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Assessment of Growth Parameters of Sesame and Cowpea Varieties under Intercropping System in the Sudan Savanna Region of Nigeria

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Abstract

A field study was conducted during the 2024 rainy season at two locations in the Sudan Savanna of Nigeria to evaluate the growth performance of sesame and cowpea varieties under intercropping systems. The experiment was laid out in a split-plot design with three replications. Four sesame varieties (530-6-1, TYPE-4, EX-SUDAN, KENENA 4) and four cowpea varieties (FUAMPEA 1, FUAMPEA 4, SAMPEA 14, SAMPEA 20-T) were used. Growth parameters such as plant height, number of leaves, number of branches, and crop growth rate were evaluated at 3, 6, and 9 weeks after sowing (WAS). Results indicated that sesame variety had a significant ($p<0.05$) main effect on all measured growth parameters. Variety 530-6-1 consistently indicated highest performance, achieving the greatest plant height (155.76 cm) and the highest crop growth rate (13.83 g/week) at 9 WAS. TYPE 4 exhibited the highest number of branches (14.85). The cowpea variety also shows a significant effect, with FUAMPEA 1 often associated with the tallest sesame plants. The interaction between sesame and cowpea varieties was largely non-significant for most parameters. For cowpea, FUAMPEA 1 consistently produced taller plants with more leaves, while SAMPEA 20-T showed a higher number of branches. The study concludes that the choice of variety is a primary determinant of growth in this intercropping system, with sesame 530-6-1 and cowpea FUAMPEA 1 identified as the most vigorous varieties. The lack of consistent significant interaction simplifies recommendations for farmers, as these varieties perform vigorous with a range of intercropping partners.

Keywords: Intercropping, Sesame, Cowpea, Growth, Sudan Savanna.

Introduction

Intercropping, the practice of cultivating two or more crop species simultaneously on the same piece of land, is a cornerstone of sustainable agriculture, particularly in resource constrained environments (Agegnehu *et al*., 2017). This system offers enhanced land use efficiency, improved soil health, and greater yield stability compared to sole cropping (Brooker *et al*., 2015). In the Sudan Savanna region of Nigeria, where agricultural production is hampered by erratic rainfall and poor soil fertility, intercropping presents a viable strategy for sustainable intensification (Adetiloye *et al*., 2021). 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). Cowpea, (*Vigna unguiculata* (L.) Walp), also popularly called "beans" in Nigeria is a legume of vital importance to the livelihood of millions of people in West and Central Africa. It provides nutritious grain and less expensive source of protein for both rural and urban consumers (Inaizumi *et al*., 1999). It is estimated that cowpea supplies 40% of the daily protein requirements to most people in Nigeria (Muleba *et al.,* 1997).Cowpea is a complementary legume, valued for its nutritional grains and its ability to fix atmospheric nitrogen, thereby improving soil fertility (Singh, 2014). The integration of these two crops can lead to synergistic interactions, optimizing the use of light, water, and nutrients. However, the success of an intercropping system is highly dependent on the compatibility of the component species and their specific varieties. The growth dynamics and competitive abilities of different genotypes can significantly influence the overall productivity of the system. While the agronomic benefits of legume-cereal intercropping are well-documented, there is a scarcity of information on the specific growth responses of different sesame and cowpea varieties when intercropped under the unique agro-ecological conditions of the Sudan Savanna. Therefore, this study was designed to investigate the effects of intercropping on the growth parameters of selected sesame and cowpea varieties. The findings will provide crucial insights for selecting optimal variety combinations to maximize vegetative development and resource use efficiency, forming a basis for improved yield outcomes.

Experimental Site

The experiment was conducted during the 2024 rainy season at the Teaching and Research Farm, Faculty of Agriculture, University of Maiduguri, Borno State (Latitude 11.47°N, Longitude 13.16°E, altitude 345 m) and the Teaching and Research Farm, Borno State University (Latitude 11.83°N, Longitude 12.99°E, altitude 315 m). The sites are located on the northern fringes of the Sudan savanna belt of Nigeria. The climate is characterized by a rainy season from June to September, with an average rainfall of over 500 mm, and temperatures ranging from 22°C to 45°C (Nimet, 2023).

