Paper ID: I0178305

Effects of Poultry droppings and NPK on the growth and yield of

Carrot- *Daucus carota* L.

ALUTA, A.A[1]., EREMRENA, P.O.[2]* AND IKULI, J.M.[3]

[1]Department of Plant Science and Biotechnology, Faculty of Science, University of Port Harcourt, P.M.B.5323, Choba, Port Harcourt, Rivers State, Nigeria.
[2]Department of Plant Science and Biotechnology, Faculty of Science, University of Port Harcourt, P.M.B.5323, Choba, Port Harcourt, Rivers State, Nigeria.
Corresponding author:* peter.eremrena@uniport.edu.ng

[3]Department of Crop and Soil, Faculty of Agriculture, Niger Delta University, Wilberforce Island,Yenagoa, Bayelsa State, Nigeria

ABSTRACT
A field experiment on the effects of poultry droppings and NPK15:15:15 on the growth and yield of carrot was carried out at the Faculty of Agriculture demonstration farm, University of Port Harcourt. The experiment was laid out in a completely randomized design of four treatments (Poultry dropping, NPK15:15:15, combination of Poultry droppings + NPK15:15:15, and control) with three replications. The result showed that the application of the treatments had significant influences (P=0.05) on all parameter studied (number of leaves, plant height, diameter of root, length of root, fresh weight of root, dry weight of roots, fresh weight of leaves, dry weight of leaves, gross yield, and marketable yield). The result revealed that the application of the Poultry droppings was found to be suitable for maximum gross yield and marketable yield (14.79 tha^{-1} and 14.65tha^{-1} respectively), while NPK 15:15:15 had better gross and marketable yield (17.14 tha^{-1} and 17.02 tha^{-1} respectively) and the combination of poultry droppings and NPK15:15:15 resulted in the best performance in gross and marketable yield (22.15 tha-1 and 22.04 tha-1 respectively).The net return (₦6,211,800 ha^{-1}) and benefit cost ratio (3.37) were maximum in the treatment with the combination of poultry droppings and NPK15:15:15.

Key Words: Poultry droppings, NPK, growth, yield, Carrot

INTRODUCTION

Carrot (*Daucus carota* L.) is an important vegetable which is ranked third among the succulent vegetables in world production (Yamaguchi, 1983). The edible roots are nutritious and contain water, protein, ash, vitamins and mineral (Norman, 1992). Carotene which is extracted from the roots is used in colouring margarine and for improving the colour of egg yolk when added to layer feed. The leaves and mature roots are used in the preparation of animal feed (Kahangi, 2004). Carrot which belongs to the family Apiaceae is a biennial and is usually cultivated as an annual crop in the tropics (De Lannoy, 2001). The crop is tolerant to soil pH of 5.5 to 6.5 and it requires a deep and well-drained loamy soil with high amount of organic matter (Yayock *et al*., 1988).
Carrot production can be a beneficial enterprise for small-scale farmers because it is a short duration crop and higher yields can be obtained per unit area (Ahmad *et al*., 2005). However, Sarkindiya and Yakubu (2006) reported low average yields in Nigeria. In most developing countries, carrot yield per unit area remains below the world average (FAO 1999). One reason for low yield is low soil fertility and low technological know-how in production methods. In order to obtain high and sustainable carrot yields, good soil fertility and constant growth are required to facilitate production and translocation of carbohydrates from leaves to roots. The key limiting factors in crop growth, development, and yield are nitrogen, phosphorous, potassium, and water. In most cases, carrot growers use chemical fertilizers as the major supply of nutrients to attain higher growth and yield (Hochmuth *et al.*, 1999; Amjad *et al*., 2005). Continuous application of synthetic fertilizer may lead to soil acidity, human health problems, and soil degradation because they release nutrients at a faster rate. Increasing costs of synthetic fertilizers have made them generally unaffordable to most small-scale farmers.
Fordham and Biggs (1985) recommended the application of 70-120 kg/ha N, 30- 35 kg/ha P and 0-55 kg/ha K for high yield of carrots. Application of 300 - 450 kg/ha NPK (15:15:15) before planting has been recommended for improved growth and yield of the crop (Norman, 1992). Kahangi (2004) has recommended the application of 10-20 t/ha poultry manure for improved growth and yield of carrot in the tropics. However, there is not much work on this study in Nigeria. The present research was therefore, undertaken to determine the effects of inorganic fertilizers and organic poultry droppings on the growth and yield of carrot.

