



PERFORMANCE OF VARIETIES OF SESAME (*SESAMUM INDICUM* L.) GROWN IN SUDAN SAVANNA OF NIGERIA

A. K. MOHAMMED¹, J.A BASSI¹, I. ALIYU², AND A.K HASSAN²

^{1&2}Department of Agric Technology, Federal Polytechnic Monguno, Nigeria.

^{1&2}Department of Crop Production, University of Maiduguri, Nigeria

Corresponding Author: abbakakamohammed22@gmail.com

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Abstract

A field trial was conducted during the 2024 rainy season at two locations: Teaching and Research Farm, University of Maiduguri (latitude 11.47°N, longitude 12°, 16.464°E) and the Teaching and Research Farm, Borno State University (latitude 11.83°N, longitude 12.99°N and altitude 315m above sea level), in the Sudan Savanna region of Nigeria. The study aimed to evaluate the performance of different sesame varieties. The experiment was laid out in a Completely Randomized Block Design (CRBD) with three replications. The treatment consisted of four sesame varieties: 530-6-1, Type 4, Ex-Sudan, and Kenena 4. The parameters assessed included plant height per plant, number of leaves per plant, number of branches per plant, days to 50% flowering, 1000 seed weight, and yield per hectare. Data collected were analyzed using analysis of variance (ANOVA) with Statistix version 10.0, and mean comparisons were conducted using the Least Significant Differences (LSD) and Duncan Multiple Range Test (DMRT) at a 5% probability level. The findings revealed that variety 530-6-1 exhibited superior plant height, number of leaves, and number of branches per plant, whereas Kenena 4 had the lowest values among the varieties. Additionally, 530-6-1 and Type 4 took longer days to reach 50% flowering. Yield related parameters were significantly higher for varieties 530-6-1 and Type 4 in both

locations. Therefore, it was concluded that cultivating either 530-6-1 or Type 4 would enhance sesame productivity and optimize yield.

Keywords: Growth, Sesame, Varieties and Yield

INTRODUCTION

Sesame (*Sesamum indicum* L.) popularly known as beniseed in Nigeria (Alegbejo *et al.*, 2003) belong to the family Pedaliaceae (Purseglove, 1969). The crop has early origins in East Africa and India (Bedigian, 2003). Today, Sudan is the world's largest producer of sesame followed by India, Myanmar, Nigeria, and Tanzania (FAOSTAT, 2022). In Nigeria, the major producing states are Jigawa, Nasarawa, Benue and Sokoto. Other sesame cultivating states include Yobe, Kano, Katsina, Kogi, Gombe and Plateau states (FAOSTAT, 2022). Nigeria's current annual export is estimated at 165 million USD and the country is the primary supplier of sesame seed to Japan. Japan being the world's largest importer (Anon, 2023). Sesame seed, popularly called "big treasure in small capsule" is currently ranked as second best to cocoa in terms of export volume and value (Anon, 2004). The crop is primarily grown for its seed (Burden, 2005) which contain 50-60% edible oil and 42% protein, rich in tryptophan and methionine, an excellent feed for animals (Hatam and Abbasi, 1994). The low production is because of variety of reasons like low inputs and poor management (e.g. low or non-fertilization, irrigation, pest control etc.), occurrence of biotic and abiotic stresses and more importantly, a scarcity of an appropriate breeding program (Pham *et al.*, 2010). The crop is grown under a variety of environments, which probably affects its performance. The environmental factors that influence sesame productivity include climatic factors like temperature, rainfall and day length, soil types and management practices like plant densities, time of sowing, irrigation, fertilizers, herbicides and fungicides, some of which may partially mitigate others (Geleta *et al.*, 2002). Nowadays, many sesame varieties are ready within the world market. These are including local varieties and commercial varieties. However, the cultivation of improved varieties is restricted in Nigeria due to insufficient varietal

information. The farmers still grow local varieties with low yields. Therefore, adequate knowledge of production technology also nearly as good quality cultivars will help the farmers to enhance yield or increase sesame production in Nigeria. Since sesame may be a vital product for oil, bakery, tahini (sesame paste), pharmaceutical and many other uses within the world, it's necessary to introduce new improved varieties which will help the Nigeria sesame from low farm yield level to the level of upper yield performance. The objective of the work is to come up with variety or varieties that will perform well in the area.

