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Performance of Cucumber (*Cucumis spp.)* as Influenced by Row Arrangement and Weeding Regime Grown in Intercrop with Okra [*Abelmoschus esculentus* (L) Moench.] in Sudan Savanna

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Authors' contributions

This work was carried out in collaboration among all authors. Author BGM designed the study and performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. Authors ZK and BHK managed the analysis of the study and literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Field trials were conducted during the rainy season of 2018 and 2019 at the Teaching and Research Farm, Faculty of Agriculture, University of Maiduguri, Borno State, Nigeria, to evaluate the performance of Cucumber in an okra-cucumber intercrop under different row arrangements and weeding regimes in the Sudan savanna agroecological zone. The experiment utilized a factorial combination of three-row arrangements of okra and cucumber (1:1, 1:2, and 2:1) and four weeding regimes (W0, W1, W2, and WF) arranged in a split-plot design with three replications. Weeding regimes were assigned to the main plots, while row arrangements were allocated to the subplots. The advantages of intercropping in crop production in comparison with pure cropping are due to the interaction between components in intercrops and the difference in competition for the use of environmental resources. It is believed that 1:1 and 1:2 row arrangements helped the okra plant to utilize its energy properly in branching because there was not much competition for light nor were there overlapping from adjacent okra plants within the row. Cucumber performance was assessed based on parameters such as the number of fruits per plant, fruit weight per plant, and fruit yield per hectare. Based on the results of the present study, a 1:2 row arrangement with two weddings should be adopted to produce cucumber in okra/cucumber intercrop in the Sudan Savanna agroecology.

Keywords: Cucumber; field trials; okra; intercropping.

1. INTRODUCTION

Cucumber (*Cucumis spp.*) is believed to have originated in India, particularly at the southern foothills of the Himalayas, or possibly Burma, where the plant exhibits great variability in its vegetative and fruit characteristics. Cultivated for over 3,000 years, cucumber spread from India to China and was highly regarded by ancient Greeks and Romans. The Romans even used advanced cultivation methods to grow cucumbers year-round for Emperor Tiberius. Christopher Columbus introduced cucumbers to the New World, planting them in Haiti in 1494 and possibly on other Caribbean islands. Many modern cucumber varieties were already known by the 17th century, with current forms ranging from small, stubby fruits (7–10 cm) to the large English greenhouse varieties that can grow up to 60 cm long.

As of 2012, cucumber cultivation spanned approximately 2 million hectares worldwide, producing 36 million tons. Asia leads global production, with China alone accounting for over 60% of the total. In tropical Africa, cucumber is cultivated in all countries but on a relatively small scale. In 2002, Africa produced 507,000 tons on 25,000 hectares, contributing less than 1.5% of global production. Egypt is the largest producer in Africa, accounting for 360,000 tons. International trade in cucumbers in 2002 amounted to 1.5 million tons, with Mexico, the Netherlands, and Spain as the main exporters. African exports, however, remain modest and largely unrecorded.

Cucumber is rich in nutrients, containing potassium, vitamins K, C, and A, as well as phosphorus, manganese, magnesium, and pantothenic acid. Lawan A.B. (2000). It is low in sodium, cholesterol, and saturated fat. Consumed raw or cooked, cucumbers offer numerous health benefits, making them an essential part of both food and skincare diets. With over 90% water content, cucumbers act as a natural cooling agent. They help reduce swelling and dark circles under the eyes, soothe and soften the skin, and provide a refreshing, relaxing effect. Cucumbers are also an alternative to caffeine for combating fatigue, as they contain carbohydrates and B vitamins.

The high water content gives cucumbers diuretic properties, aiding in the removal of waste materials and toxins from the body. They help eliminate uric acid, which benefits individuals with arthritis, and their fiber-rich skin, combined with potassium and magnesium, helps regulate blood pressure and supports overall nutrient functions. Magnesium in cucumbers also relaxes nerves and muscles, promoting healthy blood circulation. Additionally, cucumber juice contains a hormone that aids pancreatic cells in insulin production, offering potential benefits for diabetic patients.