Treatments and Experimental Design

The treatments consisted of four sesame varieties (530-6-1, TYPE-4, EX-SUDAN, KENENA 4) and four cowpea varieties (FUAMPEA 1, FUAMPEA 4, SAMPEA 14, SAMPEA 20-T). The experiment was laid out in a split-plot design replicated three times. Sesame varieties were assigned to the main plots and cowpea varieties to the sub-plots. The subplots measured 4.0 m x 4.0 m (16.0 m^2) with a 1.0 m alley between replicates and a 0.5 m pathway between plots.

Crop Management

Standard agronomic practices for sesame and cowpea cultivation in the region were followed. Land was prepared manually. Fertilizer was applied at recommended rates. Weeding was carried out manually as necessary to maintain a weed-free environment. Pest and disease control measures were implemented when needed.

Data Collection

Data on growth parameters were collected at 3, 6, and 9 Weeks after Sowing (WAS) from ten randomly selected plants per plot for both crops. The parameters measured were: Plant height (cm), Number of leaves per plant, Number of branches per plant and Crop Growth Rate (CGR; g/week)

Statistical Analysis

Data collected were subjected to a two-way Analysis of Variance (ANOVA) using the statistical software Statistix version 10.0. Differences between treatment means were separated using the Duncan Multiple Range Test (DMRT) at a 5% level of probability.

Plant Height

Sesame variety had a highly significant ($p<0.05$) effect on plant height at all growth stages and locations (Table 1). In the combined analysis, variety 530-6-1 was the tallest (155.76 cm at 9 WAS), followed by TYPE 4 (147.18 cm). KENENA 4 was the shortest (133.65 cm). Cowpea variety also significantly influenced sesame height; intercropping with FUAMPEA 1 consistently resulted in the tallest sesame plants (150.69 cm at 9 WAS), while SAMPEA 20-T resulted in the shortest (135.23 cm). The interaction between sesame and cowpea varieties was not significant, indicating that the varietal performance hierarchy for height was maintained across different intercropping partners.

Number of Leaves

The number of leaves was significantly influenced by sesame variety, particularly at later growth stages (Table 2). At 9 WAS in the combined analysis, TYPE 4 and EX-SUDAN had the highest number of leaves (56.08 and 47.85, respectively), while KENENA 4 had the lowest (40.94). A significant interaction was observed at 9 WAS (Table 3), revealing that the combination of 530-6-1 with FUAMPEA 4 produced the highest number of leaves (63.60),

whereas KENENA 4 with SAMPEA 20-T produced the lowest (27.15). This indicates that specific pairings can modulate leaf production, a key factor for photosynthetic capacity.

Number of Branches

Sesame variety significantly affected the number of branches (Table 6). TYPE 4 produced the highest number of branches (14.85 at 6 WAS), demonstrating its bushy growth habit. Cowpea variety had no significant main effect on the number of sesame branches, and no significant interaction was found, suggesting that branching in sesame is primarily a genetically controlled trait that was not markedly altered by the intercropped cowpea variety.

Crop Growth Rate (CGR)

Sesame variety had a significant effect on CGR (Table 4). Variety 530-6-1 consistently achieved the highest CGR at both 6 and 9 WAS (6.73 g/week and 13.83 g/week, respectively), underscoring its rapid biomass accumulation. The cowpea variety had no significant main effect on sesame CGR. A significant interaction was observed for CGR at 6 WAS in the combined analysis (Table 5), where 530-6-1 intercropped with FUAMPEA 1 gave the highest CGR (7.53 g/week). This suggests that while the sesame variety is the dominant factor, the choice of cowpea partner can occasionally enhance its growth rate.

