GROWTH RESPONSE OF SESAME TO VARYING POULTRY MANURE RATES ACROSS TWO SEASONS IN NSUKKA AGRO-ECOLOGY FOR SUSTAINABLE WORKFORCE

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Abstract
A two-season study was carried out at the Teaching and Research field of the Department of Crop Science, University of Nigeria, Nsukka, to test the effect of varying poultry manure rates on the growth of sesame in Nsukka agro-ecology. Four research questions and four null hypotheses formed in line with the specific objectives guided the study. Three rates of poultry manure (0, 5 and 10 tonnes/ha) were tested. The experiment was laid out in a 3 x 3 x 2 factorial experiment in a randomized complete block design in three replications. The population is 1,350 sesame plants in the field. 135 sesame plants were sampled for data collection. Mean was used to answer the research question while Analysis of Variance (ANOVA) was used to test the hypothesis at 0.05 level of significant. A combined analysis was used to test effect of season at early and late planting. The result revealed that the application of 5 tonnes of poultry manure per ha significantly recorded the highest mean value of growth attributes such as plant height, stem girth, number of leaves /plant number of branches/plant, days to 1st flowering and days to 50% flowering. The result also revealed that establishing sesame plant during the early planting season produced significantly higher plant growth. The study concludes that there are possibilities of getting higher yield using lesser rates of poultry manure, lesser number of weeding and early planting and thus, recommended 5 tonnes of poultry manure per ha for maximum growth, weeding once at 3 weeks after planting early planting if arrangement is made for drying the capsules. It was also recommended that the Ministry of Agriculture, Agricultural Education experts and extension agents should encourage farmers in Nsukka agro-ecology to go into sesame production.

Keywords: Sesame, poultry manure, seasons, sustainability and agro-ecology.

INTRODUCTION

Sesame (*Sesamumindicum*) a flowering plant in the genus Sesamum is cultivated for its seed which is considered as a major oil seed crop known to humanity (Ashiri, 2007). The seed is a good source of high quality oils, rich in carbohydrate, calcium, phosphorus and protein (National Cereals Research Institute (NCRI, 2005), (Akinoso, Igbeka & Olayanju, 2006). It is a source of high quality protein, prevents diabetes, high blood pressure, anemia, cancer, cholesterol accumulation while enhancing digestion, healthy skin and heart health (Jaya, Neelma & Smita, 2016). it is an element in animal feed (Hahma and Martin 2014). Sesame has its origin in Africa and spread early through West Asia, China and Japan (Elly and Omari, 2011). In Nigeria, Sesame production started first in the middle-belt area by the West African Oilseed Mission which was assigned to investigate the possibility for its production in Nigeria (Idowu, 2002). Consequently, the major producing areas in Nigeria in order of priority are Nasarawa, Jigawa, and Benue. Other important areas of production in Nigeria are found in Yobe, Kano, Kastina, Kogi, Gombe, and Plateau states (Doko 2014). Economically, sesame is second to cocoa as agricultural export in Nigeria thus, the production of sesame has huge potentials for farmers who are interested in making money through crop production (Food and Agricultural Organization, 2013). The discovery of the potentials of sesame production in the acquisition of foreign currency for the country made increased production of the crop a prominent priority in the Agricultural Transformation Agenda of the Federal Government of Nigeria (National Cereals Research Institute (NCRI), (2012). To this end, farmers are being encouraged to produce sesame in all agro-ecological zones of the country.

