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The effect of organic manure on the production of jute (*Corchorus olitorius*)

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Abstract

Field experiments to investigate the effect of different sources of organic manure (Swine manure (SM), Poultry manure (PM), Cattle manure (CM), Rabbit urine manure (RUM)) on production of Jute (*Corchorus olitorius*) was carried out. The experimental site was cleared and cultivated (tilled and fertilized). Treatments were laid out before planting at once, there was no re-application of treatment.

Data were collected on growth and yield parameters (Foliage, Plant height and Plant fresh weight).

There was a significant difference in the foliage of *Corchorus olitorius* treated with SM, PM, CM, and RUM when compared with the control group. The foliage of *Corchorus olitorius* with PM treatment is significantly higher ($P<0.05$) compared with other organic manure treatment except for CM.

Significant increase ($P<0.05$) in the height of *Corchorus olitorius* was obvious in all the treatment group when compared with control. There is no significant difference ($P>0.05$) in the height of jute across the organic manure treatment groups (SM, PM and RUM) but there is a significant increase in the plant height of PM when compared CM.

SM, PM and RUM significantly increase the fresh weight of the plant when compared with the control and CM. There was a numerical increase in the plant fresh weight of PM when compared to other treatment groups.

From this experimental study, PM consistently increased the number of leaves, the fresh plant weight and plant height significantly and it is recommended for *Corchorus olitorius* production.

Keywords: *Corchorus olitorius*; Organic Manure; Foliage; Plant fresh weight

1. Introduction

Jute (*Corchorus olitorius*) or Jew mallow belongs to the family Malvaceae and the genus *corchorus*. It is one of the most popular vegetables in every home. Consequently, it is grown in nearly all home gardens, farms and around the world especially in Nigeria. It has many local names in Nigeria, 'Ewedu' in Yoruba, 'ahihiara' in Igbo, and 'malafiya' or 'rama' in Hausa. In many parts of Nigeria there are two most common types of *Corchorus olitorius*; 'Amugbadu' which grow tall with large finely serrated leaves that are oblong, and 'Oniyaya', which is widely branched with broad, deeply and irregularly serrated leaves and highly mucilaginous.

Corchorus olitorius is widely grown in the tropics for the viscosity of its leaves either fresh or sundried. It is endowed with higher fiber contents and highly perishable vegetables, also one of the main fiber crops in the world [1]. The leaves are cooked into thick viscous soup added to stews and eaten with starchy staples [2].

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It is a very good source of proteins, lipid, carbohydrates, vitamins (A, C, E) and mineral nutrients like calcium and iron [3,4,5,6]. It also contains high levels of all essential amino acids [7]. The leaves, roots and seeds of jute mallow are used as herbal medicine by local people in various parts of the world [8]. Consumption of the leaves of jute mallow is observed to be demulcent, deobstruent, diuretic, lactagogue, purgative and tonic [9,10]. It is also a folk remedy for aches and pains, dysentery, enteritis, fever, pectoral pains, ascites, piles, tumors, gonorrhea, and chronic cystitis [8,11]. Consumption of Jute mallow provide indispensable antioxidants needed for good health [12,13,14].

It thrives relatively well on mildly acid, neutral and basic (alkaline) soils. It prefers sandy loam soils which is very rich in organic matter. Jute mallow is susceptible to drought at different stages of growth, even during the flowering period [15]. The plant grows well in the lowland tropics, ranging from warm temperate zones through tropical desert to wet forest life zones.

Tropical soils are inadequate in soil nutrients. There are several challenges encountered in vegetables production in Nigeria which begins with the soil, a crucial need for excellence in food production. Low soil quality could be attributed to erosion, fixation and leaching amongst others. Most Nigeria soils ranges from low to medium in productivity but with appropriate management, soil can be further improved [16]. Thus, the application of fertilizer or manure for amelioration of soil fertility is an integral part of leafy vegetable production. Leafy vegetables require nitrogen for good vegetative growth. The quality of the harvest and storability are influenced by the availability of essential minerals in balance proportion. Any deviation from the balanced proportion of nutrients is easily noticed on the leaves of vegetable crops as deficiency symptoms [2].

