Journal of Innovative Agriculture: 9(1) : 6-10, 2022
DOI: 10.37446/jinagri/rsn/9.1.2022.6-10

Research Note

Influence of farm yard manure and N-levels on the growth, yield characters and yield of sesame (*Sesamum indicum* L.)

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Received: 16 January 2022
Accepted: 02 February 2022
Published: 31 March 2022

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Field experiment was conducted at the Kogi State University Research and Demonstration Farm Anyigba, (Lat 7° 291 and Long 70 111E). Anyigba lies in the Guinea Savanna Agro-ecological Zone. This experiment was conducted during the raining season of 2021 to evaluate the effect of Farm Yard Manure and Nitrogen levels on the growth, yield characters and seed yield of sesame (*Sesamum indicum* L.). Treatments consisted of three levels of Farm Yard Manure (0 t ha^{-1}, 5 t ha^{-1}, 10 tonsha-1and 15 t ha^{-1}) respectively and Nitrogen fertilizer rates (0 tons Nha-1, 0.02 t N ha^{-1}, 0.04 t N ha^{-1}and 0.06 t N ha^{-1}) respectively. Factorial combination of treatments gave a total number of 16 treatments which was laid in a Randomized Complete Block Design (RCBD) with three replicates. 48 plots were obtained in total. Results showed that application of Farm Yard Manure did not influence (p≥0.05) all parameters studied in the experiment except dry weight/plant, plant height and seed yield/ha. Nitrogen application significantly influenced (p≤0.05) plant height and seed yield only. There was no significant interaction observed between Farm Yard Manure and Nitrogen levels in all parameters studied.

Key words: *farm yard manure, interaction, nitrogen, sesame, yield*

INTRODUCTION

Sesame indicum belongs to the family *Pedaliaceae*. Since its excavations at Harappa, Pakistan dated 2000BC, sesame is believed to be the oldest oil seed crop known to man as ancient seeds of the crop were identified (Uzo, 1998). According to NCRI (2002), sesame is grown in the tropical and sub-tropical regions around the world and is cultivated for its oil-rich seeds which grow in pods. The plant contains approximately 50% oil and 25% protein (Madina, 2020). Sesame is grown in more than seventy countries worldwide. Mean yield of sesame is very low in most tropical countries (Naturland, 2002), due to many production constraints hindering considerable yield improvement. Indeterminate flowering nature, shattering of capsules at maturity, soil types and management practices like plant densities, time of sowing, irrigation, fertilizers, herbicides and fungicides, pests and insects, diseases invasion, heat and drought, inadequate breeding program which probably affects its performance, some of which may partially mitigate others among other things are the major factors for low yields of sesame [NCRI (2002), Pham et al., 2010; Geleta et al., 2002]. Chude et al., (2012) has reported a yield of between 200 and 450 kg ha^{-1} of dry seed under farmers' conditions. However, Usman et al., (2021) have also reported that 500 – 800 kg ha^{-1} is obtainable if improved practices are adopted with a plant population of 25 - 40,000 plants ha^{-1}. Based on nature and prevailing environmental conditions, many African soils have shown

nutrient deficiency problems after a short period of cultivation. In Nigeria, soil nutrient levels are low, therefore use of fertilizers has become very imperative (Agbede, 2009; Eifediyi et al., 2016). To improve soil nutrient structure, farmers have resulted to the use of chemical fertilizer such that crops yields won't be limited by the amount of plant nutrients the natural system supplies (Agber et al., 2012; Agbede et al., 2013). Mineral fertilizers have been used overtime in improving soil nutrient levels for optimum yield of sesame in the savanna regions of Nigeria as several researchers have reported improved crop performance with the application of mineral fertilizers (Ali et al., 2006; Eifediyi et al., 2018). Mineral fertilizer uses as reported by Adekiya et al., (2009) increases soil organic matter accumulation and biological activity due to increased plant biomass production. This organic matter is recycled back to soil in the form of decaying roots, litter and crop residues (Babbu et al., 2015). Soil organic carbon is also enhanced with the addition of soil organic matter which is an important indicator of soil quality and crop productivity (Babbu et al., 2015). This research seeks to investigate the Influence of FYM, N-fertilizer and possible interactions of FYM x N on the growth, yield and yield characters of sesame in Anyigba environment of Kogi State, Nigeria.

