EVALUATION OF SOME GROWTH AND YIELD ATTRIBUTES OF SESAME (*Sesamum indicum* L.) INTERCROPPED WITH MAIZE, SOYA BEAN AND COWPEA IN SOUTHERN GUINEA SAVANNA OF NIGERIA

***[1]Oloniruha, J.A., [1]Iyela, E.L., [1]Babalola, T.S., and [2]Enyioko, C.O**
[1]Ahmadu Bello University College of Agriculture, PMB. 205, Kabba, Nigeria
[2]Federal College of Land Resources Technology, PMB. 1518, Owerri, Nigeria
***Corresponding author's email address: akinoloniruha@gmail.com**
Orcid ID: 000000029187180*

ABSTRACT
Growth and yield of sesame (*Sesamum indicum* L.) as affected by intercropping with maize, soya bean and cowpea was evaluated at the experimental plot of College of Agriculture, Kabba in 2022. There were four treatments, namely: sole sesame, sesame + maize, sesame + soya bean and sesame + cowpea and replicated three times. The experiment was laid out in a Randomized Complete Block Design. Data were collected on plant height, stem girth, number of leaves, number of primary branches at two-weeks interval and seed yield. The results showed that intercropping sesame with maize, soya bean and cowpea significantly reduced the performance of sesame. However, the performance of sesame under intercropping with soya bean and cowpea was not as suppressed as compared to where it was intercropped with maize.
Key words: Sesame; Maize; Soya bean; Cowpea; Intercropping.

INTRODUCTION
Sesame (*Sesamum indicum* L.), an oil seed belongs to the family Pedaliacea. It has been grown for many decades in dry areas worldwide. Sesame is an annual herb with simple or palmate leaves with alternate arrangement. Previous studies by Hedge (2012) and Eskandari *et al.* (2015) postulated that sesame seed have higher amount of oil compared to other oil seeds. In sesame oil, the quality index (i.e. ratio between saturated fatty acid and unsaturated fatty acid) ranges between 83 to 87% (Wei *et al.,* 2013).
The major way of enhancing diversity in agroecosystems is by intercropping which involves growing two or more crops together for a productive cycle (Mazaheri and Oveysi, 2004). Introducing sesame into cropping systems has been a successful practice in the major growing areas in Nigeria as a sole crop or mixed with cereal crops. This cropping system reduces the chances of crop failure linked with growing sesame solely, thereby placing less demand on limited supply of labour and fertile land. In addition, soil fertility is restored and weeds are supressed (Mkamilo, 2004). In this study area, yam, maize, cassava, soya bean, cowpea, and groundnut can be intercropped with sesame. To maximise yield in crop combinations, high species compatibility and reduction in above and below ground competition must be ascertained (Wei *et al.,* 2015). Successful intercropping system relies on the appropriate selection of crop species with minimal competition for light, space, moisture and nutrients (Hedge, 2012).
This study was therefore designed to evaluate how compatible maize, soya bean and cowpea are with sesame when sown simultaneously.

MATERIALS AND METHODS
The study was carried out at the College of Agriculture Kabba in the Southern Guinea Savanna Agro-ecological zone of Nigeria during the raining season of 2022. The site is located on latitude 7°35N and longitude 6°08E and is 435 meters above sea level. The raining season spans between April and November with the peak in July. The dry season runs from December to March. The mean annual rainfall is 1500mm, annual temperature ranging from 18° to 35°C, and the mean relative humidity (RH) is 60%.
Sesame, soya bean, cowpea, and maize varieties planted were NCRIBEN, IITA TGX 1987-10F, Olo-1, and respectively. The treatments consisted of sole sesame, sesame + maize, sesame + soya bean and sesame + cowpea. The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replicates. Seeds were sown on well-prepared seed beds; sesame was sown at 30 x 10cm, maize at 75 x 25 cm while soya bean and cowpea were sown at 50 x 10cm spacing. In each treatment there were two rows of sesame intercropped with either maize, soya bean or cowpea except for sole sesame where there were four rows. All plants were sown simultaneously. All agronomic practices were observed including weed and pest control, and fertilizer application to sesame.
Data collected involved plant height, number of leaves, stem girth at two-weeks interval and number of primary branches which was taken at twelve weeks as well as seed yield. The data taken were subjected to statistical analysis using ANOVA; separation of means was done by using Duncan Multiple Range Test (DMRT).