Materials and Methods
The experiment was carried out at the Faculty of Agriculture demonstration farm, University of Port Harcourt. Soil samples of the experimental plot were collected and analyzed. The seeds were sourced from Songhai farm Sapele Delta State. The carrot seed is a Thema variety and the fertilizers (NPK 15:15:15 and poultry droppings) used were provided by the Faculty of Agriculture demonstration farm, University of Port Harcourt.
The experiment was laid out in a completely randomized design of four treatments with three replications. The four treatments used in this experiment are as listed below
Treatment 1: poultry droppings (organic fertilizers)
Treatment 2: NPK 15:15:15 (inorganic fertilizers)
Treatment 3: combined effect of organic and inorganic fertilizers (poultry droppings and NPK)
Treatment 4: no fertilizer (control)
Carrot seed were soaked in water for 24hrs and wrapped with a cloth for 5 hrs (Shahid *et al*., 2011). Beds were made and seed were sown at a spacing of 25cm x 25cm at a depth of 1.5cm. 35days after sowing, the treatments were applied; poultry dropping, NPK and combined effect of poultry droppings and NPK were applied on the plot using mechanical ring method. Two thinning operations were done at 25 and 35 days after sowing of seed to maintain the spacing. The experimental plot was kept free from infestation by weed. Intercultural and irrigation operations were carried out when required. The carrots were harvested 90 days after sowing. The crop was disease free and no fungicide were used.

The following parameters were analyzed: number of leaves, plant height, diameter of root, length of root, fresh weight of roots, dry weight of roots, fresh weight of leaves, dry weight of leaves, gross yield, and marketable yield. The leaves of the plant of the various treatments were counted visually. The number obtained was then recorded appropriately against each sample. The plant height was measured with a metre tape in centimetres from the soil surface to the plant apex. The diameter of the root was measured at the thickest portion of the root at harvest. This was done using slide clippers. Marketable yield of the root was computed from conversion of the total marketable roots per plant and was recorded in hectares.
Data collected for each parameter were subjected to analysis of variance (ANOVA) using Microsoft Excel 2010 version. Means were compared using the least significant Difference (LSD) (Steel and Torrie,1960).

Results and Discussion

The results of the effects of Poultry dropping and NPK 151515 on the number of leaves are shown in fig.1. From the result, after application of treatments, there was significant P=0.05 difference in number of leaves. At week 12, the highest number of leaves was recorded in the combination of NPK 15:15:15 and Poultry droppings (11.97), followed by NPK 15:15:15(11.63) and poultry dropping (11.27). The effect of increased number of leaves was as a result of the quick release of nutrients from the combination of NPK15:15:15 and poultry droppings that enhanced the soil conditions, which might have increased the number of leaves. Generally the control showed lowest number of leaves.

