



Effects of Poultry Manure on Growth and Yield of Carrot Varieties (*Daucus Carota*)

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ABSTRACT

The study aimed to investigate the impact of poultry manure on different carrot varieties in the Agricultural Education Department's pomology garden at the Federal College of Education Zaria. Three levels of poultry manure, namely 0 tha-1, 20 tha-1, and 40 tha-1, were utilized along with two carrot varieties, 'farin cikin manoma' (FRM) and Thema. The experiment followed a complete randomized block design, with three replications for each manure rate and variety. Several parameters, including plant height, number of leaf branches, root length, root diameter, and yield, were recorded. The collected data underwent analysis of variance with a significance level of 0.05. Surprisingly, no significant effects of poultry manure rates were observed on the aforementioned parameters. However, when considering all the parameters, including yield, it was observed that the combination of 20 tha-1 poultry manure and the FRM variety resulted in the highest values. Based on the results, it is recommended that a poultry manure rate of 20 tha-1 should be used for cultivating the FRM variety to achieve higher yields.

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INTRODUCTION

The sustainability of crop production relies on the utilization of organic manures and integrated practices, particularly in regions with limited soil fertility, like the Nigerian savannah soils. These ferruginous tropical soils are generally low in fertility, with inadequate organic matter and nitrogen content (Sani, Abubakar, Jaliya, Kura, Yakubu, and Musa, 2016). To achieve sustainable crop production with improved yields, environmental protection, and better farmer well-being, alternative methods of cultivation need to be explored.

Numerous studies have emphasized the significance of using organic manure in crop production. Poultry manure, for instance, enhances soil nutrient levels, including nitrogen, phosphorus, and potassium (Appiah, Sarkodie-Addo, and Opoku, 2017). Its nutrient content is reported to be approximately 3.03% N, 2.63% P₂O₅, and 1.4% K₂O (Sani et al., 2016). Furthermore, poultry manure has been found to reduce soil parasitic nematodes, increase soil

nutrients, and improve soil moisture (Agyei and Bayor, 2017).

Carrot (*Daucus carota*) is a significant root crop from the Apiaceae family, with a long history of cultivation dating back more than 2000 years (Derebet, 2016). It was first domesticated in Afghanistan and later spread to various regions under different influences. Carrot is an important source of carotene, a precursor of vitamin A, as well as protein, carbohydrates, and fiber. Its fleshy roots are widely used in salads, soups, and other vegetable dishes, offering therapeutic effects and enhancing resistance against certain diseases (Habimana, Uwamahoro, Uwizerwa, 2014; Appiah et al., 2015).

Despite its significance, carrot production has faced persistent challenges in many parts of the world, mainly due to inadequate knowledge of new production methods and appropriate agronomic practices. The use of inorganic fertilizers to boost yields has been linked to health problems and environmental pollution, making them less desirable. Additionally, the high

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cost of inorganic fertilizers poses a challenge for resource-poor small-scale farmers. In contrast, organic fertilizers like manures and composts provide essential nutrients for crop growth without causing long-term soil damage (Eghball et al., 2004). Thus, this study aims to investigate the impact of poultry manure on the growth and yield of carrots in the study area, offering a more sustainable and environmentally friendly approach to cultivation.

MATERIALS AND METHODS

The experiment was conducted in Agricultural Education pomology garden, F.C.E, the study was conducted between November 2022 to January 2023 in Zaria situated at Latitude 11.07 & 12° North and longitude 07.44 & 8° East) and 686 meters above sea level which is situated in the Northern guinea savannah ecological zone of Nigeria (Student handbook 5th edition, 2019 Federal College of Education, Zaria). The land was prepared manually using cutlass and hoes. Two treatments levels of poultry manure and control used. Treatments was arranged in randomized complete block design in a plot size of 1 m² replicated three time. The poultry manure was applied two weeks before planting at 20 tha⁻¹ and 40 tha⁻¹ and each plot was mulched using plant materials to induce germination and sustain moisture.

