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EFFECTS OF SELECTED COMPOST TYPES ON GROWTH AND YIELD OF SESAME (*Sesamum indicum*) VARIETIES IN OGBOMOSO, OYO STATE.

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ABSTRACT

Researching into suitability of some under-utilized crops/weeds (which are naturally nutrients rich with heavy biomass production), as potential fertilizer materials for arable crop production is a worthwhile low input technology. In recent times, manifestation of ill-effects of abusive use of chemical fertilizers as become a great concern, as it affects soil fertility/productivity, crop performance and human welfare. Hence, crop production is moving towards organic farming, which disallows the use of agro-chemicals (chemical fertilizer inclusive). Field experiment was conducted at the Teaching and Research Farms, Ladoke Akintola University of Technology, Ogbomoso, Oyo State, to evaluate the performance of different sesame varieties, under different compost types. Two sesame varieties (E8 and Ogbomoso local) were investigated under six fertilizer treatments namely: NPK 15-15-15 (applied at 300kg/ha) and four compost types made from phyto-residues obtained from the Devil's claw plant (*Martynia annua)* and other three (3) selected common wild plants (*Chromolaena odorata*, *Gliricidia sepium* and *Tithonia diversifolia),* and the control. All the phyto-residues were applied at 4tons/ha. The treatments were laid out in Randomized Complete Block Design (RCBD), replicated thrice. Data were collected on plant height, number of leaves, number of branches, stem girth, number of capsules, seed weight, shoot fresh weight, shoot dry weight and grain yield parameters. All data collected were subjected to analysis of variance (ANOVA). Means were separated using Duncan Multiple Range Test at 5% level of probability ($p \leq 0.05$). Application of different fertilizers significantly influenced growth, yield parameters as well as the nutrient uptakes of sesame, irrespective of the varieties, compared to the control. Although, a significantly higher number of capsules (100.7g/plant) was recorded for E8 variety plants which received NPK 15-15-15 application, the value was not significantly different from those obtained from Martynia and Tithonia composts. All treatments applied enhanced the growth and yield parameters of sesame. The application of Zero fertilizer had the least value across all the parameters measured. The two sesame varieties responded well to improved soil nutrition from different organic fertilizers tested. *Martynia annua* and *Tithonia diversifolia* biomass significantly enhanced sesame growth and yield, compared to other treatments tested.The growth and yield of sesame responded to different fertilizer types. The most suitable fertilizer that supplies adequate nutrients for optimum performance of sesame is *Martynia annua*and*Tithonia diversifolia.* Therefore, application of either Martynia or Tithonia compost at 4tons/ha is hereby recommended to be most suitable and adequate for improving the performance of sesame (especially E8 variety), in the study area.

Keywords: *Martynia annua, Chromolaena odorata*, *Gliricidia sepium*, *Tithonia diversifola,* Compost types, sesame

INTRODUCTION

Sesame (*Sesamum indicum* L), is also known as benniseed in West Africa, simsim in East Africa. It is widely cultivated in the derived, northern and southern guinea, Sudan and Sahel savannas of Nigeria (Alegbejo *et al.,* 2003). Sesame is usually propagated by seeds and matures 70-150 days after sowing (Babajide *et al.,* 2012). It is known as the "queen of oilseeds" due to the high quality of oil, sterols, and antioxidative agents such as sesamin, sesamolin, and tocopherols, which function as nutraceuticals and provide physiological and nutritional benefits (Otles *et al*., 2021).

Devil s Claw *(Martynia annua)* belongs to family Martyniaceae (or Pedaliaceae), is a well-known small herbaceous annual plant, distributed throughout India. It is an annual or short-lived perennial herb that belongs to the family Martyniaceae or Pedaliaceae (Parsons *et al.,* 2001,). It is a small herbaceous, erect, branched, glandular hairy annual herb growing up to 0.9-1.2 m in height. Distinct parts of the plant such as leaves, roots, seeds, stems, flowers as well as the whole plant have been used for various medicinal purposes. Martyniaceae is a small family of

flowering plants which includes 12-13 species in five genera. Martynia is a monotypic genus that has varying flower sizes, colours, and leaf forms. The seeds of *Martynia annua* germinate in the presence of sufficient moisture (Parsons *et al.,* 2001).