MATERIALS AND METHODS

The study was conducted during 2024 rainy season at the Teaching and Research Farm, Faculty of Agriculture, University of Maiduguri, Borno State (Latitude 11.47°N, Longitude 12°, 16.464°E and an altitude of 345 m above sea level) and Teaching and Research Farm, Borno State University (Latitude 11.83°N and Longitude 12.99°N and altitude 315 m above sea level), in the northern fringes of the Sudan savanna belt of Nigeria. Four varieties of sesame obtained from the National Cereal Research Institute (NCRI), Badeggi, Nigeria, The experiment was laid out in a randomized complete block design (RCBD) with three replicate, each plot measured 4m² plot, with 0.5m within plots and 1m between blocks. Each contained four plots, resulting total of 12 plots for the study. With spacing of 75 x 20cm was adopted for the research. Agronomic practice such as weeding was done manually at 2 and 6 weeks after planting to ensure weed free plots, all the data were collected within the net plot where a total of 5 plants were tagged for data collection within each net plot. The parameters recorded were plant height per plant, number of leaves per plant, number of branches per plant, days of 50% flowering, 1000 seed weight and grain yield per hectare was recorded. All data collected were subjected to analysis of variance (ANOVA), while least significant difference (LSD) at 5% level of probability was used in separating the means.

Effects of sesame varieties on plant height per plant

Table 1 shows the performance of different sesame varieties on plant height at 3, 6, and 9 WAS, at Unimaid, Bosu, and combined mean during 2024 raining season. The results revealed no significant differences in plant height among the varieties at 3 WAS at both locations and in the combined mean. However, at 6 and 9 WAS, the variety 530-6-1 consistently produced significantly taller plants compared to the other varieties, followed by Type 4. In contrast, Kenena 4 produced significantly shorter plants at Unimaid, Bosu and combined mean.

Effects of sesame varieties on number of leaves per plant

Table 2 present the performance of different sesame varieties on number of leaves per plant at 3, 6, and 9 WAS, at Unimaid, Bosu combined mean during 2024 raining season. At Unimaid, sesame varieties showed no significant differences in the number of leaves per plant at 3 WAS. However, at 6 WAS, the Ex-Sudan variety significantly produced a higher number of leaves per plant compared to Type 4, 530-6-1, and Kenena 4, with Kenena 4 having the fewest leaves. At 9 WAS, the 530-6-1 variety recorded the highest number of leaves per plant, while Kenena 4 continued to have the lowest. In Bosu, there was also no significant difference in the number of leaves per plant at 3 WAS among the sesame varieties. At 6 WAS, Ex-Sudan produced a significantly greater number of leaves per plant compared to Type 4, while Kenena 4 had the fewest leaves. At 9 WAS, Type 4 recorded significantly higher number of leaves, while Kenena 4 produced the lowest number of leaves per plant. For the combined mean, Kenena 4 showed the highest number of leaves per plant compared to the other treatments, although this difference was not statistically significant when compared with Ex-Sudan and 530-6-1. At 3 WAS, Type 4 had the lower leaves per plant. At 6 WAS, Ex-Sudan and Kenena 4 significantly outperformed the other varieties in leaf production, while Kenena 4 had the lowest number of leaves in the combined mean. At 9 WAS, Type 4 significantly produced more leaves per plant than the other treatments.

Effects of sesame varieties on number of branches per plant and days to 50% flowering

Table 3 indicate the performance of different sesame varieties on number of branches per plant at 3, 6, and 9 WAS, at Unimaid, Bosu combined mean during 2024 raining season. At 3 WAS, Type 4 consistently produced the highest number of branches per plant compared to other varieties at both locations and in the combined mean while Kenena 4 produced the lower branches. At 9 WAS, the varieties 530-6-1, Type 4, and Kenena 4 significantly produced more branches compared to Ex-Sudan, which had the lowest number of branches at both locations and in the combined mean. Additionally, the performance of different sesame varieties on days to 50% flowering are shown in Table 3. The results reveal in Unimaid, the variety 530-6-1 took longer days to reach 50% flowering, while Ex-Sudan and Kenena 4 required significantly fewer days compared to 530-6-1 and Type 4. In Bosu and the combined mean, Ex-Sudan and Kenena 4 consistently reached 50% flowering earlier than 530-6-1 and Type 4.