Data was collected on weekly basis using a ruler, paper and ropes from the plants tagged in each net plot for the experiment. Leaves number was recorded every 7 days in the plant

tagged and average was taken. Plant height was measured using a ruler and average number was recorded carefully. Number of branches were counted manually on the plant and average number was recorded carefully. Root length data was collected using measuring tape and average was recorded. Root diameter was recorded using Vanier caliper. Harvested plant roots were measured using weighing scale and average was recorded. Analysis of variance was used to compare mean variables and the result was presented using tables and bar charts.

RESULT AND DISCUSSION

Plant Height

Table 1 presents the effect of poultry manure and variety on plant height of carrot varieties at 4, 6 and 8 weeks after sowing during 2021- 2022 wet season period. Increase in poultry manure rates shows no significant effect (P <0.05) on plant height at all the growing period. This implies that both control and 20 tha⁻¹ perform the function as 40 tha⁻¹ but by physical observation, 40 tha⁻¹ gave longer plant height as compared to the rest of the treatments. This finding is line with the report made by Osae and Bayor (2016) and in contrast with the findings of Sylvester (2014). Varietal effect on plant height was also significantly the same. This implies that variety has effect on plant height. The interaction between poultry manure and variety was also not significant. This also implies that interaction between manure and variety has no effect on plant height.

Table 1: effect of poultry manure on plant height of carrot varieties at 4WAS, 8WAS, 12WAS ,2021- 2022 period

Treatment	Plant Height		
	4WAS	8WAS	12WAS
Poultry Manure (tha⁻¹)			
Control	5.95	12.92	15.12
20 tha ⁻¹	6.21	13.63	14.38
40 tha ⁻¹	7.2	13.53	16.05
SE±	0.75	1.19	1.11
Variety			
FRM	6.22	13.79	14.42
Thema	6.68	12.93	15.94
SE±	0.61	0.97	0.9
Interactions			
V x P	NS	NS	NS

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FRM = farincikin manoma, means followed by the same letter within a treatment group are not statistical different at 5%

