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PERFORMANCE OF VARYING RATES OF NEEM COMPOST ON SESAME (*Sesamum indicum Linn*)

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ABSTRACT

Application of organic residues to soils as amendment is a common agronomic practice, especially nowadays that the awareness on the needs for organic agriculture in the tropics is meaningfully increasing. However, there is dearth of information about the best form or nature of applying these phyto-residues which will ensure maximum utilization of their nutrients by crop plants. Field experiment was conducted during the rainy season of 2022 at the experimental plot, behind Bee-Hall, Ladoke Akintola University of Technology, Ogbomoso to evaluate the performance of varying rates of neem compost on Sesame (*Sesamum indicum* L.) Six fertilizer treatments introduced were; T0 =(Zero application of fertilizer material) T1 = 20 tons/ha, T2 = 40 tons/ha, T3 = 60 tons/ha, T4 = 80 tons/ha, T5 = 100 tons/ha. The trial was arranged in Randomized Complete Block Design (RCBD) replicated three times. Data were collected on the following parameters: plant heights, numbers of leaves, numbers of branches, stem girths, root fresh weights, root dry weights, shoot fresh weights, shoot dry weights and subjected to Analysis of Variance (ANOVA). Means were separated using Duncan Multiple Range Test (DMRT), at 5% level of probability (SAS, 2019). Application of T4 (6tons/ha) with enhanced the growth with the highest mean value of (98.60) and not significantly difference from T1 (75.50), T4 (69.80), and T5 (67.27) but significantly difference from T2 (27.40) and T0 (25.27) which has the least mean value across all the parameters measured. Therefore, application of T4 (6tons/ha) of Neem compost is hereby recommended as optimum, for improved performance of Sesame in the study area.

INTRODUCTION

Human activities (such as incessant yearly bush burning, continuous cropping, monocropping, overgrazing, mining, bulldozing, open-clean-clear cultivation, ridging-along-the-slope, excessive logging etc) and other climatic attributes (such as torrential rainfall and high solar radiation) are equally aggravating nutrient imbalances and rapidity of nutrient depletion in the tropics (Babajide *et al.,* 2008). Sesame (*Sesamum indicum*) is a flowering annual plant in the genus sesamum. It belongs to the family Pedaliaceae. Sesame (*Sesamum indicum* L.) is one of the oldest cultivated oilseed crops, known for its resilient growth in arid conditions and highly valued seeds for their oil and nutritional content. Often hailed as the "Queen of Oilseeds", it owes this distinction to its remarkably high oil content, which can reach to 63%, surpassing the quality of other oilseed crops such as groundnut (45%–56%), sunflower (45%), rapeseed (40%), and soybean (20%) - - Teklu *et al.,* 2021.

Originating from Africa and the Indian subcontinent, sesame has spread globally, playing a significant role in traditional and commercial agriculture (Bedigian, 2010).

Sesame seeds contain high levels of fatty acids (45%–55%) and proteins (19%–25%). sesame seeds are also rich in essential minerals, including magnesium, phosphorus, calcium, iron, and zinc. In addition, they contain vitamins B and E and have potent antioxidant properties (Langyan *et al.,* 2022; Mostashari and Mousavi Khaneghah 2024). Sesame is unique because it contains two antioxidants, sesamin, and sesamolin, and its oil is more stable than other oils owing to sesamole, a third antioxidant (Dossou *et al.,* 2023; Wan *et al.,* 2023). Sesame seeds offer a range of important benefits, including anti-aging, antihypertensive, anticancer, antioxidant, and cholesterol-lowering properties (Majdalawieh and Mansour 2019; Mili *et al.,* 2021). Neem based organic fertilizer is a natural organic fertilizer. It is a non synthetic soil amendment that aids enhance soil quality, thereby improving the vegetative and seed parts of crops
(OrgoNeem, 2015). Therefore, it is necessary to study the performance of varying rate of neem compost on sesame in the study area.