Wiley, (1990) considers “intercropping as an economic method for higher production with lower levels of external inputs. This increasing use efficiency is important, especially for small-scale farmers and also in areas where the

growing season is short" (Altieri, 1995). "Production is more in intercropping, and this can be attributed to the higher growth rate, reduction of weeds, reduction in pests and diseases, and more effective use of resources due to differences in resource consumption" (Altieri, 1995; Eskandari et al., 2009a; Eskandari, 2012b). In addition, if there are "complementary effects" between the components of intercropping, production increases due to reducing the competition between them (Zhang & Li, 2003).

"Intercropping is important for farmers who have limited sources, of income, and stable yield of agricultural systems" (Eskandari et al., 2009c). When several crops can be grown together, a failure by a component to produce a product could be compensated by another crop thereby reducing the risk. The risk of agronomy failure in multi-cropping systems is lower than in pure-cropping systems. It may be an appropriate growth condition for a species and inappropriate for other species. Tsubo *et al*. (2003) reported that "mixed/intercropping is a technique for small farmers and intercropping systems of maize with legumes (soybean, cowpea, French beans, and urd beans) were superior to sole crops" (Tsubo et al., 2003). "The advantages of intercropping in crop production in comparison with pure cropping are due to the interaction between components in intercrops and the difference in competition for the use of environmental resources" (Mahapatra, 2011). Dantata *et al*. (2020) and Adam *et al.* (2020) reported "higher maize yield/ha in 2:1 row arrangements of maize/watermelon mixture compared with 1:1 or 1:2 row arrangements" (Dantata et al., 2020; Bunu *et al*., n.d.). "It is believed that 1:1 and 1:2 row arrangements helped the okra plant to utilize its energy properly in branching because there was not much competition for light nor were there overlapping from adjacent okra plants within the row. It could be observed that the taller the okra plant, the lesser the number of branches. Also, the wide row arrangements with a lesser plant population led to an increase in the stem diameter of okra stems which makes for profuse branching without the okra lodging" (Hamma et al., 2012). "The productive node of okra increased with an increase in row arrangements. This could be attributed to close row arrangements due to insufficient light energy received by these okra plants and partly due to the inter-plant shading along the row. The percentage of productive nodes affected crop yield in some treatments. Intercropping with increasing diversity in weed control is less and therefore the number of weeds per unit area decreases" (Aruna *et al*. 2013). "Intercropping a uniform population of weeds by reducing the relative abundance of dominant weed population changes" (Unamma et al., 1990). "Weed dry matter accumulation depends on the duration of interference between crop and weed as well as the density of the weeds" (Mahmoud et al., 2013). "Weed dry matter continues to increase in interference period in okra in a mixture, weed infestation until 3 WAS was found to have no significant effect on the growth and yield however, weed interference until 6 WAS had a significant effect on its growth and yield" (Gbadamosi et al., 2003).

The study was to determine the appropriate row arrangement and optimum weeding regime for the maximum performance of Cucumber grown in intercrop with Okra in the Sudan Savanna region.

2. MATERIALS AND METHODS

Field experiments were conducted during the wet season of 2018 and 2019 at the Teaching and Research Farm, Department of Crop Production, Faculty of Agriculture, University of Maiduguri (Longitude 13°12' 36.02'' E and Latitude 11°48' 2.32'' N and on an altitude of 354 m above sea level). Maiduguri is in the Sudan Savannah region of Borno State, Nigeria under a semi-arid environment characterized by sparse vegetation with an average annual rainfall of 650mm, spanning 4-5 months (May – September). The average temperature is 28.5^0 C with relatively low humidity during the dry season and high humidity during the wet season. The soils are generally sandy loam. (Geographical Information System Laboratory "GIS Lab" Department of Geography, Faculty of Social and Management Science, University of Maiduguri).

The experiment consists of three (3) row arrangements (1:1, 1:2, 2:1) and four (4) weeding regimes (weedy check, hoe weeding once at 3 WAS, hoe weeding twice at 3 and 6 WAS, and weed-free). The sole crops of okra and cucumber were also included for the purpose of calculating land equivalent ratio (LER). The weeding regimes were allocated to the main plots while the raw arrangements was allocated to the subplots. The treatments were factorially combined and laid out in a Split Plot Design and replicated three times. There were a total of 36 plots each measuring 3.0 m x 4.5m (gross size of $13.5m^2$) while the net plots consist of the three (3) most central rows in each gross plot

excluding border rows (6.75m^2). Within the replicate block, rows were separated using 1m apart and 2m between each replicate block. The estimated land area used for the experiment was 0.11ha. Data collected were subjected to analysis of variance and difference between means determined according to Duncan's Multiple Range Test (DMRT) in the General Linear Model (GLM) of SPSS(Gomez and Gomez 1984).

