Agronomic Performances Of *Corchorus Olitorus* ("Ewedu") As Influenced By Poultry Manure And Npk 15-15-15 Fertilizer In Ikorodu Agro-Ecological Zone Of Nigeria

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ABSTRACT: The maintenance of organic matter content of soil through the use of fertilizer is of primary importance to any soil management programme under continuous cropping. In light of this, a Radomised Complete Block Design (RCBD) experiment with 3 treatments (25t/ha^{-1} (12.5kg/bed) poultry manure (PM), 400kg/ha^{-1} (0.2kg/bed) NPK fertilizer and control with no fertilizer application) and 3 replicates was conducted the Teaching and Commercial Farms of Lagos State Polytechnic, Ikorodu, Nigeria to evaluate the agronomic and yield performances of *Corhorus olitorus* to organic and inorganic fertilizers. The result showed significant ($P<0.05$) effects of PM and NPK fertilizer on all the parameters measured. PM and fertilizer had significant ($P<0.05$) on plant height with the tallest plant recorded in plots applied to PM at 3 (18.80cm) and 5 (49.26cm) weeks after planting (WAP). Similarly, PM had significant ($P<0.05$) effect on leaf number and stem girth development. Lowest yield (4.46kg) was obtained from control plot and highest yield was obtained from plots treated with PM (6.35kg) followed by NPK (6.10kg) which was not significantly different compared to PM. Therefore, it was concluded that Ikorodu farmers could apply 25 t ha^{-1} PM to obtain maximum *C. olitorus* growth and yield. This will save the farmers the shortcomings encountered with the use of inorganic fertilizer and offer a veritable means of disposing PM waste in urban cities.

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Introduction

The depreciating return of land and variation in soil productivity has always been a matter of concern to agronomist worldwide. These especially, land depreciation returns have led to a sharp fall in the quantity of agricultural produce hence, inability to meet the increasing consumers demands. There is then the need to boost soil productivity using different measures, one of which is the application of fertilizers with a view to increasing crop yield and productivity. For healthy growth and optimal yield, nutrients must be available to plants in correct quantity, proportion and in a usable form at right time. To fulfill these requirements, chemical fertilizers and organic manures are needed. Organic manures, apart from improving physical and biological properties of soil, help in improving the use of efficiency of chemical fertilizers [1]. Organic manures such as farmyard and poultry manure are known to improve the physical, chemical and biological conditions of soil and their application ensure sustainable soil health [2]. Biofertilizers are cost-effective, eco-friendly and renewable source of plant nutrients which play a vital role in maintaining long – term soil fertility and sustainability [3].

Corchorus olitorus belongs to the family Tiliacea and is known under various names such as long fruited jute, bush okra, Ewedu or Ooyo (Western Nigeria) and Lalo (Northern Nigeria). The succulent leaves of *C. olitorus* leaves soften rapidly with little cooking and thicken into a viscous mucilaginous soup which can be eaten with starch foods developed from processing of the common staple root and tuber crops. *C. olitorus* as leafy vegetable is accredited with possession of high nutritional values of essential nutrients like protein, calcium, phosphorous, iron and other important components such as vitamins A, B complex, C, fiber, carbohydrate, fat and a high calorific value [4]. The young fruits can also be cut and cooked into okra like viscous soup. In spite of the nutritional value and importance of *C. olitorus* in Nigerian diet, little is known about the factors that are responsible for the optimum yield of the crop. Attempts should therefore be made to increase the yield. Therefore, this study is to evaluate the effect of poultry manure and NPK 15-15-15 fertilizer on the agronomic performance and yield of *C. olitorus* in Ikorodu area of Lagos, Nigeria.

Materials and methods

The experiment was carried out on 171m^2 land at the Teaching and Commercial Farms of Lagos State Polytechnic, Ikorodu, Nigeria (6^{o}37N; 3^{o}53'E). The land has been under cultivation for many years with no history of fertilizer application and the natural vegetation at the site consisted of *Panicum maximum.*

Composite soil sample (0-30 cm depth) was taken from the site and analysed for routine soil physical and chemical properties using standard laboratory procedures outlined by Mylavapus and Kennelley [5]. The routine analysis showed that it had pH (H_2O) 5.38, total nitrogen (%) 0.11, organic carbon (%) 1.05, available phosphorus (mg / kg) 14.76, exchangeable K (cmol / kg) 0.25, exchangeable Ca (cmol / kg) 1.60, exchangeable Mg (cmol / kg) 1.04, exchangeable Na (cmol / kg) 0.25, clay (%) 7.06, silt (%) 11.09 and sand (%) 81.85.

The poultry manure used for the study was obtained from the livestock section of teaching and Research Farms, Lagos State Polytechnic, Ikorodu, Nigeria. The manure was air dried, pulverized and subjected to laboratory analysis to determine its chemical constituent by methods as already described.