MATERIALS AND METHODS

This experiment was conducted at the Kogi State University Research and Demonstration Farm Anyigba, (Lat 7° 29^1 and Long 7^0 11^{1}E) which lies in the Guinea Savanna Agro-ecological Zone during the raining season of 2021. The experimental site has characteristic deep and moderately drained sandy-loam soil. Soil sample was taken from six locations of the experimental plot with an auger at a depth of 0 – 30cm, mix thoroughly to form a composite sample and analyzed for its physio-chemical properties (see result in table 1). The period of this trial was September – December where temperature was relatively high (29^{0}C - 35^{0}C with a damp weather condition. Treatment consisted of two factors (FYM and N-fertilizer) each applied at 4 rates (0 t ha^{-1}, 5 t ha^{-1}, 10 t ha^{-1} and 15 t ha^{-1} of FYM and 0 t N ha^{-1}, 0.02 t N ha^{-1}, 0.04 t N ha^{-1}and 0.06 t N ha^{-1} of Nitrogen fertilizer) respectively. A total number of 16 treatments was obtained from factorial combination and laid in a Randomized Complete Block Design (RCBD) with three replicates. A total of 48 plots were obtained with each measuring 9sqm. Each replicate was separated by 2m discard space, while each plot was separated by 1m. About 7.2g of seed was weighed and planted per plot; 3 - 5 seeds were sown per hill on ridges and furrows at a spacing of 65cm x 20cm. sowing was done in three rows per plot. Missing hills were supplied with seeds to achieve the desired plant population. NPK 15:15:15 Fertilizer was applied in two split doses, first at first week and second dose at fourth week after sowing. Weeding was done manually with hoe and hand pulling method at regular intervals. Roundup was applied post emergence at 4litres/ha. Harvesting was done when flowering ceased, capsules fully mature (i.e. 75% of the capsules turned yellow) to avoid losses of seeds. This stage is reached at 75 – 150 DAS depending on variety threshing was carried out by gently beating harvested capsules obtained per treatment in sacks with stick to release seeds, released seeds was then collected, winnowed to get rid of chaffs. Data on growth and yield characters such as number of leaves/plant, plant height, number of capsules/plant, 1000 seed weight, seed yield/ha, fresh shoot weight and dry matter per plant was observed and recorded

RESULTS AND DISCUSSION

Number of leaves was not influenced significantly ($p \geq 0.05$) by the application of FYM and N-levels (table 2). Also, there was no interaction of FYM and N-levels. Plant height was however significantly influenced ($p \leq 0.05$) by application of FYM (table 2). Application of 15 t ha^{-1} produced the tallest plant. However, this increase was same with zero application of FYM while application of 5 t ha^{-1} and 10 t ha^{-1} did not differ significantly. Also, 60kg of N produced the tallest plant followed by 40, 30, 20 and 0 kg N ha^{-1} in that order on plots treated with Mineral fertilizer. FYM and N-levels did not influence ($p \geq 0.05$) fresh weight, Number of capsules, and 100 seed weight significantly as interaction of FYM and N-levels was found also to be insignificant ($p \geq 0.05$) for all characters measured throughout the sampling periods. Dry weight was significantly influenced by FYM only as application of 15 t ha^{-1} gave the highest dry matter. However, this yield was not different from those obtained when 10 and 0 t ha^{-1} FYM was applied. Application of 5 t ha^{-1} FYM produced the lowest dry matter. Seed yield was significantly influenced ($p \leq 0.05$) by FYM and N-levels from mineral fertilizers. Application of 15tha^{-1} gave the highest yield (148.1kg ha^{-1}) followed by application of 10 t ha^{-1} which was not significantly different from those obtained when 5 t ha^{-1} FYM was applied. However, control plots gave the least seed yield throughout the sampling periods.