Fertilizer can be organic or inorganic, though the adoption of organic farming has been encouraged in previous years to maintain and increase the long-term fertility of soils, enhance biological cycles within the farming system, involving micro-organisms, soil flora and fauna, plants and animals [17,18]. Organic matter improves the soil structure, reduces soil erosion, has a regulating effect on soil temperature and helps the soil to store more moisture, thus significantly improving soil fertility. Organic manure will help soil organic matter status, nutrient availability and good crop yield [19]. Hence, this study was carried out to expound the organic manure that will improve soil quality and fertility which will increase the production and yield of *Corchorus olitorius*.

2. Material and methods

The experiment was conducted at the research farm of the department of crop production, Peace House Agricultural Training Institute, Isarun, Ondo state, South-Western part of Nigeria.

2.1. Experimental treatment

The site was cleared and subdivided into five equal experimental plots. Each manure used was allocated a plot each. Group A was for Control (No manure was applied), Group B (Swine manure: SM) and Group C (Poultry manure: PM), Group D (Cattle Manure: CM), Group E (Rabbit urine manure: RUM). The manure application method used is direct broadcasting; this involves the spreading of the manure on the surface of the ridges /plots to be planted and there was no replication.

Table 1 NPK Values of Animal manure

Nutrient	Swine Manure	Poultry Manure	Cattle Manure	Rabbit urine
N (%)	0.8	1.1	0.6	2.4
P (%)	0.7	0.8	0.4	1.4
K (%)	0.5	0.5	0.5	0.6

https://www.allotmentment-garden.org/composts-fertilizers/npk-nutritional-values-animal-manures-compost/

2.2. Propagation and Agronomic Practice

The experimental site was measured (10m by 5.5m) and was equally demarcated (2m by 5.5m) into five plots and labelled accordingly. The seeds were planted using the broadcasting method. Equal quantity of seed was propagated per plot. Manual weeding was carried out regularly to maintain weed-free plots.

2.3. Soil Analysis

The soil pH was determined with the pH meter and the soil fertility was also determined.

2.4. Data Collection

All data collection began from the second week after planting. Data were collected from 20 randomly selected plant stands in each plot. Data collected includes: Number of leaves (foliage) per plant per plot of manure: this was done on the 20 plant stands by counting the number of leaves on each of them from week two to week 5. Plants height per plot of manure: the height of the plants was taken from week 3 to week 5 for each treatment. Weight of leaves at harvest (6weeks after planting) per plot of manure: this was done by weighing the harvested leaves per plot.

2.5. Data Analysis

The means and standard error of mean (SEM) of the data were calculated. The results were analysed by two-way analysis of variance (ANOVA) with Bonferroni Test using GraphPad prism to determine significant differences between means and where applicable, least significant difference (LSD) was used to determine significant results. The differences between groups were considered significant at $P < 0.05$.

3. Results

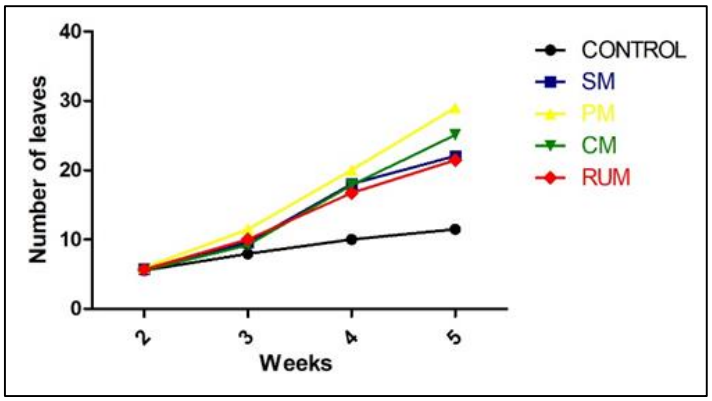

Figure 1 Number of leaves per plant

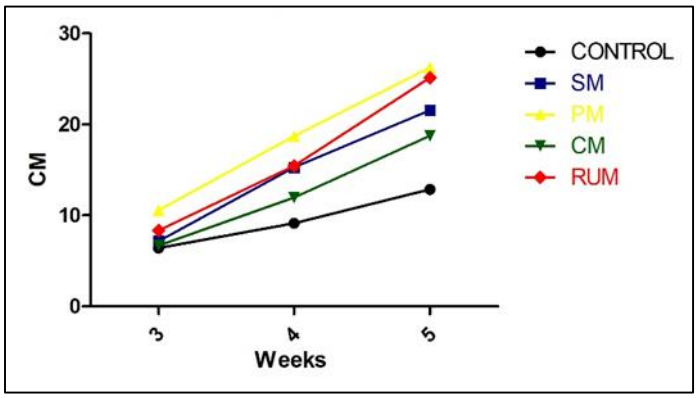

Figure 2 Plant height (cm)