The current thrust on sustainable agriculture, organic farming and use of natural resources as fertilizer has assumed greater practical significance for environmentally safe agricultural development (Rockstrom, Williams, Gretchen, Andrew, Nathanial, Gordon, Hanna, Fabrice, Mihir, Pasquale, Charlotte, Nuhu, Jeremy, Lindiwe, and Smith, 2016). Sesame production in a sustainable manner with the use of poultry manure will go a long way in improving

the quality of goods produced, reduce cost of production and increase the profit made by farmers (Jim, Bob, John, and Owen, 1996). This improved agricultural productivity can be achieved through enhancing science and technology and building farmers capacity (Matemilola & Elegbede 2017). The role of agricultural education is necessary in equipping individuals with the right knowledge, skill, competencies and attitudes for specific occupations cannot be over emphasized (Barrick 1991), (Dipcharima, 2004). Sesame production is still concentrated in the north and middle belt areas and is carried out in small scale farms by peasant farmers. Production is characterized by poor production techniques and low input, one season production and yield is always low at 83 tons/annum compared with 800 and 750 tons/annum obtainable in China and India, respectively (FAO, 2005). El-Greedly, Nadia & Mekki, (2005) had reported increase in sesame production in recent years which they attributed to expansion of the growing area. This study is part of studies being carried out to find the possibility of growing this important oil seed crop outside the traditional growing area in Nigeria. It is in view of the economic and nutritional benefits of sesame production, nutrient availability and application, expansion of the growing area and seasonal/climatic suitability for sesame production that the researcher went into an organized inquiry to determine the growth and yield response of sesame to varying poultry manure rates across two seasons in Nsukka agro-ecology for Sustainable Workforce.

Statement of the Problem

Sesame is a cash crop with high global demand due to its numerous health and industrial benefits. Accelerated production of cash crop like sesame will boost the economic relationship that exists among Nigeria and other countries. Such relationships can be a driver to the improvement of the Nigerian economy through trading of sesame seeds with other countries, investing in them or receiving investors from them, exchanging different business flow, including financial capitals, foreign borrowing and remittances, among others.

However, sesame production is alien to Nsukka agro- ecological zone. It is notable that sesame production has some fundamental problems just like any other crop. This crop requires adequate amount of nutrient for optimum growth and yield. Farmers in this agro-ecological zone are practicing continuous cropping due to insufficient arable land, which is not economically viable because it depletes plant nutrient without sufficient rest period to regain its fertility. Observation also shows that people in other parts of Nigeria where sesame has been under cultivation for decades, do cultivate towards the end of the year (August - September). Could their reason be; to plan maturity and harvest to fall within dry season for easy processing, to reduce pest and disease infestation or to achieve greater yield?

To this end, it became important to determine the growth and yield response of sesame to varying poultry manure rates across two seasons in Nsukka agro-ecology.

Purpose of the Study

The purpose of the study was to determine the effect of different poultry manure rates, on the growth of sesame (*Sesamum indicum L.*) across two seasons in Nsukka agro-ecology**.** Specifically, the study seeks to:

1. determine the growth response of sesame to varying poultry manure applications under Nsukka agro-ecology.
2. Determine the yield response of sesame to varying poultry manure application under Nsukka agro-ecology.
3. determine the effect of season on the growth of sesame under Nsukka environmental condition.
4. determine the effect of season on the growth of sesame under Nsukka environmental condition.

Research Questions

1. What are the growth response of sesame to varying poultry manure application under Nsukka agro-ecology?
2. What are the yield response of sesame to varying poultry manure application under Nsukka agro-ecology?
3. What are the effect of season on the growth of sesame under Nsukka agro-ecology?
4. What are the effect of season on the yield of sesame under Nsukka agro-ecology?

Research Hypotheses

The following hypotheses were formulated to guide the study and would be tested at 0.05 level of significant.

1. There is no significant difference in the mean of growth of sesame to varying poultry manure rates.
2. There is no significant difference in the mean of yield of sesame to varying poultry manure rates.

3. There is no significant effect of season on the growth of sesame under Nsukka agro-ecology.
4. There is no significant effect of season on the yield of sesame under Nsukka agro-ecology.

Methodology

This study was carried out in the Teaching and Research farm of the Department of Crop Science, University of Nigeria, Nsukka, in 2020. The site is located at latitude 06° 52' N and longitude 07° 24'E and altitude 447 m above sea level.