Plant Height

Cowpea variety significantly influenced its own plant height (Table 7). At 9 WAS (combined), FUAMPEA 1 was the tallest (40.94 cm), while SAMPEA 20-T was the shortest (34.85 cm). The sesame variety also had a significant effect; intercropping with EX-SUDAN resulted in the tallest cowpea plants (41.27 cm), whereas TYPE 4 resulted in the shortest (31.89 cm). This indicates a competitive effect where the less vigorous sesame variety (TYPE 4) allowed for more vertical growth in cowpea, or vice versa.

Number of Leaves and Branches

Cowpea variety significantly affected the number of leaves, with FUAMPEA 1 having the most leaves (40.17 at 9 WAS) and SAMPEA varieties having the least (Table 8). For the number of branches, SAMPEA 20-T consistently produced more branches (6.99 at 6 WAS) than other varieties (Table 9). The sesame variety also showed a significant effect, with EX-SUDAN and TYPE 4 often associated with a higher number of cowpea branches.

Crop Growth Rate (CGR)

Cowpea variety had a significant main effect on CGR (Table 10). FUAMPEA 4 achieved the highest CGR at 9 WAS (10.82 g/week), indicating rapid biomass accumulation, while SAMPEA 14 had the lowest (7.40 g/week).

DISCUSSION

The clear superiority of sesame variety 530-6-1 in key growth parameters like plant height and CGR highlights its inherent genetic potential for vigorous vegetative development under the competitive conditions of intercropping. Such varietal superiority in growth attributes is often a direct consequence of genetic makeup, which dictates resource capture and utilization efficiency (Lithourgidis *et al*., 2011). Its robust growth likely allows it to compete effectively for light, a critical resource in dense intercropping systems (Zhang *et al*., 2020), a trait essential for dominance in such mixtures. The stability of varietal performance across different cowpea partners, as evidenced by the general lack of significant interaction for most parameters, is a key finding. This consistency simplifies the selection process for farmers, as the best-performing sesame varieties can be recommended with a range of cowpea varieties without expecting drastic changes in growth patterns, enhancing the practical adoption of these systems (Matusso *et al*., 2014).

For cowpea, the performance of FUAMPEA 1, which resulted in both its own strong growth and a positive effect on sesame height, suggests a potentially less competitive or even facilitative nature. This aligns with the principle that some legume varieties can improve growing conditions for intercropped companions through mechanisms like modest nutrient sharing or altered microclimate, without exerting intense competition (Brooker *et al*., 2015). Conversely, the poor vegetative performance of SAMPEA 14 across multiple parameters aligns with its previously reported poor yield performance, confirming its unsuitability for this intercropping system and environment, underscoring the importance of variety-specific selection in achieving system productivity (Gitari *et al*., 2018).

The significant interaction for sesame leaf number and CGR, though not the norm, underscores that resource complementarity and competition can be fine-tuned at the variety-specific level (Li et al., 2020). The combination of the vigorous 530-6-1 with FUAMPEA 1 appears to be a particularly synergistic pairing for promoting vegetative growth. This specific compatibility may arise from optimal niche differentiation, where the component species utilize resources in a complementary spatio temporal manner, which may contribute to the high yields reported for this combination (Yu *et al*., 2015).

CONCLUSION

The study demonstrates that growth dynamics in sesame cowpea intercropping systems are primarily governed by the genetic potential of the individual varieties.

i. Sesame variety 530-6-1 is recommended for its superior vegetative growth, particularly in plant height and crop growth rate.
ii. Cowpea variety FUAMPEA 1 is recommended as it supports strong growth in both itself and the intercropped sesame.
iii. The general lack of significant interaction for most growth parameters indicates that farmers can select the best performing varieties independently, allowing for flexible and vigorous intercropping system design.

These findings provide a physiological basis for the yield outcomes observed in parallel studies and offer farmers evidence-based options for selecting varieties to optimize the initial and mid-season growth phases in intercropping systems within the Sudan Savanna.