Table 1. Result of Soil Analysis

Physical properties (%)	Depth (0-30cm)
Silt	5.72
Clay	8.32
Sand	82.96
Textural Class	Sandy-Loam
Chemical properties (%)	
pH (H_2O)	7.3
Organic Carbon (OC)	0.72
Total Nitrogen (TN)	0.0014
Available Phosphorus (ppm)	8.6
Exchangeable Cations (EC)	
Calcium (Cmol/kg)	4.42
Magnesium (Cmol/kg)	1.51
Potassium (Cmol/kg)	2.61
Sodium (Cmol/kg)	1.17
Cation Exchange Capacity (CEC)	10.49

In the same vein, application of 60 kg N ha^{-1} gave the highest yield (137.4 kg ha^{-1}) on plots treated with mineral fertilizer. However, this was not significantly different from those treated with 40kg N ha^{-1}. Also yield obtained with plot treated with 40kg N ha^{-1} was not significantly different from those of 20kg N ha^{-1}. Application of 0kg N ha^{-1} consistently gave the lowest yield in terms of mineral fertilizer. Significant effects of

Table 2. Growth and Yield Characters of sesame as affected by FYM and N-level in Anyigba environment

	9 WAS				After harvest		
Treatments	No of Leaves/plant	Plant Height (cm)	Fresh wt./plant (g)	Dry wt./plant (g)	No of Capsules	1000seed wt. (g)	Seed Yield (kg ha^{-1})
FYM (t ha^{-1})							
0	18.9	53.5ab	140.0	0.29ab	13.0	2.19	75.8c
5	18.4	53.5b	138.3	0.25b	14.5	2.16	112.1b
10	18.7	52.7b	125.0	0.33a	13.5	2.06	113.3b
15	18.3	55.9a	150.8	0.32a	12.7	2.17	148.1a
SE (±)	0.5	0.53	3.4	0.01	0.6	0.06	5.95
N-level (t ha^{-1})							
0	19.5	45.0d	121.6	0.32	12.6	2.1	18.3c
0.02	18.2	53.0c	141.6	0.27	13.5	2.21	110.6b
0.04	18.1	55.9b	140.8	0.28	14.1	2.18	121.1ab
0.06	18.5	61.7a	150.0	0.32	13.6	2.09	137.4a
SE (±)	0.5	0.53	3.4	0.01	0.6	0.06	5.95
Interaction (F x N)	ns	ns	ns	Ns	ns	ns	ns

Means followed by the same letter(s) within a sampling period is not statistically significant at 0.05 level of probability using N-DMRT.
WAS: weeks after sowing
Wt: weight

FYM on parameters measures is supported by Bonsu (2013), who obtained 13% increase in total seed yield of sesame with poultry manure application over control plots without poultry manure. Agbede (2009), had also insinuated that low application of inorganic fertilizer could result to incomplete decomposition of organic matter resulting from enhanced activities of soil micro-organisms. This may be translated to the fact that integrated use of organic and mineral nutrient is essential for optimum yield in sesame and overall soil nutrient replenishment. N release from component NPK fertilizer enhanced soil microbial activities thus increasing nutrient concentration of soil necessary for optimum yield Adeniyan and Ojeniyi (2003). Duhoon et al., (2004), who worked on the optimization of sesame production through bio/natural inputs obtained significantly higher seed yield compared with the control when he applied 3.75 t farmyard manure ha^{-1} with other organic amendments.

Significant effect of N-levels on parameters measured has been reported by Yunusa et al., (2019) who obtained the highest yield of sesame from application of 300kg/ha NPK fertilizer equivalent to 45kgha^{-1} N. Osman (1993) reported that application of 40 kg N ha^{-1} significantly enhanced grain yield and yield parameters of sesame. This is supported by Chukwu et al., (2012) who reported that application of 300 kg/ha of NPK fertilizer could lead to increase in soil pH in the Southeastern Nigeria. Olowe and Busari (2000) had also reported that highest number of capsules per plant, branches per plant, capsule weight per plant and grain yield per hectare was obtained with the application of 60 kg N ha^{-1} and 13.2 kg P ha^{-1}. This was supported by Hossein et al., (2007) and Okpara et al., (2007) who has recorded same with the application of 60 kg N ha^{-1}, 75 kg N ha^{-1} and 26.4 kg P ha^{-1}. Also Jakusko and Usman (2013) had reported highest yield of sesame from application of 300kg/ha NPK fertilizer in Northeastern Nigeria.

