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STUDIES ON THE PROXIMATE COMPOSITION OF *CUCUMIS SATIVUS* GROWN IN SOIL WITH DIFFERENT ORGANIC MANURE

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ABSTRACT

The proximate composition of *Cucumis sativus* grown in soil with different organic manure (cow dung, poultry manure and rice husk) was analyzed for their nutritive values. The experiment lasted for duration of 10 weeks. Parameters analyzed include fruit weight, fruit length and girth and then the proximate composition (moisture content, lipids, protein, crude fiber, ash content and carbohydrate). *C.sativus* grown with cow dung showed a high value of moisture content (9.50±3.08), lipids (5.82±2.41), protein (0.88±0.93), crude fibre (16.0±4.00), ash content of (14.90±3.86) and carbohydrate (52.90±7.27). For poultry manure, the values were as follows; (9.01±3.01) lipids (5.75± 2.39), protein (0.77± 0.87), crude fibre (15.90±3.98), ash (14.63±3.86) and carbohydrate (52.80±7.26). *C. sativus* grown with rice husk gave the following values; moisture content (8.97±2.99), lipid (5.56±2.35), protein (0.72±0.84), crude fibre (15.11±3.88), ash (14.24±3.77) and carbohydrate (52.10±7.21). The control sample had the lowest content of minerals with the moisture content at (7.00±2.64), lipid (4.10±2.02), protein (0.61±0.78) crude fibre (14.13±3.74), ash (12.90±3.59) and carbohydrate (46.20±6.79). The average weight recorded for the fruit was as follows; cow manure (657±25.63kg), poultry manure (488.7±22.10kg), and the rice husk (448±21.16kg) and control (308±17.54kg). While for the fruit length, the following values were recorded; cow manure (27.50±5.24cm), poultry manure (25.50±5.04cm), rice husk (21.10±4.59) and the shortest which is the control (21.60±4.64). Also, the fruit girth was thus; cow dung (23.00±4.79), poultry manure (21.50±4.63), rice husk (20.50±4.52) and control (18.42±4.28). *Cucumis sativus* grown with cow manure gave the highest proximate composition among the organic manure investigated. Therefore, cow dung manure would be the preferred manure for the cultivation of *Cucumis sativus*.

Keywords: *Cucumis sativus,* Cucumber, Organic, Manure, Proximate composition.

INTRODUCTION

Cucumis sativus commonly known as cucumber is a member of family Cucurbitaceae and is originated from South Asia. They are generally grown in the Caribbean, Malaysia, Indonesia and West Africa. It is eaten raw or cooked, sometimes picked. The leaves, fruit and stem are all edible (Tindal, 1967).

Within the species, wide variation with respect to bearing habitat, maturity, yield, shape, size, colour, spines and vine habit of the crop has been observed in India. *C. sativus* houses several botanical varieties including *Var. sativus*, the cultivated cucumber and the wild, free-living Var. hardwikii (R) Alef. (Kirkbride, 1993). Species of Cucurbitaceae are grown widely around the world as crops. The family is comprised of about 118 genera and 825 species that are primarily cold sensitive, annual/perennial vines (Chen *et al.*, 1995). *C. sativus* have both culinary and non-food uses, hence, some cosmetic products, including lotions, perfumes and soaps contain cucumber extracts. Cucumbers are consumed as fresh or processed forms (Jeffery, 1990).

Application of organic waste including manure, sewage sludge, and municipal compost in soil is a suitable method for the maintenance of soil organic matter, improve soil quality and supply nutrients needed by plants (Greer and Diver, 2000; Shetty and Wehner, 2002). Excessive use of chemical fertilizer and pesticides in agricultural systems make some problems such as environmental pollution, soil erosion, food chain restriction, pest resistance to pesticides, in addition human and environmental problems may also arise. An unpracticed use of agricultural pesticides and inorganic fertilizer has harmful effects on humans and the environment, and this is a critical issue in the world today.

Use of organic manure and biological control, plays an important role in this context (Greer and Diver, 2000).To improve agricultural productivity and soil fertility it is necessary to add organic matter to the soil. The use of organic manure in the soil, generally in order to maintain and increase aggregate stability and fertility of soils for farming and garden in the past decade has been of particular importance.