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Table 1: Plant height (cm) of sesame as affected by sesame and cowpea varieties at 3, 6 and 9 WAS at Unimaid, Bosu and the combined in 2024 raining season

	UNIMAID			BOSU			COMBINED		
Treatment	3	6	9	3	6	9	3	6	9
Sesame variety (SV)									
530-6-1	9.02^{a}	50.64^{a}	158.76^{a}	6.73	47.65^{a}	152.76^{a}	7.87	49.15^{a}	155.76^{a}
TYPE 4	9.80^{a}	44.40^{b}	150.18^{b}	7.57	41.40^{b}	144.18^{b}	8.68	42.90^{b}	147.18^{b}
EX – SUDAN	9.13^{a}	45.45^{b}	138.41^{c}	6.87	44.45^{b}	132.41^{c}	8.00	44.95^{b}	135.41^{c}
KENENA 4	9.48^{a}	40.38^{c}	136.65^{c}	7.25	37.47^{c}	130.65^{c}	8.36	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
Cowpea variety (CV)									
FUAMPEA 1	8.46	47.30^{a}	153.69^{a}	6.21	44.88^{a}	147.69^{a}	7.35^{b}	46.09^{a}	150.69^{a}
FUAMPEA 4	10.11	42.07^{b}	144.24^{bc}	7.86	39.57^{b}	138.24^{bc}	8.98^{a}	40.82^{b}	141.24^{b}
SAMPEA 14	9.69	48.72^{a}	147.83^{ab}	7.47	46.22^{a}	141.83^{ab}	8.58^{a}	47.47^{a}	144.83^{b}
SAMPEA 20-T	9.16	42.79^{b}	138.23^{c}	6.84	40.29^{b}	132.23^{c}	8.00^{ab}	41.54^{b}	135.23^{c}
SE(±)	0.789	1.769	3.975	0.746	1.770	3.975	0.597	1.175	2.646
Interaction									
CV x SV	NS	NS	NS	NS	NS	NS	NS	NS	NS

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, NS =Not Significant, * = Significant ($P < 0.05$), WAS = Weeks after Sowing

Table 2: Number of leaves of intercropped sesame as affected by sesame and cowpea varieties at 3, 6 and 9 WAS at Unimaid, Bosu and the combined in 2024 raining season

	UNIMAID			BOSU			COMBINED		
Treatment	3	6	9	3	6	9	3	6	9
Sesame variety (SV)									
530-6-1	5.42	22.42^{b}	52.70^{a}	6.71	18.91^{b}	41.70^{c}	6.08^{ab}	20.67^{b}	43.34^{c}
TYPE 4	4.79	24.45^{ab}	48.63^{b}	6.16	21.13^{ab}	54.57^{a}	5.47^{b}	22.79^{a}	56.08^{a}
EX – SUDAN	5.56	26.43^{a}	49.44^{b}	6.85	23.07^{a}	46.28^{b}	6.20^{ab}	24.75^{a}	47.85^{b}
KENENA 4	5.68	17.78^{c}	43.69^{c}	6.98	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
Cowpea variety (CV)									
FUAMPEA 1	5.58	21.87^{a}	44.98^{c}	6.94	18.44^{a}	49.42^{a}	6.27^{a}	20.16^{b}	51.06^{a}
FUAMPEA 4	5.17	22.16^{a}	57.59^{a}	6.43	18.77^{a}	45.73^{b}	5.79^{a}	20.47^{b}	47.18^{b}
SAMPEA 14	5.42	22.69^{a}	49.43^{b}	6.79	19.42^{a}	46.27^{b}	6.11^{a}	21.06^{ab}	47.86^{b}
SAMPEA 20-T	5.28	24.35^{a}	42.46^{c}	6.54	20.94^{a}	40.54^{c}	5.91^{a}	22.65^{a}	42.12^{c}
SE(±)	0.602	1.347	1.494	0.575	1.359	1.505	0.422	0.999	1.057
Interaction									
CV x SV	NS	NS	*	NS	NS	NS	NS	NS	*