One variety of sesame seeds (NCRIBEN 01m) obtained from the National Cereal Research Institute (NCRI), Badeggi, Nigeria, were used. Poultry manure was sourced from a deep litter poultry farm. The experiment was laid out in a 3 × 3 experiment in randomized complete block design (RCBD*).*

The population for the study is 1,350 sesame plants in the field. 135 sesame plants were sampled for data collection. Score Sheet that contained different growth and yield parameters measured and the intervals during which such measurements were taken from each treatment was used for data collection.

The score sheet was subjected to face validation by three experts, two from the Department of Agricultural Education, University of Nigeria, Nsukka and one from the Department of Crop Science, University of Nigeria, Nsukka.

The researcher and two research assistance were involved in the collection of data. Three rates of poultry manure poultry manure (0, 5 and 10 tons/ha) were used. The site was ploughed, harrowed and marked out into blocks and plots. Distance between blocks and plots are 0.5m and 1.0 m. Soil samples were collected at random from the experimental plot at the depth of 0 to 15 cm prior to land preparation. These were bulked together to form a composite sample from which a sub-sample was taken to soil science laboratory for analysis for physiochemical properties of the soil. The poultry manure was measured out according to treatment and applied to the respective plots and worked into the soil. The sesame seeds were sown in their respective plots three days after manure application. Sowing was done by drilling the seeds in shallow furrows and then covered lightly with soil. Two weeks after germination, the plants were thinned down to two plants/stand at the spacing of 30 × 60 cm between and within rows.

Data was analyzed using mean analysis and Analysis of Variance s (ANOVA). A combined analysis was used to test effect of season at early and late planting.

Results

The results are presented in Tables in line with the research questions stated.

Table 1

Mean analysis of different rates of poultry manure application during early and late season on plant height of Sesame at 2, 4, 6, 8, 10, 12 and 14 weeks after planting (WAP)

(Season 1)

	Plant height (cm)						
	Weeks after planting (WAP)						
Manure Rates	2	4	6	8	10	12	14
P_0	3.71	17.07	57.13	113.69	137.02	171.38	167.38
P_1	6.79	17.09	65.13	124.02	147.35	187.02	188.47
P_2	5.93	13.22	47.51	97.38	120.71	153.67	152.11
Grand mean	**5.48**	**15.79**	**56.59**	**111.70**	**135.02**	**170.69**	**169.32**

(Season 2)

Plant height (cm)						
Weeks after planting						
2	4	6	8	10	12	14
3.71	11.71	33.36	57.29	75.87	102.31	102.47
6.62	16.60	40.80	93.71	112.29	125.89	126.60
5.92	14.98	38.40	81.24	99.82	111.44	112.07
5.42	**14.43**	**37.52**	**77.41**	**95.99**	**113.21**	**113.71**

Where P_0= 0 tonnes/ha of poultry manure, P_1 = 5 tonnes/ha of poultry manure, P_2 = 10 tonnes/ha of poultry manure

Result in table 1 showed different mean values recorded at 2, 4, 6, 8, 10, 12 and 14 weeks after planting during early and late planting season. However, 5tonnes/ha application rate of poultry manure produced higher mean values for plant height in both seasons.

Table 1.1: Analysis of variance (ANOVA) of varying poultry manure rates on plant height during early and late planting season

	(Season 1)						(Season 2)					
Source of Variation	**d.f.**	**Sum of squares**	**Mean sum of squares**	**F**	**Sig.**	**Rmks**	d.f.	Sum of squares	Mean sum of squares	F	Sig.	Remarks
Poultry rates	2	2632.67	1316.32	6.3567	0.04	S	2	2564.22	1282.12	5.10	0.05	S
Residual	16	6186.00	386.64				16	5098.77	318.69			
Total	18	8818.67	1702.96				18	7662.99	1600.80			

Where PH = Plant height, d.f. = degree of freedom, Sig.= level of significance, S = significant, NS = non-significant

The result presented in Table 2 revealed that the probability value was 0.04 and 0.04 in both seasons. This signifies that there was a significant difference in the plant height of sesame grown with different poultry manure rates on plant height of sesame. The null hypothesis is therefore not accepted.