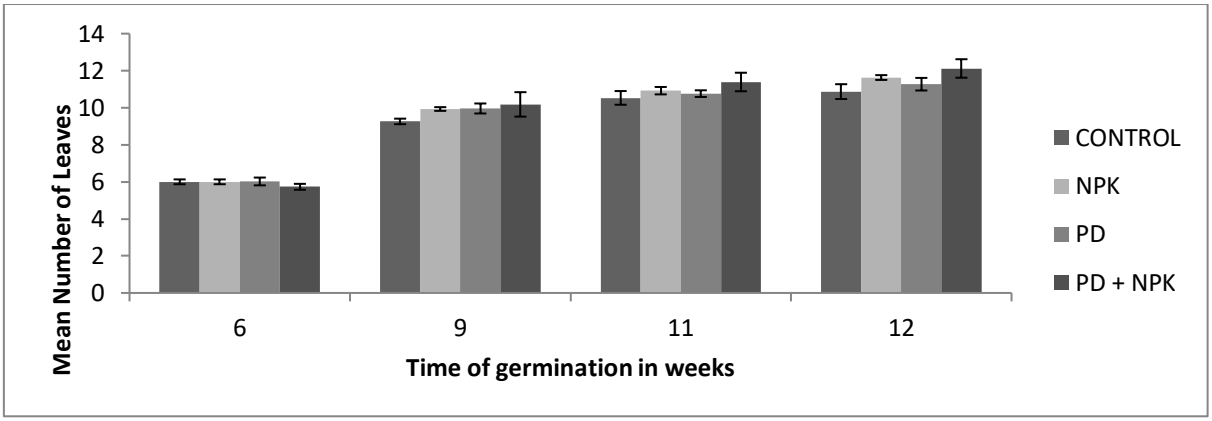

Fig.1: EEFECTS OF POULTRY DROPPINGS (PD) AND NPK15:15:15 ON NUMBER OF LEAVES

The Plant height varied significantly P=0.05 with the application of the poultry droppings, NPK 15:15:15 and their combination (poultry droppings and NPK15:15:15). At 12 weeks the highest plant height (61.67cm) was found with NPK15:15:15 and poultry droppings treatment, followed by poultry dropping (59.50 cm), NPK 15:15:15 (56. 33cm) and the shortest height were found in control (53.33cm) fig. 2.

