



The Upshots of Organic and Inorganic Manure on the Growth of Cabbage Production

Usman M. I¹., Kachallah A.S.¹, Yunus Hassan² and Muhammed Isah Muhammed²

¹Department of Agricultural and Bio-Environmental Engineering Federal Polytechnic Monguno, Borno State

²Department of Agricultural and Bio-Environmental Engineering Ramat Polytechnic Maiduguri, Borno State

Abstract: An experiment was conducted to determine the effect of organic and inorganic fertilizer on growth parameters of cabbage crop. The study was conducted for period of six weeks at Ramat Polytechnic Teaching and Research Farm which is located in a semi-arid climate, of Maiduguri Nigeria. Furthermore, the highest growth parameters such plant height, leaf length, leaf width and number of leaves at all weeks after sowing were remarkably influenced by organic manure used as treatment and it was closed by inorganic at same weeks after. While, mostly control plot yielded a lowest growth parameter throughout the period of the experiment. Similarly, correlation analysis among the growth parameters at 9WAS showed that, there is strong positive relationship of about (82% to 90%) among the crop parameters experimented. Therefore, the study indicates that organic manure treatment has the highest influence on growth parameter of cabbage crop study in the region. In this way, depending on the needs of the user, therefore, it recommended that the experiment should be repeated in similar agro-climatic condition in order to confirm the findings. Similar experiment are needed to be conducted using different organic manure and crop varieties in order to ascertain this finding.

Keywords: Organic manure, inorganic manure, upshots, growth, cabbage production.

INTRODUCTION

Background Information

Cabbage (*Brassica oleracea*L.) is one of the cool crops, a member of the Brassicaceae family. Cabbage is an important fresh and processing vegetable crop in most of the countries of the world. Cabbage is generally grown during Rabi season in Bangladesh. Cabbage is an important and nutritious winter leafy vegetable in Bangladesh. It contains a range of essential vitamins and minerals as well as a small amount of protein and good caloric value. The productivity of cabbage

per unit area is quite low (15 t/ha per unit area) as compared to the developed countries of the world. Various factors such as soil nutrient management, irrigation, variety, plant population per unit area, are involved for better growth of cabbage. Among the factors, suitable variety and nutrient supply are the important inputs for realizing higher cabbage yield and its nutrient content. Variety is an important factor for successful crop yield. An improved variety represents a higher yield than a wild one. Generally, nutrient requirement is determined by the variety of crops. High yielding variety requires more nutrients than the local or wild variety. Usually, it depends on its vegetative and reproductive characters. And it was also mentioned that the vegetable variety and history of fertilizer use are important factors to be considered in the development of a soil nutrient management program. The cultivation of cabbage is required a proper supply of plant nutrients. The requirement of these plants' nutrients can be provided by applying inorganic fertilizer or organic manure or both. However, farmers are now showing interest in organic farming because of, they are more aware of the residual effect of chemical substances used in the crops field and environmental degradation. Besides, the excess application of inorganic fertilizer causes a hazard to public health and the environment. But the application of both organic and inorganic fertilizer combined, can increase the yield as well as keep the environment sound. Considering the above factors, the present experiment was therefore undertaken to compare the influence of NPK fertilizer and poultry manure on the growth of cabbage production.

Statement of the Problem

Macronutrients are the most limiting nutrients in our soils due to continuous cropping (Savant and Stangel, 1990). Increased use of inorganic fertilizers, deteriorate the physical properties of the soil (Ogungbile and Olukosi, 1990). Some of the inorganic fertilizers are volatile and others leach to lower horizons where roots cannot reach them, Aisha et al. (2007). The quality and quantity of Cabbage is low, growth and development rate is also low, this limitation require quick intervention because high quality and quantitative yield of crops, including cabbage can be obtained by incorporating organic manure (Okalebo, 2002). Aisha et al. (2007) showed that inorganic fertilizers generate several deleterious effects to the environment and human health. They argued that inorganic fertilizers should be replenished every cultivation season because, the synthetic compounds of N, P and K fertilizer is rapidly lost by either evaporation or by leaching in drainage water and leads to dangerous environmental pollution. Continuous usage of organic fertilizer affects soil structure because it causes soil to clump, forming soil aggregate thus improving the soil structure, organic manure decomposes to form humus which binds soil particles together thus improving the soil structure and its physical properties (Ogungbile and Olukosi, 1990). Hence, organic manures can serve as alternative to mineral fertilizers as reported by Naeem et al. (2006) for improving soil structure (Dauda et al., 2008).