Experimental site

The field experiment was conducted during the rainy season of 2022 at the experimental plot, behind Bee-Hall, Ladoke Akintola University of Technology, Ogbomoso to evaluate the performance of varying rates of neem compost on Sesame (*Sesamum indicum* L.). Ogbomoso is on latitude 80 10' N and longitude 40 10' E. This also falls under the southern guinea savanna ecoregion of the south-western Nigeria. Ogbomoso has bimodal rainfall distribution i.e. having the early rainy season which usually starts yearly from late March and ends in late July / early August. It is normally followed by a short dry spell in August. Finally, the late rainy season starts from August to November every year (Babajide *et al.,* 2017).

Material and Methods

Soil sampling and analysis

Pre planting collection of soil sample was carried out using auger at a depth of 0-30cm, for laboratory routine analysis.

Treatments

Six treatment were introduced; T0 = (Zero application of fertilizer material) T1 = 2 tons/ha, T2 = 4 tons/ha, T3 = 6 tons/ha, T4 = 8 tons/ha, T5 = 10 tons/ha and were applied at recommended rate. Two pots per treatment were used and replicated three times.

Data collection and Analysis

Data were collected on the following parameters; plant height (cm), number of leaves, stem girth (cm), number of branches, shoot fresh weight, shoot dry weight, root fresh weight and root dry weight. Data collected were subjected to analysis of variance (ANOVA) means were separated using Duncan's multiple range test (DMRT) at $p<0.05$.

RESULTS AND DISCUSSION

Soil physical and chemical properties of sample used.

The soil was mildly acidic with pH of 6.10 and grossly low in essential nutrients particularly N ($0.26gkg^{-1}$), P ($4.90mgkg^{-1}$) and K ($0.32cmolkg^{-1}$). Also the soil was texturally sandy loam (Table 1) The results corroborated the earlier research finding of (Babajide *et al.,* 2008) which indicate that the soil in the study area was grossly low in essential nutrients and there by requires regular supply of organic materials to improve its quality.

Effect of varying rate of neem compost on growth parameters of *Sesamum indicum* at different week after sowing (WAS)

Plant Height

Table 2 shows the effect of varying rates of Neem compost application on sesame. Application of T3 at 6WAS increased the plant height and had the highest mean value (58.58cm) which was not significantly different from T1, T2 and T4 but significantly different from T5 and T0 which had the least mean value of (27.23cm). At 7 WAS, application of T3 increased the plant height and had the highest mean value (82.60cm) which was not significantly different from all other treatments tested except T0 which had the least mean value of (41.27cm). At 8WAS, application of T3 increased the plant height and had the highest mean value (80.47cm) and was not significantly different from T1, T4 and T5 but significantly different from T2 and T0 which had the least mean value of (51.67cm). Application of T3, at 9WAS increased the plant height and had the highest mean value (90.50cm) which was not significantly different from all other treatments tested except T0 which had the least mean value of (70.03cm). Application of T3 at 10WAS increased the plant height and had the highest mean value (91.50cm) which was not significantly different from T1, T4 and T5 but significantly different from T2 and T0 which had the least mean value of (70.01cm).

3 Stem Girth

Table 3 shows the effect varying rates of neem compost application on sesame. Application of T1 at 6WAS increased the plant height and had the highest mean value (1.31cm) which was not significantly different from all other treatments tested except T0 which had the least mean value of (0.51cm). Application of T1 at 7WAS increased the plant height and had the highest mean value (1.30cm) which is not significantly different from all other treatments tested except T0 which had the least mean value of (0.55cm). Application of T1 at 8WAS increased the plant height and had the highest mean value (1.52cm) which was not significantly different from all

other treatments tested including T0 which had the least mean value of (0.62cm). Application of T1 at 9WAS increased the plant height and had the highest mean value (1.45cm) which was not significantly different from all other treatments tested except T0 which had the least mean value of (0.81cm). Application of T1 at 10WAS increased the plant height and had the highest mean value (1.53cm) which was not significantly different from all other treatments tested including T0 which had the least mean value of (0.90cm).