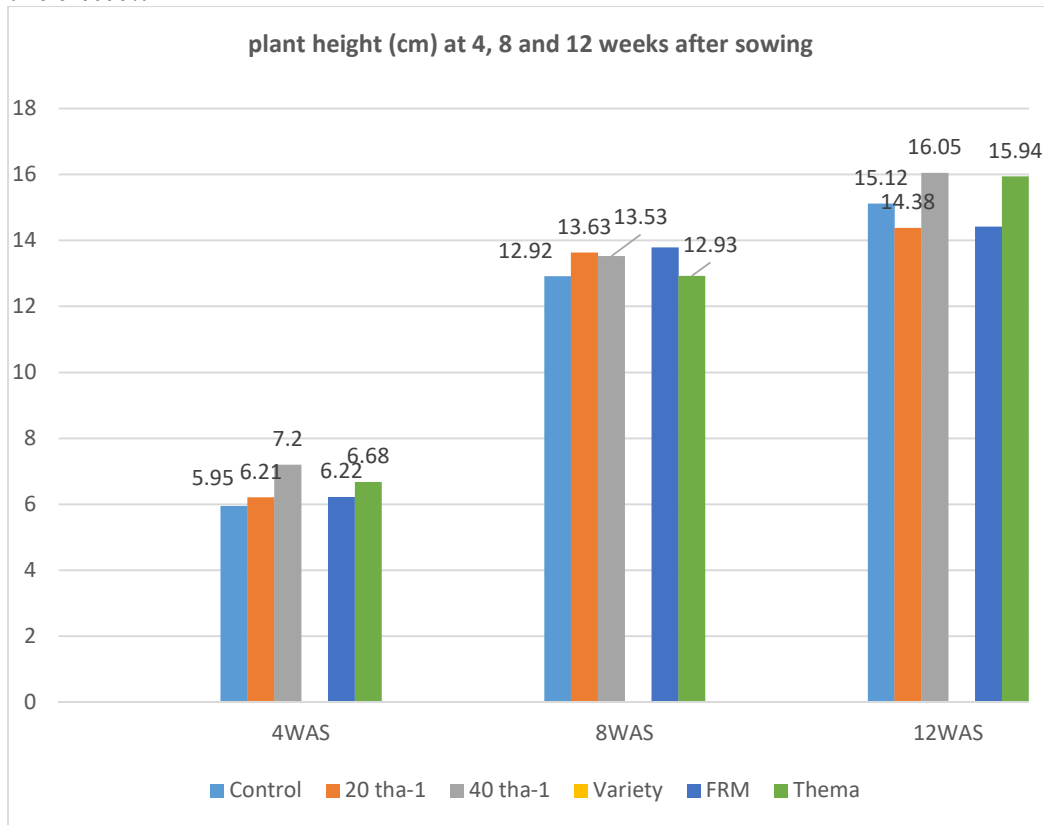


Figure 1: Plant height at 4, 8 and 12 weeks after sowing

Number of Leaf Branch

Poultry manure rates show no statistical differences with regard to if effect ($P < 0.05$) on number of leaf branch but, physically, 20 tha⁻¹ gave number leaf branches both control and 40 tha⁻¹. Varietal effect ($P < 0.05$) was statistically similar on number leaf branches at all the growing periods but physical observation reveals that 'Farin cikin

manoma (FRM) had more number leaf branches. Also, interaction shows no statistical influence on number leaf branches. The results indicate that for all the manure treatment had no influence on number of leaves branches. This result is in accordance with the findings of Sani *et al*, (2016) where reported that application of 10 tha⁻¹ poultry manure had no effect number of leaf branches.

Table 2: Effects of poultry manure on number of leaves of carrot varieties at 4WAS, 8WAS, 12WAS.

Treatment	Manure	Number of leaf branch		
		4WAS	8WAS	12WAS
Poultry (tha ⁻¹)				
	Control	3.35	5.72	6.17
	20 tha ⁻¹	4.3	5.38	7.38
	40 tha ⁻¹	4.12	5.18	6.77

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SE±	0.56	0.27	0.48
Variety			
FRM	4.06	5.52	7.02
Thema	3.79	5.33	6.52
SE±	0.45	0.22	0.39
Interactions			
V x P	NS	NS	NS

FRM = farincikin manoma, means followed by the same letter within a treatment group are not statistical different at 5%

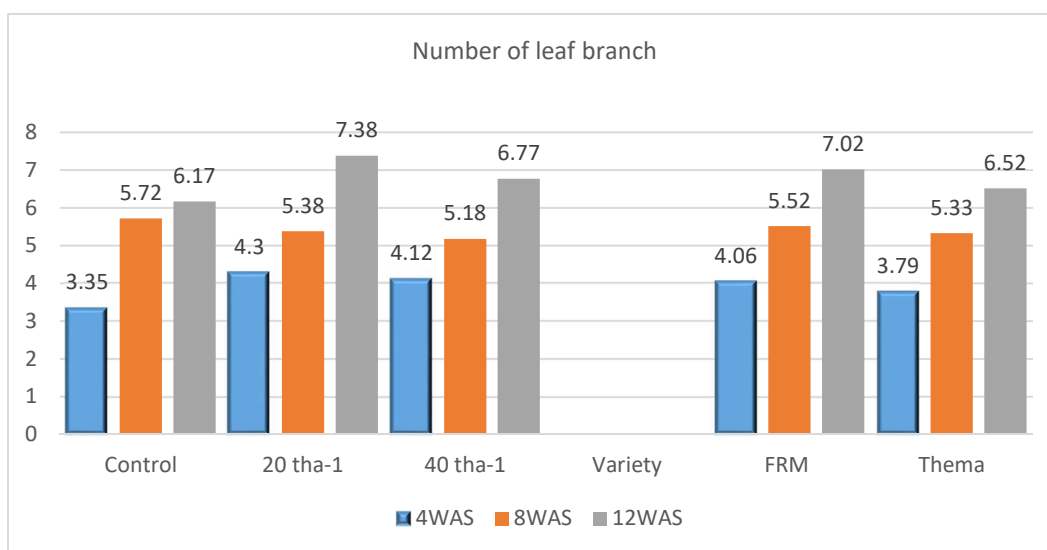


Figure 2: Number of leaf branch per plant

ROOT LENGTH, ROOT DIAMETER AND YIELD THA⁻¹

Table 3 reveals that all the poultry manure treatment had no significant effect ($P < 0.05$) on root length. Similarly, varietal effect and interaction effect ($P < 0.05$) on root length were statistically the same. This shows that no differences in root length of the carrot but physically, the result revealed that 20 tha⁻¹ of PM had longer root length. This result is can be supported by the finding of Sylvester *et al*, (2014) where they reported that poultry manure at 20, 40 and 70 tha⁻¹ in Nyankpala Campus in the Northern Region of Ghana, had lower root length.