Table 1.2

Mean analysis of different rates of poultry manure application on stem girth of Sesame during early and late season at 2, 4, 6, 8, 10, 12 and 14 weeks after planting (WAP) season 1

(Season 1) **(Season 2)**

	Stem girth (cm)							Stem girth (cm)						
	Weeks after planting							Weeks after planting						
Manure Rates	2	4	6	8	10	12	14	2	4	6	8	10	12	14
P_0	0.47	2.27	3.41	3.83	4.21	4.52	5.14	0.43	1.39	1.99	2.40	3.08	5.12	6.50
P_1	0.88	2.62	6.26	4.92	5.30	5.48	6.10	0.91	1.92	2.72	3.40	4.08	6.00	7.38
P_2	0.78	2.00	4.13	4.02	4.40	4.59	5.21	0.77	1.51	2.37	2.83	3.51	5.52	6.90
Grand mean	**0.71**	**2.30**	**4.60**	**4.26**	**4.64**	**4.86**	**5.48**	**0.70**	**1.61**	**2.36**	**2.88**	**3.56**	**5.55**	**6.93**

Where P_0= 0 tonnes/ha of poultry manure, P_1 = 5 tonnes/ha of poultry manure, P_2 = 10 tonnes/ha of poultry manure

Data presented in Table 1.2 showed that the application of 5tonnes/ha of poultry manure had higher mean performance on stem girth in both seasons.

Table 1.3
Analysis of variance (ANOVA) of varying poultry manure rates on stem girth during early and late planting season

(Season 1)

Source of Variation	d.f.	Sum of squares	Mean sum of squares	F	Sig.	Remarks
Poultry rates	2	10.63	5.31	3.80	0.12	NS
Residual	16	53.66	3.35			
Total	18	64.29	8.67			

(Season 2)

d.f.	Sum of squares	Mean sum of squares	F	Sig.	Remarks
2	2.99	1.49	3.44	0.04	S
16	7.17	0.45			
18	10.16	1.94			

Where SG = Stem girth, d.f. = degree of freedom, Sig.= level of significance, S = significant, NS = non-significant

Result presented in Table 1.3 revealed that the probability value was 0.12 and 0.04 in both seasons. This signifies that there was a non-significant difference in the plant height of sesame grown with different poultry manure rates on plant height of sesame at the early planting season but a significant effect was recorded during the late planting season. The null hypothesis is therefore accepted in season one but rejected in season 2.

Table 1.4
Mean analysis of different rates of poultry manure application on number of leaves of Sesame during the early and late season at 2, 4, 6, 8, 10, 12 and 14 weeks after planting (WAP)

(Season 1)

	Number of leaves						
	Weeks after planting						
Manure Rates	2	4	6	8	10	12	14
P_0	4.49	13.91	45.38	133.20	197.93	204.09	229.81
P_1	5.96	17.80	57.07	170.93	251.89	283.91	309.63
P_2	5.51	13.80	43.73	144.60	221.02	226.36	252.08
Grand mean	**5.32**	**15.17**	**48.73**	**149.58**	**223.61**	**238.12**	**263.84**

(Season 2)

Number of leaves						
Weeks after planting						
2	4	6	8	10	12	14
4.53	13.82	31.26	58.00	98.13	111.10	129.84
6.04	19.07	47.09	87.42	155.22	142.40	161.17
5.56	14.82	38.09	70.51	108.71	113.20	131.88
5.38	**15.90**	**38.81**	**71.98**	**120.69**	**122.23**	**140.96**

Where P_0= 0 tonnes/ha of poultry manure, P_1 = 5 tonnes/ha of poultry manure, P_2 = 10 tonnes/ha of poultry manure

Result in table 1.4 showed different mean values recorded at 2, 4, 6, 8, 10, 12 and 14 weeks after planting during early and late planting season. However, 5tonnes/ha application rate of poultry manure produced higher mean values for number of leaves per plant in both seasons.