CONCLUSION

Sesame yield responded well to FYM and N-level at rates 15 t ha^{-1} and 40 kg N ha^{-1} respectively and therefore recommended for farmers in the area to get the more yield in the sesame crop.

AUTHOR CONTRIBUTIONS

This research was jointly conducted by all the authors mentioned in this manuscript. Author Atabo J.O and Musa, U.T designed the research, initiate the protocols and data interpretation. Author Yusuf M. supervised and anchored the field work, obtained field data and performed preliminary data analysis. All the authors managed the literature searches and review to produce the initial draft. Final manuscript was read and approved by all authors.

ACKNOWLEDGMENTS

We are thankful to Kogi State University for the technical support.

COMPETING INTERESTS

The authors have no conflict of interests.

ETHICS APPROVAL

Not applicable

REFERENCES

Adekiya, A. O., Agbede, T. M., & Ojomo, A. O. (2009). Effects of tillage methods on soil properties, nutrient content, growth and yield of tomato on an alfisol of Southwestern Nigeria. *American-Eurasian Journal of Sustainable Agriculture*, *3*(3), 348-353..

Adeniyan, O. N., & Ojeniyi, S. O. (2003). Comparative effectiveness of different levels of poultry manure with NPK fertilizer on residual soil fertility, nutrient uptake and yield of maize. *Moor Journal of Agricultural Research*, *4*(2), 191-197.

Agbede, O. O. (2009). Understanding Soil and Plant Nutrition Salman. *Press & Co. Nig. Ltd. Keffi, Nigeria 260pp*.

Agbede, T. M., Adekiya, A. O., & Ogeh, J. S. (2013). Effects of organic fertilizers on yam productivity and some soil properties of a nutrient-depleted tropical Alfisol. *Archives of Agronomy and Soil Science*, *59*(6), 803-822.

Agber, P. I., Ter, S., & Ayuba, S. A. (2012). Assessment of pearl millet performance to early and late planting opportunities and fertilizer application models in Makurdi, Nigeria. *African Journal of Agricultural Research*, *7*(44), 5955-5961.

Ali, A., Ayuba, S. A., & Ojeniyi, S. O. (2006). Effect of tillage and fertilizer on soil chemical properties, leaf nutrient content and yield of soyabean in the guinea savanna zone of Nigeria. *Nigerian Journal of Soil Science*, *16*, 126-130.

Singh Brar, B., Singh, J., Singh, G., & Kaur, G. (2015). Effects of long term application of inorganic and organic fertilizers on soil organic carbon and physical properties in maize–wheat rotation. *Agronomy*, *5*(2), 220-238.

Bonsu, O. K. (2003). Effect of spacing and fertilizer application on the growth, yield and yield components of sesame (Sesamum indicum L.). *J. Sust. Agric*, *23*(1), 40-49.

Chude, V. O., Olayiwola, S. O., Daudu, C., & Ekeoma, A. (2012). Fertilizer Use and Management Practices for Crops in Nigeria. *4th edition Federal Fertilizer Department, Federal Ministry of Agriculture and Rural Development. Abuja.* Pp. 224

Chukwu, L. I., Ano, A. O., & Asawalam, D. O. (2012). Effects of poultry manure and NPK fertilizer on soil properties and nutrient uptake of maize (*Zea mays* L.) plants growth in an Ultisol. Proceedings of the 36th Annual Conference of the Soil Science Society of Nigeria (SSSN) on 7th – 11th March. University of Nigeria Nsukka.

Duhoon, S. S., Jyotishi, A., Deshmukh, M. R., & Singh, N. B. (2004, September). Optimization of sesame (Sesamum indicum L.) production through bio/natural inputs. In *Proceedings of the 4th International Crop Science Congress Brisbane, Australia* (Vol. 26).