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, NS =Not Significant, * = Significant (P < 0.05), WAS = Weeks after Sowing

Table 3: Interaction of sesame with cowpea varieties on sesame number of leaves per plant at 9 WAS at Combined mean in 2024 raining season

Sesame varieties		Cowpea varieties	UNIMAID	COMBINED
			9	9
530-6-1	×	FUAMPEA 1	45.33^{e-h}	43.60^{eh}
TYPE 4	×	FUAMPEA 1	65.10^{a}	41.43^{gh}
EX – SUDAN	×	FUAMPEA 1	57.53^{bc}	48.57^{cd}
KENENA 4	×	FUAMPEA 1	42.833^{gh}	39.75^{h}
530-6-1	×	FUAMPEA 4	42.80^{gh}	63.60^{a}
TYPE 4	×	FUAMPEA 4	62.47^{ab}	60.90
EX– SUDAN	×	FUAMPEA 4	43.63^{fgh}	49.07^{cd}
KENENA 4	×	FUAMPEA 4	45.60^{e-h}	50.68^{c}
530-6-1	×	SAMPEA14	50.27^{de}	55.85^{b}
TYPE 4	×	SAMPEA 14	50.57^{de}	42.26^{fgh}
EX– SUDAN	×	SAMPEA 14	49.00^{def}	47.42^{cde}
KENENA 4	×	SAMPEA 14	47.93^{d-g}	45.88^{def}
530-6-1	×	SAMPEA 20-T	41.50^{h}	41.18^{gh}
TYPE 4	×	SAMPEA 20-T	52.23^{cd}	44.05^{efg}
EX– SUDAN	×	SAMPEA 20-T	47.53^{d-h}	46.38^{def}
KENENA 4	×	SAMPEA 20-T	33.50^{i}	32.15^{h}
SE(±)			2.989	1.998

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, WAS = Weeks after Sowing

Table 4: Crop growth rate of sesame as affected by sesame and cowpea varieties at 3, 6 and 9 WAS at Unimaid, Bosu and the combined in 2024 raining season

Treatment	UNIMAID		BOSU		COMBINED	
	6	9	6	9	6	9
Sesame variety (SV)						
530-6-1	7.53^{a}	15.42^{a}	5.93^{a}	12.23^{a}	6.73^{a}	13.83^{a}
TYPE 4	5.99^{b}	13.89^{b}	4.39^{b}	10.69^{b}	5.19^{b}	12.29^{b}
EX – SUDAN	5.32^{b}	13.22^{b}	3.72^{b}	10.02^{b}	4.52^{b}	11.62^{b}
KENENA 4	5.37^{b}	13.27^{b}	3.77^{b}	10.07^{b}	4.57^{b}	11.67^{b}
SE(±)	0.550	0.550	0.550	0.550	0.426	0.615
Cowpea variety (CV)						
FUAMPEA 1	5.81	13.71	4.21	10.51	5.01	12.11

Treatment	UNIMAID		BOSU		COMBINED	
FUAMPEA 4	6.42	14.32	4.82	11.12	5.62	12.72
SAMPEA 14	6.37	14.27	4.77	11.07	5.56	12.67
SAMPEA 20-T	5.62	13.52	4.02	10.32	4.82	11.92
SE(±)	0.550	0.550	0.550	0.550	0.426	0.615
Interaction						
SV x CV	NS	NS	NS	NS	*	NS

Mean follows by the same letter(s) in a column significantly different according to Duncan's Multiple Range Test (DMRT) at 5% level of probability, NS =Not Significant, * = Significant ($P < 0.05$), WAS = Weeks after Sowing

Table 5: Interaction of sesame with cowpea varieties on sesame crop growth rate at combined mean in 2024 raining season