Table 1.5: Analysis of variance (ANOVA) for number of leaves of varying poultry manure rates during early and late planting season

(Season 1)

Source of Variation	d.f.	Sum of squares	Mean sum of squares	F	Sig.	Remarks
Poultry rates	2	8587.98	4294.08	3.58	0.04	S
Residual	16	31634.11	1977.19			
Total	18	40222.09	6271.27			

(Season 2)

d.f.	Sum of squares	Mean sum of squares	F	Sig.	Remarks
2	4696.50	2348.25	2.60	0.15	NS
16	16851.96	1053.30			
18	21548.46	3401.54			

NL = number of leaves, d.f. = degree of freedom, Sig.= level of significance, S = significant, NS = non-significant

Result presented in Table 1.5 revealed that the probability value was 0.04 and 0.15 in both seasons. This signifies that there was a significant difference in the number of leaves per plant of sesame grown with different poultry manure rates at the early planting season but a non- significant effect was recorded during the late planting season. The null hypothesis is therefore rejected in season one but accepted in season 2.

Table 1.6

Mean analysis of different rates of poultry manure application on number of branches of Sesame during early and late planting season at 2, 4, 6, 8, 10, 12 and 14 weeks after planting (WAP)

(Season 1)

	Number of branches						
	Weeks after planting						
Manure Rates	2	4	6	8	10	12	14
P_0	0.00	0.00	8.91	12.62	14.96	16.88	18.37
P_1	0.00	0.00	11.40	17.82	24.64	27.46	28.95
P_2	0.00	0.00	9.29	15.42	15.02	17.64	19.13
Grand mean	**0.00**	**0.00**	**9.87**	**15.29**	**18.21**	**20.66**	**22.15**

(Season 2)

Number of branches						
Weeks after planting						
2	4	6	8	10	12	14
0.00	0.00	1.41	3.40	4.11	5.83	6.35
0.00	0.00	1.88	5.79	6.50	7.75	8.27
0.00	0.00	1.61	4.98	5.69	6.82	7.34
0.00	**0.00**	**1.63**	**4.72**	**5.43**	**6.80**	**7.32**

Where P_0= 0 tonnes/ha of poultry manure, P_1 = 5 tonnes/ha of poultry manure, P_2 = 10 tonnes/ha of poultry manure

Result in table 1.6 showed different mean values recorded at 2, 4, 6, 8, 10, 12 and 14 weeks after planting during early and late planting season. However, 5tonnes/ha application rate of poultry manure produced higher mean values for number of branches per plant in both seasons.

Table 1.7
Analysis of variance (ANOVA) for number of branches of varying poultry manure rates during early season

(Season 1)

Source of Variation	d.f.	Sum of squares	Mean sum of squares	F	Sig.	Remarks
Poultry rates	2	314.43	157.22	2.42	0.05	S
Residual	16	1155.05	72.20			
Total	18	1469.49	229.42			

(Season 2)

d.f.	Sum of squares	Mean sum of squares	F	Sig.	Remarks
2	12.48	6.24	2.47	0.16	NS
16	42.83	2.68			
18	55.31	8.92			

NB = number of branches, d.f. = degree of freedom, Sig.= level of significance, S = significant, NS = non-significant

Result presented in Table 1.5 revealed that the probability value was 0.05 and 0.16 in both seasons. This signifies that there was a significant difference in the number of branches per plant of sesame grown with different poultry manure rates at the early planting season but a non- significant effect was recorded during the late planting season. The null hypothesis is therefore rejected in season one but accepted in season 2.

Table 2
Seasonal mean performance of early and late season planting on plant height in Sesame at 2, 4, 6, 8, 10, 12 and 14 WAP

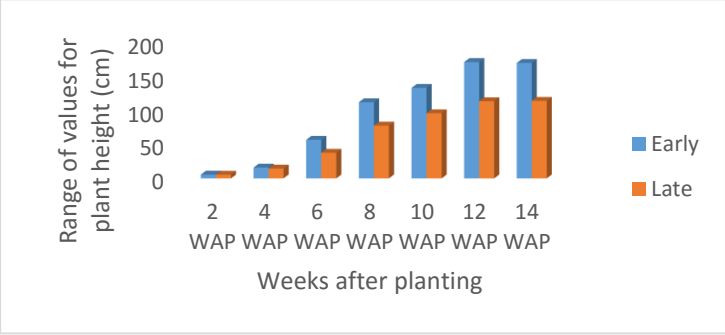

Figure 1: Graphical illustration of seasonal effects on plant height of Sesame at 2, 4, 6, 8, 10, 12 and 14 WAP