3. RESULTS AND DISCUSSION

The results of the analysis of soil samples taken from the experimental sites are presented in Table 1. The soil of the research site was coarsely textured and well-drained sandy loam at 0-15cm and 15-30cm depth, slightly acidic and low in organic carbon. The soil also has a low cation exchange capacity. Similarly, available phosphorus and Nitrogen were also low. This is in agreement with Rayer A. J. (1987) who reported that the Sudan savanna soils are low in nutrient status.

The effects of row arrangements and weeding regimes on a number of fruits/plants of cucumber in 2018, and 2019 and the combined mean are presented in Table 2. There was a significant effect of row arrangements on a number of fruits/plants of cucumber in 2018, and 2019, and the combined mean. Throughout the period of observations in both the years and combined mean, 1:2 row arrangements produced the highest number of fruits/plants significantly while 2:1 row arrangements produced the least number of fruits/plants. Similarly, there was a significant effect of weeding regimes on a number of fruits/plants of cucumbers in both the years and combined mean. The two weeding and weed-free gave a significantly higher number of fruits/plants in both years and combined mean than the other weeding regimes. However, two weeding was optimum for the number of fruits/plants.

There was a significant interaction between row arrangements and weeding regimes on a number of fruits/plants of cucumbers in both years and combined means. In both years and combined mean, the 1:2 row arrangements with two weeding were optimum for a number of fruits/plants of cucumber while 1:1 and 2:1 row arrangements with weedy check produced the least number of fruits/plants (Table 3).

The effects of row arrangements and weeding regimes on fruit weight/plant of cucumber in 2018, and 2019 and the combined mean is presented in (Table 4). There was a significant effect of row arrangements on fruit weight/plant of cucumber in both the years and combined mean. The 1:2 row arrangements produced the best fruit weight/plant of cucumber and the least fruit weight/plant was observed in 2:1 row arrangements in both the years and combined mean. There was a significant effect of weeding regimes on fruit weight/plant of cucumber in both years and combined mean. Two weeding and Weed free produced the best fruits weight/plant. However, two weeding was optimum for fruit weight/plant of cucumber and the least was observed in weedy check.

Table 1. Physico-chemical properties of the surface (0-15) and sub-surface (15-30) soil at the experimental site in Maiduguri during the 2018 and 2019 rainy season

Soil properties	**2018**		**2019**	
Particle Size Distribution	**0 – 15**	**15 – 30**	**0 – 15**	**15 - 30**
Sand g/kg	76.00	76.00	76.00	76.00
Silt g/kg	10.00	12.00	10.00	12.00
Clay g/kg	14.00	11.50	16.00	11.00
Textural class	Sandy loam	Sandy loam	Sandy loam	Sandy loam
Chemical composition				
pH in water	6.27	6.27	6.28	6.26
Organic carbon	0.43	0.23	0.42	0.22
Total nitrogen	0.13	0.06	0.13	0.06
Available phosphorus (mg/kg)	3.15	4.90	3.15	3.14
Exchangeable cation (mg/kg)				
K	0.61	0.47	0.61	0.46
Mg	0.60	0.40	0.60	0.41
Ca	1.20	1.00	1.20	1.01
Na	0.13	0.05	0.13	0.06
CEC	2.54	1.92	2.52	1.91

Mg kg = Milligram per kilogram CEC = Cation Exchange Capacity

Table 2. Effect of row arrangements and weeding regimes on number of fruits/plant of cucumber in Maiduguri during 2018, 2019 rainy season and combine mean

Number of fruits/plants			
Treatment	**2018**	**2019**	**Combined mean**
Row arrangement (A)			
1:1	11.93[b]	11.65[b]	11.79[b]
1:2	13.27[a]	13.00[a]	13.14[a]
2:1	10.74[c]	10.38[c]	10.56[c]
SE±	0.38	0.40	0.26
Weeding regimes (B)			
Weedy check	8.83[c]	8.40[c]	8.61[c]
1W	10.43[b]	9.91[b]	10.17[b]
2W	14.13[a]	13.84[a]	13.98[a]
WF	14.53[a]	14.57[a]	14.55[a]
SE±	0.44	0.46	0.30
Interaction (AXB)	*	*	*

