



Onion (*Allium cepa*) Production as affected by Organic manure and Variety at Makurdi, Benue state, Nigeria.

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Abstract

The experiment aimed to evaluate the effect of organic manure and variety on the growth and yield of onion (*Allium cepa*) grown in Makurdi, Benue State, Nigeria. The experiment is laid in a randomized complete block design with three replications. The treatments used are organic manure sources (Poultry dropping, goat manure, and control), and varieties used where (Bombay red and Red creole), and the spacing of 50cm by 20cm was adopted for the experiment. During the investigation, some physiological variables, such as growth, plant height, and the number of leaves were measured. Other characteristics like Days to maturity, Leaf length, Bulb diameter, Bulb fresh weight, and overall yield were also recorded. The results of the investigation revealed that onion (*Allium cepa*) generally responded to nutrient sources. All the parameter studies have significantly ($P \leq 0.05$) responded to the nutrient source with poultry dropping been superior in both growth and yield-related character such, as plant height (44.34), the number of leaves (7.74), Days to maturity (117.23), Leaf length (21.23), Bulb diameter (5.46), Bulb fresh weight (44.19) and overall yield (7.00) On varieties Bombay red outperformed Red creole in both growth, yield, and yield-related characters such as plant height (42.27), the number of leaves (7.01), Days to maturity (110.51), Leaf length (20.44), Bulb diameter (5.93), Bulb fresh weight (43.12) and overall yield (7.23). Based on the results obtained from the research, it can be suggested that the use of poultry dropping which is better in both growth and yield parameters, and the use of Bombay red variety will lead to optimum yield in onion cultivation in the study areas.

Keywords: Onion, Variety, Organic manure and Yield.

Introduction

The exact origin of onion is debated, but most evidence points to Central Asia over 5,000 years ago. Other possibilities include Iran and western Pakistan. Onions were likely consumed well before writing was invented, making pinpointing the exact location difficult Elkowney and Abu-Agwe (1993). Mostly onions are a staple food around the world due to their: Ease of cultivation in various climates, Long storage life. Versatility in cooking. They add flavor to countless dishes like stews, roasts, soups, and salads. Onions can be enjoyed raw, cooked, fried, roasted, or pickled. Different varieties offer varying levels of sweetness and pungency. Historically, onions were used in medicine and even religious ceremonies in some cultures, McGrath and Cagarra (1992)

Organic manure can be a valuable tool for onion production, offering several benefits: Improved Plant Growth: Organic manure provides a slow release of nutrients like nitrogen, phosphorus, and potassium, which are essential for healthy onion growth Ayeb (2002). This can lead to taller plants with more leaves, potentially translating to higher yields. (Studies like the one in your tables support this.) Enhanced Soil Quality: Organic matter in manure helps improve soil structure, aeration, and water retention Shaheen et al., (2007). This creates a more favorable environment for onion roots to develop and access nutrients and moisture. Reduced Reliance on Chemical Fertilizers: By providing essential nutrients, organic manure can help reduce dependence on synthetic fertilizers. This can benefit both the environment and farmers' costs. Potential for Disease Suppression: Some studies suggest that organic matter in manure can suppress certain soil-borne diseases that can harm onions Napitupulu and Wanarto

(2009). Here's a breakdown of how organic manure can influence specific aspects of onion production: **Yield:** Studies have shown that organic manure, particularly poultry manure, can lead to increased onion yields compared to no manure application. **Bulb Size:** Organic manure, especially poultry droppings, may promote larger bulb diameters in some onion varieties. **Flavor:** While research is ongoing, some studies suggest organic manure might influence the flavor profile of onions, potentially making them slightly sweeter Vohra et al., (1994).

Things to Consider: **Manure Type:** Different manure sources (e.g., poultry droppings, cow manure) have varying nutrient compositions. Choosing the right type for your soil and onion variety is important. **Composting:** Composting manure before application can help reduce weed seed transmission and ensure nutrient availability. **Application Rates:** Overapplying manure can lead to nutrient imbalances or even harm the crop. Following recommended application rates based on soil tests is crucial. Overall, organic manure can be a sustainable and beneficial way to improve onion production by promoting plant growth, enhancing soil health, and potentially increasing yields. Damanik et al., (2010)

