PROXIMATE COMPOSITION OF AFRICAN EGGPLANT (*Solanum macrocarpon*) OBTAINED FROM SOIL AMENDED WITH CATTLE DUNG AND POULTRY MANURE

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Oyebamiji, Kehinde J.[1] and Ayeni Leye Samuel[2]*
Department of Crop Science and Production, Joseph Ayo Babalola University, Arakeji, Ikeji, Osun State, Nigeria
Department of Agricultural Science, Adeyemi College of Education, PMD 520, Ondo, Ondo State Nigeria
*Corresponding author: leye_sam@yahoo.com

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Abstract: Pot and field experiments were conducted at the Teaching and Research Farm of Agricultural Science Department, and the screen-house of the Department of Biology, Adeyemi College of Education, Ondo, Southwestern Nigeria in 2018 to compare the effect of cattle dung (CD) and poultry dung (PD) on nutritive value of African garden egg (*Solanum macrocarpon*). In pot experiment, cattle dung and poultry manure were separately applied as treatments at the rate of 0, 25, 37.5 and 50 g/10 kg soil to represent 0, 5, 7.5 and 10 t ha^{-1} while cattle dung and poultry manure were separately applied at 0, 5, 7.5 and 10 t ha^{-1} in field experiment. In pot experiment, the treatments were laid out in completely randomized design (CRD) while randomized complete block design (RCBD) was used in field experiment. All the treatments were replicated three times. The results obtained in pot and field experiments followed the same trend. Relative to control, except 5CD and 5PD, all the treatments significantly increased ($p < 0.05$) crude protein, carbohydrate, fat, fibre and ash content of *Solanum macrocarpon.* Poultry dung applied at 7.5 and 10 t ha $^{-1}$ had higher increase in plant crude protein, carbohydrate, fibre and ash content of *Solanum macrocarpon* than its corresponding 7.5 and 10 t ha^{-1} cattle dung. Poultry manure applied at 7.5 t ha $^{-1}$ is most suitable for growing *Solamun macrocarpon* and where poultry manure is not available cattle dung can be used.

Keywords: Ash, carbohydrate, crude protein, fat, fibre, *Solanum macrocarpon*

Introduction

Nowadays it has become imperative to change orientation of Africans from eating heavy starchy foods such as cassava, yam, rice etc. at the expense of fruits and vegetables. There are many local vegetables that are not domesticated but grow everywhere in the country especially during the wet season in southern Nigeria. Among the common local vegetables and fruits are water leaf *Talinum triangulare*, amaranthus spp, bitter leaf, celosia spp, eggplants solanum spp, etc. African vegetables are common, cheap and nutritious with health value (Makinde *et al.*, 2011; Olubunmi *et al*., 2011). Some of them serve as weeds which constitute nuisance to the environment that need to be removed. Records have shown that, African vegetables have health beneficial effect, if properly harnessed, can possibly substitute for synthetic medicines (Makinde *et al*., 2011; Tamègnon *et al*., 2012; Adeyemi *et al*., 2017).

Solanum macrocarpon is a local leafy vegetable that is cultivated mainly for its leaves. Unlike the other solanum varieties, its bitter taste has made the fruits less edible. Macrocarpon has many benefits. It is readily available, cheap, and nutritious with nutritive value. It could be used to prepare soup. Kausshik *et al*. (2009) maintained that *Solanum macrocarpon* could be used to treat tuberculousis, convulsion and boost infertility and insomnia in women in traditional way. The leaves can be boiled to extract the juice which can be used to alleviate jaundice, asthma and whooping cough (Jain, 1968).

Consumers prefer vegetables that are unspotted, succulent with green colour and nutritious. The low fertility status of most Nigerian soils hampers the production of macrocarpon to consumers' taste. This is one of the reasons why many Olericulturists grow vegetables with mineral fertilizers especially with NPK fertilizers, urea, and ammonium sulphate with the ultimate aim of increasing the leaf area. These nitrogenous fertilizers are acidic and their long time use increase soil acidity (Ayeni *et al*., 2008). It has been reported that organically produced foods are better than foods produced from synthetic materials (Makinde *et al*., 2010).