**Significant. 1W – one weeding. 2W – two weeding. WF – Weed free*
Means having the same letters(s) are not statistically different at p ≤ 0.05 (DMRT)

Table 3. Interaction between row arrangements and weeding regimes on number of fruits/plant of cucumber in Maiduguri during 2018, 2019 rainy seasons and combined mean

Weeding regimes				
	Weedy Check	**1W**	**2W**	**WF**
2018				
Row arrangements				
1:1	8.00[e]	9.00[de]	11.50[c]	14.63[b]
1:2	9.46[de]	10.13[cd]	17.63[ab]	18.63[a]
2:1	9.03[de]	9.16[de]	13.13[b]	13.63[b]
SE±		0.77		
2019				
Row arrangements				
1:1	8.03[e]	8.30[de]	11.93[c]	13.80[b]
1:2	8.90[de]	9.96[d]	17.20[ab]	18.50[a]
2:1	8.26[e]	9.50[de]	12.73[bc]	13.06[b]
SE±		0.80		
Combined Mean				
Row arrangements				
1:1	8.01[h]	8.65[gh]	12.53[d]	14.21[c]
1:2	9.18[fg]	10.05[f]	17.33[ab]	18.56[a]
2:1	8.65[gh]	9.33[fg]	12.11[d]	13.35[cd]
SE±		0.53		

Means having the same letters(s) are not statistically different at p ≤ 0.05 (DMRT)
1W – one weeding. 2W – two weeding. WF – Weed free

The interaction between row arrangements and weeding regimes on fruits weight/plant of cucumber in 2018, and 2019, and the combined mean is shown in (Table 5). There was a significant interaction between row arrangements and weeding regimes on fruit weight/plant of cucumber in both years and combined mean. Generally, the 1:2 row arrangements with two weeding and weed-free produce the best fruit weight. Essentially, 1:2 with two weeding was optimum for the fruit weight of the cucumber. The least was observed in 2:1 row arrangement with the weedy check (Table 5).

The effects of row arrangements and weeding regimes on the fruit yield of cucumber in 2018, and 2019 and the combined mean are presented in (Table 6). There was a significant effect of row arrangements on the fruit yield of cucumber in 2018, 2019, and combined mean. Generally, 1:2

row arrangements produced significantly higher fruit yield than the other row arrangements in both years and combined mean. There was a significant effect of weeding regimes on fruit yield in 2018, 2019, and the combined mean. Weed-free produced significantly higher fruit yield/ha and the least fruit yield was observed in the weedy check. However, two weeding was optimum for the fruit yield/ha of cucumber in both the years and combined mean.

Table 4. Effect of row arrangements and weeding regimes on fruits weight/plants of cucumber in Maiduguri during 2018, 2019 rainy season and combine mean

Fruit weight/plants(kg)			
Treatment	**2018**	**2019**	**Combined mean**
Row arrangement (A)			
1:1	2.93^{b}	2.87^{b}	2.90^{b}
1:2	3.83^{a}	3.67^{a}	3.75^{a}
2:1	2.23^{c}	2.85^{c}	2.54^{c}
SE±	0.49	0.68	0.53
Weeding regimes (B)			
Weedy check	1.86^{d}	1.40^{d}	1.63^{c}
1W	2.66^{c}	2.51^{c}	2.58^{b}
2W	4.89^{a}	4.93^{a}	4.91^{a}
WF	4.95^{a}	4.97^{a}	4.96^{a}
SE±	0.11	0.14	0.12
Interaction (AXB)	*	*	*

Means having the same letters(s) are not statistically different at p ≤ 0.05 (DMRT)
**Significant 1W – one weeding. 2W – two weeding. WF – Weed free*

Table 5. Interaction effect of row arrangements and weeding regimes on fruit weight/plants (kg) of cucumber in Maiduguri during 2018, 2019 rainy seasons and combined mean