	Plant height (cm)						
	Weeks after planting (WAP)						
Seasons	2	4	6	8	10	12	14
Early	5.48	15.79	56.59	111.70	132.75	170.69	179.32
Late	5.42	14.43	37.52	77.41	95.49	113.21	113.71
Grand mean	**5.45**	**15.11**	**47.06**	**94.56**	**114.12**	**141.95**	**141.52**

The result in Table 2 and Figure 1 shows the seasonal mean performance of early and late planting seasons on the plant height of sesame at 2, 4, 6, 8, 10, 12 and 14 WAP. It revealed that early season planting produced the highest mean performance over the late season.

Table 2.1
Analysis of variance (ANOVA) for different seasons on plant height

Source of Variation		d.f.	Sum of squares	Mean sum of squares	F	Sig.	Rmks
PH							
Seasons	(combined)	1	17856.80	17856.80	34.69	0.48	NS
Residual		34	11211.51	329.76			
Total		35	29068.31	18186.56			

Where PH = Plant height, d.f. = degree of freedom, Sig.= level of significance

Data presented in Table 2.1 shows that the probability value is 0.48, which implies that there was non-statistically significant effect of different seasons on the plant height of sesame. Therefore, the null hypothesis was upheld.

Table 2.2
Mean performance of different seasons on stem girth of Sesame at 2, 4, 6, 8, 10, 12 and 14 weeks after planting (WAP)

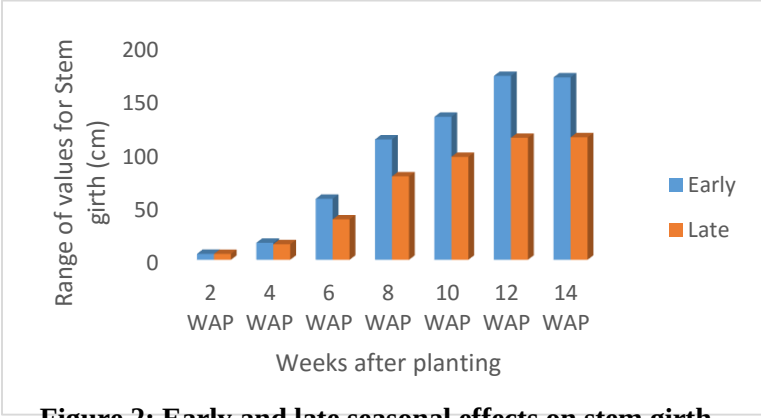

Figure 2: Early and late seasonal effects on stem girth of Sesame at 2, 4, 6, 8, 10, 12 and 14 WAP

	Stem girth (cm) Weeks after planting (WAP)						
Seasons	2	4	6	8	10	12	14
Early	0.71	2.30	4.26	4.60	4.78	4.86	5.28
Late	0.70	1.61	2.88	2.36	2.61	2.84	3.12
Grand mean	**0.71**	**1.96**	**3.57**	**3.48**	**3.70**	**3.85**	**4.20**

The result in Table 2.2 and Figure 2 shows the mean performance of different seasons on the growth of stem girth at 2, 4, 6, 8, 10, 12 and 14 WAP, with emphasis on stem girth. From the result, early season showed higher mean performance on stem girth than late season. .

Table 2.3
Analysis of variance (ANOVA) of different seasons on stem girth

Sources of Variation		d.f.	Sum of squares	Mean sum of squares	F	Sig.	Remarks
SG							
Seasons	(combined)	1	31.08	31.08	30.23	0.04	S
Residual		34	61.54	1.81			
Total		35	92.62	32.89			

Where SG = Stem girth, d.f. = degree of freedom, Sig.= level of significance

The data in Table 2.3 with probability value of 0.04 indicates that there was statistically significant difference on the effect of different seasons on the stem girth of sesame. Therefore, the null hypothesis is rejected.

