively, the micro nutrients which includes Mn, Fe, Zn and Cu were 800 mg/g, 17.60 mg/g, 32.2 mg/g and 1.40 mg/g respectively while the CEC was observed to be 1.42Cmol/kg.

2.2 Experimental design

The experiment waslaid out in a Randomized Complete Block Design (RCBD)in three replicates.The treatments includes poultry dropping (PM) Cowdung (CD) and Solid waste (SW) and no treatment (CT).

2.3 Plant establishment andtreatmentapplication

Yellow passion fruit plant is a shallow rooted vine hence shallow holes were dug before the seedlings were transplantedwith ball of earth on their root from the nursery bag. This was done after land clearing. The seedlings were transplanted at the rate of one plant per hole. Sticks were erected beside each plant to trail the vines a week after transplanting. The plants were rain fed from the start of experiment to the end. Manure application was done a weekafter transplanting.The application was done by ring method where a shallow pit was dug around each vine at a distance of 7cm (from theroot to the ring) and the appropriate treatment was applied and covered back with soil.

III. Methodology and Data Collection

Vine length, number of leaves andnumber of branches per plant were collected at weekly interval to evaluate the response of the yellow passion fruit plant to the different organic manures which include poultry dropping, cowdung solid waste and no treatment.

3.1 Measurement of the Morphological Characteristics of yellow passion fruit plant

The vine length which was measured atthree weeks interval was done by the use of tape rule and was terminated when the vine was too tall to be measured. The vine length is the length from the soil surface to the terminal bud.

Numberof leavesand number of branches of plants weredetermined by counting.

3.2 Statistical Analyses

Data collected were subjected to ANOVA while treatment means were separated using Duncan Multiple Range Test (DMRT) at 5% probability level.

IV. results and discussions

Significantly higher vine lengthwas obtained in yellow passion fruit when solid waste was used as manure after first week oftransplanting compared to other treatment (Table 2). At 2(two)weeks after transplanting, significantlylower vine lengthwas obtained when cowdungs was used as manure compared to other treatments. Solid waste also recorded the highest vine lengthalthough it was not significantly different from poultry dropping. Highest number of vine lengthwere obtained when solid waste andpoultrydroppings were used as manure although they were not significantly different from other treatments at three WAT. At 4 WAT,solid waste gave significantly higher vine lengthcompared to other treatments except for poultry dropping. Solid waste also gave significantly higher vine length at five and seven weeks after transplanting compared to other treatments and a marked higher vine length on six weeks after transplanting which however was not significantly different from that of poultry drroppings and cowdung. There was consistent increase in vine length as the weeks increases when solid waste was used as manure compared to other treatments, this complements the findings ofAdejumo *et al*. (2010) who reported that higher dose of municipal solid waste caused an increase in vine length. Carmine *et al*.(2004) also reported that Municipal Solid Waste (MSW) compost can be used to maintain long term productivity of agro-ecosystems and to protect the soil environment from over cropping. Crecchio et al. (2001),Herencia *etal.* (2007) and Weber *et al*. (2007), discovered potential increase in the content of nutrients available for plants and some enzymatic activities directly associated to

biochemical and microbiological transformations which facilitated plant growth when composted solid waste was added as inputs to an agricultural soil. Mbau *et al*. (2014) also observed and reported that population of soil macrofauna, especially earthworm, termites and beetles, were numerous on soil treated with composts solid waste compared to that of the control and inorganic fertilizer treatments. These beneficial changes in soil properties with compost-amended treatments, positively affect the growth and yield of maize.

There was significant increase in number of leaves when solid waste was used as manure compared to other treatments at two weeks after transplanting (Table 3). Application of poultry droppings as manure markedly increased the number of leaves at three and four weeks after transplanting, although it was not significantly different from other treatments except for control. No application of the organic manure significantly reduced number of leaves at five weeks after transplanting compared to other treatments. At 6 and 7 weeks after transplanting, application of solid waste significantly increased number of leaves compared to no application. There was also a marked increase in number of leaves observed for application of solid waste compared to poultry droppings and cowdung although they were not significantly different from each other. Consistent increase was also observed in number of leaves across the week for the application of solid waste. Law-Ogbomo and Ajayi (2009), observed increased vegetative development and herbage yield of *Amaranthus cruentus*with application of solid waste compost.

At 2, 3 and 4 weeks after transplanting, there was no significant difference between the treatments and the control (Table 4). At 5 weeks after transplanting, number of branches markedly increased with the application of solid waste compared to other treatments except for application of poultry droppings. No application of organic manure resulted to significantly lowest number of branches at both six and seven weeks after transplanting compared to solid waste, however solid waste which recorded highest number of branches was not significantly different from poultry droppings and cowdung. Solid waste influenced higher increase in number of branches evaluated across the week after transplanting. These results corresponds with the findings of Wilson *et al.*(2004) who studied the use of compost in the production of four species of ornamental plants and found that the plants cultivated in Municipal Solid Waste compostimproved all growth parameters especially in branches than the plants cultivated in pit. Pagliai *et al.(*1981), also observed an increase in the number of small and medium sized pores in solid waste compost amended soils, indicating a better structure and potential for plant growth. Ribeiro *et al*. (2000), found that the addition of 10-20% MSW compost, increased growth and yield of *Geranium.*

V. conclusion

Application of solid waste as manure positively influenced all the parameters assessed in yellow passion fruit plant however, poultry droppings also showed good performanced compared to other treatments used. This could mean that poultry manure can substitute for solid waste manure in the production of yellow passion fruit. Further studies needs to be carried out on the effect of these treatments on yield of yellow passion fruit plant.

Table 2: Effect of Organic ammendments on yellow passion fruit vine length at successive weeks.

TREATMENT	WEEKSAFTER TRANSPLANTING					
	1	2	3	4	5	6 7
CT	57b	85bc	102ab	106b	119d	132d 126b
PD	59b	103ab	136a	149a	172bc	184ab 199bc
CD	52b	67d	123ab	126b	163cd	164ab 174dc
SW	74a	123a	150a	161a	161a	257a 272a

Legend
CT= control
PD= Poultry manure
SW = Cowdung
SW = Solid waste

Table 3 : Effect of Organic ammendments on yellow passion fruit Number of leaves at successive weeks.

TREATMENT	WEEKSAFTER TRANSPLANTING					
	1	2	3	4	5	6 7
CT	23b	32b	58b	62b	74d	74c87d
PD	22cd	36b	103a	111a	128abc	133abc 144ab
CD	19d	44b	89ab	96ab	144ab	155ab 168ab
SW	27ab	69a	99ab	107a	161a	170a 185a

Legend
CT= control
PD= Poultry manure
SW = Cowdung
SW = Solid waste
CT= control
PD= Poultry manure
SW = Cowdung
SW = Solid waste

Table 4: Effect of Organic ammendments on yellow passion fruit Number of branches at successive weeks.

TREATMENT	WEEKSAFTER TRANSPLANTING					
	1	2	3	4	5	6 7
CT	_	6a	6a	7b	7b	8b 8b
PD	_	6a	7a	8a	11ab	12ab12ab
CD	_	7a	8a	9b	7b	10ab11ab
SW	_	7a	8a	9a	13a	14a 14a

Legend
CT= control
PD= Poultry manure
CD = Cowdung
SW = Solid waste

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