Growing Solanum animal wastes is expected to influence its growth components and nutritive value because trials have been made in growing some vegetables with organic manures such as cattle dung, poultry manure, pig dung among others (Okubena-Dipeolu *et al*., 2016). The objective of this study was to compare the effect of poultry manure and cattle dung on nutritional quality of African Eggplant.

Materials and Methods

Screen-house and field experiments were conducted in Ondo southwestern Nigeria. Ondo is located in longitude 7 10^0 6 ^{1} 0 N and 4^0 50^1 E (Hapstead, 1975). It has bimodal rainfall pattern.

The Garden egg seeds were bought from NIHORT, Ibadan, Oyo State of Nigeria. Fresh poultry manure was collected from a local poultry farm in Ondo town located in Ondo State southwestern Nigeria while cattle dung was collected from abattoir in Ondo town. Washed river sand was collected from the river near the Research Farm of the Department of Agricultural Science, Adeyemi College of Education, Ondo. The soil sample was bulked, air-dried for two weeks and sieved through a 2 mm mesh.

Poultry manure at 0, 25, 37.5 and 50 g to represent 0, 5, 7.5 and 10 t ha^{-1} and cattle dung at 0, 25, 37.5 and 50 g to represent 0, 5, 7.5 and 10 t ha^{-1} were individually applied to 10 kg soil in a perforated poly pot. The treatments were placed on raised platform in the screen- house. The treatments were replicated three times and arranged on completely randomized design.

The treatments were watered with equal volume of water every week. Hands were used to uproot the weeds in the screen-house. The land was manually cleared, stumped, mapped out, pegged and made into twenty eight beds. The size of each plot was 4 x 4 m with alley way of 1 m apart. The field experiment was laid out in randomized complete block design and replicated three times. Three levels of each of poultry manure and cattle dung at 0, 5, 7.5 and 10 t ha $^{-1}$ were formulated as treatments.

The fresh poultry manure and cattle dung was each cured for two weeks under shade before they were applied as treatments. Poultry manure, and cattle dung were incorporated into the soil with local hoe two weeks before the eggplants seedlings were transplanted into the plots. The seedlings of

eggplants were transplanted at a spacing of 60 x 60 cm. Weeding was carried out at three weeks interval using hand hoe.

Nutrient composition determination

The leaves were ash by the procedure described by Hach (1999) and the nitrogen content was determined by the normal Kjedal digestion method and multiplied by 6.25 to get crude protein. The crude fat was determined by soxhet extraction method, ash and fibre and the moisture contents were determined by the methods described by the Association of Official Analytical Chemists (1999).

Data analysis

Data collected was subjected to analysis of Variance (ANOVA) using Statistical Packages (SAS) where there is significant differences the means were separated using Duncan Multiple Range Test (DMRT).

Results and Discussion

Nutrients composition of poultry manure and cattle dung

The nutrients composition of poultry manure and cattle dung used as treatments in the conduct of the experiments are shown in Table 1. Poultry manure and cattle dung had reasonable amount of N, P, K, Ca, Mg, Fe, Cu and Zn. This is in line with the assertion of Ayeni *et al*. (2008) that animal manures comprised reasonable amount of plant nutrients that could be used to increase nutrient status of infertile soils. Poultry manure had higher amount of N, P, K, Ca, Mg and Cu than cattle dung while cattle dung had higher amount of Fe and Zn than poultry manure. This result shows that poultry manure might have added more N, P, K, Ca, Mg and Zn to the soil for eggplant uptake than cattle dung.

The effect of poultry manure and cattle dung on nutritive value of *Solanum macrocarpon* in screen-house experiment is shown in Table 2. Relative to control, all the treatments except 5CD and 5 PD significantly increased ($p < 0.05$) crude protein, carbohydrate, fibre and ash content of *Solanum macrocarpon*. Generally, *Solanum macrocarpon* had high moisture content, low crude protein , low crude fat and high fibre content. Oboh *et al*. (2005) recommended 4.3, 0.6, 1.4, 1.3 and 89.7% for protein, crude fat, crude fibre, total ash and moisture content respectively as the critical level for optimum nutritive value of *Solanum macrocarpon*

The fat contents in the leaves of S. *macrocarpon* amended with poultry and cattle dungs were lower than the 0.6% reported for *S. macrocarpon* by Oboh *et al*. (2005).