Weeding regimes				
	Weedy Check	**1W**	**2W**	**WF**
2018				
Row arrangements				
1:1	1.7^{e}	2.6^{d}	3.0^{c}	4.5^{ab}
1:2	1.6^{e}	2.4^{d}	4.9^{ab}	5.1^{a}
2:1	1.1^{e}	2.0^{d}	3.3^{c}	3.9^{b}
SE±		0.98		
2019				
Row arrangements				
1:1	1.4^{e}	2.4^{d}	3.2^{c}	4.6^{ab}
1:2	1.6^{e}	2.6^{d}	4.4^{ab}	4.9^{a}
2:1	0.9^{e}	2.2^{d}	3.0^{c}	3.9^{b}
SE±		0.88		
Combined Mean				
Row arrangements				
1:1	1.5^{e}	2.5^{d}	3.1^{c}	4.5^{ab}
1:2	1.6^{e}	2.5^{d}	4.6^{ab}	5.0^{a}
2:1	1.0^{e}	2.1^{d}	3.3^{c}	3.9^{b}
SE±		0.88		

Means having the same letters(s) are not statistically different at p ≤ 0.05 (DMRT)
1W – one weeding. 2W – two weeding. WF – Weed free

Table 6. Effect of row arrangements and weeding regimes on fruits yield of cucumber in Maiduguri during 2018, 2019 rainy season and combine mean

Fruit yield (t/h)			
Treatment	**2018**	**2019**	**Combined mean**
Row arrangement (A)			
1:1	8.75^{b}	9.32^{ab}	9.03^{ab}
1:2	9.38^{a}	9.71^{a}	9.54^{a}
2:1	8.56^{b}	8.39^{b}	8.47^{b}
SE±	0.15	0.17	0.16
Weeding regimes (B)			
Weedy check	4.91^{d}	5.52^{d}	5.21^{d}
1W	8.30^{c}	7.60^{c}	7.95^{c}
2W	10.07^{a}	10.51^{ab}	10.29^{a}
WF	10.31^{a}	11.34^{a}	10.82^{a}
SE±	0.17	0.19	0.18
Interaction (AXB)	*	*	*

Means having the same letters(s) are not statistically different at p ≤ 0.05 (DMRT)
**Significant 1W – one weeding. 2W – two weeding. WF – Weed free*

Table 7. Interaction effect of row arrangements and weeding regimes on fruit yield (t/ha) of cucumber in Maiduguri during 2018, 2019 rainy season and combined mean

Weeding regimes				
	Weedy Check	**1W**	**2W**	**WF**
2018				
Row arrangements				
1:1	6.75^{ef}	7.56^{de}	9.61^{b}	10.30^{ab}
1:2	7.07^{ef}	9.31^{c}	10.21^{ab}	11.21^{a}
2:1	6.41^{f}	8.23^{d}	9.94^{b}	9.96^{b}
SE±		0.31		
2019				
Row arrangements				
1:1	7.32^{de}	7.90^{d}	9.63^{c}	11.38^{ab}
1:2	7.82^{de}	7.97^{d}	11.38^{ab}	12.16^{a}
2:1	6.78^{e}	7.57^{de}	10.47^{b}	10.51^{b}
SE±		0.34		
Combined Mean				
Row arrangements				
1:1	7.36^{de}	8.07^{d}	10.38^{b}	10.66^{ab}
1:2	7.69^{d}	8.59^{d}	11.06^{a}	11.29^{a}
2:1	6.60^{e}	7.20^{de}	9.47^{b}	10.46^{ab}
SE±		0.32		

Means having the same letters(s) are not statistically different at p ≤ 0.05 (DMRT)
1W – one weeding. 2W – two weeding. WF – Weed free

Table 8. Effect of row arrangements and weeding regimes on land equivalent ratio (LER) of okra and cucumber in Maiduguri during 2018, 2019 rainy season and combine mean

	Fruit yield (t/h)		
Treatment	**2018**	**2019**	**Combined mean**
Row arrangement (A)			
1:1	1.10^{b}	1.14^{b}	1.17^{b}
1:2	1.39^{a}	1.24^{a}	1.32^{a}
2:1	1.01^{c}	1.05^{c}	1.03^{c}
SE±	0.029	0.031	0.030

