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POULTRY MANURE RATES INFLUENCED NUTRITIONAL COMPOSITION OF CARROT (*Daucus carota* L.) IN UMUDIKE RAINFOREST ZONE.

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ABSTRACT

A laboratory experiment was carried out to determine proximate, vitamins and mineral concentration of carrot grown under different rates of poultry manure in umudike southeastern Nigeria. Samples were sourced from field research comprising of four rates (control, 10, 20 and 30 t/ha) of poultry manure in the department of crop and horticultural sciences, umudike during October 2024 cropping season. The determination was done in triplicates using standard methods (AOAC, 2003) in a completely randomized design format. The result showed that all the proximate parameters determined were significantly ($P<0.05$) influenced with the exception of carbohydrate. Control plot had the higher Ash content of 1.28 % and Crude fat of 0.35 % contents compared to others. However, the plot that received 30 tha^{-1} of poultry manure had the higher Crude fibre of 2.71 % and Dry matter content of 21.71 g than other treatments. The 10 tha^{-1} poultry manure gave the higher Crude protein content than other soil amendments. The plot that received 10t/ha of poultry manure gave the higher mean value 0.25 (mg/100 g) of vitamin B1 while 20 tha^{-1} of poultry manure gave the least 0.17 (mg/100g). The control treatment gave the higher mean value 0.32 (mg/100g), 19.52 (mg/100g) and 0.95 (mg/100g) of vitamin B2, vitamin C and vitamin E, respectively, while the least came from application of 30 tha^{-1} of poultry manure. The result of the minerals assayed differed significantly ($P<0.05$). The control plot had higher concentration of Calcium of 32.48 (mg/100g), Sodium 45.30 (mg/100g) and Magnesium 19.74 (mg/100g), however, potassium content was higher in the plot that received 30t/ha of poultry manure.30 tha^{-1} of poultry manure.

Keywords: *Carrot, poultry manure, proximate, minerals and vitamins.*

INTRODUCTION

Carrot (*Daucus carota* Var. sativus L.) belongs to the umbellifer family Apiaceae. Carrot is one of the most important root vegetables, usually orange in colour, though purple, black, red, white and yellow cultivars exist. Carrots are particularly rich in B-carotene (pro-vitamin A) and also good source of fiber, vitamin K, potassium and antioxidant (Kanall, 2014). They are consumed either fresh, as a salad crop or cooked. Carrot is a very important vegetable crop in Nigeria. The plant is a biennials; it grows vegetative in the first season and produces seed in the second season. For root production, carrot is grown as an annual crop. (Benjamin *et al*., 1997). Carrot is an important crop in many parts of the world especially where it thrives well due to enabling environmental conditions and human interventions.

In Nigeria, it thrives well mostly in Northern states of Nigeria and has consequently been zoned as a northern crop and has over the years been produced in states of the northern such as Kaduna, Kano and Jos, etc. (Orakpo, 2010). Carrots are 88% water, 4.7% sugar, 0.9% protein 2.8% dietary fibre, 1% ash and 0.2% fat. Free sugars in carrot include sucrose, glucose and fructose (Nutrition facts for carrots, 2014). Carrot dietary fibre comprises mostly cellulose, with smaller proportions of hemicellulose, cignin and starch (Rubatsky *et al*., 1999). The traditional orange coloured get their bright colour from beta-carotene, an antioxidant that is converted to vitamin A in the body carrots are excellent sources of vitamin A in the form of beta-carotene. They are also good source of several B-vitamins, vitamin K and potassium (Adda, 2015). Carrot consumption has been linked with reduced risk of cancer and heart disease and also improved eye health. They may be valuable component of an effective weight loss diet (Adda, 2015). The demand for nutrient requirement of teeming population in the area of infant and pregnant women is imperative. Therefore crop improvement through agronomic practices to optimize nutrient concentration is vital. Different levels of organic fertilizer could be effective in increasing nutrient content of carrot root.

OBJECTIVES OF THE STUDY.

Therefore, the objectives of this study were to;

►determine proximate of carot, qualities, Beta-Carotene, vitamin C and E, B1 and B2 and minerals such as, Ca, K, Mg, Zn, Na, and Fe of carrot grown under different levels of poultry manure soil amendment.

MATERIALS AND METHODS

EXPERIMENTAL SITE

The study was conducted during 2024 cropping season at the Department of Crop and Horticultural Sciences, College of Crop and Soil Sciences, Michael Okpara University of Agriculture, Umudike Teaching and Research Farm. Umudike is located at latitude $5^0$29'N and longitude 7^0 33'E with an elevation of 122m above sea level. Nutritional analysis were determined at Department of Fishery College of Natural Resources and Environmental Management Teaching and Research Laboratory Michael Okpara University of Agriculture, Umudike

MATERIALS AND EXPERIMENTAL DESIGN

The (Touchon carrot roots were harvested from an existing research farm of Department of Crop and Horticultural Sciences, College of Crop and Soil Sciences, Michael Okpara University of Agriculture, Umudike The treatments were four (4) levels of poultry manure (0, 10, 20 and 30 tons/ha). The samples harvested across the treatments were used to determine Proximate, Beta-carotene, Vitamins (B1, B2, C and E,), calcium, potassium, magnesium Zinc and sodium in Completely Randomized Design arraignment and in triplicate.