The experimental plot was manually cleared, debris burnt and seed beds were constructed using hoe. The experiment was arranged in a randomized complete block design with 3 treatments replicated 4 times. Plot size was 1 × 5 m with 1 m between plots. Treatment blocks were spaced 1 m apart. Organic fertilizers (Poultry manure 15t/ha^{-1}) were applied a weeks before planting. It was uniformly spread on the plots and lightly worked into the soil with hoe. The inorganic fertilizer (400 Kg/ha^{-1} NPK 15-15-15) was applied by ringing around the plant a weeks after planting. The seed of *C. olitorus* $NHCO_7$ 'Oniyaya' cultivar used for the experiment was obtained from National Horticultural Research Institute (NIHORT), Ibadan. The seeds were soaked in warm water for 10 minutes to break dormancy (to ensure rapid and uniform seed germination), thereafter the seeds was planted at 30cm × 30cm using drilling method to gives room for easy cultural operation [6]. Monocrot 40® (Monocrotophos; SaroAgro, Nigeria) was applied at 40 mL in 15 L of water to control insects. Weeding was done at the early stage by roughing (hand-pulling) and at the later stage; a small hoe and cutlass were used.

Data Collection and Data analysis

Five plants were randomly selected per plot for determination of growth and yield parameters. The growth parameters assessed included plant height (cm), stem girth (cm), number of leaves. Plant height was determined with a meter rule at the distance from soil level to the terminal bud; number of leaves was determined by visual counting of the leaves, stem girth was determined from measurements taken from two centimeters above the soil level with venire calipers. At harvest the shoot were harvested fresh and weighed using an Electronic Balance and the averages of their respective weights were taken for each treatment. This was extrapolated to evaluate total yield per hectare. The Analysis of Variance (ANOVA) procedure was carried out to determine the difference in parameters. Mean values were compared using the Least Significant Difference (LSD) at 0.05% level of probability.

Result and discussion

Plant height

Nutrients supplied in the form of NPK from PM affected okra plant height at 3 and 5 WAP. Plots treated with PM had the tallest plants (18.80cm, 49.26cm). While plots with NPK produced plants with comparable heights (16.02cm, 41.76cm) and plants from the control treatment had significantly shorter plants (11.85cm, 32.18cm) than from any of the fertilizer types. The significant response of the plant to applied fertilizer could be due to low organic matter content and N, P and K content of the experimental site PM apart from enriching the soil with N, P and K when decomposed, it also add organic matter to the soil that improves the structure, water holding capacity and cation exchange capacity of the soil, thus shall influence the growth of plant. This study support earlier report by Singh & Kawu [7] that PM influenced okra plant height better than NPK fertilizer.

Number of leaves

Poultry manure had significant ($P<0.05$) effect on the leaf number with highest leaves number (15.75 leaves/plant, 58.40 leaves/plant) at 3 and 5 WAP respectively. The response could be due to low organic matter of the soil at the experimental site and the increase in nitrogen present in the poultry manure which enhances physiological activities in crops thereby improving the synthesis of photo assimilates. Moreover, poultry manure is known to contain 3.77% N, 1.89% P2O5 and 1.76% K2O [8], which when decomposed add nutrients to the soil resulting in better growth and development. This agrees with the work of Rice and Rice [9].

Stem girth (Circumference)

The PM treatment produced plants with the greatest stem circumference at 3 WAP (1.45cm) and 5 WAP (2.56cm). NPK produced plants with similar

stem circumferences at 3 WAP (1.35cm) and 5 WAP (2.05cm). The control had smallest circumference of 1.16cm and 1.74cm at 3 WAP and 5 WAP respectively and there was no significant different among the treatment when compared at 3 WAP. The ability of poultry manure to increase the performance of *C. olitorus* could also be attributable to the fact that organic manures improve both physical and chemical soil properties [10].

Yield

C. olitorus yield was lowest for the control treatment. The highest yield was from application of PM (6.35gk) followed by plot treated with NPK (6.10kg). statistically there was significant different between plot treated with fertilizer and control plot with no fertilizer, while there was no significant difference in the yield obtained from plot treated with PM and NPK.

The increase in vegetative and yield parameters was mainly due to the translocation of nutrients and assimilation of photosynthetic activities during the crop and growth stages and this may be due to the nutrients - N, Zn, Fe, Mn supplied from the poultry manure. This is in line with Aliyu and Kuchinda, [11] that reported significant improvement in growth and yield with organic fertilizers

Conclusion

Based on the findings of this study, the problem of affordability and procurement of chemical fertilizers by resource-poor farmers make the use of poultry manures at 25 t ha^{-1} a viable alternative to boost *C. olitorus* production in Ikorodu agro ecological zone of Nigeria, thereby increase the income level of the resource-poor farmers and reduced the environmental pollution caused by the indiscriminate disposal of poultry droppings in town and cities.

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