Tithonia diversifolia commonly known as Wild flower or Mexican sunflower), is a shrub belonging to the family Asteraceae. Although, the plant was believed to have originated from Mexico and introduced into Africa as an ornamental plant, it is now widely distributed all over the humid and sub-humid tropics of the central and South America, Asia and Africa (Babajide *et al.,* 2008). Tithonia is potentially a dependable organic fertilizer material (which is relatively high in nutrient concentrations, particularly nitrogen), required for enhanced soil moisture, fertility and crop productivity (Jama *et al.,* 2000; Chukwuka and Omotayo, 2009).

Chromolaena odorata Linn belongs to the family Asteraceae (Aster family), genus Chromolaena (Thoroughwort). (Vijayaraghavan *et al.,* 2017). The family Asteraceae or Compositae (known as the aster, daisy, or sunflower family) is the largest family of flowering plants represented by about 950 genera and 20,000 species over the globe (Mahbubur, 2013). It has been shown that *Chromolaena odorata* plants not only invade soil that contains potassium and phosphorus, but it can also increase the nutrient contents in the soil, namely potassium, phosphorus, calcium, nitrogen, and magnesium (Ojeniyi *et al.,* 2012).

NPK fertilizer application tends to release fast nu trients to sustain soil fertility and crop production (Uyovbwasere *et al.,* 2010). The use of inorganic fertilizer has been observed to cause the destruction of soil texture and structure, which often leads to soil erosion and acidity as a result of the leaching effect of nutrients. Likewise, using inorganic fertilizer has led to reduced crop yield, soil acidity and nutrient imbalance (Agbede *et al.,* 2018).

Therefore it was necessary to study the effects of compost types on the growth and yield of sesame (*Sesamum indicum*).

Experimental site

Field experiment was carried out on the field at the Teaching and Research Farm, Ladoke Akintola University of Technology, Ogbomoso, Oyo State. The climate of Ogbomoso is mostly influenced by the North East trade wind and south monsoon wind. The temperature of the area ranges from 28- 33^{o}C.

Soil sampling and analysis

After land preparation, pre planting collection of soil sample was carried out using auger at a depth of 0-30cm. The samples were bulked into a composite sample and taken to the laboratory for analysis of the soil physical and chemical properties.

Treatments

Six treatment were introduced; T0 (control), T1 (NPK), T2 (*Martynia annua*), T3 (*Chromoleana odorata*), T4 (*Gliricidia sepium*), T5 (*Tithonia diversifolia*). One plot per treatment was used and replicated three times with a spacing of 0.4m x 0.5m and plot size of 2m x 2m

Data collection and Analysis

Data were collected on the following parameters; Plant height (cm), Number of leaves, Stem girth (cm), Number of branches and Yield. All data collected were subjected to analysis of variance (ANOVA). Means were separated using Duncan's multiple range test (DMRT) at $p \leq 0.05$.

Results

Soil physical and chemical properties of sample used.

The table shows that the soil is slightly acidic with pH 6.14 and grossly low in essential nutrients particularly N (0.06 g kg^{-1}), P (4.86 mg kg^{-1}) and K (0.12 cmol kg^{-1}). Also the soil was texturally sandy loam (Table 4.1) The results is in line with 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.

Effects of compost on Plant Height of Sesame

Table 4.2 shows the effects of compost types on plant height of sesame. At 8 weeks, variety 1 that receive NPK had the highest value of 93.3 cm and was significantly different from other treatment regardless of the variety with the least value of (53.9cm) was recorded from variety 2 that receives no fertilizer. At 10 weeks, variety 1 that receives NPK had the highest value of 99.6cm and was significantly different from other treatment irrespective of the variety and the least value (58.6 cm) was obtained from variety 1 that receives no fertilizer. At 12 weeks, variety 1 that receives NPK had the highest value of (93.8cm) and was significantly different from other treatment regardless of the variety with the lowest value (53.1cm) obtained from variety 1 that receives no fertilizer. At 14 weeks, variety 1 that receives NPK had the highest value (88.4cm)

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and was significantly different from other treatment irrespective of the variety while the least value (47.6cm) was obtained from variety 1 that receives no fertilizer.