			COMBINED
Sesame Varieties		Cowpea Varieties	6
530-6-1	×	FUAMPEA 1	7.53^{a}
TYPE 4	×	FUAMPEA 1	6.20^{abc}
EX–SUDAN	×	FUAMPEA 1	6.46^{abc}
KENENA 4	×	FUAMPEA 1	6.70^{ab}
530-6-1	×	FUAMPEA 4	4.50^{def}
TYPE 4	×	FUAMPEA 4	6.30^{abc}
EX – SUDAN	×	FUAMPEA 4	6.16^{a-d}
KENENA 4	×	FUAMPEA 4	3.80^{f}
530-6-1	×	SAMPEA 14	3.66^{f}
TYPE 4	×	SAMPEA 14	4.83^{c-f}
EX – SUDAN	×	SAMPEA 14	5.86^{a-d}
KENENA 4	×	SAMPEA 14	3.70^{f}
530-6-1	×	SAMPEA 20-T	4.33^{ef}
TYPE 4	×	SAMPEA 20-T	5.13^{b-f}
EX – SUDAN	×	SAMPEA 20-T	3.76^{f}
KENENA 4	×	SAMPEA 20-T	5.07^{b-f}
SE(±)			0.854

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

Table 6: Number of branches of sesame as affected by sesame and cowpea varieties at 6 and 9 WAS at Unimaid, Bosu and the combined in 2024 raining season

	UNIMAID		BOSU		COMBINED	
Treatment	6	9	6	9	6	9
Sesame variety **(SV)**						
560-1-3	11.93^{c}	16.77	9.42^{c}	14.56^{a}	10.67^{c}	15.67^{a}
TYPE 4	16.05^{a}	16.59	13.66^{a}	14.18^{a}	14.85^{a}	15.38^{a}
EX-SUDAN	13.31^{b}	13.33	11.03^{b}	10.71^{b}	12.16^{b}	12.02^{b}
KENENA 4	11.30^{c}	15.90	9.05^{c}	13.62^{a}	10.17^{c}	14.75^{a}
SE(±)	0.575	1.070	0.569	1.034	0.522	0.757
Cowpea variety (CV)						
FUAMPEA 1	12.92	17.18	10.63	14.93	11.77	16.05
FUAMPEA 4	12.83	16.02	10.35	13.54	11.59	14.77
SAMPEA 14	13.04	14.75	10.83	12.24	11.94	13.49
SAMPEA 20-T	13.79	14.64	11.33	12.36	12.56	13.50
SE(±)	0.575	1.070	0.569	1.034	0.522	0.757
Interaction						
CV x SV	NS	NS	NS	NS	NS	NS

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

Table 7: Plant height of intercropped cowpea as affected by cowpea and sesame varieties at 3, 6 and 9 WAS at Unimaid, Bosu and the combined in 2024 raining season

	UNIMAID			BOSU			COMBINED		
TREATMENT	3	6	9	3	6	9	3	6	9
Cowpea variety (CV)									
FUAMPEA 1	13.22	27.24	41.08^{a}	11.82^{a}	24.78^{ab}	40.79^{a}	12.52^{a}	28.01^{ab}	40.94^{a}
FUAMPEA 4	12.65	28.67	40.59^{a}	10.39^{b}	27.33^{a}	35.58^{b}	11.53^{ab}	26.00^{a}	38.08^{b}
SAMPEA 14	11.27	29.47	37.74^{b}	11.54^{ab}	25.02^{ab}	29.09^{bc}	11.40^{ab}	27.25^{ab}	39.42^{a}
SAMPEA 20-T	11.36	25.91	31.28^{b}	10.23^{b}	23.69^{b}	38.42^{ab}	10.79^{b}	24.80^{b}	34.85^{bc}
SE(±)	0.751	1.941	2.422	0.679	1.591	2.449	0.564	1.487	2.003
Sesame variety (SV)									
530-6-1	13.73^{a}	24.07^{b}	38.06^{ab}	12.78^{a}	21.82^{b}	35.99^{b}	13.25^{a}	22.95^{b}	37.03^{b}
TYPE 4	11.35^{b}	29.94^{a}	33.03^{b}	10.18^{b}	27.88^{a}	30.76^{c}	10.77^{b}	28.91^{a}	31.89^{c}
EX-SUDAN	11.87^{ab}	33.64^{a}	41.46^{a}	10.67^{b}	29.65^{a}	41.08^{a}	11.27^{b}	31.65^{a}	41.27^{a}
KENENA 4	11.55^{b}	23.64^{b}	38.14^{ab}	10.33^{b}	21.46^{b}	36.03^{b}	10.94^{b}	22.55^{b}	37.08^{b}
SE(±)	0.751	1.941	2.422	0.679	1.591	2.449	0.564	1.487	2.003
Interaction									
CV x SV	NS	NS	NS	NS	NS	NS	NS	NS	NS