Root Diameter

Effect of poultry manure rates ($P < 0.05$) on root diameter was significantly the same for all

treatments (table 3). Physical observations showed that 20 tha⁻¹ had larger root diameter (figure 3). This implies that 20 tha⁻¹ had a little bit more than 40 tha⁻¹ and the control. The poor effect of these manure rates on root diameter is in accordance with the findings of Sylvester *et al*, (2014) who reported that poultry manure low effect on root diameter.

Yield tha⁻¹

Effect of manure rates and variety on yield per hectare after harvest was not significant ($P < 0.05$) (table 3). Although, no significant statistical influenced on yield was observed, but physically 20 tha⁻¹ had more yield compared to 40 tha⁻¹ which is also lower than the control (figure 3). Varietal influence on yield per hectare was also at par for all the treatments.

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Table 3: Effects of poultry manure on root length, root diameter and yield of carrot varieties at 4WAS, 8WAS, 12WAS.

Treatment	Root Length	Root Diameter	Yield t/ha
Poultry Manure (tha⁻¹)			
Control	15.47	6.98	5.8
20 tha ⁻¹	16	12.15	8.7
40 tha ⁻¹	14	7.13	4.3
SE±	1.09	2.09	2.32
Variety			
FRM	16.16	7.54	73.8
Thema	14.16	9.97	51.5
SE±	0.89	1.71	18.9
Interactions			
V x P	NS	NS	NS

FRM = farincikin manoma, means followed by the same letter within a treatment group are not statistical different at 5%

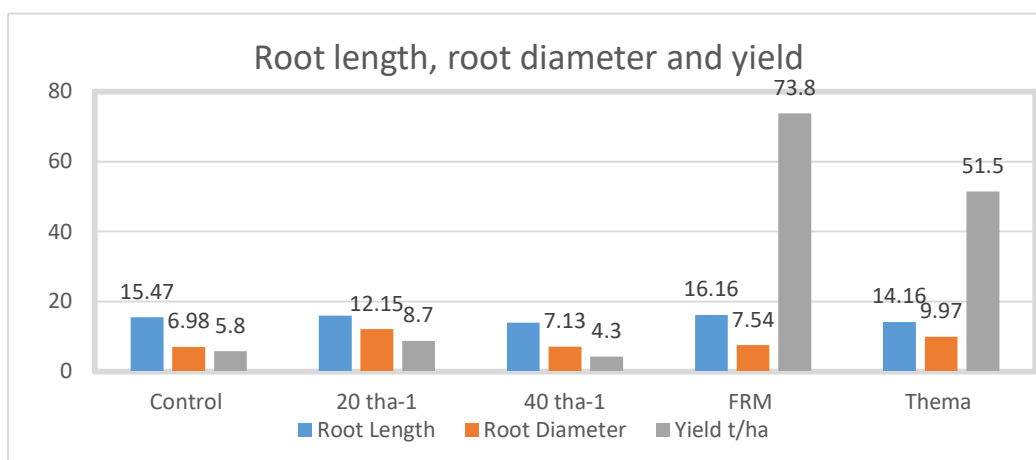


Figure 3: Root length (cm), root diameter (mm) and yield (tha⁻¹)

CONCLUSION AND RECOMMENDATION

Although poultry manure improves growth and yield parameter in crop production, but, statistical differences were not observed in the effects of manure rates and variety. However, 40 tha⁻¹ PM as the largest manure rate did not give any appreciable effect in comparison with 20 tha⁻¹ PM. The application of PM at 20 tha⁻¹ was found to be more cost effective in the production of carrot than the 40 tha⁻¹. No varietal differences were observed. It can be concluded that PM, especially at 20 tha⁻¹ can be used for carrot production on

tropical soil. Further research should be carried out on more poultry manure rates.

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