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Research Paper

Effects of Different Rates of Solid (Kitchen) Waste and Poultry Droppings on Early Growth of Yellow Passsion Fruit (Passiflora Edulis Var. Flavicarpa)

[1]Akinboye, O.E.[1]Nwokocha, A. G. and [1]Abiola F.R
Department of Agronomy and Landscape Design, School of Agriculture and Industrial Technology Science
Babcock University, Ilishan-Remo Nigeria 08069415949

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ABSTRACT:- Field investigations were carried out on the effects of solid kitchen waste and poultry droppings performance of passion fruit at the University of Ibadan between August and October 2000). These treatments (solid kitchen waste and poultry droppings) were applied at the rate of 0kg/ha, 0.5kg/ha and 1kg/ha. Starting from the second week after transplanting (WAT), data on vine length, number of leaves and number of branches were collected over a period of six weeks (at two weeks interval). Data collected were analysed using ANOVA and means were separated using Duncan Multiple Range Test (DMRT) at 5 % probability level.

Results obtained indicated significant response of passion fruit plant to the various organic manure applications. Application of solid kitchen waste (SW) at the rate of 1kg/ha was found to be the most superior organic manure influencing growth of the passion fruit plant compared to SW at 0.5kg/ha, Poultry dropping (PD) at 0.5kg/ha and 1kg/ha. However, the plants also responded positively to poultry droppings **(**PD) at 0.5kg/ha and 1kg/ha applied. Completion of this investigation to the yield stage will confirm the effect of the manure applied on the passion fruit plants. This will help to make a more in-depth recommendation for passion fruit farmers.

KEYWORDS:- Solid Waste, Poultry Droppings, Different Rates, growth of Yellow Passion fruit

I. INTRODUCTION

Yellow Passion fruit belongs to the plant Family Passifloraceae, and genus Passiflora. The genus Passiflora contains as many as 400 species, most of which have ornamental values which are well known around the world (Vanderplank, 1991). *Passiflora edulis* is a species of the genus Passiflora which has two varieties, *passiflora edulis var*. flavicarpa and *passiflora edulis* var.edulis.The yellow passion fruit passiflora edulis var. flavicarpa is a vigorous, perennial, woody climbing vine which can grow up to 4.5 to 6m per year once it is well established on a plot and its suitable for ornamental screening. The leaves are glossy and dark green on the upper side and of a light green on the underside, they vary from 5 to 18 cm in length for central lobe and from 4 to 17 cm for the lateral lobes (Eeckenbrugge and Ferla, 2000). It has a life-span of between 5 to 7 years. (Morton, 1987).

The yellow passion fruit has many uses, it is a good source of carotene and vitamin C. Its seed oil is used both industrially and domestically and the seed meal contains 12 % protein and 50 to 55 % fiber (Zuniga, 1981). Passion fruit cropping offers a revenue-earning opportunity for developing countries like Nigeria with an emerging economy. The ban on imported fruit drinks into the country, which has stimulated a demand for locally produced juice concentrates by the fruit drink industry for local and export markets, placed passion fruit in a good chance of large-scale cultivation in Nigeria (Alegbejo, 2004). The pharmaceutical properties can not be over emphasized which includes the fact that its being used for asthmatic, bronchitis and whooping cough patients. In peruvian traditional medicine today, passion juice is used to treat unwary infections and as a mild diuretic. More of its pharmaceutical properties in the area of traditional medication and herbal remedies and also the fruit industry need to be developed especially in Nigeria. Passion fruits grow on many soil types but light to heavy sandy loam with pH of 6.5 to 7.5 are suitable. Passion fruit require a well-drained soil with plenty of moisture in the growing season including soil rich in organic matter (Chittendon, 1992 ; Knight and Sauls, 1994).

*Corresponding Author: [1]Nwokocha, A. G.

Department of Agronomy and Landscape Design, School of Agriculture and Industrial Technology Science
Babcock University, Ilishan-Remo Nigeria 08069415949

Organic matter is important for maintenance of soil fertility through nutrient cycling and improvement of soil physical properties such as structure, water infiltration and water holding capacity of the soil. It helps to regulate soil temperature, pH and it increases the cation exchange capacity of the soil. It acts as a source of calcium, magnesium, nitrogen and phosphorus required for plant growth (Chikowo, 1998). Agboola and Unamma, (1991) observed that all trace elements were more available to plant when organic matter was applied and there was increase in crop yield. It is also relatively cheaper and more eco-friendly when compared with inorganic amendments. Darwish *et al*. (1995) reported that high organic matter content reduced soil physical degradation and improved soil strength. Studies have shown that poultry dropping and solid waste have the ability to influence the growth and production of agricultural crops hence the decision to try their effect on yellow passion fruit crop production.

The main objective of this research work was to find out which rate among poultry manure and solid waste (Kitchen waste) will be suitable for the growth of yellow passion fruit.

II. MATERIALS AND METHODS

The experiment was carried out in the teaching and research farm department of Agronomy, University of Ibadan. The yellow passion fruit seedlings used for this study were collected at the age of 12 weeks .