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, NS =Not Significant, * = Significant ($P < 0.05$), WAS = Weeks after Sowing

Table 8: Number of leaves of intercropped cowpea as affected by sesame and cowpea varieties at 3, 6 and 9 WAS at Unimaid, Bosu and the Combined in 2024 raining season.

	UNIMAID			BOSU			COMBINED		
Treat8ment	3	6	9	3	6	9	3	6	9
Cowpea variety (CV)									
FUAMPEA 1	10.77	23.87^{a}	39.61^{a}	11.82	25.26^{a}	40.75^{a}	11.29	24.57^{a}	40.17^{a}
FUAMPEA 4	10.32	19.66^{b}	34.05^{ab}	11.25	20.57^{b}	35.05^{ab}	10.78	20.12^{b}	34.55^{b}
SAMPEA 14	11.22	20.91^{b}	28.08^{b}	12.38	20.18^{b}	30.15^{b}	11.80	20.55^{b}	29.12^{c}
SAMPEA 20-T	10.42	19.14^{ab}	29.17^{b}	11.39	21.91^{b}	29.20^{b}	10.90	20.53^{b}	29.18^{c}
SE(±)	0.867	1.290	3.045	0.898	1.305	3.075	0.572	0.948	1.963
Sesame variety (SV)									
530-6-1	9.55	18.53^{b}	32.10	10.66	19.61^{b}	33.12^{a}	10.11^{b}	19.06^{b}	32.60^{bc}
TYPE 4	10.85	20.95^{ab}	28.83	11.97	21.92^{ab}	29.97^{ab}	11.42^{a}	21.44^{a}	36.66^{a}
EX-SUDAN	10.71	22.49^{a}	36.14	11.70	23.51^{a}	37.19^{ab}	11.20^{ab}	23.00^{a}	29.40^{c}
KENENA 4	11.60	21.63^{ab}	33.85	12.50	22.90^{ab}	34.88^{b}	12.05^{a}	22.26^{a}	34.37^{ab}
SE(±)	0.867	1.290	3.045	0.898	1.305	3.075	0.572	0.948	1.963
Interaction									
CV x SV	NS	NS	NS	NS	NS	NS	NS	NS	NS

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, NS =Not Significant, * = Si1gnificant ($P < 0.05$), WAS = Week after Sowing

Table 9: Number of branches of intercropped cowpea as affected by cowpea and sesame varieties at 3, 6 and 9 WAS at Unimaid, Bosu and the combined in 2024 raining season

	UNIMAID		BOSU		COMBINED	
Treatment	6	9	6	9	6	9
Cowpea variety(SV)						
FUAMPEA 1	5.75^{b}	10.59^{a}	4.61^{b}	8.33^{bc}	5.18^{c}	9.46^{b}
FUAMPEA 4	6.63^{ab}	11.26^{a}	5.41^{ab}	10.37^{a}	6.01^{b}	10.82^{a}
SAMPEA 14	5.69^{b}	7.51^{b}	4.45^{b}	7.30^{c}	5.07^{c}	7.40^{c}
SAMPEA 20-T	7.57^{a}	10.33^{a}	6.42^{a}	9.54^{ab}	6.99^{a}	9.94^{b}
SE(±)	0.555	0.690	0.556	0.710	0.396	0.541
Sesame variety **(SV)**						
530-1-3	6.53^{a}	9.53^{b}	5.25^{b}	8.45^{b}	5.89^{b}	8.98^{b}
TYPE 4	7.39^{a}	9.13^{b}	6.23^{ab}	8.05^{b}	6.81^{a}	8.59^{b}
EX-SUDAN	7.45^{a}	11.34^{a}	6.44^{a}	10.45^{a}	6.95^{a}	10.89^{a}
KENENA 4	4.28^{b}	9.71^{b}	2.97^{c}	8.59^{b}	3.63^{c}	9.15^{b}
SE(±)	0.555	0.690	0.556	0.710	0.396	0.541
Interaction						
CV x SV	NS	NS	NS	NS	NS	NS