Significance of the study

The study was fundamental in providing scientific facts on effect of poultry manure and NPK fertilizer on overall cabbage production. The research developed appropriate recommendations for the poultry manure to be applied by the farmers thus increasing cabbage production. The results study can act as a basis for advising farmers on use of the orphaned vegetable that is high yielding, high nutritive and matures within a short time. By carrying out this study, it may end up

as a source of knowledge on the effects of organic and inorganic manure on overall crop production. This will also assist cabbage production farmers on efficient production of cabbage using organic poultry manure.

Aim and Objectives of the Study

The aim of this study was to compare the effect of organic and inorganic fertilizer on the growth of cabbage production.

To compare the influence of poultry manure and NPK fertilizer on the growth of cabbage at 5t/ha.

Scope and Limitation of the Study

Scope

The scope of this study was undertaken to compare the effect of organic and inorganic fertilizer on the growth of cabbage, was carried out in the agricultural Research Farm of Ramat Polytechnic Maiduguri.

Limitation

The quality and quantity of Cabbage is low, growth and development rate is also low, this limitation require quick intervention because high quality and quantitative yield of crops, including cabbage can be obtained by incorporating organic manure

MATERIALS AND METHODS

The Study Site

The study was carried out at the agricultural research farm of Ramat polytechnic Maiduguri. From January 2020 to April 2020. The location of the experimental site was 115°N latitude and 13°09'E longitude (Kyari et al). And at an elevation of 335m from sea level. The climate of experimental site was under the tropical climate region and is characterized by three seasons' cool-dry season (October to March), hot season (April to June) and a rainy season (June to September). The average annual rainfall is around 640mm and the temperature is high ranging "between" 20-40 °C (Dalorima, 2002). The area is highly susceptible to draught with relative humidity of 13% and 65% in dry and rainy season respectively (Bashir. 2014). Also, the area is vulnerable to desertification (Dibal, 2002). The soil of the experimental area is sand loamy which have low moisture holding capacity. It is characterized with clay of 8.0%, silt 11.8% and sand 80.2% having P^H of 6.8 and the field capacity volume is 16.2%, wilting point 3.2%, available water content 13.0%, bulk density 1.70g/cm³ and organic matter 3.99% respectively.

The experimental design

The experiment was carried out in a 5×3 factorial arrangement in a randomized complete block design (RCBD) with three replications. There were two factors under study, poultry manure and NPK fertilizer which was applied at recommended rate. Both organic and inorganic manure were applied at the same rate of 5 t/ha.

Experimental layout

Experimental area had dimensions of 3.9 m by 7.2 m (28.08 m²) while each block measure 1.1 m by 7.2 m (7.92 m²) individual plots measured 1.1 m x 2.2 m (2.42 m²) individual blocks were spaced 0.3m apart and plots within the blocks were also spaced 0.3m.

There were three blocks, each of the plots contained 15 plants. Well decomposed poultry manure was applied in dry weight at 5t/ha as recommended and NPK was also applied at same rate.

Management of the experiment /agronomic practices

The land was cleared before transplanting. The land was then manually ploughed and leveled to create a suitable tilt. The plot units were slightly raised about 25-30 cm high to ensure that inter plot spacing was maintained. Seedling of the selected cabbage variety were raised in the seed bed one month before the actual transplanting (January 06, 2020). Healthier and uniform seedling were transplanted into a hole of 6cm depth to an individual experimental unit at an inter row spacing of 45cm and intra spacing of 40 cm apart giving a plant population of 15 plants per plots. Watering was also carried out early in the morning or late in the evening. The variety of cabbage used was spring light. It is popular grown by farmers, both for home and source of income. The treatment that comprises of organic fertilizer at a rate of 104g per each plant which is equivalent to 5t/ha and the inorganic fertilizer is also at a rate of 104g per each plant were applied after three weeks of transplanting.

Data Collection

To compare the influence of poultry manure and NPK fertilizer on the growth of cabbage, nine samples were selected per plot. And based on the samples, plant height, leaves length, leaves width and the number of leaves from each experimental unit were recorded and their average values were used for the computation.