Table 1: ANNUAL SUMMARY OF WEATHER DATA FOR IITA CENTER STATION IBADAN, 2000

	Total monthly rainfall (mm)	**Total Rain Pan evaporation (mm)**	**Mean wind speed (km/hr)**	**Solar radiation (MJ/M^2/day)**		**Temp (^0C) mean**	**Min**	**Max**
Jan	11.7	130.7	3.1	11.9	22.1	33.2	27.6	43
Feb	0.0	177.2	3.2	15.6	19.7	34.7	29.1	21
Mar	46.5	190.0	4.8	17.15	22.4	35.8	29.1	32
April	123.5	146.4	5.3	16.21	22.9	35.8	27.9	61
May	87.3	152.1	3.7	16.83	22.6	32.0	27.3	63
June	163.9	105.0	3.1	15.85	21.7	30.1	25.9	68
July	231.6	106.4	3.1	12.85	21.4	28.4	24.9	73
Aug	251.7	88.9	1.8	10.35	21.4	27.8	24.6	77
Sept	236.2	116.9	1.9	13.11	22.1	29.5	25.8	72
Oct	103.8	135.8	1.8	15.35	22.1	30.8	26.4	64
Nov.	0.0	147.3	1.5	16.19	23.2	32.9	28.0	49
Dec.	0.0	38.6	0.4	3.96	5.2	8.5	8	26
Total	1306.2	1535.3	33.7					
Average annual			2.8					

Collection of soil sample

The soil samples were randomly taken 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 analysis were carried out on the soil. The soil physical and chemical characteristics were as follows: 692 g/kg Sand, 74 g/kg Silt, 234 g/kg Clay; pH in (H_20) 6.8; 110.8 g g/kg organic carbon; 2.86 mg/kg Extractable P (Bray 1) soils; 2.3 g/kg total N and Exchangeable Ca, Mg, K were 0.80, 0.16, 0.09 Cmol/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 found to be1.42 Cmol/kg (Table 2).

Experimental design

The experiment was laid out on a randomized complete block design (RCBD) with five treatments as poultry dropping at 0.5 kg/ha (PM1) and 1 kg/ha (PM1), solid waste at 0.5 kg/ha (SW1) and 1 kg/ha (SW2) and no treatment (CT) which was replicated three times.

III. PLANT ESTABLISHMENT AND TREATMENT APPLICATION

After land clearing, the seedlings were transplanted with ball of earth on their root from the nursery bag. Yellow passion fruit plant is a shallow rooted vine hence shallow hole was dug before the seedlings were transplanted. 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 weeks after transplanting. Rate of 0.5 kg/ha and 1.0 kg/ha of manure which includes poultry manure and solid waste were applied to each point. The application was done by ring method

where a shallow pit was dug around each vine at a distance of 7 cm and the appropriate treatments was applied and covered back with soil.

IV. METHODOLOGY AND DATA COLLECTION

Data on three growth parameters were collected at two weeks interval to evaluate the response of the yellow passion fruit plant to the different manure types and rates. The growth parameters were

i Vine length
ii Number of branches per plant
iii Number of leaves per plant

Measurement of the Morphological Characteristics of yellow passion fruit plant

The vine length was measured by using a tape rule and was terminated when the vine was too tall to be measured by direct method. The vine length is the length from the soil surface to the terminal bud.
The number of leaves were counted using direct method. The number of branches were also counted plant by plant and recorded as appropriate.

Statistical Analyses

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

V. RESULTS AND DISCUSSIONS

During the period of this experiment (August) rainfall was 251.7mm (Table 1). At 2 weeks after transplanting, highest vine length was obtained in yellow passion fruit when solid waste at the rate of 1 kg/ha was used as manure, it was significantly higher compared to other treatments except for poultry dropping at the rate of 1 kg/ha (Table 3).

At 4 weeks after transplanting, the lowest vine length were obtained when there was no treatment (control) and when solid waste at the rate of 0.5 kg/ha was used as manure. They were significantly lower compared to other treatments. Solid waste at the rate of 1 kg/ha also recorded the highest vine length although it was not significantly different from poultry dropping at the rate of 0.5 kg/ha and 1 kg/ha respectively. At 6 weeks after transplanting, there was significant difference between vine length for all treatments and no treatment (control). Solid waste at 1 kg/ha also gave highest vine length compared to other treatments although it was not significantly different from poultry dropping at the rate of 0.5 kg/ha and 1 kg/ha respectively and solid waste at 0.5 kg/ha. There was consistent increase in vine length as the weeks increases when solid waste at 1 kg/ha was used as manure compared to other treatments, this complements the findings of Carmine et al.(2004) who 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. Adejumo et al**.** (2010) also reported accordings to his findings that higher dose of municipal solid waste caused an increase in vine length.