Number of branches

Table 4 shows the effect varying rates of Neem compost application on sesame. Application of T4 at 6WAS increased the plant height and had the highest mean value (55.73) which was not significantly different from all other treatments tested except T0 which had the least mean value of (27.23). Application of T4 at 7WAS increased the plant height and had the highest mean value (22.50cm) which was not significantly different from all other treatments tested including T0 which had the least mean value of (13.00cm). Application of T4 at 8WAS increased the plant height and had the highest mean value (28.70cm) which was not significantly different from all other treatments tested including T0 which had the least mean value of (19.83cm). Application of T3 at 9WAS increased the plant height and had the highest mean value (22.47cm) which was not significantly different from all other treatments tested including T0 which had the least mean value of (15.77cm). Application of T3 at 10WAS increased the plant height and had the highest mean value (49.77cm) and was not significantly different from all other treatments tested including T0 which had the least mean value of (31.33cm).

Number of leaves

Table 5 shows the effect varying rates of Neem compost application on sesame. Application of T3 at 6WAS increased the plant height and had the highest mean value (43.33) which was not significantly different from all other treatments tested except T0 which had the least mean value of (15.50). Application of T3 at 7WAS increased the plant height and had the highest mean value (39.50) which was not significantly different from all other treatments tested except T0 which had the least mean value of (21.67). Application of T3 at 8WAS increased the plant height and had the highest mean value (64.83) which is not significantly different from all other treatments tested except T0 which had the least mean value of (36.17). Application of T3 at 9WAS increased the plant height and had the highest mean value (80.83) which was not significantly different from all other treatments tested except T0 which had the least mean value of (49.83). Application of T3 at 10WAS increased the plant height and had the highest mean value (99.40) which was not significantly different from all other treatments tested except T0 which had the least mean value of (66.83).

Effect of varying rate of Neem compost on the yield parameters (g) of *Sesamum indicum*

Root Fresh Weight

Table 6 shows the effect varying rates of Neem compost application on sesame. Application of T3 at Root Fresh Weight increased the yield parameters and had the highest mean value (33.67g) which is not significantly different from T4, T1 and T5 but significantly different from T2 and T0 which had the least mean value of (9.17g).

Root Dry Weight

Application of T3 at 10WAS increased the yield parameters and had the highest mean value (13.58g) which is not significantly different from T1, T4 and T5 but significantly different from T2 and T0 which had the least mean value of (3.23g).

Shoot Fresh Weight

Application of T3 at 10WAS increased the yield parameters and had the highest mean value (98.60g) which is not significantly different from T1 but significantly different from T2, T4, T5 and T0 which had the least mean value of (25.27g).

Shoot Dry Weight

Application of T3 at 10WAS increased the yield parameters and had the highest mean value (20.47g) which is not significantly different from T5, T1 and T4 but significantly different from T2 and T0 which had the least mean value of (7.67g).

Effect of varying rate of Neem compost on Nutrients uptake of Sesame

Nitrogen uptake was influenced by the application of varying rates of Neem compost, T3 had the highest mean value of (111.93gkg^{-1}) which was significantly different from all other treatments including T0 which had the least mean value of (6.37gkg^{-1}) – Table 7. Uptake of phosphorus was influenced by the application of Neem compost, T4 had the highest mean value of (25.77gkg^{-1}) which was significantly different from all other treatments including T0 which had the least mean value of (0.50gkg^{-1}). Uptake of potassium was influenced by the application of Neem compost, T3 had the highest mean value of (23.07gkg^{-1}) which was significantly different from all other treatments including T0 which had the least mean value of (0.50gkg^{-1}).