Plant height (PH)

Cabbage plant height (PH) was measured at week 4 after transplanting and continuously from selected plant per plot and their mean were recorded. The measurement was done with a ruler from the tip head to down collar at maturity and express in centimeter.

Leaves length (LL)

Leaves length were measured every week after the application of the treatment from the same selected plant per plot for calculating leave area index.

Leaves width (LW)

Width of the leaves were also measured from the selected plant every week and the data were recorded for further analysis of the leave area index.

Number of leaves per plant (NLPP)

Number of leaves per plant were counted at the first week of applying the treatment and continuously every week from the selected plant per plot and their mean were recorded.

Statistical Analysis

Data was subjected to analyses of variance (ANOVA) at 95% confidence level and where there were significant differences further mean separation was obtained by least significant difference (LSD) at 5%.

RESULTS AND DISCUSSION

The results recorded on the effect of organic and inorganic fertilizer on the plant height of cabbage.

Table 1 shows the effect of organic and inorganic fertilizer on the growth of cabbage production. The treatment used had significantly ($p \leq 0.05$) affected the plant height of the cabbage. The highest plant height at all WAS was remarkably observed with organic fertilizer with corresponding (PH) values of (10.87cm, 16.47cm, 16.23cm, 17.00cm, 18.77cm and 19.53cm) respectively. It was narrowly closed by inorganic at same WAS with PH values of (11.83cm, 15.37cm, 16.67cm, 17.57cm, 18.37 and 17.93cm) respectively. While the least was observed with control. The result is in line with the findings of (Devi and Singh, 2012).

Table: 1 effect of organic and Inorganic fertilizer on PH (cm) of Cabbage

Treatment	4WAS	5WAS	6WAS	7WAS	8WAS	9WAS
Inorganic	11.83 ^a	15.37 ^{ab}	16.67 ^a	17.57 ^a	18.37 ^a	17.93 ^a
Organic	10.87 ^a	16.47 ^a	16.23 ^a	17.00 ^a	18.77 ^a	19.53 ^a
Control	10.97 ^a	11.20 ^b	11.93 ^b	13.73 ^b	13.77 ^b	14.43 ^b
SE±	1.22	1.50	0.72	0.73	1.03	1.16
Significance	NS	S	S	S	S	S

The results recorded on the effect of organic and inorganic fertilizer on the leaves length of cabbage

The result presented in table 4.2 shows that the treatment had an ultimate significant ($p \leq 0.05$) influence on the growth of leaves length of cabbage. The LL values at all WAS was similarly observed with organic fertilizer of (7.8cm, 11.7cm, 11.23cm, 11.7cm, 14.53cm and 15.53cm) respectively. And the inorganic had a correlated value of (12.17cm, 10.5cm, 12.53cm, 13.7cm, 14.07cm, and 13.83cm) respectively. While control had the least.

Table 2 shows the effect of organic and inorganic fertilizer on leaves length of cabbage

Treatment	4WAS	5WAS	6WAS	7WAS	8WAS	9WAS
Inorganic	12.17 ^a	10.50 ^a	12.53 ^a	13.70 ^a	14.07 ^a	13.83 ^{ab}
Organic	7.80 ^a	11.70 ^a	11.23 ^{ab}	11.70 ^{ab}	14.53 ^a	15.53 ^a
Control	6.67 ^a	7.580 ^b	8.63 ^b	10.50 ^b	11.20 ^b	11.97 ^b
SE±	2.41	0.77	0.96	1.04	0.95	1.13
Significance						

The results recorded on the effect of organic and inorganic fertilizer on leaves width of cabbage plant

The organic and inorganic material experimented for cabbage statistically did not influence the leaf width at 4WAS, 6WAS, 7WAS, 8WAS, and 9WAS. But indirectly had significant ($p \leq 0.05$) effect on leaf width at 5WAS with largest leaf width value of 8.77cm, 8.97cm and 5.97cm respectively.

Table 3 the effect of organic and inorganic manure on leaves width of cabbage plant.

