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EFFECT OF WATER HYACINTH (*Eichhornia crasspies*) MANURE ON THE PERFORMANCES AND YIELD OF OKRA (*Abelmoschus esculentus*) (L.)Moench.

[1]Sanni, K. O., [2]Adesina, J. M. and [3]Ewulo, B. S.

[1]Department of Crop Production and Horticulture, Lagos State Polytechnic, Ikorodu, Lagos, State, Nigeria

.[2]Department of Crop, Soil and Pest Management Technology, Rufus Giwa Polytechnic, P. M. B. 1019, Owo, Ondo State, Nigeria

.[3]Department of Crop, Soil and Pest Management, Federal University of Technology, P. M. B. 704, Akure, Ondo State, Nigeria.

**moboladesina@yahoo.com, Tel: 08037110905*

ABSTRACT

Water hyacinth is one of the most economically damaging weeds and all efforts to control it met with little success. An experiment was conducted during the 2011 cropping season at Lagos State Polytechnic, Ikorodu, Lagos State, to evaluate the effects of manure produced from water hyacinth on the growth and yield of okra. There were three (3) treatments: 0.9 kg, 1.35 kg of water hyacinth manure per plot and control replicated three times. The treatments were compared on the basis of plant height, number of days to flowering, number of fruits per plant and total fruit yield/plot. Plant height, number of days to flowering, number of fruits and fruit yield were significantly increased by the manure. Okra plants that received 45g/plant of manure produced the highest fruit yield (1.77 kg) followed by plants which received 30 g/plant. It is indicated that water hyacinth is suitable organic fertilizer.

INTRODUCTION

One largely overlooked resource available for soil fertility improvement is the use of non-traditional organic materials such as weeds. The use of decayed tissues of unwanted plants to provide nutrients for crops is a crude but effective way of exploiting weeds and is a simpler technique than any of the other alternatives available (Lata and Veenapani, 2011).

Water hyacinth is a freshwater plant that invaded Nigeria water ways from Benin Republic through Badagry creeks and is considered the world's worst aquatic weed. All efforts at constraining its proliferation did not achieve much; hence the utilization of the weed is a veritable means for its management (Sanni and Adesina, 2012). The proximate analysis of water hyacinth showed that by 100 percent wet weight the plant contained 29.99% organic carbon, 2.19% nitrogen, 0.59% phosphorus, and 4.85% potassium (Lawal, 1988 Personal Comm.)

Okra is a popular vegetable crop grown in most parts of Nigeria and commands a high market price because it features daily in the diets of most Nigerians. However, its yield is

limited by availability of adequate nutrients in soil. Hence, the crop has been found to respond to application of organic and inorganic fertilizers. However, research information is scarce on response of okra to manure derived from water hyacinth. Therefore, the main objective of this work was to study effect of water hyacinth manure on growth and pod yield of okra.

MATERIALS AND METHODS

This study was carried out on a 96 m^2 piece of land at the Teaching and Research Farms of Lagos State Polytechnic, Ikorodu, Lagos State (Latitude 5^0 10' N and Longitude 3^0 16') in 2011 cropping season. The land was ploughed and harrowed twice and beds were made across the slope. Each bed was 3 x 1.2m. Composite soil sample was taken randomly using soil auger for determination of soil physicochemical properties before the commencement of the experiment. Soil samples were air-dried, ground and sieved to pass through a 2-mm sieve. The chemical analysis of soil and the water hyacinth manure, was carried out using standard laboratory methods: soil pH (soil: water ratio of 1:25); organic carbon; total nitrogen, available P (using Bray-1 method), exchangeable basic cations; exchangeable acidity, effective cation exchange capacity and micronutrients were determined. Particle size analysis was done using Bouyoucos method.

Preparation of water hyacinth manure

Large quantity of water hyacinth was collected from the river bank of Ijede river in Ikorodu, the roots were washed to remove the attached dirt, chopped and pounded using mortar and pestle into slurry. Thereafter, 18 kg of pounded water hyacinth was mixed with 500cm^3 of water, and thoroughly mixed; the whole mixture was kept in a clean plastic bucket and covered in order to allow for fermentation. The purpose of allowing the slurry to undergo fermentation was to enable the toxic elements of cadium, lead, zinc and nickel to be reduced to the lowest concentration (Lawal, 1988 Personal Comm; Singhal and Rai, 2003). Sample of the pounded water hyacinth was taken to the laboratory for chemical analysis.