	Fruit yield (t/h)		
Treatment	**2018**	**2019**	**Combined mean**
Weeding regimes (B)			
Weedy check	0.58^{d}	0.53^{d}	0.55^{d}
1W	0.65^{c}	0.60^{c}	0.63^{c}
2W	1.02^{ab}	1.06^{ab}	1.04^{ab}
WF	1.22^{a}	1.13^{a}	1.17^{a}
SE±	0.038	0.030	0.034
Interaction (AXB)	*	*	*

*Means having the same letters(s) are not statistically different at p ≤ 0.05 (DMRT); * Significant*

Table 9. Interaction between row arrangements and weeding regimes on LER of okra and cucumber in Maiduguri during 2018, 2019 and rainy seasons and combined mean

Weeding regimes				
	Weedy Check	**1W**	**2W**	**WF**
2018				
Row arrangements				
1:1	0.84^{cd}	0.87^{cd}	1.15^{ab}	1.10^{b}
1:2	0.98^{c}	1.02^{bc}	1.20^{ab}	1.25^{a}
2:1	0.79^{cd}	0.82^{cd}	1.17^{ab}	1.11^{b}
SE±		0.038		
2019				
Row arrangements				
1:1	0.83^{cd}	0.87^{c}	1.10^{ab}	1.04^{b}
1:2	0.88^{c}	0.92^{c}	1.12^{ab}	1.18^{a}
2:1	0.79^{d}	0.82^{cd}	1.12^{ab}	1.02^{b}
SE±		0.038		
Combined Mean				
Row arrangements				
1:1	0.86^{d}	0.90^{cd}	1.09^{ab}	1.04^{b}
1:2	0.93^{c}	0.97^{bc}	1.16^{ab}	1.24^{a}
2:1	0.79^{d}	0.83^{cd}	1.07^{ab}	1.03^{b}
SE±		0.041		

Means having the same letters(s) are not statistically different at p ≤ 0.05 (DMRT)

There was a significant interaction between row arrangements and weeding regimes on the fruit yield of cucumber in both years and the combined mean (Table 7). In both the years and combined mean, the 1:2 row arrangements with two weeding and weed-free produced the best fruit yield of cucumber. Essentially, 1:2 row arrangements with two weeding were optimum for a yield of cucumber and the least fruit yield was observed in 2:1 row arrangements with a weedy check (Table 7).

Results of the experiment showed that row arrangements and weeding regimes on LER of crop mixture in 2018, and 2019, and the combined mean were significant. LER was more than unity in all the planting patterns indicating greater biological efficiency and yield advantage(Dariush *et al.* (2006). Intercropping okra/cucumber in the ratio of 1:2 row arrangements resulted in significantly higher LER than the other row arrangements in both years and combined mean. The least was from 2:1 row arrangements. Weed-free significantly had the highest LER of crop mixture but was not statistically different from the two weeding. The two weeding was therefore the optimum regime for the LER of the okra/cucumber mixture. The weedy check gave the least LER values in both the years and combined mean(Table 8).

Interaction between row arrangements and weeding regimes on LER of okra/cucumber mixture was significant (Table 9). In both the years and combined mean, the 1:2 row arrangements with weed-free produced higher LER and the least was from 2:1 supplied with weedy check (Table 9).

4. CONCLUSION

From the result of the present study, the use of 1:2(one row of okra to 2 rows of Cucumber) row

arrangement with two weeding is most suitable for producing Cucumber in a mixture with Okra in the Sudan savanna. We, therefore, recommend the planting pattern of a ratio 1:2 of a cucumber/okra intercrop and two weeding regimes for optimum cucumber production in the Sudan savanna region.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

Adam, B.K., Kabura, B.H and Dantata, I.J. (2020). Performance of Watermelon (*Citrullus lanatus* [L]*)* as Influenced by Row Arrangements and Cow Dung Rates Grown in Intercrop with Maize (*Zea mays* [L]) in Sudan Savanna. *American Journal of Experimental Agriculture International* 42(5): 8-15

Altieri, M.A. (1995). Agroecology: The Science of Sustainable Agriculture, second edition. Publisher: Westview Press.