Effects of compost types on Stem Girth of Sesame

Table 4.3 shows the effect compost types on stem girth of sesame. At 8 weeks, variety 1 that receive NPK had the highest value (3.7cm) which was not significantly different from variety 1 that receive (*Tithonia diversifolia*) but significantly different from all other treatment regardless of the variety with the least value (2.0cm) obtained from variety 2 that receive no fertilizer. At 10 weeks, variety 1 that receive NPK had the highest value (3.9cm) which was not significantly different from variety 1 that receive (*Tithonia diversifolia*) but significantly different from all other treatment regardless of the variety with the least value (1.6cm) obtained from variety 2 that receive no fertilizer. At 12 weeks, variety 1 that receive NPK had the highest (3.9cm) which was not significantly different from variety 1 that receive (*Tithonia diversifolia*) but significantly different from all other treatment regardless of the variety with the lowest value (1.9cm) obtained from variety 2 that receive no fertilizer. At 14 weeks, variety 1 that receive NPK had the highest (3.8cm) which was not significantly different from variety 1 that receive (*Tithonia diversifolia*) but significantly different from all other treatment regardless of the variety with the lowest value (1.3cm) obtained from variety 2 that receive no fertilizer.

Effects of compost types on Number of leaves of Sesame

Table 4.4 shows the effects of compost types on number of leaves of sesame. At 6 weeks, variety 1 which receive (NPK and *Tithonia diversifolia*) had the highest value (54.0cm) which was not significantly different from variety 1 that receive (*Martynia annua*) but significantly different from all other treatment regardless of the variety with the least value (20.0cm) obtained from variety 2 that receive no fertilizer. At 8 weeks, variety 1 which receive (NPK and *Tithonia diversifolia*) had the highest value (58.0cm) and was not significantly different from variety 1 that receive (*Martynia annua*) but significantly different from all other treatment regardless of the variety with the least value (25.0cm) obtained from variety 2 that receive no fertilizer. At 10 weeks, variety 1 that receive NPK had the highest value (54.0cm) which was not significantly different from variety 1 that receive (*Martynia annua*) and (*Tithonia diversifolia*) but significantly different from all other treatment irrespective of the variety and the least value (21.0 cm) was obtained from variety 2 that did not collect any fertilizer. At 12 weeks, variety 1 that receive NPK had the highest value (50.1cm) which was not significantly different from variety 1 that receive (*Tithonia diversifolia*) but significantly different from all other treatment irrespective of the variety and the least value (17.0 cm) was obtained from the control.

4.1: Physical and chemical Analysis of the soil sample used

Soil characteristics	Values
pH (H_20)	6.12
Organic Carbon (gkg^{-1})	3.26
Total N (gkg^{-1})	0.18
Available P ($mgkg^{-1}$)	5.20
Fe ($mgkg^{-1}$)	11.84
Cu ($mgkg^{-1}$)	2.86
Zn ($mgkg^{-1}$)	2.84
Exchangeable K ($cmolkg^{-1}$)	0.30
Exchangeable Na ($cmolkg^{-1}$)	0.24
Exchangeable Ca ($cmolkg^{-1}$)	24.10
Exchangeable Mg ($cmolkg^{-1}$)	3.25
Sand (gkg^{-1})	800.8
Silt (gkg^{-1})	90.2
Clay (gkg^{-1})	109
Textural class	sandy loam

4.2 Effects of compost types on Plant Height of Sesame

Treatment	8	10	12	14
V1T0	54.1e	58.6f	53.1f	47.6g
V1T1	94.3a	99.6a	93.8a	88.4a
V1T2	84.1b	89.6b	83.7b	78.6b
V1T3	75.2c	79.7c	73.5c	68c
V1T4	69.2cd	74.1cd	68.5cd	63.8cd
V1T5	82.9b	89.5b	83.8b	78.6b
V2T0	53.9e	58.8f	53.5f	48.9fg
V2T1	58.2e	65.7ef	59.9ef	54.8ef
V2T2	65.8d	70.5de	64.5de	59.2de
V2T3	66.6d	70.6de	64.7de	59.3de
V2T4	67.1d	71.3de	64.9de	59.4de
V2T5	61.9de	67.9de	61.9de	56.5e

Means followed by the same letter are not significantly different using analysis of variance (Anova). T0 (control), T1 (NPK), T2 (Martynia annua), T3 (Chromoleana), T4 (Gliricida), T5 (Tithonia)

4.3 Effects of compost types on stem girth of Sesame

Treatment	8	10	12	14
V1T0	2.0c	2.0c	2.0c	1.7de
V1T1	3.7a	3.9a	3.9a	3.8a
V1T2	2.8bc	2.7bc	3.1b	3.2b
V1T3	1.9de	2.6cd	2.1c	2.6cd
V1T4	1.8de	2.1c	2.5de	2.5de
V1T5	3.4ab	3.5a	3.8a	3.6a
V2T0	2.2h	1.6h	1.9h	1.3g
V2T1	2.5cd	1.8h	2.5cd	1.7fg
V2T2	2.0c	2.0c	1.7fg	1.5fg
V2T3	2.6gh	2.6gh	2.3gh	1.4g
V2T4	2.6gh	2.6gh	2.4de	1.6g
V2T5	2.4ef	2.5ef	2.4de	1.5ef

Means followed by the same letter are not significantly different using analysis of variance (Anova). T0 (control), T1 (NPK), T2 (Martynia annua), T3 (Chromoleana), T4 (Gliricida), T5 (Tithonia).