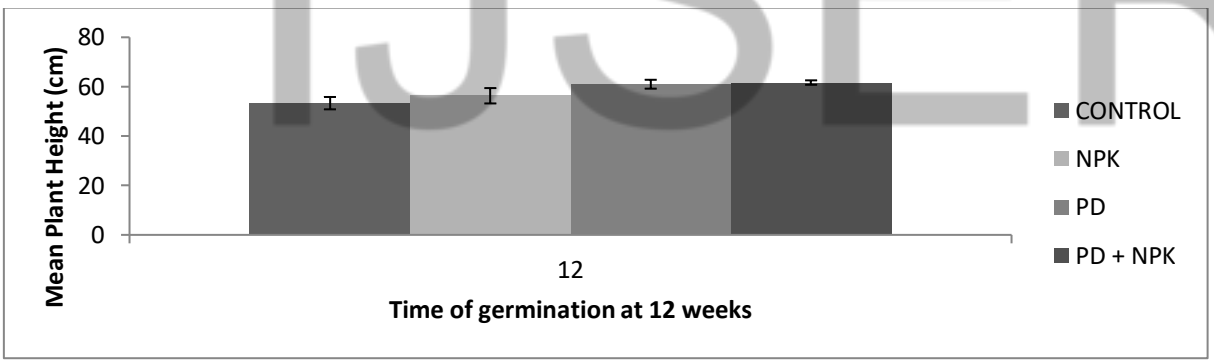

Fig 2: EFFECT OF POULTRY DROPPINGS (PD) AND NPK 15:15:15:15 ON PLANT HEIGHT

The maximum leaf weight per plant was recorded in the combination of poultry droppings and NPK15:15:15 (138.44g) followed by NPK15:15:15 (107.15g) and poultry droppings (92.43g) and the control were recorded to have the minimum weight (84.91g). The combination of poultry droppings and NPK15:15:15 were found to have the maximum weight, this is due to the adequate supply of nutrient leading to higher vegetative growth of the plant. Table 1
The fresh weight of root per plant was significantly P=0.05 different with respect to the treatments. The highest fresh weight of root per plant was found in the combination of poultry droppings and NPK15:15:15 (64.55g) followed by NPK15:15:15 (53.54g) and poultry droppings (46.04g) while the lowest weight (38.09g) was found with control (table 1). This may be due to the fact that the combination of the fertilizers supports the soil physical condition for better development. Table1.
The maximum dry weight of leaves was found in control (17.94%) followed by poultry droppings (16.94%) and NPK15:15:15 (16.29%) while the combination of NPK 15:15:15 and poultry droppings (15.15%) was the minimum dry weight (Table 1).
The maximum dry weight was found in the combination of poultry droppings and NPK15:15:15 (16.65%), followed by NPK15:15:15 (14.98%) and poultry droppings (13.86%) while the control (11.71%) had the minimum percentage of dry weight (Table 1). The provision and supply of adequate nutrient for better growth by the combination of the poultry droppings and NPK15:15:15 enhanced the production of maximum amount of dry weight of the root.

Table 1.Effects of Poultry Droppings and NPK15:15:15 on the Growth and Yield of Carrot.

Treatments	Length of root/plant (cm)	Diameter of root/plant (cm)	Fresh wt. of root/plant (g)	Fresh wt. of leaves/plant (g)	Percent dry wt. of roots	Percent dry wt. of leaves
NPK15:15:15+PD	16.04±0.34	5.95±0.46	138.44±5.23	64.55±3.21	15.15±0.48	15.65±3.11

POULTRY DROPPINGS (PD)	13.60±1.5	6.10±0.02	92.43±5.6	46.04±3.64	16.94±1.18	13.86±0.47
NPK 15:15:15	14.70±0.8	5.97±0.27	107.15±4.89	53.54±5.34	16.29±1.61	14.98±0.58
CONTROL	11.70±0.4	5.98±0.58	84.91±6.45	38.09±5.81	17.94±2.66	11.71±1.56

Mean±Standard Error

The cracked root production was significantly P=0.05 influenced by the application poultry droppings and the NPK15:15:15 (fig. 3). The maximum number of cracked roots (0.08) was obtained from the treatments of poultry droppings followed by NPK15:15:15 (0.07) and the combination of NPK151515 and poultry droppings (0.04) while the control had the lowest (0.03) number of cracked roots. Fig. 3

The branched root production was significantly P=0.05 influenced by the application of poultry droppings and the NPK15:15:15. The maximum number of cracked roots (0.12) was obtained from the control followed by treatments of poultry droppings (0.07) and NPK15:15:15 the combination of NPK151515 and poultry droppings (0.04) while the combination of NPK151515 and poultry droppings had the lowest (0.03) number of branched roots. Fig. 3.