There was significant increase in number of leaves when 1 kg/ha rate of solid waste was used as manure compared to other treatments except for number of leaves obtained when 1 kg/ha rate of poultry dropping was used at two weeks after transplanting (Table 4). At 4 weeks after transplanting, application of 0.5 kg/ha poultry droppings and 1 kg/ha solid waste gave a marked increase in number of leaves compared to other treatments. At 6 weeks after transplanting, application of solid waste at 1 kg/ha significantly increased number of leaves compared to application of 0.5 kg/ha rate of solid waste and control except for 0.5 kg/ha and 1 kg/ha of poultry droppings respectively. Consistent increase was observed in number of leaves across the week in the application of 0.5 kg/ha and 1 kg/ha of poultry dropping and also in 1 kg/ha of solid waste. The observed differences in values obtained in all the number of leaves assessed could be attributed to the differences in nutrient contained in the rate of manure applied. The increase in number of leaves observed in application of poultry droppings at different rates corresponds to the findings of Shiyam and Binang (2013) who observed that fresh leaf yield increased with increasing poultry manure rates. Nweke *et al. (*2013) also reported that poultry manure increased number of leaves compared to other treatments he worked on.

At 2 and 4 weeks after transplanting, there was no significant difference between the treatments and the control, although there was a slight increase in the number of branches when 1 kg/ha of solid waste was applied at 2 WAT and when 1 kg/ha solid waste and 0.5 kg/ha poultry dropping were applied at 4 WAT (Table 5). At 6 weeks after transplanting, number of branches significantly increased with the application of solid waste at the rate of 1 kg/ha compared with 0.5 kg/ha of solid waste application and control except for application of 1 kg/ha and 0.5 kg/ha of poultry droppings respectively. Nevertheless solid waste at 1 kg/ha still influence higher increase in all parameters across the weeks after transplanting. These results correspond to the findings of Pagliai et al.(1981) who 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. Increase in soil water

holding capacity after application of solid wastes has also been reported (Baziramakenga *et al.* , 2001 ; Chang *et al.* ,1983 ; Giusquiani *et al.* ,1995) . Solid wastes compost has also been shown to increase total porosity which is a measure of the size and arrangement of voids in the soil matrix, thus this affects both aeration and water movement.

VI. CONCLUSION

Generally, application of 1 kg/ha rate of solid waste was as markedly effective as manure in all the parameters assessed in yellow passion fruit plant however, 1 kg/ha and 0.5 kg/ha of poultry droppings respectively also showed good performanced compared to 0.5 kg/ha of solid waste and control. This could mean that either 0.5 kg/ha or 1 kg/ha of poultry manure can substitute for 1 kg/ha solid waste manure in the production of yellow passion fruit. Further studies needs to be carried out on the effect of the differents rates of treatments on yield of yellow passion fruit plant.

Table 2: Effect of different rates of solid waste and poultry droppings on yellow Passion fruit vine length at successive weeks.

	WEEKS AFTER TRANSPLANTING		
Treatments	**2**	**4**	**6**
CT (0 kg/ha)	85bc	106b	132d
PD_1 (1 kg/ha)	103ab	149a	182ab
SW_1 (1 kg/ha)	123a	161a	257a
PD_2 (0.5 kg/ha)	79cd	152a	186ab
SW_2 (0.5 kg/ha)	67d	126b	164ab

Means with same letter(s) in a column are not significantly different at 5 % level of probability according to Duncan Multiple Range Test (DMRT)

Legend
CT = control at 0 kg/ha
PD_1 = Poultry manure at 1kg/ha
SW_1 = Solid waste at 1kg/ha
PD_2 = Poultry manure at 0.5kg/ha
SW_2 = Solid waste at 0.5kg/ha

Table 3: Effect of different rates of solid waste and poultry droppings on yellow Passion fruit number of leavess at successive weeks.

	WEEKS AFTER TRANSPLANTING		
Treatments	**2**	**4**	**6**
CT (0 kg/ha)	32b	62b	79c
PD_1 (1 kg/ha)	53ab	111a	133abc
SW_1 (1 kg/ha)	69a	107a	170a
PD_2 (0.5 kg/ha)	36b	78ab	117abc
SW_2 (0.5 kg/ha)	40b	98ab	84c

Means with same letter(s) in a column are not significantly different at 5 % level of probability according to Duncan Multiple Range Test (DMRT)

Legend
CT = control at 0 kg/ha
PD_1 = Poultry manure at 1kg/ha
SW_1 = Solid waste at 1kg/ha
PD_2 = Poultry manure at 0.5kg/ha
SW_2 = Solid waste at 0.5kg/ha

Table 4: Effect of different rates of solid waste and poultry droppings on yellow passion fruit Number of branches at successive weeks.

WEEKS AFTER TRANSPLANTING

Treatments	2	4	6
CT (0 kg/ha)	6a	7a	8b
PD_1 (1 kg/ha)	6a	8a	12ab
SW_1 (1 kg/ha)	7a	9a	14a
PD_2 (0.5 kg/ha)	6a	9a	9ab
SW_2 (0.5 kg/ha)	6a	7a	7b

Means with same letter(s) in a column are not significantly different at 5 % level of probability according to Duncan Multiple Range Test (DMRT)

Legend

CT = control at 0 kg/ha
PD_1 = Poultry manure at 1kg/ha
SW_1 = Solid waste at 1kg/ha
PD_2 = Poultry manure at 0.5kg/ha
SW_2 = Solid waste at 0.5kg/ha

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