Table 17: Mean analysis of different seasons on number of leaves of Sesame at 2, 4, 6, 8, 10, 12 and 14 weeks after planting (WAP)

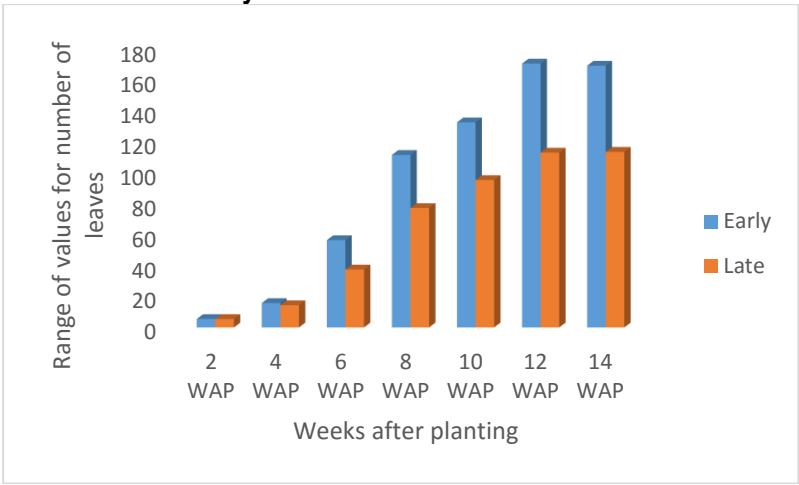

Figure 3: Early and late seasonal effects on number of leaves of Sesame at 2, 4, 6, 8, 10, 12 and 14 WAP

	Number of leaves						
	Weeks after planting (WAP)						
Seasons	2	4	6	8	10	12	14
Early	10.72	15.90	48.73	149.58	223.61	238.12	278.22
Late	5.33	15.17	38.81	71.98	120.69	183.53	186.46
Grand mean	**8.03**	**15.54**	**43.77**	**110.78**	**172.15**	**210.83**	**232.34**

From the results, it was observed that the Early planting season gave higher mean values for number of leaves per plant over the late season.

Table 2.4
Analysis of variance (ANOVA) for number of leaves for different seasons

Source of Variation		d.f.	Sum of squares	Mean sum of squares	F	Sig.	Remarks
NL							
Seasons	(combined)	1	109655.90	109655.90	39.93	0.03	S
Residual		34	58318.18	1715.26			
Total		35	167974.08	111371.16			

Where NL = number of leaves, d.f. = degree of freedom, Sig.= level of significance

The data presented in Table 2.4 shows the probability value of 0.03, which implies there was statistically significant effect of the seasons on number of leaves as it shows that seasons influence the growth of sesame. Therefore, the null hypothesis is rejected.

Table 2.5
Effects of different seasons on number of branches of Sesame at 2, 4, 6, 8, 10, 12 and 14 weeks after planting (WAP)

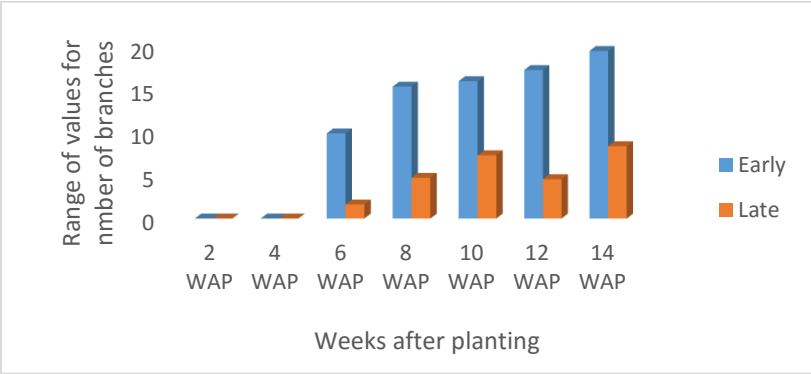

Figure 4: Early and late seasonal effects on number of branches of Sesame at 2, 4, 6, 8, 10, 12 and 14 WAP