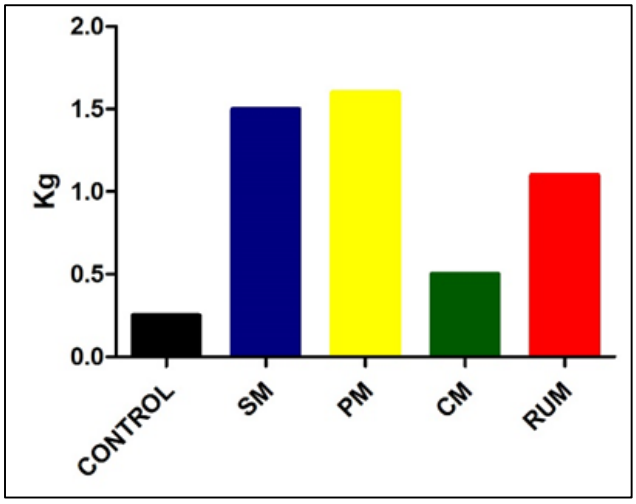

Figure 3 Weight at harvest

4. Discussion

The results of soil physico-chemical analyses revealed that; the soil used for this experiment was mildly-acidic (pH 5.9 for control; 6.5 for SM; 6.7 for PM; 6.6 for CM and 6.4 for RUM) which shows that it is marginally supportive for vegetative and reproductive stages of the commonly grown arable crops.

Application of organic manure significantly increased growth performance of *Corchorus olitorius* since all the manure treatments introduced were significantly higher than the control (Figure 1). The least performance of the plants in the control plot was a reflection of soil nutrients deficiency. In the Figure 1 above, the foliage of *Corchorus olitorius* with PM treatment is significantly higher ($P<0.05$) compared with other organic manure treatment, which shows the vegetative performance of poultry manure. This finding is in agreement with [19] who reported that poultry manure treatment significantly increase the number of leaves in okra production. The findings of [20] is similar to our findings who reported that the highest number of leaves was obtained from jute mallow provided with 20 t/ha chicken manure. A similar result was found in the findings of [21] and [22], who found that the application of PM led to an increase in the number of tomato leaves.

There is no significant difference in the height of jute across the organic manure treatment groups (SM, PM and RUM) but there is a significant increase in the plant height of PM when compared CM. According to Figure 2, at week 5, it shows that there is a significant increase ($P<0.05$) in all the treatment group when compared with control. The present study revealed that fertilization with Poultry manure numerically increased jute mallow plant height compared with control treatment and other treatment group (SM, CM and RUM). This agreed with the work of [23] and [24], who reported a significant increase in plant height as a result of the application of PM.

Plant Fresh weight was highly significant at ($p < 0.05$) for all treatment groups except for CM when compared with control (Figure 3). There was a numerical increase in the plant fresh weight of PM when compared to other treatment groups. This could have been caused by the increment of mineral content as the manure decomposed and released certain minerals. In this study, the PM treatment group has the highest number of leaves and also highest plant biomass which was in accordance to the study conducted by [25] who reported that plant biomass production and foliage production are highly correlated, that is, the plants with more leaves produce high plant biomass because of highly photosynthetic rate.

5. Conclusion

From the results in this study, PM consistently increased the number of leaves and the fresh plant weight significantly and it is identified as a good source of organic manure and recommended for jute production because it improves soil structure and it is a source of organic matter to the soil thus significantly improving soil fertility. It is cheap, easily accessible, available and good alternative to inorganic manure due to the reduction of health hazard that comes with the use of inorganic manure and the sustainability effects on soil.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors declare no conflict of interest.

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