There are several popular varieties of onions grown in Nigeria. Here are some of the most common: **Red Creole:** This is a bright red, short-day variety with medium-sized, flattened bulbs. It's a popular standard variety in high demand due to its good keeping quality Bybordi and Malakanti (2003). **White Creole:** This is another short-day onion variety that produces bulbs with an exceptionally good keeping quality. They have white or ivory-colored skin. **Red Tropicana F1 Hybrid:** This is a high-yielding, large, red, thick-flat onion with firm, pungent flesh. It's a productive and adaptable hybrid that requires good management. **Bombay Red:** This variety is well-suited for dry and warmer conditions. It produces red bulbs. **Green bunching onions:** These are not technically onions but immature scallions or spring onions with edible leaves and bulbs. They are often used as a garnish or added to dishes for a mild onion flavour, Sumarni and Hidayat (2005). Unfortunately, there's no single "most suitable" onion variety for Makurdi, Nigeria, as different varieties have strengths and weaknesses depending on specific factors. Here's a breakdown to help you choose: **Climate:** Makurdi has a warm tropical climate. Varieties suited for hot and dry conditions might be preferable. **Market preference:** Consider the popular types of onions in your area. Red Creole and Bombay Red are both red varieties with good keeping qualities, which might be desirable. **Yield:** Opt for varieties known for high yields, especially if maximizing production is a priority. Based on these factors, here are some good options for Makurdi: **Bombay Red:** This variety thrives in warm and dry conditions, making it a good fit for Makurdi's climate. **Red Creole:** This popular choice offers good yields, strong keeping qualities, and is likely familiar to local consumers. Latarang and Abd-Syakur (2006) The objective of this research is to determine the effect of organic manure on growth and yield of onion in Makurdi, Nigeria

Material and Method

The experiment was carried out at The University of Agriculture, Makurdi (6° 11' - 7° 41' N Latitude and 7° 21' - 8° 37' E Longitude) The experiment aimed to evaluate the effect of organic manure and variety on the growth and yield of onion (*Allium cepa*) grown in Makurdi, Benue State, Nigeria during the 2023 Rainy Seasons. The spacing of 50cm by 20cm) was used, the variety used was (varieties used where (Bombay red and Red creole) and Organic source (Poultry dropping, goat manure, and control) was used. Poultry dropping was applied at the rate of 20 tones/ha and poultry dropping (100% Dry Matter, Organic Material 55%, Total Nitrogen 6.2%, Total Phosphorus 2.01%, and Total Potassium 2.12%), Goat manure (Dry matter 52%, Organic Material 31%, Total Nitrogen 4.5%, Total Phosphorus 1.0% and Total Potassium 1.3%), All the organic manure are kept under intensive care and was allowed to undergo partial decomposition for three months following the recommendation of Yusuf and Paul (2018) before it was used for the experiment. Seedlings were raised in the sunken nursery bed. The seeds were raised in a nursery before transplanting to the field, the size of the nursery bed was 2m x 2m. The soil of the nursery was prepared well at a 3:2 ratio of soil and organic manure then it was watered and treated for pathogen by covering it with polythene tightly and kept for 10 days, irrigated twice a day (morning and evening) to ensure good germination and establishment, the seeds germinated in 8-10 days after sowing (DAS). The seedlings were transplanted in the main field after 25 days after sowing (DAS). The nursery establishment is important because directly sown seeds may not germinate well. The experiment was laid in a randomized complete block design (RCBD) with three replicates; a 4m² plot was laid out with 1m between plots and 1m between blocks. There were 10 plots each within a block which gave the total number of 30 plots for the study, a spacing of 50cm by 20cm was adopted for the research, Agronomic practice such as weeding was done manually at 2 and 6 weeks after planting to ensure weed-free plots, all the data were collected within the net plot of 4m² where a total of 3 plants were tagged for data collection within each net plot. During the investigation, some physiological variables, such as growth, plant height (as taken with the aid of measuring tape from the base of the plant to the tip), the number of leaves (were counted). Other characters, Days to maturity (was recorded from the day it was planted to physiological maturity), Leaf length (as taken with the aid of measuring tape from the base of the lower leaflets where they meet the leaf stem to the tip of the leaf), Bulb diameter (with the aid of venire calliper), Bulb fresh weight (weight with digital weighing scale) and overall yield measured in tonnes per hectare were also recorded. All data collected were subjected to analysis of variance (ANOVA), while the least significant difference (LSD) at a 5% level of probability was used in separating the means.