In this way, in addition to cost reduction and waste disposal, it will lead to more efficiency and usefulness (Shetty and Wehner, 2002). Shafiee (1996) studied the effect of 50, 100 and 150t/h manure as compared to other treatments, had a greater impact on *Cucumis sativus* yield. They reported that *Cucumis sativus* field in the treatments of 50, 100, 150t/h manure lead to 89, 100 and t/h respectively. Azimzadeh *et al*. (2014) tested the effect of different amounts of manure on yield and quality of *Cucumis sativus* cultivars and explained that application of 30t/h manure and 50 kg/h nitrogen produced maximum number of nodes per plant. Ahmadi. (2003) reported that safflower showed better reaction to organic fertilizer in both dry land and irrigated condition. Ahmadi. (2003) also reported that canola shows better reaction to manure and vermiform post in limited condition of moisture and their replacement possibility in such as these conditions with chemical fertilizer in considerable.

The aim of this work was to determine the effect of organic manure (cow manure, poultry manure, rice husk) on the yield of cucumber (*C. sativus*) and to determine its nutritional values.

MATERIALS AND METHODS

Field experiment

Field Experiment was conducted at Presco Campus Abakliki Ebonyi State, South-East Nigeria located at latitude 6.32^0 South and longitude 8.12^0 East and 117m above the sea level. The vegetation of the region where this experiment was conducted is a tropical rain forest. The land was tilled with a hoe to make the soil soft and suitable for easy germination and establishment of crop and four beds was made. The beds were selected to represent each treatment, three for the organic manure and then one for the control.

The organic manure used include: cow dung, poultry manure and rice husk. The organic manure were applied to the soil two weeks before planting in order to enable proper release of nutrients that would serve as starter dose for the crop. The manure was measured 10g for each cultivated bed. Planting of *Cucumis sativus* seeds was carried out on 6th July, 2014 and the experiment lasted for duration of 10 weeks.

Planting was done three seeds per hole and later thinned to two seeds per stand two weeks after planting during the first manual weeding to give a total plant 80 plants/ha at a spacing of 75x75cm inter and intra row spacing. Subsequent manual weeding was carried out at two weeks intervals up to maturity of the crop. Each plot size was 3.75m x 3.75m with 1.5m pathways. The experiment was carried out in complete random block design (RCBD) replicate to a total of four plots.

Insect pests were controlled at two weeks interval using wood ash. Yield parameters of crop such as fruit length per plant (cm), fruit girth per plant (cm) and fruit weight (kg) were equally assed at harvest.

Sample Preparation

The plant samples were cleansed of dirt and insect larvae. The leaves were washed and spread on a mat, they were dried under the sun for 14 days until they turned brittle and crispy enough to mill. Milling was done manually with pestle and mortar to obtain powdered samples needed for analyses.

Proximate analysis

The gross components considered were moisture content, ash content, crude protein, crude fat, crude fibre and carbohydrate and these was carried out using the method described by AOAC. (1990).

Determination of Fat Content (lipids)

Continuous Solvent Extraction Gravimetric Method using Soxhlet apparatus as described by Harbone (1973) was used to determine the fat content in the plant sample. About 5.0 g of each sample was wrapped in a porous paper (Whatman No 45 Filter paper) the wrapped sample was put in a Soxhlet flask containing 200 mL of petroleum ether. The upper end of the reflux flask was conducted to a condenser. By heating the flask through electro-thermal heater, the solvent vaporized and condensed into the flux flask such that the wrapped sample was completely immersed in the solvent and remained in contact with it until the flask filled up and siphoned over thus carrying oil extract from the sample down to the boiling flask.

The defatted sample was removed and reserved for crude fibre analysis. The solvent was recovered and the extraction flask with its oil content was dried in the oven at 60°C for 3 mins so as to remove any residual solvent. After cooling in a desiccator, the flask was reweighed. By difference, the weight of fat (oil) extracted was determined and expressed as a percentage of the sample weight. It was calculated as:

$$\% fat = \frac{w_3 - w_2}{w_1} * \frac{100}{1}$$

Where: W_1 = weight of sample analyzed, W_2 = weight of empty flask, W_3= weight of flask and extracted oil.