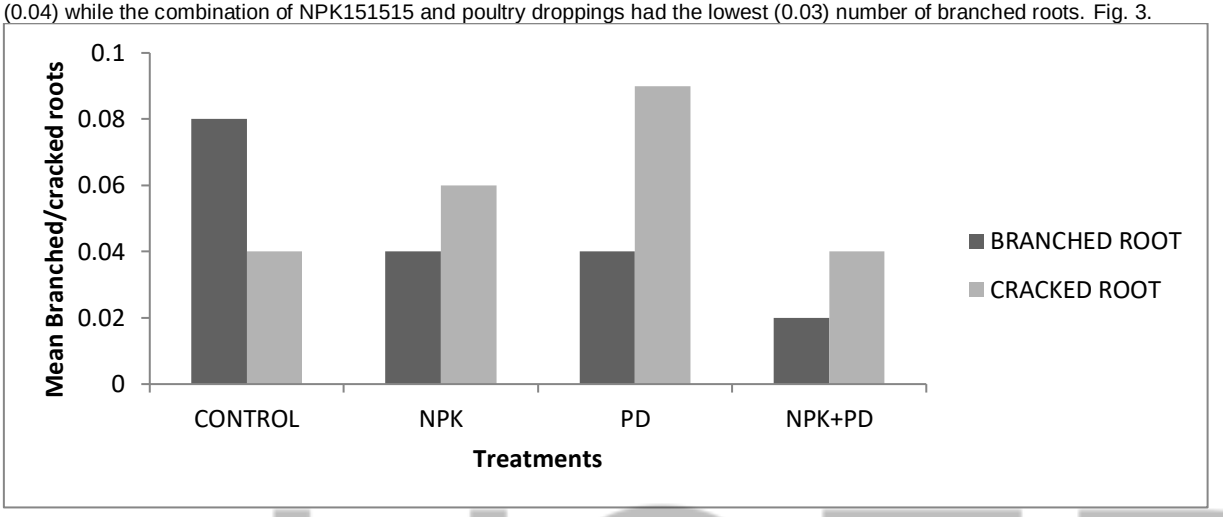

Fig. 3: Mean Branched and Cracked Roots of Carrot

CONCLUSION

Organic manures helps to improve the soil fertility and productivity, inorganic fertilizers also supply adequate nutrients in known proportion but on the other hand creates problem to the environment when use indiscriminately From the results of the present study, it can be concluded that the combination of poultry dropping and NPK15:15:15 is suggested for maximum carrot production.

ACKNOWLEDGMENT

The authors wish to acknowledge the Department of Crop and Soil Science, Faculty of Agriculture, University of Port Harcourt for granting permission to use her demonstration farm.

REFRENCES

Ahmad Z, Ali N, Ahmad M, Ulhag S. and Ahmad S. (2005). Yield and economics of carrot production in organic farming. *Sarhad Journal of Agriculture*, 21(3): 357-364.

Amjad, M. Naz, S. and Ali, S. (2005). Growth and seed yield of carrot as influenced by different regimes of nitrogen and potassium. *Journal of Research (Science),* pp. 73-78

De Lannoy, G., (2001). *Leafy Vegetables*. In: Crop Production in Tropical Africa. Raemaekers, R.H. (Ed.). Directorate General for International Co-operation (DGIC), Brussels, Belgium, pp: 403-511.

FAO (1999) Food and Agricultural Organization Report.

Fordham, R. and Biggs, A.G. (1985). *Principles of Vegetable Crop Production* William Collins and Sons Co Ltd London. p 175.

Hochmuth, G. J. Brecht, J. K. Bassett, M. J. (1999). Nitrogen fertilization to maximize carrot yield and quality on a sandy soil. American Society for Horticultural Science. 34(4): 641-645.

Norman, J.C., 1992. *Tropical vegetable crops*. Arthur Stockwell, Elms Court, United Kingdom. 252 pp.

Kahangi, E. (2004). *Daucus carota* L. *In*: Grubben,G.J.H. and Denton, O.A. (eds.) Plant Resources of Tropical Africa 2.Vegetables.PROTA Foundation, Wageningen, Netherlands.p 280– 285.

Sarkindiya S., Yakubu A.I. 2006. Effect of intra-row spacing, fertilizer level and period of weeding in the performance of carrot (Daucus carota L.) in Sokoto, Rima Valley. *Savannah Journal of Agriculture* 1(1): 1–5.

Shahid M, Pinelli E, Pourrut B, Silvestre J, and Dumat C. (2011) Lead-induced genotoxicity to *Vicia faba* L. roots in relation with metal cell uptake and initial speciation. *Ecotoxicology and Environmental Safety.*74(1):78–84

Steel, R. G. D., and Torrie J.H. (1960). *Principles and procedures of statistics*. McGraw-Hill Book Company, New York. 481 pp.

Yamaguchi, M. (1983). *World Vegetables, Principles Production and Nutritive Values. Growth and yield* \ *response of carrot* Van Nostrand Reinhold, New York. 240– 246.

Yayock, J.Y., Lombin, G. and Owonubi, J.J. (1988). *Crop Science and Production in Warm Climates*. Macmillan Publishers, London, Pages: 307.