4.4 Effects of compost types on number of leaves of Sesame

Treatment	8	10	12	14
V1T0	42.0bcde	46.0bcde	42.0bcd	38.0cd
V1T1	54.0a	58.0a	54.0a	50.1a
V1T2	48.0ab	52.7ab	48.0ab	43.0bc
V1T3	44.0bcd	49.0bc	44.0bc	40.0cd
V1T4	45.0bc	50.0bc	45.0bc	41.0cd
V1T5	54.0a	58.0a	53.7a	49.0ab
V2T0	20.0f	25.0f	21.0e	17.0f
V2T1	45.0bc	51.0bc	46.0bc	41.0cd
V2T2	40.0cde	44.0cde	39.0cd	35.0de
V2T3	37.0de	43.0de	38.0cd	34.0de
V2T4	35.0e	40.0e	36.0d	30.0e
V2T5	43.3bcd	48.0bcd	43.0bcd	38.0cd

Means followed by the same letter are not significantly different using analysis of variance (Anova). T0 (control), T1 (NPK), T2 (Martynia annua), T3 (Chromoleana), T4 (Gliricida), T5 (Tithonia).

Effects of compost types on the yield parameters of Sesame

Shoot Fresh Weight

At Shoot fresh weight, variety 1 that receive NPK had the highest value (236.7g/plant) which was significantly different from all other treatment irrespective of the variety with the lowest value (44.7g/plant) obtained from variety 2 that did not receive any fertilizer.

Shoot Dry Weight

Concerning Shoot dry weight, variety 1 that receive NPK had the highest value (68.4g /plant) which was not significantly different across all the treatment tested at variety 1 except Variety 1 that receive Gliricidia compost but significantly different from other treatment tested at variety 2 with the minimum value (8.7g/plant) obtained from variety 2 that receive no fertilizer

Seed Yield Weight

Variety 1 that receive NPK had the highest value (12.5g/plant) which was significantly different from all other treatment regardless of the variety with the least value (2.1g/plant) obtained from variety 2 that receive no fertilizer.

Number of Capsules

Variety 1 that receive NPK had the highest value (100.7g/plant) and was not significantly different from variety 1 that receive (*Martynia annua* and *Tithonia diversifolia*) but significantly different from all other treatment irrespective of the varieties and the lowest value (37.0g/plant) was recorded from variety 1 that receive no fertilizer.

Effect of selected compost types on nutrient uptake (g/plant) of Sesame.

Nutrient uptake was significantly ($p \leq 0.05$) improved by application of organic fertilizer especially Nitrogen (66.9g/kg), Phosphorus (8.4g/kg) and Potassium (36.7g/kg).

4.5 Effect of selected compost types on yield parameters (g/plant) of Sesame.

Treatment	SFW(g/plant)	SDW(g/plant)	Number of Capsules(g/plant)	Seed Weight(g/plant)
V1T0	89.7c	35.8c	37.0e	4.2e
V1T1	236.7a	68.4a	100.7a	12.5a
V1T2	165.0b	56.9ab	94.0ab	9.9b
V1T3	146.3b	46.6bc	72.7cd	8.9bc
V1T4	170.3b	59.9ab	67.0d	7.3cd
V1T5	163.3b	63.4ab	92.7ab	10.3b
V2T0	44.7c	8.7d	45.3e	2.1f
V2T1	75.7c	21.1d	83.7bc	8.8bc
V2T2	70.0c	16.6d	72.0cd	6.3d
V2T3	66.0c	14.2d	61.3d	5.9de
V2T4	63.7c	12.8d	69.3d	5.6de
V2T5	73.7c	18.9d	83.0bc	7.2cd

Means followed by the same letter are not significantly different using analysis of variance (Anova). T0 (control), T1 (NPK), T2 (Martynia annua), T3 (Chromoleana), T4 (Gliricida), T5 (Tithonia). NP (Number of pods), SW (Seed weight). SFW (Shoot fresh weight), SDW (Dry shoot weight).