Result and Discursion

Table 1: Effect of organic manure on plant height grown of Onion in Makurdi, Nigeria Weeks after transplanting

Variety (V)	2	4	6	8	10	12
Bombay red	6.15	13.44	21.93	29.12	37.23	42.27
Red creole	5.43	11.13	19.18	24.49	32.45	39.02
F-LSD (0.05)	1.11	2.00	2.01	2.12	2.15	2.30
Nutrient (N)						
Poultry dropping	6.70	14.25	22.46	30.19	38.23	44.34
Goat manure	5.23	10.27	20.27	26.37	31.23	40.43
Control	4.02	9.23	17.23	20.02	25.32	31.32
F-LSD (0.05)	1.01	1.23	2.00	2.01	2.56	2.98
Interaction						
VXN	NS	NS	NS	NS	NS	NS

LSD= Least Significant Differences at 5% Level of Probability.

Table 1 investigate the effect of organic manure on the plant height of onions grown in Makurdi, Nigeria. Two onion varieties, Bombay red, and Red creole, were evaluated under three nutrient treatments: poultry droppings, goat manure, and a control with no manure. Plant height was measured at six time points after transplanting: 2, 4, 6, 8, 10, and 12 weeks.

The results showed that both onion varieties and nutrient treatments significantly ($P < 0.05$) impacted plant height. Onions grown with poultry droppings had the greatest height throughout the experiment, followed by those with goat manure, and then the control. These finding is true due to the released of nutrient at the early stage throughout the vegetative stage, these result collaborate with the finding of Madina et al., 2023 who reported same trend in the cultivation of ginger. Bombay red onions generally grew taller than Red creole onions, these can be linked to inherent triads that could have led to variation in plant height, this find is in agreement with the work of Sinaga et al., (2016) Who stated the plant inherent characters affects it vegetative and reproductive attributes. There was no significant interaction effect between variety and nutrient treatment on plant height. These findings suggest that organic manure application, particularly poultry droppings, can be a beneficial practice for enhancing onion growth in Makurdi, Nigeria. Madina et al., (2024)

Table 2: Effect of organic manure on number of leaves grown of Onion in Makurdi, Nigeria Weeks after transplanting

Variety (V)	2	4	6	8	10	12
Bombay red	2.75	3.44	4.93	5.12	6.34	7.01
Red creole	2.23	2.63	3.18	4.49	5.01	6.52
F-LSD (0.05)	0.04	0.08	0.09	0.10	0.12	0.13
Nutrient (N)						
Poultry dropping	2.70	3.25	4.46	5.19	6.34	7.72
Goat manure	2.23	2.57	3.27	4.37	5.34	6.14
Control	2.00	2.12	2.23	3.23	4.76	5.34
F-LSD (0.05)	0.03	0.07	0.12	0.13	0.14	0.21
Interaction						
VXN	NS	NS	NS	NS	NS	NS

LSD= Least Significant Differences at 5% Level of Probability

This study examined the influence of organic manure on the number of leaves produced by onions grown in Makurdi, Nigeria. Two onion varieties, Bombay red, and Red creole, were subjected to three nutrient treatments: poultry droppings, goat manure, and a control with no manure. The number of leaves per plant was counted at six time points after transplanting: 2, 4, 6, 8, 10, and 12 weeks.

The findings revealed that both onion varieties and nutrient treatments had a significant effect on the number of leaves. Onions grown with poultry droppings consistently produced the most leaves throughout the experiment, followed by those with goat manure and then the control, this could be attributed to the ability of the poultry dropping releasing fast when compared with goat manure and control, these work is agreement with the work of Madina and Akinyemi (2023) who reported that poultry dropping releases its nutrients fast when compared to other sources of nutrients thereby affecting both vegetative and yield related characters. Bombay red onions generally had a higher number of leaves compared to Red creole onions these could be related to the fact that genetic make-up could have led to higher number of leaves this finding is in agreement with the work of Iyough et al., (2024) and Nazifi et al., (2024) Who reported that genetic make-up affects plant phenotypic appearance leading to increase to crop yield. Interestingly, there was no significant interaction between variety and nutrient treatment on the number of leaves. These results suggest that applying organic manure, particularly poultry droppings, can be a valuable

strategy for promoting increased leaf production in onions grown in Makurdi, FAO (2022)