The crude fibre content of 2.68 - 7.18% recorded by the *Solanum macrocarpon* amended with poultry and cattle dungs in this experiment was higher than higher than the 1.11 % reported by Chinedu *et al*. (2011) and 1.4% recommended by Oboh *et al*. (2005). The results that the nutrients composition of *Solanum macrocarpon* were higher than the control experiment justifies the use of animal manures in improving the nutrient quality of the crop. Ilodibia *et al.* (2016) stated that animal manures improve the nutritional quality of macrocarpon. Showemimo *et al*. (2004) affirmed that high crude fibre and low-fat contents of these fruits may be helpful in preventing such disorders as constipation, carcinoma of the colon and rectum, diverticulitis and atherosclerosis They may also partly account for the weight reduction effect of African eggplants (Odetola *et al*., 2004; Edijala *et al*., 2000, Ayeni, *et al.*, 2018).

Bonsu *et al*. (2002) stated that the high fibre contents together with the low carbohydrate contents found in this plant are also good in the management of diabetes mellitus. The ash contents of *Solanum macrocarpon* amended with both poultry manure and cattle dung at all rates varied between 0.59 and 7.18% and were higher than the 0.47% value obtained by Chinedu *et al.* (2011). Carbohydrate contents ranged between 2.42 – 7.18%. The carbohydrate content of the *Solanum macrocarpon* amended with poultry manure and cattle dung at 7.5 and 10 t ha $^{-1}$ compared favourably with the results of Edem *et al*. (2009) who reported 4.42% as the critical value. This reasonably good amount of carbohydrate and crude fibre with low crude proteins and crude fats make them good source of raw material for food industries (Edem *et al*., 2009).

Table 1: Nutrients composition of poultry manure and cattle dung (%)

Manure	OC	N	C/N	P	K	Ca	Mg	Fe^{2+}	Cu^{2+}	Zn^{2+}
Poultry manure	20.4	2.41	8.46	3.9	3.2	2.6	0.69	0.03	0.11	1.4
Cattle dung	22.4	1.23	18.21	0.76	0.34	0.71	0.3	0.11	0.2	1.24

Table 2: Effect of poultry manure and cattle dung on nutritive value of *Solanum macrocarpon*.in Screen-house Experiment (%)

Treatment	Moisture	crude protein	Crude fat	Carbohydrate	Ash	Fibre
C	95a	0.46b	0.02a	2.42c	0.59b	1.12b
5CD	95a	0.51b	0.02a	2.68c	0.64b	1.15b
7.5CD	92a	0.80a	0.03a	4.20b	1.02a	1.96a
10CD	91a	0.81a	0.03a	4.72b	1.03a	2.00a
5PD	94a	0.52b	0.02a	2.87c	0.70b	1.45a
7.5PD	91a	0.87a	0.03a	5.12b	1.11a	2.22a
10PD	89a	0.91a	0.04a	7.18a	1.16a	2.14a

Mean with the same letter are not significantly different at 5% using Duncan Multiple Range Test

NB: C = Control, CD = cattle dung, PD = poultry manure

The effect of poultry manure and cattle dung on nutritive value of *Solanum macrocarpon* in field experiment is shown in Table 3. Relative to control, all the treatments significantly increased ($p < 0.05$) crude protein, crude carbohydrate, ash and crude fibre. The moisture content of *Solanum macrocarpon* was high in all soil samples ranging between 75 – 87%. Horwat *et al*. (2001) affirmed that African eggplant fruits generally have high moisture content (about 75%) and low dry matter. The moisture content of any food is an index of its water activity and is used as a measure of stability and the susceptibility to microbial contamination (Horwat *et al*. 2001). This high moisture content implies that dehydration would increase the relative concentrations of the other food nutrients and improve the shelf-life/preservation of the fruit.

The Protein content as reported by Howart *et al.* (2001) was 5.79% which was lower than the values obtained in this study (5.86 – 6.55%). The value of protein content obtained in screen- house experiment was lower than the values obtained in the field experiment. This might be as a result of the lesser volume of the soil used in pot than the field that might have limited the uptake of nutrients by the *Solanum macrocarpon*.