4.6 Effect of selected compost types on nutrient uptake of Sesame

Treatment	N	P	K	Ca	Mg	Fe	Cu	Mn	Zn
	→		g/kg	←		→	mg/kg	←	
V1T0	15.9e	0.9e	10.4b	1.1c	0.5c	387.0a	11.8d	71.3a	29.1a
V1T1	52.4d	5.9d	36.7a	5.4b	1.9b	283.3b	15.8c	53.4bc	20.7b
V1T2	66.7ab	7.8c	35.3a	8.5a	3.6a	231.6e	23.5b	47.4d	15.2d
V1T3	60.8c	8.3ab	36.6a	8.8a	3.4a	260.9c	24.8ab	52.9bc	16.2cd
V1T4	66.9a	8.1abc	36.1a	8.5a	3.5a	238.0de	25.7a	51.5bcd	16.9c
V1T5	62.4bc	8.4a	36.5a	8.5a	3.5a	246.1d	25.4a	51.2bcd	16.5cd
V2T0	14.3e	0.9e	10.2b	0.9c	0.5c	384.3a	11.6d	72.2a	29.3a
V2T1	52.7d	6d	36.7a	5.5b	1.9b	282.7b	15.7c	54.6b	21.0b
V2T2	66.8a	7.9bc	35.9a	8.7a	3.6a	233.3e	23.4b	49.4cd	15.4d
V2T3	62.4bc	8.3ab	36.3a	8.5a	3.4a	263.7c	24.7ab	55.1b	16.5cd
V2T4	64.2abc	8.3ab	36.3a	8.7a	3.5a	237.7de	25.7a	51.5bcd	17.2c
V2T5	62.1c	8.4a	36.7a	8.5a	3.5a	246.7d	25.7a	51.2bcd	17.3c

Means followed by the same letter are not significantly different using analysis of variance (Anova). T0 (control), T1 (NPK), T2 (Martynia annua), T3 (Chromoleana), T4 (Gliricida), T5 (Tithonia).

DISCUSSION

Fertilizers play an important role in improving soil fertility by adding essential nutrients to soil which aid in adequate growth and yield of plants. This effect can be associated to the vital nutrients contained in the fertilizers which are deposited in the soil and thereby absorbed by the plants. Nitrogen is known as one of the most essential element needed to be managed under modern and sustainable crop production because of its

important roles to crop production. It is essential for the development of field crops. Insufficient N causes stunted plant growth, older leaves turn yellow. Nitrogen fertilizer is costly and harmful to the environment. Nitrogen contributes up to 50% of all the nutrient input. This makes nitrogen a key determining factor for farmer crop yield (Akanbi 2002).

In the pre-cropping soil analyses, it showed that the soil were slightly acidic and low in essential nutrient. These results are in agreement with the other earlier researchers (Babajide *et al*., 2008) who reported that the soil in the study area are slightly acidic and also they are grossly insufficient in nutrient to support completion of the vegetative and reproductive stages of crops. The result from the study showed that the growth of sesame on growth parameters such as plant heights, number of leaves, number of branches and stem girth from all the varieties tested responded positively to both organic and inorganic fertilizers material except the control. The height of the plant is an important growth character directly linked with it productive potential of plants. An optimum plant height is claimed to be positively corrected with productivity of plants (Saeed *et al.,* 2007).

NPK fertilizer applied at 300kg/ha gave the highest mean value across all the yield parameters and was not significantly different from Martynia and Tithonia compost.

RECOMMENDATION AND CONCLUSION

The study was examined to evaluate the performance of different sesame varieties under composted *Martynia annua* and other selected composts. All treatments applied enhanced the growth and yield parameters of sesame. The application of Zero fertilizer had the least value across all the parameters measured. The two sesame varieties responded well to improved soil nutrition from different organic fertilizers tested. *Martynia annua* and *Tithonia diversifolia* biomass significantly enhanced sesame growth and yield, compared to other treatments tested. The growth and yield of sesame responded to different fertilizer types. The most suitable fertilizer that supplies adequate nutrients for optimum performance of sesame is *Martynia annua* and *Tithonia diversifolia.* Therefore, *Martynia annua* at 4tons/ha and *Tithonia diversifolia* at 4tons/ha is thereby recommended for improved performance of sesame especially E8 varieties so as to alleviate chemical loads on the soil.

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