Effects of Sesame Varieties on 1000 Seed Weight and Grain Yield per hectare

Table 4 present the performance of different sesame varieties on 1000 seed weight at Unimaid, Bosu and combined mean during 2024 raining season. The results indicate significant differences in 1000-seed weight among the varieties at both locations and in the combined mean. At Unimaid, the varieties 530-6-1 and Type 4 significantly produced the heaviest 1000-seed weight, while Ex-Sudan produced the lightest, which was statistically similar to Kenena 4. In contrast, no significant differences were observed among the varieties at the Bosu location. For the combined mean, 530-6-1 and Type 4 continued to produce significantly heavier 1000-seed weights, while Ex-Sudan yielded significantly lighter seeds. Furthermore, the performance of different sesame varieties on grain yield per hectare are shown in Table 4. The findings reveal significant differences in grain yield among the varieties at both locations and in the combined mean. At Unimaid, the varieties 530-6-1 and Type 4 produced significantly

higher grain yields, while Ex-Sudan and Kenena 4 had significantly lower yields. At the Bosu location, 530-6-1 significantly outperformed other varieties in terms of grain yield, while Ex-Sudan and Kenena 4 had the lowest yields. For the combined mean, 530-6-1 and Type 4 consistently produced significantly higher yields, while Ex-Sudan and Kenena 4 recorded lower grain yields compared to other treatments.

DISCUSSION

Effect of Sesame Variety on Growth and Development

The sesame variety 530-6-1 exhibited significantly greater plant height and a higher number of leaves, likely due to factors such as soil conditions, environmental influences, and genetic traits. This aligns with the findings of Anon (2004) and Mulkey *et al.*, (2017), who observed similar trends in leaf count among varieties, with Type 4 having the highest number, followed by 530-6-1. The genetic composition of the plant plays a crucial role in intercepting solar radiation for photosynthesis, as noted by Day *et al.*, (2002). Georgiev (2000) also supports this view, stating that environmental factors, agronomic practices, and genetic makeup significantly impact plant floral structures, thereby influencing crop yield. Type 4 had the highest number of branches, followed by 530-6-1, likely due to a combination of environmental conditions, genetic traits, and farming practices. This is consistent with Magashi and Yusuf (2013), who reported that vegetative growth and branch formation are mainly influenced by environmental factors and genetic characteristics. Additionally, the varieties Kenena 4 and Ex-Sudan matured early, within 90-112 days, leading to earlier flowering, as reported by NCRI (2017).

Effect of Sesame Variety on Yield and Development

Sesame varieties 530-6-1 and Type 4 exhibited the highest 1000-seed weight among the evaluated sesame varieties, which can be attributed to their genetic characteristics. Yakubu *et al.*, (2016) reported that genetic variation among sesame varieties plays a significant role in determining seed size and weight. Similarly, Udom *et al.*, (2018) found that improved varieties developed significantly higher 1000-seed

weights. Environmental factors, including soil fertility and moisture availability during the seed-filling phase, also have a substantial impact on seed weight (Magashi and Yusuf, 2013). Moreover, optimal agronomic practices, such as appropriate fertilization and planting density, have been shown to enhance 1000-seed weight (Mulkey *et al.*, 2017). Furthermore, sesame varieties 530-6-1 and Type 4 also achieved remarkably higher grain yields compared to other varieties, most likely due to their genetic attributes. According to Udom *et al.*, (2018), varieties that accumulate greater biomass and efficiently utilize nutrients generally demonstrate improved yield performance. Environmental factors, such as soil fertility, temperature, and moisture availability, are also crucial determinants of grain yield. Magashi and Yusuf (2013) emphasized that favorable soil conditions and climatic factors significantly enhance the yield potential of high-performing varieties. Additionally, Mulkey *et al.*, (2017) revealed the importance of selecting varieties that are well adapted to local environmental conditions to maximize grain yield.

CONCLUSION

In the context of this study, it can be concluded that the 530-6-1 or Type 4 varieties was appropriate for higher productivity of sesame, leading to optimum yield.

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Table 1: Performance of sesame varieties on plant height per plant at 3, 6 and 9WAS at Unimaid, Bosu and combined mean during 2024 raining season.