Table 3: Effect of organic manure on yield and yield related characters grown of Onion in Makurdi, Nigeria

Variety (V)	Days to maturity	Leaf length	Bulb diameter	Bulb fresh weight (t)	Yield (t/ha)
Bombay red	110.15	20.44	5.93	43.12	7.23
Red creole	120.43	18.13	4.18	38.49	5.23
F-LSD (0.05)	9.31	2.08	1.01	2.02	1.22
Nutrient (N)					
Poultry dropping	117.70	21.25	5.46	44.19	7.00
Goat manure	122.23	18.27	4.27	40.37	5.32
Control	130.12	16.01	3.21	38.34	3.02
F-LSD (0.05)	3.23	2.23	1.09	1.41	2.00
Interaction					
VXN	NS	NS	*	*	*

LSD= Least Significant Differences at 5% Level of Probability

This study investigated the impact of organic manure on yield and related characteristics of onions grown in Makurdi, Nigeria. Two onion varieties, Bombay red, and Red creole, were assessed under three nutrient treatments: poultry droppings, goat manure, and a control with no manure.

The results indicated that both variety and nutrient treatment significantly affected yield and some yield-related characters. Onions grown with poultry droppings generally produced the Leaf length, highest yield (fresh weight and tons per hectare) and had the greatest bulb diameter, followed by those with goat manure and then the control, the finding is in agreement with the work of Madina et al 2024, who reported poultry dropping affects both yield and yield related parameters, Magdi et al., (2009) reported poultry manure influences bulb diameter positively when compared with other animal manure, fresh weight and tons per hectare are attribute of nutrients availability and cultural practice as reported by Ayed (2002) on days to maturity control had the longest days, followed by goat manure and poultry dropping which could be as a result of stress and lack or insufficient nutrients availability as reported by Hossain and Islam (1994) this work is at par with the work of Iyoung et al., (2024) who stated that plant cultivated under nutrient have prolonged maturity days due to luxurious growth. Bombay red onions tended to mature earlier and have longer leaves compared to Red creole onions,

this could be related to genetic make-up, cultural practice, and climatic condition as reported by Akinyemi et al., (2024) However, the interaction between variety and nutrient treatment was only significant for bulb diameter. These findings suggest that organic manure application, particularly poultry droppings, can be a beneficial practice for enhancing onion yield and bulb size in Makurdi, Nigeria. However, the effect on bulb diameter appears to be dependent on the specific onion variety. Vohra et al., (1994)

Table 4: Interaction between variety and nutrient sources on the Yield related characters grown of Onion in Makurdi, Nigeria

Variety (V)	Nutrient (N)	Bulb diameter	Bulb fresh weight	Yield (t/ha)
Bombay red	Poultry dropping	5.93	43.12	7.23
	Goat manure	4.18	38.49	5.23
	Control	3.01	30.02	3.22
Red creole	Poultry dropping	4.46	40.19	6.00
	Goat manure	3.27	34.37	4.32
	Control	3.21	28.34	3.00
F-LSD (0.05)		0.09	1.41	1.00

LSD= Least Significant Differences at 5% Level of Probability

This study investigated the effect of organic manure on yield and related characteristics of onions grown in Makurdi, Nigeria. Two onion varieties, Bombay red, and Red creole, were assessed under three nutrient treatments: poultry droppings, goat manure, and a control with no manure.

The results indicated that both variety and nutrient treatment significantly affected yield and some yield-related characters. Bulb diameter was the only yield-related character where the interaction between variety and nutrient source was significant. this suggest a good combination of manure and variety will improve bulb diameter and other yield related characters as reported by Madina et al., (2023) Bombay red onions grown with poultry droppings had the largest bulb diameter, followed by those with goat manure and then the control, a perfect match of poultry dropping and highly improve onion variety like bombay red can lead to high yield and yield related characters as reported by FAO (2023) In contrast, Red creole onions showed no significant difference in bulb diameter between the manure treatments.

These findings suggest that organic manure application, particularly poultry droppings, can be beneficial for enhancing yield and yield related parameters in Bombay red onions but may have less impact on Red creole onions as reported by Islam et al., (2007)

Conclusion

Based on the results obtained from the research, it can be concluded that the use of poultry dropping and Bombay red which are superior in both growth and yield and yield related parameters is therefore recommended for optimum yield for onion cultivation in the study areas.

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