DATA COLLECTION

DETERMINATION OF PROXIMATE, MINERALS AND VITAMINS.

Proximate analysis: The method of the Association of Official Analytical Chemist (AOAC, 2003) was used.

Vitamin Analysis:
The composition of water soluble vitamins such as ascorbic acid (vitamin C, A) and (vitamin E), vitamin A content were determined by the method of AOAC (2003).

Mineral analysis. Mineral levels were determined using (AOAC, 2003)

DATA ANALYSIS

All data determined were subjected to analysis of variance (ANOVA) using GENSTAT 2016 release 7.220 software and significance difference between treatments means were separated using Least Significant Deference (LSD) at 0.05% level of probability.

RESULTS AND DISCUSSIONS

Proximate Composition of Fresh Carrot Root.

The result in table 1 showed that all the parameters determined were significantly ($P<0.05$) influenced with the exception of carbohydrate. Untreated plot had the higher Ash content of 1.28 % and Crude fat of s0.35 % contents compared to others. However, the plot that received 30 tha^{-1} of poultry manure had the higher Crude fibre of 2.71 % and Dry matter content of 21.71 g than other treatments. The 10 tha^{-1} poultry manure gave the higher Crude protein content than other soil amendments

Vitamins Composition of Fresh Carrot Root.
The result obtained from the analysis of variance shown in table 2 indicated significant ($P<0.05$) variation among the treatments. The plot that received 10t/ha of poultry manure gave the higher mean value 0.25 (mg/100 g) of vitamin B1 while 20 tha^{-1} of poultry manure gave the least 0.17 (mg/100g). The control treatment gave the higher mean value 0.32 (mg/100g), 19.52 (mg/100g) and 0.95 (mg/100g) of vitamin B2, vitamin C and vitamin E, respectively, while the least came from application of 30 tha^{-1} of poultry manure.

Mineral Composition of Fresh Carrot Root.
The result of the analysis of variance presented in table 3 differed significantly ($P<0.05$). The control treatment had higher concentration of Calcium of 32.48 (mg/100g), Sodium 45.30 (mg/100g) and Magnesium 19.74 (mg/100g), however, 30 tha^{-1} of poultry manure had the least mean value of above minerals, while potassium content was higher in the plot that received 30t/ha of poultry manure.

Table 1. Influence of poultry manure levels on proximate composition of Carrot Toucheon *Daucus carota* L variety grown in umudike humid rainforest zone

	PROXIMATE (%)						
Poultry manure (t ha^{-1})	Ash	CHO	Crude fibre	Crude protein	Crude fat	Dry matter (g)	Moisture content
Control	**1.28**	16.47	2.36	1.07	**0.35**	21.17	78.83
10 t/ha	1.17	**16.77**	2.62	**1.17**	0.28	21.62	78.38
20 t/ha	1.23	15.79	2.45	1.12	0.32	20.91	**79.09**
30 t/ha	1.23	16.25	**2.71**	1.15	0.26	**21.71**	78.29
LSD (0.05)	0.05	n.s	0.11	0.55	0.06	0.10	0.19

Table 2. Influence of Poultry Manure on Vitamin composition of Carrot Toucheon (*Daucus carota* L) variety grown in umudike rainforest zone

	VITAMINS (mg/100g)				
Poultry manure t ha^{-1}	Beta carotene	Vitamin B1	Vitamin B2	Vitamin C	Vitamin E
Control	135.00	0.18	**0.32**	**19.52**	**0.95**
10 t/ha	191.00	**0.25**	0.28	18.35	0.85
20 t/ha	**194.00**	0.17	0.26	16.75	0.78
30 t/ha	192.00	0.22	0.19	15.80	0.59
LSD (0.05)	n.s	0.02	0.02	0.10	0.27

NOTE: n.s= Non-significant; t= tons; ha=Hectare

Table 3. Influence of Poultry Manure on mineral composition of Carrot Toucheon (*Daucus carota* L) Variety grown in umudike rainforest zone

	MINERALS (mg/100g)				
Poultry manure t ha^{-1}	Calcium	Potassium	Sodium	Magnesium	Zinc
Control	**32.48**	120.54	**45.30**	**19.74**	1.47
10 t/ha	31.68	123.79	43.77	18.78	1.57
20 t/ha	30.33	126.38	40.89	16.69	1.69
30 t/ha	30.06	**127.62**	39.00	12.38	**1.79**
LSD (0.05)	0.09	0.08	0.06	0.14	0.04

DISCUSSIONS

Influence of poultry manure rates on proximate composition of carrot.