	UNIMAID			BOSU			COMBINED		
MEAN									
Treatment	3	6	9	3	6	9	3	6	9
530-6-1	9.02 ^a	50.64 ^a	158.76 ^a	6.73 ^a	47.65 ^a	152.76 ^a	7.87 ^a	49.15 ^a	155.76 ^a
TYPE 4	9.80 ^a	44.40 ^b	150.18 ^b	7.57 ^a	41.40 ^b	144.18 ^b	8.68 ^a	42.90 ^b	147.18 ^b
EX	—	9.13 ^a	45.45 ^b	138.41 ^c	6.87 ^a	44.45 ^b	132.41 ^c	8.00 ^a	44.95 ^b
135.41 ^c									
SUDAN									
KENENA 4	9.48 ^a	40.38 ^c	136.65 ^c	7.25 ^a	37.47 ^c	130.65 ^c	8.36 ^a	38.92 ^c	133.65 ^c
SE(±)	0.789	1.769	3.975	0.746	1.770	3.975	0.597	1.175	2.646

Mean follows by the same letter(s) in a column are not significantly different according to Duncan's Multiple Range Test (DMRT) at 5% level of probability.

Table 2: Performance of sesame varieties on number of leaves per plant at 3, 6 and 9WAS at Unimaid, Bosu and combined mean during 2024 raining season.

	UNIMAID			BOSU			COMBINED MEAN		
Treatment	3	6	9	3	6	9	3	6	9
Sesame varieties									
530-6-1	5.56 ^a	26.43 ^a	49.44 ^b	6.85 ^a	23.07 ^a	46.28 ^b	6.20 ^{ab}	24.75 ^a	47.85 ^b
TYPE 4	4.79 ^a	24.45 ^{ab}	48.63 ^b	6.16 ^a	21.13 ^{ab}	54.57 ^a	5.47 ^b	22.79 ^a	56.08 ^a
Ex-Sudan	5.42 ^a	22.42 ^b	52.70 ^a	6.71 ^a	18.91 ^b	41.70 ^c	6.08 ^{ab}	20.67 ^b	43.34 ^c
KENENA 4	5.68 ^a	17.78 ^c	43.69 ^c	6.98 ^a	14.45 ^c	39.42 ^c	6.33 ^a	16.12 ^c	40.94 ^d
SE(±)	0.602	1.347	1.494	0.575	1.359	1.505	0.422	0.999	1.057

Mean follows by the same letter(s) in a column are not significantly different according to Duncan's Multiple Range Test (DMRT) at 5% level of probability.

Table 3: Performance of sesame varieties on number of branches per plant at 3, 6 and 9 WAS and Days to 50% flowering at Unimaid, Bosu and combined mean during 2024 raining season

Treatment	Number of branches per plant						Days to 50% flowering		
	Unimaid		Bosu		Combined		Unimaid	Bosu	Combined
	6	9	6	9	6	9			
560-1-3	11.93 ^c	16.77 ^a	9.42 ^c	14.56 ^a	10.67 ^c	15.67 ^a	68.33 ^a	67.33 ^a	67.83 ^a
TYPE 4	16.05 ^a	16.59 ^a	13.66 ^a	14.18 ^a	14.85 ^a	15.38 ^a	66.17 ^b	65.17 ^b	65.67 ^b
EX-SUDAN	13.31 ^b	13.33 ^b	11.03 ^b	10.71 ^b	12.16 ^b	12.02 ^b	60.58 ^c	61.58 ^c	61.08 ^c
KENENA 4	11.30 ^c	15.90 ^a	9.05 ^c	13.62 ^a	10.17 ^c	14.75 ^a	61.75 ^d	60.92 ^c	61.33 ^c
SE(±)	0.575	1.070	0.569	1.034	0.522	0.757	0.392	0.360	0.281

Mean follows by the same letter(s) in a column are not significantly different according to Duncan's Multiple Range Test (DMRT) at 5% level of probability.

Table 4: Performance of sesame varieties on Grain Yield per hectare and 1000 Seed Weight Unimaid, Bosu and combined mean during 2024 raining season.

Treatment	Grain Yield			1000 Seed Weight		
	Unimaid	Bosu	Combined	Unimaid	Bosu	Combined
530-6-1	635.87 ^a	725.83 ^a	680.85 ^a	4.29 ^a	2.99 ^a	3.64 ^a
TYPE 4	617.60 ^a	683.00 ^b	650.30 ^a	4.13 ^a	3.26 ^a	3.69 ^a
EX- SUDAN	461.53 ^b	487.92 ^c	474.72 ^b	3.23 ^b	3.20 ^a	3.22 ^b
KENENA 4	480.13 ^b	511.17 ^c	495.65 ^b	3.61 ^b	3.20 ^a	3.30 ^b
SE(±)	35.235	44.04	26.296	0.248	0.161	0.185

Mean follows by the same letter(s) in a column are not significantly different according to Duncan's Multiple Range Test (DMRT) at 5% level of probability.