Mean follows by the same letter(s) in a column significantly different according to Duncan's Multiple Range Test (DMRT) at 5% level of probability, NS =Not Significant, * = Significant ($P < 0.05$), WAS = Weeks after Sowing

Table 10: Crop growth rate of intercropped cowpea as affected by cowpea and sesame varieties at 3, 6 and 9 WAS at Unimaid, Bosu and the combined in 2024 raining season

Treatment	UNIMAID		BOSU		COMBINED	
	6	9	6	9	6	9
Cowpea variety (CV)						
FUAMPEA 1	0.10	0.88^{b}	0.09^{b}	0.78^{b}	0.10^{ab}	0.83^{b}
FUAMPEA 4	0.09	1.02^{a}	0.13^{a}	0.92^{a}	0.09^{b}	0.97^{a}
SAMPEA 14	0.09	0.88^{b}	0.10^{b}	0.78^{b}	0.11^{a}	0.83^{b}
SAMPEA 20-T	0.08	0.83^{b}	0.10^{b}	0.73^{b}	0.09^{b}	0.78^{c}
SE(±)	0.001	0.026	0.018	0.013	0.007	0.023
Sesame variety (SV)						
530-6-1	0.09	0.89	0.11	0.79	0.10	0.84
TYPE 4	0.09	0.92	0.12	0.82	0.09	0.87
EX-SUDAN	0.09	0.91	0.11	0.81	0.10	0.86
KENENA 4	0.09	0.89	0.11	0.79	0.09	0.85
SE(±)	0.001	0.026	0.018	0.013	0.007	0.023
Interaction						
CV x SV	NS	NS	NS	NS	*	NS

Mean follows by the same letter(s) in a column significantly different according to Duncan's Multiple Range Test (DMRT) at 5% level of probability, * = Significant ($P < 0.05$), WAS = Weeks after Sowing

Table 11: Interaction of cowpea with sesame varieties on cowpea number of branches at 6 and 9 WAS at Bosu and the combined in 2024 raining season

			BOSU
Cowpea varieties		**Sesame varieties**	**6**
FUAMPEA 1	×	530-6-1	6.00^{bc}
FUAMPEA 1	×	TYPE 4	9.86^{a}
FUAMPEA 1	×	EX – SUDAN	5.23^{b-e}
FUAMPEA 1	×	KENENA 4	3.00^{ef}
FUAMPEA 4	×	530-6-1	5.20^{b-e}
FUAMPEA 4	×	TYPE 4	5.60^{bcd}
FUAMPEA 4	×	EX – SUDAN	7.26^{b}
FUAMPEA 4	×	KENENA 4	3.60^{def}
SAMPEA 14	×	530-6-1	3.33^{def}
SAMPEA 14	×	TYPE 4	5.23^{b-e}
SAMPEA 14	×	EX – SUDAN	5.96^{bc}
SAMPEA 14	×	KENENA 4	3.30^{ef}
SAMPEA 20-T	×	530-6-1	6.50^{b}
SAMPEA 20-T	×	TYPE 4	4.20^{c-f}
SAMPEA 20-T	×	EX – SUDAN	7.30^{b}
SAMPEA 20-T	×	KENENA 4	2.00^{f}
SE(±)			1.113

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, WAS = Weeks after Sowing

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