Treatment	4WAS	5WAS	6WAS	7WAS	8WAS	9WAS
Inorganic	8.00 ^a	8.77 ^{ab}	10.70 ^a	13.37 ^a	13.63 ^a	13.67 ^a
Organic	7.07 ^a	8.97 ^a	11.37 ^a	9.00 ^a	14.70 ^a	16.00 ^a
Control	5.53 ^a	5.97 ^b	7.50 ^a	9.40 ^a	13.03 ^a	10.63 ^a
SE±	1.10	1.06	1.92	1.69	0.77	2.09
Significance	NS	S	NS	NS	NS	NS

The results recorded on the effect of organic and inorganic fertilizer on numbers of leaves of cabbage plant.

The result shows that the treatment organic and inorganic material applied for cabbage growth had no effect on the numbers of leaf of cabbage plant at all WAS except at 4WAS which had significantly ($p \leq 0.05$) effect where plant with inorganic treatment had the highest number of leaf 10.77cm, it was however had a relatively close value for plant with organic treatment at same WAS with number of leaf 10.3cm and control with 9.4cm.

Table 4 show the effect of organic and inorganic fertilizer on the numbers of leaves of cabbage plant.

Treatment	4WAS	5WAS	6WAS	7WAS	8WAS	9WAS
Inorganic	10.77 ^a	14.10 ^a	15.20 ^a	15.33 ^a	16.00 ^a	14.70 ^a
Organic	10.30 ^{ab}	12.33 ^a	12.73 ^a	12.40 ^a	11.77 ^a	15.77 ^a
Control	9.40 ^b	10.40 ^a	11.80 ^a	12.10 ^a	12.37 ^a	13.47 ^a
SE±	1.12	0.73	1.43	1.60	1.76	1.52
Significance	S	NS	NS	NS	NS	NS

Correlation coefficients among the growth parameters of cabbage at 9WAS

Table 5 shows the correlation results among the growth parameter in the study area. the parameters considered were; plant height, leaf length, leaf width and number of leaves of the cabbage crop experimented and was analyzed at ($p < 0.05$). As shows in Table 5. Plant height showed a significant positive association with leaf length and leaf width with corresponding association values of (0.9655** and 0.8498**) respectively, followed by number of length leaf with significant association of (0.78 23**). Correspondingly, the leaf length, showed a highly significant positive association with leaf width and number of leaves, with corresponding association values (0.9837** and 0.8934**) respectively. Conversely, leaf width exhibited extremely significant positive association values of (0.9865) with number of leaves respectively. The results are in line with the finding (Egharevba 1999)

Table 5: Correlation coefficients matrix among growth parameter of cabbage at 9WAS

Cabbage	PH	LL	LW	NLP
PH	1			
LL	0.9655	1		
LW	0.8498	0.9837	1	
NL	0.7823	0.9853	0.8934	1

PH= plant height, LLL= t leaf length LW= Longest leaf width., NL= Number of leaf and Significances**

Table 6: soil characteristics of the experimental site (0-30 cm)

Soil type (USDA soil classification)	sandy loamy
Clay (%)	8.0
Silt (%)	11.8
Sand (%)	80.2
p ^H	6.8
Field capacity (vol. %)	16.2
Wilting point (vol. %)	3.2
Available water content (vol. %)	13.0
Bulk density (g/cm ³)	1.70
Organic matter (%)	3.99

CONCLUSION AND RECOMMENDATION

Conclusion

An experiment was conducted to determine effect of organic and inorganic fertilizer on growth parameters of cabbage crop. The study was conducted for period of six weeks at Ramat Polytechnic Teaching and Research Farm which is located in a semi-arid climate, of Maiduguri Nigeria. Furthermore, the highest growth parameters such plant height, leaf length, leaf width and number of leaves at all weeks after sowing were remarkably influenced by organic manure used as treatment and it was closed by inorganic at same weeks after. While, mostly control plot yielded a lowest growth parameter throughout the period of the experiment. Similarly, correlation analysis among the growth parameters at 9WAS showed that, there is strong positive relationship of about (82% to 90%) among the crop parameters experimented. Therefore, the study indicates that organic manure treatment has the highest influence on growth parameter of cabbage crop study in the region.

Recommendations

In this way, depending on the needs of the user, Therefore, the following recommendations were stated.

- (i) The experiment should be repeated in similar agro-climatic condition in order to confirm the findings.
- (ii) Similar experiment is needed to be conducted using different organic manure and crop varieties in order to ascertain this finding.

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