Experimental Design and Treatments

The experiment was laid out in Randomized Complete Block Design (RCBD) replicated three times with three treatments. The treatments are: control (with no water hyacinth manure) (Treatment I); water hyacinth applied at the rate of 0.9 kg/plot with 30 g applied per plant (Treatment II) and water hyacinth applied at the rate of 1.35 kg/plot with 45 g applied per plant (Treatment III).

The okra seeds NHAE 47 – 4 variety used for the experiment was obtained from National Institute for Horticultural Research, Ibadan (NIHORT). The okra seeds were planted 2 seeds per hole sown on 27th April, 2011 at a spacing of 60 cm × 50 cm to give 2 rows per plot. This was later thinned to one stand a week after planting (WAP). Weeding was carried out twice: 3 WAP and 6 WAP to ensure efficient use of the compost and reduce the incidence of insect pests.

The water hyacinth manure was applied 3 WAP using band placement method and was done by placing the compost 5cm away on one side to the base of the plant. Foliage insect pests were controlled by applying Lambda-cyhalothrin 2 WAP when infestation was first observed and repeated three times at a week interval. Okra fruits were harvested at fresh succulent stage. Harvesting was done every 3 days.

Data Collection and Analysis

Ten plants were randomly selected per plot and the following data were collected: plant height at 3 WAP (before compost application) and 9 WAP (after compost application); number of days to 50% flowering; plant height at flowering, number of fruits per plot and total weight of fruits per plot. Data collected on growth and yield were analysed statistically

and compared using Least Significant Difference (LSD) test at 5 % probability level. Pooled analyses were carried out within location across years/seasons.

RESULT

Data of the analysis of the soil and pounded water hyacinth are presented below. Water hyacinth manure contained appreciable amount of macro and micro elements required for the good growth of crops. The soil was low in organic matter, N, available P and Ca. Analysis indicated that the manure had 2.18 % N, 3.2 % P, 1.8 % K, 0.23 % Mg, 0.97 % Ca, 0.06 % Mn, 0.41 % Fe, 0.003 % Cu, 0.04 % Zn and 15.6 % organic matter. The test soil had 1.67 % OC, 1.25 % N, 0.02 mg/kg available P, 0.4 cmol/kg K, 0.10 cmol/kg Ca, 5.0 cmol/kg Mg, Mn, Fe, Al of 4.0, 7.5 and 5.0 cmol/kg respectively, 70.6, 13.6 and 15.8 % sand, silt and clay respectively. The sandy loam soil is slightly acidic (pH 6.0).

The control recorded the highest plant height (10.30cm), followed by 45g manure/plant (10.00cm) and the least being 30g manure/plant before the compost application. After manure application, 30g manure recorded the highest plant height (33.13 cm) closely followed by 45g manure (31.03cm). At flowering plant height was highest with 45g manure (64.35cm), closely followed by 30 g manure (62.45cm) and the least is control (47.27cm). Manure had significant effect on plant height. With reference to number of days to flowering, the 45 g manure flowered 47 days after planting (DAP), followed by 30 g manure at 54 DAP and the control had 59 DAP. Also, 45 g manure had highest yield of 9 fruits per plant, 30 g manure had 8 fruits and control had 5 fruits. The effect on fruit yield was not significant.

DISCUSSION

The use of non-traditional organic resources such as weeds for soil fertility improvement purposes has been studied by Nziguheba *et al.* (2002); Chukwuka and Omotayo (2008). This study showed that water hyacinth compost positively influenced the performance and yield of okra. The increases in plant height after application of the manure is consistent with the findings of Gashamura, (2009); Gunnarsson and Mattsson, (1997), who reported that application of fresh water hyacinth manure and mulch increased plant height in maize. Increase in performance of okra in this work is attributable to release of nutrients contained in the water hyacinth residue such as N, P, and K, secondary and micro nutrients. Previous studies (Gashamura, (2009; Mukandinda, 2006; Widjajnto *et al.*, 2001; Sivaprakasam and Ramaraj, 1991) also reported that maize, rice and mushroom yields were significantly increased by water hyacinth manure.

CONCLUSION

Since water hyacinth is freely available in waterways especially in riverine areas, its manure or compost can be used as fertilizer and source of nutrient to crops.

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