CONCLUSION AND RECOMMENDATION

This study examined the Performance of Sesame (*Sesamum Indicum Linn*) as Influenced by varying rate of N.P.K and Neem compost fertilizer on the growth and yield of Sesame. The integrations had a significant effect on the growth and yield of *Sesamum indicum*. Nutrient uptake particularly N, P and K were also significantly enhanced through the application of integration. Application of T4 (60tons/ha) enhanced the growth with the highest mean value of (98.60) and not significantly difference from T1 (75.50), T4 (69.80), and T5 (67.27) but significantly difference from T2 (27.40) and T0 (25.27) which has the least mean value across all the parameters measured. Therefore, application of T4 (80KgN/ha) of Neem compost is hereby recommended as optimum, for improved performance of Sesame (*Sesamum indicum*) in the study area.

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Table 1: physical and chemical analysis of the soil sample uses

Soil characteristics	Values
pH (H_20)	6.10
Organic Carbon (gkg^{-1})	3.32
Total N (gkg^{-1})	0.26
Available P ($mgkg^{-1}$)	4.90
Fe ($mgkg^{-1}$)	10.82
Cu ($mgkg^{-1}$)	3.11
Zn ($mgkg^{-1}$)	2.78
Exchangeable K ($cmolkg^{-1}$)	0.32
Exchangeable Na ($cmolkg^{-1}$)	0.24
Exchangeable Ca ($cmolkg^{-1}$)	22.25
Exchangeable Mg ($cmolkg^{-1}$)	3.16
Sand (gkg^{-1})	854.20
Silt (gkg^{-1})	74.00
Clay (gkg^{-1})	71.80
Textural class	Sandy loam

Tabe 2: Effect of varying rate of Neem compost on the plant height (cm) of *Sesamum indicum* at different week after sowing (WAS)

TREATMENTS	6WAS	7WAS	8WAS	9WAS	10WAS
T0	27.23c	41.27c	51.67c	70.03b	70.01b
T1	48.63ab	73.50ab	75.23ab	89.20a	89.20a
T2	51.67ab	52.40ab	60.90b	68.30ab	68.3bc
T3	58.58a	82.60a	80.47a	90.50a	91.50a
T4	51.10ab	67.80ab	74.10ab	88.93a	90.93a
T5	43.47b	61.27ab	74.47ab	90.40a	90.60a

Means within the column with the same letter are not significantly different by DMRT($P \leq 0.05$). T0 =(Zero application of fertilizer material) T1 = 2 tons/ha, T2 = 4 tons/ha, T3 = 6 tons/ha, T4 = 8 tons/ha, T5 = 10 tons/ha.

Table 3: Effect of varying rate of NPK and Neem compost on the stem girth (cm) of *Sesamum indicum* at different week after sowing (WAS)

TREATMENTS	6WAS	7WAS	8WAS	9WAS	10WAS
T0	0.51b	0.55b	0.62b	0.81b	0.90b
T1	1.31a	1.30a	1.52a	1.45a	1.53a
T2	1.0a	1.30a	1.50a	1.10ab	1.41a
T3	1.0a	1.11a	1.13a	1.13a	1.40a
T4	1.0a	1.12a	1.15ab	1.15ab	1.33a
T5	1.1a	1.20a	1.21ab	1.25ab	1.30a

Means within the column with the same letter are not significantly different by DMRT($P \leq 0.05$). T0 =(Zero application of fertilizer material) T1 = 2 tons/ha, T2 = 4 tons/ha, T3 = 6 tons/ha, T4 = 8 tons/ha, T5 = 10 tons/ha.

Table 4: Effect of varying rate of Neem compost on the number of branches (cm) of *Sesamum indicum* at different week after sowing (WAS)

TREATMENTS	6WAS	7WAS	8WAS	9WAS	10WAS
T0	27.23b	13.00ab	19.83ab	15.77ab	31.33ab
T1	46.97a	17.67a	27.50a	17.83a	36.67ab
T2	51.67a	15.83ab	21.17ab	20.03a	30.33ab
T3	41.73a	21.59a	25.00a	22.47a	49.77a
T4	55.73a	22.50a	28.70a	16.27a	47.67a
T5	44.87a	17.67a	24.83a	16.87a	34.83ab

Means within the column with the same letter are not significantly different by DMRT(P≤0.05). T0 =(Zero application of fertilizer material) T1 = 2 tons/ha, T2 = 4 tons/ha, T3 = 6 tons/ha, T4 = 8 tons/ha, T5 = 10 tons/ha.