Proximate composition of carrot grown under different poultry manure rates were assayed. There were significant difference among the manure rates applied. The Touchen variety on control plot had higher contents of Ash 1.28 % and crude fat of 0.35 % than other treatments. The application of 10t/ha of poultry manure gave higher mean values of crude protein 1.17 %, while 20 t ha^{-1} gave higher moisture contents 79.09 (%). However, 30t/ha had higher crude fibre 2.71 % and dry matter content.21.71 %, respectively. The findings were in consonant with the report of (Festus *et al*, 2024) who reported similar result on the variety Touchen and manure effect. This might be due to expression of genetic make-up in response to manure treatment. The investigation of proximate composition through different levels of poultry manure on carrot revealed some differences, except for CHO content. Notably, carrots emerged as an outstanding source of moisture and carbohydrates, boasting an average moisture level of nearly 79.09%. This high level of moisture content proposes that carrots could possibly enhance body rehydration. However, it's imperative to acknowledge that this characteristic, while useful for consumption, could pose threats during storage due to its tendency to encourage the growth of microorganisms, thereby shortening the shelf life of stored carrot roots.

In relation to nutritional constituents, the protein content was very low at 1.17%, showing that carrots are not a substantial source of protein. The crude fiber, essential for digestion, was consistently present at range of 2.4 to 2.71.0% across the manure rates. The inclusion of crude fiber in carrots enhances their popularity as a dietary component, promoting digestion, while ash content was approximately 1.28%,

Influence of poultry manure rates on vitamins composition of carrot.

The vitamins B1, B2, C and E content of Touchon variety of carrot assayed were significantly influenced by poultry manure rates. The control plot gave the higher concentration of vitamins B2, C and E, however, 10 t ha^{-1} and 20 t ha^{-1} had the higher contents of vitamin B1 and Beta carotene, respectively. This results were not in conformity with the findings of (Festus *et al*, 2024), who reported vitamin C and E To have 3.8 mg and 2.2mg against 19.52 and 0.95mg/100mg. this variation might be due to residual effect of farmland. According to their mineral makeup, carrot roots include significant levels of potassium, calcium, sodium and magnesium, The result also revealed that carrots will be a good source of vitamin C and vitamin E. Vitamin C is good for the body's normal metabolism, and can also be used in the prevention of scurvy and in wound healing and tissue repair (Sarpooshi *et al.,* 2017). Vitamin E functions as a fat-soluble antioxidant that guards against cellular damage and lowers the risk of several illnesses, including cancer and heart ailments (Wang (1999)).

Influence of poultry manure rates on mineral composition of carrot.

The results of the analysis showed a considerable amount of minerals. The sodium 45.3 mg/100g and potassium 120 mg/100g concentration is in close range with the findings of (Festus *et al.*, 2024) who reported sodium 40.5 to 72.0 mg/100g and potassium 110 to 188 mg/100g, respectively. The zinc (1.47 mg/100g), calcium (32.45 mg/100g), magnesium 19.74 (mg/100g), and potassium 120.5 (mg/100g) was not in tandem with the finding of (Festus *et al.,* 2023) who reported 0.4 mg of zinc, 78.6 mg of calcium, 4.8 mg of magnesium and 183.4 mg of potassium. This might be as a result of genetic by environment interaction in farming site. The plant may have expressed its hybrid vigour in the environment where they are grown. Moreso, residual effects of soil amendment may have also contributed in above results.

The minerals (K, Ca, Na, and Mg) found in carrot roots in this experiment were similar to those reported by (Bonasia 2021, Majkowska-

Gadomska, *et al,* 2017). Sodium and potassium are important intracellular and extracellular cations respectively. Sodium is involved in the regulation of plasma volume, acid–base balance, and muscle contraction (Sharma *et al*, 2012]. Sodium remains one of the major electrolytes in the blood. Without sodium, the body cannot maintain its hydration and would become dehydrated (AOAC (2003)). Calcium is necessary for the coagulation of blood, the proper functioning of the heart and nervous system and the normal contraction of muscles (LeBrasseur (2003)). Its primary role is to support the development of bones and teeth. Magnesium is a component of chlorophyll and is a crucial mineral element in relation to ischemic heart disease and calcium metabolism in bones (Fiorentini, 2021).

CONCLUSION

It was obvious that the proximate quality of untreated plot had the higher ash content 1.28 % and Crude fat 0.35 % contents compared to others, The control treatment also gave the higher mean value 0.32 (mg/100g), 19.52 (mg/100g) and 0.95 (mg/100g) of vitamin B2, vitamin C and vitamin E, respectively, Calcium of 32.48 (mg/100g), Sodium 45.30 (mg/100g) and Magnesium 19.74 (mg/100g), The plot that received 30 t ha^{-1} of poultry manure had the higher Crude fibre of 2.71 % and Dry matter content of 21.71 g than other treatments. Potassium content was higher in the plot that received 30t/ha of poultry manure.

Furthermore, plot that received 10 t ha^{-1} of poultry manure gave the higher mean value 0.25 (mg/100 g) of vitamin B1. The 10 tha^{-1} poultry manure gave the higher Crude protein content than other soil amendments

RECOMMENDATION

More research Should be done to establish the appropriate poultry manure to be recommended for optimum level of nutritional composition of carrot in Umudike.

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