Eifediyi, E. K., H. E. Ahamefule, I. F. Ojiekpon, T. M. Agbede, S. U. Remison, T. H. Aliyu, T. O. Olukayode, and A. K. Bangura. "Response of sesame (Sesamum indicum L.) to mulching and inorganic fertilizer application in a southern guinea savannah zone of Nigeria." *Agriculture & Forestry/Poljoprivreda i Sumarstvo* 62, no. 2 (2016).

Eifediyi, E. K., Komolafe, O. A., Ahamefule, H. E., & Folola, A. (2018). Effect of tillage and poultry manure rates on physiological growth and yield of sesame (*Sesamum indicum* L.). *Plant Sciences: Scientia Agriculturae Bohemica, 49*(4), 255 - 266.

Geleta, B., Atak, M., Baenziger, P. S., Nelson, L. A., Baltenesperger, D. D., Eskridge, K. M., ... & Shelton, D. R. (2002). Seeding rate and genotype effect on agronomic performance and end-use quality of winter wheat. *Crop Science*, *42*(3), 827-832.

Hossain, M. A., Hamid, A., & Nasreen, S. (2007). Effect of nitrogen and phosphorus fertilizer on N/P uptake and yield performance of groundnut (Arachis hypogaea L.). *Journal of Agricultural Research (Pakistan)*.

Jakusko, B. B., & Usman, B. D. (2013). Effects of NPK fertilizer and plant population density on productivity of sesame (Sesamum indicum L.). *Research Journal of Agricultural and Environmental Management*, *2*(5), 121-126.

Madina, P. (2020). PERFORMANCE OF TEN (10) VARIETIES OF SESAME (Sesamum Indicum) GROWN IN BILLIRI, GOMBE STATE, NIGERIA. *FUDMA JOURNAL OF SCIENCES*, *4*(3), 453-456.

Naturland (2002). Organic farming in the Tropics and Subtropics: Sesame. 21/07/11. Available at: www.naturland.de/fileadmin/MDB/documents/Publication/English/sesame.pdf

NCRI (2002). *Guide to Beniseed (sesame) Production.* Oilseed Research Program. NCRI, Badeggi*. Pp.4-5.*

Okpara, D. A., Muoneke, C. O., & Ojikpong, T. O. (2007). Effects of nitrogen and phosphorus fertilizer rates on the growth and yield of sesame (Sesamum indicum L.) in the Southeastern rain forest belt of Nigeria. *Nigeria Agricultural Journal*, *38*, 1-11.

Olowe, V. I. O., & Busari, L. D. (2000). Response of sesame (Sesamum indicum L.) to nitrogen and phosphorous application in Southern Guinea savanna of Nigeria. *Tropical Oilseed Journal*, *5*, 30-37.

Osman, H. E. (1993). Response of sesame cultivars to plant-density and nitrogen in the Sudan central Rainlands. *Arab Gulf Journal of Scientific Research*, *11*(3), 365-376.

Pham, D.T., Nguyen, T.T.D., Carlsson, A.S. & Bui, M.T. (2010). Morphological evaluation of sesame (*Sesamum indicum* L.) varieties from different origins. *Australian Journal of Crop Science, 4*(7), 498 - 504.

Usman, M., Ali, A., & Agber, P. I. (2021). Productivity of sesame (*Sesamum indicum* L.) varieties as influenced by tillage practices in two agro-ecological zones of Nigeria. *Direct Research Journal of Agriculture and Food Science, 9* (2), 18-28.

Uzo (1998). Beniseed, a neglected oil wealth in Nigeria. In; Pre-conference Proceedings of First National Workshop on Beniseed pp. 1 – 17.

Yunusa, M. M., Usman, M., Nangere, M. G., & Usman, B. D. (2019). Yield of Sesame Varieties and Soil Properties as Influenced by Tillage and Fertilizer in Sudan Savanna Zone of Nigeria. *International Journal of Innovative Agriculture & Biology Research,* 7(4), 30 – 39.