	Number of branches						
	Weeks after planting (WAP)						
Seasons	2	4	6	8	10	12	14
Early	0.00	0.00	9.87	15.29	15.92	17.21	19.42
Late	0.00	0.00	1.63	4.72	7.33	4.56	8.38
Grand mean	**0.00**	**0.00**	**5.75**	**10.01**	**11.63**	**10.89**	**13.90**

From the result, it was observed that early planting season recorded higher mean values for number of branches over the results obtained during the late season.

Table 2.6: Analysis of variance (ANOVA) of different seasons on number of branches at 2, 4, 6, 8, 10, 12 and 14 WAP

Source of Variation		d.f.	Sum of squares	Mean sum of squares	F	Sig.	Remarks
NB							
Seasons	(combined)	1	1145.54	1145.54	136.05	0.04	S
Residual		34	933.56	27.46			
Total		35	2079.10	1172.99			

Where NB = number of branches, d.f. = degree of freedom, Sig.= level of significance

Discussion

From the result of the analysis in table 1 – 1.7, it was revealed that the application of poultry manure affects the growth of sesame plant. The result equally revealed that poultry manure significantly increased the height of plants, stem girth, number of leaves and number of branches. The finding of the study agrees with the findings of Shehu, Kwari, and Sandabe, (2009) who discovered that nitrogen (N) is one of the most important element that induce the growth of sesame plant because it is a constituent of chlorophyll and ensure crop vigorous growth. Similarly, Abubakar, Mohammad, Ashabul, Suraya, Bijoy, Mominul and Biswas, (2017) discovered that nitrogen significantly increased morpho-physiological parameters such as leaf area and rate of photosynthesis. Amanullah, Somasundaram, Vaiyapuri, and Sathyamoorthi, (2007) also recorded that the enhancing effect of poultry manure on growth is attributed to a gradual and more lasting release of a wide range nutritional elements (Nitrogen, Phosphorous and potassium) to the soil.

The findings of this study with respect to the effect of season on growth of sesame under Nsukka environmental condition revealed that season has significant effect on the growth of sesame. It showed that the growth attribute has higher performance during the early season than in the late season. The finding specifically revealed that early planting (season 1) recorded higher effect on plant height, stem girth, number of leaves and number of branches. While the late planting (season 2) recorded lower effect on all the growth attributes. The finding of this study agrees with the finding of Lagham, et al (2008) who found out that notwithstanding the drought resistance nature of sesame, it will give higher growth with higher moisture. This report supports the finding of the study that season has effect on the growth of sesame.

Conclusion and Implications

Based on the results obtained, the study draws the following conclusions and implications.

The need to increase productivity among farmers through increased and environmental friendly soil fertility management and cost reduction methods cannot be overemphasized. To increase the growth of sesame, several treatments have been suggested. Among the suggested treatments is the application of poultry manure. The study experimented on the effect of different poultry manure rates on the growth of beniseed. The result showed practical evidence of the possibility of getting higher growth using a lesser rate of poultry manure, and getting higher growth when sesame is planted at beginning of the raining season. Indications are that using 5 tonnes of poultry manure per ha gave higher growth than using higher dose of 10 tonnes per ha.

The findings of this study had implications for Agricultural Education experts, Agricultural Extension Change Agents, policy makers in the Ministry of Agriculture Enugu state, farmers in Nsukka and Enugu area and future researchers.

Recommendations

1. Sesame farmers should be encouraged to use up to 5 tonnes of poultry manure for maximum growth.
2. Farmers should be encouraged to grow sesame early if proper arrangement is made for drying the capsules.
3. The Ministry of Agriculture should formulate policies that would encourage farmers to go into sesame production.
4. Extension agents should create adequate awareness about the high yielding capacity and the benefit of sesame.

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