RESULTS
Treatment effect on sesame plant height
The result of the effect of intercropping maize, soya bean and cowpea on plant height of sesame is presented in table 1.
At four weeks after planting, sesame plant height was significantly higher for sole sesame followed by sesame + cowpea. Sesame + maize and soya bean had the lowest but comparable plant height. The trend is

the same at six weeks. However, at eight weeks after planting, sole sesame recorded the highest plant height followed by sesame + soya bean which had comparable plant height with sesame + cowpea while sesame + maize recorded the lowest sesame plant height. This trend was repeated at 10 and 12 WAP.

Treatment effect on sesame stem girth

The effect of intercropping sesame with maize, soya bean and cowpea is shown in Table 2.

Sole sesame had the thickest stem girth at 4, 6, 8, 10 and 12WAP. Sesame + soya bean and sesame + cowpea had comparable stem girth which was superior to sesame + Maize up to 10WAP. However, at 12 WAP, sesame + cowpea had a significantly thicker stem then sesame + soya bean. Sesame + maize had the thinnest stem girth throughout the duration of the study.

Treatment effect on number of leaves of sesame

Table 3 presents the effect of intercropping of sesame with maize, soya bean and cowpea on number of leaves of sesame. At 6, 8, 10 and 12 WAP, number of leaves of sesame varied with the intercropping but did not differ at 4 WAP. Sole sesame produced more leaves, this was closely followed by sesame intercropped soya bean, sesame intercropped cowpea and sesame intercropped maize.

Treatment effect on number of primary branches and seed yield

The result for the effect sesame intercropped with maize, soya bean and cowpea is presented in Table 4.

Number of primary branches of sesame is highest in sole sesame followed by sesame + cowpea. Number of primary branches of sesame was lowest when sesame was intercropped with maize and sesame + Soya bean. Seed yield of sole sesame was superior to all other treatments. Of the intercrop treatments, sesame + soya bean recorded the highest seed yield while sesame + maize produced the lowest seed yield.

DISCUSSION

Growth attributes

Sole sesame was consistently higher in plant height than when intercropped with the other crops. This may be due to the fact that vigorous growth for sesame starts earlier compared to soya bean and cowpea. Since both the sole crop and the intercrops were planted at the same time, sesame probably had an early take-off when sown alone and maintained this advantage throughout the growth period. Intercropping maize, soya bean and cowpea with sesame significantly reduced the plant height of sesame. The same trend was observed for stem girth, number of leaves and number of primary branches. Maize suppressed sesame growth and this could be linked to the formation of canopy which reduces light interception that prevents photosynthetic activities to take place in sesame. This result agrees with the findings of Palaniappen (1985), Obasi (1989), Olasanta and Lucas (1992), Muoneke *et al.* (1997) and Bhatti et al (2005) who reported reduced growth for sesame when intercropped with other crops. They also deduced that canopy height is a major factor that determines the competitive ability of a plant. Palaniappen (1985) also posited that in crop mixtures, the growth rate will be proportional to amount of light intercepted by the crops. However, this result negates the findings of Krishna and Reddy (2005), Putse *et al.* (2014), Kumar *et al.* (2017), and Kumar *et al.* (2021) who all reported that intercropping legumes with sesame increased sesame plant height. They attributed their findings to competition for light and N fixation by the legumes. In this study, it does not appear that sesame benefited from the release of N by the legumes mixtures during the growth period. It was also observed that stem girth and number of leaves of sesame followed the same trend as plant height probably due to the reasons adduced for plant height.