Determination of Crude Fibre

The Wended Method described by James (1995) was used for the determination of the crude fiber content. A measured weight of the defatted sample 5g from the fat analysis was boiled under reflux for 30mins. After that, the samples were washed with several portions of hot boiling water using a two-fold muslin cloth to trap the particles. The washed samples were carefully transferred quantitatively back to the flask and 20mL of 1.25% NaOH solution was added to it. Again, the samples were transferred to a weighed porcelain crucible and dried in an oven at 105 °C for 3hours after cooling in a desiccator, they were reweighed (W2) and then put in a muffle furnace and incinerated at 550 °C for 2hours (until they turned into ash), again they were cooled in a desiccator and weighed. The crude fibre content was calculated gravimetrically as:

$$\% \text{ crude fibre} = \frac{w_2 - w_3}{w_1} * \frac{100}{1}$$

Where: Where: W_1 = weight of sample analyzed, W_2= weight of crucible and sample after boiling and drying, W_3 = weighed of crucible and sample after ashing.

Determination of Total Ash

Furnace Incineration Gravimetric Method described by James (1995) was used to estimate the total ash content. A measured weight of the sample was put in a previously weighed porcelain crucible and allowed to incinerate in a muffle furnace at 550°C until only ash content was left of it. The crucible and its ash content was cooled in a desiccator and then weighed, total ash was given by the formula.

$$\% \text{ Ash} = \frac{w_3 - w_1}{w_2 - w_1} * \frac{100}{1}$$

Where: W_1 = weight of dry crucible, W_2= weight of crucible and sample before ashing, W_3 = weighed of crucible and sample after ashing.

Determination of Moisture Content

The moisture content was determined gravimetrically as described by Pearson (1976). A five gram 5.0g weight of each sample was weight of each was weighed into a pre-weighed moisture can, each can with its sample content were dried in the oven at 105°C for 3 hours in the first instance. It was cooled in desiccator and reweighed. The weight was recorded while the sample was returned to the oven and dried further. The drying, cooling and weighing was continued repeatedly until a constant weight was obtained. The weight of moisture lost was determined by difference and expressed as a percentage. It was calculated as

$$\% \text{ moisture} = \frac{w_3 - w_1}{w_2 - w_1} * \frac{100}{1}$$

Where: W_1 = weight of dry crucible, W_2= weight of crucible and sample before drying, W_3 = weight of crucible and sample after drying.

Determination of Carbohydrate

The carbohydrate content was determined by calculating the difference of Nitrogen Free Extractive (NFE). It was given as the difference between 100 and a sum total of the other proximate components. Hence it was calculated using the formula below:

% CHO = 100 - % (Protein + Fat + Fibre + Ash + Moisture content).

Determination of protein

Semi-micro Kjedahl method as described bt AOAC (was used for the protein determination. A measured weight of the test sample 2g was mixed with 10ml of conc. H_2SO_4 in a Kjedahl digestion stand in addition to a tablet of selenium catalyst and heated strongly under a film cupboard as the digestion process. A reagent blank was digested as well but without any sample. All digest were carefully diluted with distilled water and transferred quantitatively to a 100ml volume flask and made up to mark with distilled water. An aliquot 10ml of the digest was mixed with equal volume 10ml of 45% NaOH solution in a machine distillation apparatus. The mixture was distilled and the distillate connected into 10ml of 4% boric acid solution containing three drops of mixed indicator solution (methyl red and bromocressol green), a total of 50ml of distillate was collected and titrated against 0.02N H_2SO_4 solution. The end point was marked by a colour change from green to deep red colour both the sample and the reagent blank digest were distilled and titrated. The formula below was used to calculate the nitrogen and protein content.

$$\%\, protein = \%\, N_2 * 6.25$$

$$\%\, N_2 = \frac{100}{w} * \frac{14 \text{ X N}}{1000} * \frac{V_d}{V_a} * (t - b)$$

Where: W= weight of sample analyzed, N= Normality (conc) of titration (0.02N-H_2SO_4), *Vd*= total volume of digest, *Va* = volume of digest analyzed, *t* = titre value of sample, *b* = Titre value of blank.

