**EVALUATION OF ANIMAL MANURES ON THE YIELD AND CHEMICAL PROPERTIES OF SOIL GROWN WITH *Solanum macrocarpon***

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**ABSTRACT**

Animal manures regarded as wastes could be channeled towards improving the fertility of the soil and crop production. A field experiment was conducted at the Federal University of Agriculture, Abeokuta Nigeria in 2013 to evaluate the effect of animal manures on yield and chemical properties of soil grown with *Solanum macrocarpon*. Treatments used were: goat manure at 10, 20 and 30t/ha (GM 10, GM 20 and GM 30 respectively), poultry manure at 10, 20 and 30t/ha (PM 10, PM 20 and PM 30 respectively), cow dung at 10, 20, 30t/ha (CD 10, CD 20 and CD 30 respectively) and control. Application of GM 30 significantly increased the height (25.90 cm), number of leaves (65), yield (248.65 g/plant) of *S. macrocarpon* and post harvest soil K (0.08 cmol/kg)above the control. Highest post harvest soil available phosphorus (54.58 mg/kg) and magnesium (2.47 cmol/kg) were observed from PM 30 treated plots. *S. macrocarpon* could be grown with either goat manure at 30t/ha or poultry manure at 30 t/ha for higher yield and improved soil quality on soils similar to the one used for the experiment.

Keywords: Poultry manure, Post harvest, *Solanum macrocarpon*, Yield, Goat manure

**INTRODUCTION**

*Solanum macrocarpon* is a vegetable crop cultivated for its various uses, the young leaves are consumed while the fruits and roots have a variety of medicinal uses. *S. macrocarpon* was reported by Olaniyan *et al*, (2006) to be frequently grown in Nigeria on soils which lack the ability to supply necessary nutrients. The use of chemical fertilizer on such soils has been discouraged due to high cost and non availability at the right time (Chude, 1999). This requires investigation into the use of cheaper materials which could be sourced locally and regularly for *S. macrocarpon* production.

**MATERIALS AND METHODS**

**DESCRIPTION OF THE EXPERIMENTAL SITE**

The study was carried out at the Organic Farm of the Federal University of Agriculture, Abeokuta in 2013. The soil in the area was classified by FDALR (1990) as Oxic Paleustal.

**LAND PREPARATION AND TREATMENT APPLICATION**

The experimental site was manually cleared, plots measuring 3 m x 2 m were marked out with pegs. Spacings of I m and 2 m were left between plots and replicates respectively. Soil samples were taken at six points on the site before treatment application. Treatments applied were: Poultry manure at 10, 20 and 30 t/ha (PM 10, PM 20 and PM 30 respectively), Goat manure at 10, 20 and 30 t/ha (GM 10, GM 20 and GM 30 respectively), Cow dung at 10, 20 and 30 t/ha (CD 10, CD 20 and CD 30 respectively) and Control.

**PLANTING AND WEED CONTROL**

*S. macrocarpon* seeds were planted at inter and intra row spacings of 30 cm x 45 cm and at the rate of four seeds per hole on the 23rd of January, 2013. Thinning was done to one seedling per stand at two weeks after planting. Weeds were manually controlled at four weeks interval.

**DATA COLLECTION**

Plant height and number of leaves were observed at eight weeks after planting, fresh yield was determined by cutting the plant at 10 cm above soil level at 10, 12 and 14 weeks after planting and these were weighed on a balance. Soil samples (0-15 cm layer) were randomly collected at four points on each plot with the aid of a soil auger at the end of the experiment, bulked and sub-sampled for analysis.

**SOIL ANALYSIS**

Post harvest soil total nitrogen, available phosphorus and exchangeable potassium were determined by Kjeldahl method, Bray 1 method and flame photometry respectively. Calcium and magnesium were determined by atomic absorption spectrophotometry. Organic carbon was determined by wet oxidation method and pH by glass electrode method.

**RESULTS AND DISCUSSION**

The experimental soil was low in nitrogen and potassium, goat manure is highest in potassium but lowest in C/N while poultry manure has highest nitrogen, organic carbon phosphorus, calcium and magnesium contents (Table 1). Plant height ranged from 4.15 cm to 25.90 cm, application of GM 30 significantly (P < 0.05) increased *S. macrocarpon* height above all other amendments and the control which had the shortest plants (Table 2). Plants treated with GM 30 and GM 20 had significantly higher number of leaves (65 and 33 respectively) than the control (12.50) and plants amended with CD 30 (13). The highest percentage increase in yield over control (78.73 %) resulted from GM 30 application. Percentage increase in yield over control relative to amendment application followed this order: GM 30 (78.73 %) > PM 30 (73.30) > PM 10 (62.70 %) > CD 10 (61.47 %) > PM 20 (61.35 %) > CD 30 (59.62 %) > GM 10 (57.04) > GM 20 (56.96 %) > CD 20 (49.13 %) (Table 2). This observation may be due to early release of nutrients by GM as a result of its low C/N. Moyin – Jesu *et al,* 2012 reported quick release of nutrient by manure with low C/N.