Number of primary branches of sesame also reduced with intercropping. This is in consonance with the findings of Kumar and Thakur (2006), Bindhu *et al.* (2014) and Sarma *et al.* (2016) who demonstrated that sole sesame significantly gave higher number of primary branches per plant over intercropping treatments.

Yield attributes.

The seed yield of sesame was significantly higher for sole sesame than intercropping treatments. This might be due to the fact that yield is a function of photosynthetic activities in addition to soil and other factors. Hence sole sesame which is taller, thicker, possesses more leaves and number of primary branches per plant yielded more than when it was intercropped with maize and legumes. Sesame intercropped with maize had the lowest seed yield which might be attributed to the canopy effect of maize on sesame. These findings agree with those of Kumar *et al.* (2017), Ajibola and Kolawole (2019) and El-Mehi *et al.* (2022). Bhatti, (2006) also reported that sesame grown in association with different grain legumes appeared to be a dominant crop as indicated by its higher values of crowding coefficient, competitive ratio and positive sign of aggressivity. This result however contradicts that of Afe (2017) who reported that intercropping sesame with cowpea had no negative impact on the growth and yield of sesame. Although, in his study, cowpea was introduced two weeks after sowing of sesame.

Table 1: Effect of intercropping sesame with maize, soya bean and cowpea on sesame plant height

Treatment	Weeks After planting (cm)				
	4	6	8	10	12
Sole Sesame	7.36a	23.51a	69.30a	93.4a	128.40
Sesame + Maize	4.82b	12.73b	47.91b	72.40c	93.63c
Sesame + Soya bean	5.55b	17.42b	55.20c	81.71b	104.41b
Sesame + Cowpea	6.03ab	18.94ab	57.91b	86.46b	113.22b

Means in the same column followed by the same alphabet are not significantly different (>0.05)

Table 2: Effect of intercropping sesame with maize, soya bean and cowpea on sesame stem girth

Treatment	Weeks After planting (cm)				
	4	6	8	10	12
Sole Sesame	0.74a	1.32a	1.54a	2.26a	2.54a
Sesame + Maize	0.43	0.64b	0.90b	1.13c	1.17d
Sesame + Soya bean	0.56ab	0.96ab	1.03b	1.24b	1.33c
Sesame + Cowpea	0.58ab	0.96ab	1.14b	1.31b	1.6ab

Means in the same column followed by the same alphabet are not significantly different (>0.05)

Table 3: Effect of intercropping sesame with maize, soya bean and cowpea on number of leaves of sesame per plant

Treatment	Weeks After planting (cm)				
	4	6	8	10	12
Sole Sesame	9c	14.07a	30.74a	78.14a	158.03a
Sesame + Maize	8a	9.00b	22.2ab	43.14c	111.31d
Sesame + Soya bean	8a	12.02a	27.18a	64.21b	139.01b
Sesame + Cowpea	8a	13.13a	23.31b	52.36b	127.2b

Means in the same column followed by the same alphabet are not significantly different (>0.05)

Table 4: Effect of intercropping sesame with maize, soya bean, and cowpea on number of primary branches and seed yield of sesame.

Treatment	No of primary branches at 12 weeks	Seed yield kg/ha
Sole Sesame	5.54a	503.33a
Sesame + Maize	2.93c	189.00d
Sesame + Soya bean	3.53c	366.33b
Sesame + Cowpea	4.13b	241.33c

Means in the same column followed by the same alphabet are not significantly different (>0.05)

CONCLUSION

Farmers in the study area prefer intercropping to sole cropping. From the results of this study, it is safe to conclude that maize is not compatible with sesame in an intercrop when the component crops are sown simultaneously. Soya bean and cowpea did not suppress the growth and yield of sesame as much as maize. Further studies involving sole soya bean and sole cowpea is needed in the study area to be able to determine the land equivalent ratio (LER) and land equivalent coefficient (LEC) of the crop mixtures.

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