RESULTS AND DISCUSSION

Table 1 shows the length, the girth and the weight of cucumber fruit. Cucumber plant grown with cow manure had the highest weight, length and girth while those grown with poultry manure and rice husk showed relatively more improvement than the control sample which gave a significant lower value.

Table 1: Average Fruit Length, Girth and the Weight

Sample	Plant weight (kg)	Plant length (cm)	Plant girth (cm)
Cow dung	657±25.63	27.50±5.24	23.00±4.79
Poultry dung	488.7±22.10	25.50±5.04	21.50±4.63
Risk husk	448±21.16	21.10±4.59	20.50±4.52
Control	308±17.54	21.60±4.64	18.40±4.28

Result is the mean of triplicate study ± SEM

Table 2 shows the proximate values of cucumber plant grown with different manure. In the cucumber plant grown with cow dung, carbohydrate was the highest proximate content (52.90±7.27) while protein was the least (0.88±0.93). Also, in cucumber plant grown with poultry manure, carbohydrate was the highest proximate content (52.80±7.26) while protein was the least (0.77±0.87). The proximate values of cucumber plant grown with rice husk showed that carbohydrate was the highest proximate content (52.10±7.21) while protein was the least (0.72±0.84). And finally the proximate values of the control sample of cucumber plant also showed carbohydrate was the highest proximate content (46.20±6.79) while protein was the least (0.61±0.78).

Table 2: Proximate results of *Cucumis sativus* grown with different manure

Parameter (%)	Poultry	Rice husk	Cow dung	Control
Moisture	9.10±3.01	8.97±2.99	9.50±3.08	7.0±2.64
Lipids	5.75±2.39	5.56±2.35	5.82±2.41	4.10±2.02
Protein	0.77±0.87	0.72±0.84	0.88±0.93	0.61±0.78
Crude fibre	15.90±3.98	15.11±3.88	16.00±4.00	14.13±3.74
Ash	14.63±3.86	14.24±3.77	14.90±3.86	12.90±3.59
CHO	52.80±7.26	52.10±7.21	52.90±7.27	46.20±6.79

Result is the mean of triplicate study ± SEM

Application of organic waste including manure, sewage sludge, and municipal compost in soil is a suitable method for the maintenance of soil organic matter, improving soil quality and supplying nutrients needed by plants. The application of cow dung, poultry manure and rice husk had varying effects on the fruit length, the weight and the girth of *Cucumis sativus*. The result in Table 1showed that cow manure had a very significant effect in the growth of the plant and also had the highest proximate value. The results obtained confirms the report of Kroon et al. (1980) which showed that the application of organic wastes to the soil is a suitable method for the maintenance of soil organic matter and improvement of soil quality, thus, supplying sufficient nutrients to the plants.

Plants improve well and more better when added an adequate amount of organic manure which help in the production of more fruits which as well will have the right minerals which is needed by the plant and of course the animal that eats it (Greer and Diver, 2000). Various studies have shown that to improve agricultural productivity and soil fertility it is necessary to add organic matter to the soil to maintain and increase aggregate stability and fertility of soils for farming. Although, studies by Shafiee (1996) have shown that *Cucumis sativus* thrives well when grown with poultry manure and cow manure, however, cow dung had a greater impact on the yield of cucumber.

The proximate analyses also revealed the presence of various compositions in varying quantities, which is a result of the effects of the type of manure used. Carbohydrate was the highest proximate content while the least proximate content was protein in the three manure treatments used for the experiment.

CONCLUSION

Use of organic manure plays an important role in raising crops of good quality. To improve agricultural productivity and soil fertility it is necessary to add organic matter to the soil. The use of organic manure in the soil, generally in order to maintain and increase aggregate stability and fertility of soils for farming and garden in the past decade has been of particular importance. From the result of the experiment, *Cucumis sativus* grown with cow manure gave the highest proximate composition among the organic manure investigated. Therefore, cow dung manure would be the preferred manure for the cultivation of *Cucumis sativus*.

CONFLICT OF INTEREST

None declared.

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