Howart, (2001) reported that vegetables contain very little fats. Dietary fats are essential for the make-up and biological functions and integrity of cells and also increase the tastiness of food by absorbing and retaining flavours. A diet high in fat is said to be implicated in certain cardiovascular disorders such as atherosclerosis, cancer and aging. Eggplants may therefore be ideal fruits for individuals with high serum lipid levels, high blood pressure and other ischemic heart diseases.

The percentage carbohydrate obtained in this study (8.74 – 9.44) was found to be in the range of (8.54 – 34.74% reported for papaya, apple, water melon, guava, orange and prickly pear. The low carbohydrate level of eggplant cultivars make them good for diabetic patients and individuals watching their weight (Odetola *et al*., 2004). The ash level shows the degree of the inorganic matter. Values obtained from this study (3.07 – 3.34) were higher than those in the work of Agoreyo *et al*. (2012) which was within the range of 1.81 - 1.78% but lower than that recorded by Auta *et al*. (2011) which was 7.10%. Agoreyo *et al*. (2012) asserted that the high crude fiber, low fat and low dry matter of the eggplants may be helpful in preventing diseases such as constipation, carcinoma of the colon and rectum and atherosclerosis. The low energy content of the eggplant cultivars may be very helpful in weight management i.e. to lose weight; fewer calories must be taken than what is expended. Grunwald *et al*. (2001) stated that water and fiber in foods increase volume of the food and thereby reduce its energy density. It has been shown that in their natural state, fruits and vegetables have high water and fiber content and are low in calories and energy density.

Table 3: Effect of poultry manure and cattle dung on nutritive value of *Solanum macrocarpon* in field experiment (%)

Treatment	Moisture	Crude protein	Crude fat	Carbohydrate	Ash	crude fibre
C	87a	2.10d	1.11a	4.40b	2.06b	2.89b
5CD	78a	3.13c	1.50a	8.74a	3.07a	5.86a
7.5CD	77a	4.19b	1.17a	9.37a	3.10a	4.93a
10CD	76a	4.21b	1.20a	9.33a	3.26a	5.99a
5PD	75a	5.97bc	1.24a	8.89a	3.10a	5.98b
7.5PD	75a	4.95a	1.18a	9.64a	3.33a	6.34a
10PD	75a	4.64a	1.32a	9.44a	3.34a	6.55a

Mean with the same letter are not significantly different at 5% using Duncan Multiple Range Test

NB: C = Control, CD = cattle dung, PD = poultry manure

Table 4: Effect of poultry manure and cattle dung on nutritive value of *Solanum macrocarpon* in field experiment (%)

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5CD	78a	3.13c	1.50a	8.74a	3.07a	5.86a
7.5CD	77a	4.19b	1.17a	9.37a	3.10a	4.93a
10CD	76a	4.21b	1.20a	9.33a	3.26a	5.99a
5PD	75a	5.97bc	1.24a	8.89a	3.10a	5.98b
7.5PD	75a	4.95a	1.18a	9.64a	3.33a	6.34a
10PD	75a	4.64a	1.32a	9.44a	3.34a	6.55a

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NB: C = Control, CD = cattle dung, PD = poultry manure

The effect of poultry manure and cattle dung on nutritive value of *Solanum macrocarpon.*in field experiment is shown in Table 4. Relative to control, all the treatments significantly increased ($p < 0.05$) crude protein, crude carbohydrate, ash and crude fibre. The moisture content of *Solanum macrocarpon* was high in all soil samples ranging between 75 – 87%. Horwat *et al*. (2001) affirmed that African eggplant fruits generally have high moisture content (about 75%) and low dry matter. The moisture content of any food is an index of its water activity and is used as a measure of stability and the susceptibility to microbial contamination (Horwat *et al*., 2001). This high moisture content implies that dehydration would increase the relative concentrations of the other food nutrients and improve the shelf-life/preservation of the fruit.

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Conclusion

Pot and field experiments were conducted at the Teaching and Research Farm of Agricultural Science Department, and the screen-house of the Department of Biology, Adeyemi College of Education, Ondo, Southwestern Nigeria in 2018 to compare the effect of cattle dung (CD) and poultry dung (PD) on nutritive value of African garden egg (*Solanum macrocarpon*). Cattle dung and poultry manure had significant effect on nutritional value of African eggplant. Application of 7.5 ha^{-1} of poultry manure compared favourably with 10 t ha^{-1} poultry manure on nutritional value of African eggplant.

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