Aruna,U. I., Amans, E.B., Mahmud, M., Ahmed, A., Luka, G.L., and Isah A.S.(2013). Yield yield components of maize as influenced by row arrangements, nitrogen and phosphorus levels in maize (*zea mays L)/castor(Ricinus communis)* mixture. *Journal of Agriculture and veterinary science ISSN 2319 – 2380 volume Pp 45-49*

Bunu, A., Kyari, Z., T. L. D., Muktar, B., & Kundili, Y. Effect of Row Arrangements and Weeding Intervals on Growth and Yield of Maize-Watermelon Intercrop in Semi-Arid Zone of Maiduguri. *International Journal of Pure and Applied Science Research*.11(11): 119-133

Dantata, I.J., Adam, B.K and Kabura, B.H (2020). Performance of Maize (*Zea mays* [L]) as Influenced by Row Arrangements and Cow Dung Rates Grown in Intercrop with Watermelon (*Citrullus lanatus* [L]*)* in Sudan Savanna. *Asian Journal of Research in Crop Science* 5(4): 45-51.

Dariush, M., Madani, A. and Oveysi, M. (2006). Assessing the land equivqlent ratio (LER) of two corn varieties intercropping at various nitrogen levels in Kajal, Iran.*Journal of Central European Agriculture. 7: 2, 359-364.*

Eskandari, H., (2012b). Intercropping of maize (*Zea mays*) with cowpea (*Vigna sinensis*) and mungbean (*Vigna radiata*): effect of complementarity of intercrop components on resource consumption, dry matter production and legumes forage quality. *Journal of Basic and Applied Scientific Research*, 2: 355-360.

Eskandari, H., Ghanbari A. and Javanmard A. (2009a). Intercropping of cereals and legumes for forage production. *Notulae Scientia Biologicae*, 1: 07-13.

Eskandari, H., Ghanbari A., Bonjar, M. Galavai and Salari, M. (2009c). Forage quality of cow pea (*Vigna sinensis*) intercropped with corn (*Zea mays*) as affected by nutrient uptake and light interception. *Notulae Botanicae Horti Agrobotanici Cluj-Napoca*, 37: 171-174.

Gbadamosi A.A, Iremiren GO, Aladesama R.D. (2003). Effects of weeding regimes and atrazine application on soil factors of growth performance of maize in rain forest area of Nigeria. *Journal of Agriculture*, Forestry and Fisheries 3 &4, 58-62.

Gomez K.A and Gomez A. (1984). A statistaical procedures for Agricultural Research John Wiley and Sons, New York, 680pp.

Hamma, I. L.., Ibrahim , U and Yusuf, S.M.(2012). Growth and yield of okra as influenced by live mulch in Samaru, Zaria, Nigeria. *European journal of sustainable development,* I(2): 229 - 234

Lawan A. B. (2000). Response of Cucumber (*Cucumis sativus L.*) to intercropping with maize (*Zea mays L.)* and varying rates of farmyard manure and inorganic fertilizer Ph. D Agronomy Thesis A. B. U Zaria Pp 268

Mahapatra, S.C. (2011). Study of grass-legume intercropping system in terms of competition indices and monetary advantage index under acid lateritic soil of India. *American Journal of Experimental Agriculture*, 1(1): 1-6. 485 J. Appl. Environ. Biol. Sci., 1(11)482-486, 2011

Mahmoud *et al.* (2013) Growth and yield of okra as influenced by weeding regimes in Samaru- Zaria, Nigeria. International *Journal of Agronomy and Agricultural Research* (IJAAR)

Rayer, A. J. 1984. University of Maiduguri, Nigeria. Farm Development Planning Report for Faculty of Agriculture, Annex A, Soil Survey Details.

Tsubo, M., Walker, S. and Ogindo, H.O (2003). A simulation model of cereal-legume intercropping system for semi-arid regions. *Field Crop Research.* 93: 23-33.

Unamma, R.P.A., Anuebunwa, F.O., Oputa, C.O. (1990). On farm evaluation of different weed management alternatives in yam-maize intercrop. *Nigerian Journal of Weed Science* 3:59-66

Willey, R.W. (1990). Resource use in intercropping systems. *Journal of Agriculture and Water Management*, 17: 215-231.

Zhang, F. and Li, L. (2003). Using competitive and facilitative interactions in intercropping systems enhance crop productivity and nutrient-use efficiency. *Plant and Soil*, 248: 305-312.

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