Table 5: Effect of varying rate of Neem compost on the number of leaves (cm) of S*esamum indicum* at different week after sowing (WAS)

TREATMENTS	6WAS	7WAS	8WAS	9WAS	10WAS
T0	15.50c	21.67c	36.17b	49.83b	66.83c
T1	40.17a	35.50a	60.17a	64.67ab	85.63ab
T2	32.17ab	34.87a	48.67ab	66.33ab	91.17a
T3	43.33a	39.50a	64.83a	80.83a	99.40a
T4	29.67ab	36.17a	51.00ab	62.50ab	86.57ab
T5	32.30ab	35.17a	52.50ab	69.83ab	88.67ab

Means within the column with the same letter are not significantly different by DMRT(P≤0.05). T0 =(Zero application of fertilizer material) T1 = 2 tons/ha, T2 = 4 tons/ha, T3 = 6 tons/ha, T4 = 8 tons/ha, T5 = 10 tons/ha.

Table 6: Effect of varying rate of Neem compost on the yield parameters (g) of *Sesamum indicum*

	RFW (g)	RDW (g)	SFW (g)	SDW (g)
T0	9.17c	3.23b	25.27bc	7.67b
T1	23.33ab	10.63a	75.50ab	15.23ab
T2	7.27c	3.67b	27.40bc	8.90b
T3	33.67a	13.5a	98.60a	20.47a
T4	23.4ab	7.10ab	69.80ab	13.00ab
T5	18.20ab	7.47ab	67.27b	18.47a

Means within the column with the same letter are not significantly different by DMRT(P≤0.05). T0 =(Zero application of fertilizer material) T1 = 2 tons/ha, T2 = 4 tons/ha, T3 = 6 tons/ha, T4 = 8 tons/ha, T5 = 10 tons/ha, SFW = Shoot fresh weight, SDW = Shoot dry weight, RFW = Root fresh weight, RDW = Root dry weight.

Table 7: Effect of varying rate of Neem compost fertilizers on the uptake of nutrient

	N gkg^{-1}	P gkg^{-1}	K gkg^{-1}	Ca $mgkg^{-1}$	Na $mgkg^{-1}$	Mg $mgkg^{-1}$	Fe $mgkg^{-1}$	Cu $mgkg^{-1}$	Mn $mgkg^{-1}$	Zn $mgkg^{-1}$
T0	6.37e	0.53d	0.50d	0.50d	0.97a	0.83c	55.73d	1.67d	54.23a	12.73c
T1	44.60d	15.73c	11.53c	2.90c	1.00a	1.27c	89.63c	6.73a	59.50a	22.47ab
T2	83.33b	22.20b	19.93b	16.93ab	0.57b	2.53ab	145.56b	6.60ab	24.47b	24.20ab
T3	111.93a	21.80b	23.07a	18.90a	0.30c	3.20ab	164.06a	6.40ab	24.77b	26.40a
T4	68.40c	22.47b	20.73b	14.83b	0.27c	2.27a	163.96a	5.73bc	25.07b	25.87a
T5	74.06c	25.77a	19.13b	17.53ab	0.33c5	2.47b	150.93b	5.07c	23.23b	22.43b

Means within the column with the same letter are not significantly different by DMRT(P≤0.05). T0 =(Zero application of fertilizer material) T1 = 2 tons/ha, T2 = 4 tons/ha, T3 = 6 tons/ha, T4 = 8 tons/ha, T5 = 10 tons/ha.