Post harvest soil nitrogen contents were similar in all plots. Phosphorous contents ranged from 20.24 mg/kg to 54.58 mg/kg. The highest value which is significantly (P< 0.05) higher than control resulted from PM 30 application. Potassium was highest in plots amended with GM 30 (0.08 cmol/kg), this value is significantly (P < 0.05) higher than the control plot (0.04 cmol/kg). Application of PM 30 increased the magnesium content (2.47 cmol/kg) significantly (P < 0.05) above PM 10 (1.27 cmol/kg), GM 10 (1.11 cmol/kg), CD 10 (1.05 cmol/kg), CD 20 (1.05 cmol/kg), CD 30 (1.13 cmol/kg) and control (1.02 cmol/kg). This is in agreement with the findings of Aboutayeb *et al,* 2014 who reported that chicken manure significantly increased post planting soil P above control. Adeleye *et al,* (2010) also observed that poultry manure increased magnesium content of soil planted with yam.

**CONCLUSION AND RECOMMENDATION**

The results of this experiment showed that the application of goat manure at 30 t/ha (GM 30) significantly increased the height, number of leaves of *S. macrocarpon*  and post harvest soil K above the control. Highest post harvest soil P and Mg resulted from the application of Poultry manure at 30 t/ha (PM 30). *S. macrocarpon* could be planted with either goat manure at 30 t/ha or poultry manure at 30 t/ha for higher yield and improved soil quality on similar soils.

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Table 1. Properites of pre-planting soil and organic amendments

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Property | Soil | Poultry manure | Goat manure | Cow dung |
| O. C. (%) | 1.62 | 15.57 | 10.56 | 9.25 |
| N (%) | 0.08 | 3.45 | 2.89 | 2.37 |
| P (mg/kg) | 32.63 | 0.32 | 0.11 | 0.06 |
| K | 0.05 cmol/kg | 0.49 % | 0.63 % | 0.55 % |
| Ca | 4.10 cmol/kg | 14.15 % | 1.98 % | 0.41 % |
| pH | 6.80 | - | - | - |
| Mg | 1.69 cmol/kg | 1.58 % | 0.82 % | 0.44 % |

Table 2. Effect of animal manures on agronomic yield of *S. macrocarpon* and post harvest soil chemical properties

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Treatment/ha | Plant height (cm) | Number of leaves | Yield (g/plant) | TN (%) | Avail. P (mg/kg) | Exch. K (cmol/kg) | Ca (cmol/kg) | Mg (cmol/kg) | pH | O. C. (%) |
| Control | 4.15b | 12.50c | 52.88b | 0.77 | 20.24g | 0.04b | 2.61 | 1.02b | 6.80 | 1.54 |
| GM 30 | 25.90a | 65a | 248.65a | 0.81 | 38.68c | 0.08a | 6.21 | 1.47ab | 7.20 | 2.41 |
| GM 20 | 7.25b | 33b | 122.86ab | 0.85 | 31.42e | 0.05ab | 5.06 | 1.37ab | 7.10 | 2.31 |
| GM 10 | 11.35b | 23bc | 123.09ab | 0.81 | 34.84de | 0.05ab | 2.66 | 1.11b | 6.85 | 2.39 |
| PM 10 | 8.10b | 27bc | 141.76ab | 0.82 | 37.92cd | 0.06ab | 6.25 | 1.27b | 7.10 | 2.32 |
| PM 30 | 9.90b | 25.5bc | 198.24ab | 0.82 | 54.58a | 0.06ab | 6.40 | 2.47a | 7.30 | 2.02 |
| CD 10 | 6.65b | 21.5bc | 137.26ab | 0.79 | 20.89g | 0.06ab | 4.30 | 1.05b | 6.85 | 2.07 |
| CD 20 | 9.80b | 23bc | 103.96ab | 0.81 | 23.78fg | 0.05ab | 2.69 | 1.05b | 7.25 | 1.75 |
| PM 20 | 6.75b | 24.5bc | 136.81ab | 0.86 | 43.12b | 0.06ab | 5.57 | 1.42ab | 7.20 | 2.14 |
| CD 30 | 5.35b | 13c | 130.96ab | 0.79 | 24.60f | 0.05ab | 2.96 | 1.13b | 6.90 | 2.27 |
|  |  |  |  | NS |  |  | NS |  | NS | NS |

GM – Goat Manure PM – Poultry Manure CD – Cow Dung NS – Not Significant