International Academic Research Consortium Journals (IARCJ)
International Journal of Agricultural Science and Technology
ISSN: 2360-9888. Volume 12, Issue 1
PP 168-175, July, 2024
DOI: 427251-452781-1224
arcnjournals@gmail.com
https://arcnjournals.org

Assessment of Different Row Patterns and Weeding Intervals on Okra (*Abelmochusesculentus*(L)Moench)/Cucumber (*Cucumis spp*) Mixture in Maiduguri, Borno State

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Abstract: *An experiment was carried out to find the effects of row Patterns and weeding interval on okra (Abelmoschus esculentus (L) Moench)/cucumber (Cucumis spp) mixture in Borno State. The research was conducted during the wet season of 2024 at the Teaching and Research Farm of the Department of Agriculture Technology, Federal Polytechnic Monguno. The treatments consisted three (3) row patterns of okra/cucumber (1:1, 1:2 and 2:1) and four (4) weeding intervals (weedy check, 1 weeding, 2 weeding and weed free) laid out in a split plot design and replicated three times. Weeding intervals were assigned to the main plots while row patterns were assigned to the sub plots. The growth (plant height, number of leaves/plant), yield component (number of fruits/plant) were measured. The result showed that 1:2 row patterns gave significantly greater number of leaves/plant of okra. Two weeding was found to be optimum for number of leaves/plant. Number of leaves/plant and number of fruits/plant of cucumber, fruits were significantly greater in 1:2 row patterns. Number of leaves/plant and number of fruits/plant are found to be optimum at two weeding. From the results of the present study, the growing of okra and cucumber in mixture using 1:2 row patterns with two weeding is found to be more beneficial.*

Keywords: *Row Patterns, Weeding Interval, Okra Cucumber Mixture, Maiduguri Borno State*.

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Introduction

Okra (*Abelmoschus esculantus)* is one of the most widely known utilized species of the family *Malvacea* and an economically important vegetable crop grown in tropic and sub-tropic parts of the world. Okra plant was previously included in the genus *Hibiscus*. Later, it was designated to *Abelmoschus,* which is distinguished from the genus *Hibiscus*. Okra originated somewhere around Ethiopia and was cultivated by the ancient Egyptian by the 12th Century B.C. Its cultivation spread throughout Middle East and North Africa. The route by which okra has taken from Ethiopia to North Africa, the Eastern Mediterranean, Arabia and India is by no means certain (Franklin, 2012). Okra is known by many local names in different parts of the world. In Northern part of Nigeria it is called “Ngwalto” in Kanuri, “Darraba” in Shuwa, “Azgha” in Gwoza and “Kubewa” in Hausa. It is called “lady’s finger” in England, “Gumbo” in the United States of

America while in Ethiopia, it is also called "Kenkase". The name okra probably drives from one of the Niger-Congo groups of Languages. (The name of okra in the Twi Language in Nkuruma). The term okra was in the use of English by the late 18th Century. Okra plants are grown commercially in many countries such as India, Japan, Turkey, Iran, Western Africa, Yugoslavia, Bangladesh, Afghanistan, Pakistan, Myanmar, Malaysia, Thailand, Brazil, Ethiopia, Cyprus and in the southern United States. The crop is also grown throughout North Carolina in home garden's and for commercial markets (Sander's 2001). In Africa, the Okra is produced in Nigeria, Ghana, Egypt, Sudan, Cote D'Ivoire, Benin, Burkina Faso, Togo, Cameroon, Tanzania, Zambia, and Zimbabwe. The most important producing countries are Nigeria, Ghana and Burkina Faso. (De Lannony, 2001). In Nigeria, Okra is grown in about 1 to 2 million hectares (m/ha) of farmland (Hamma, *et. al*., 2012). The total world annual production of Okra as at 2005 stood about 5 million metric tones (Mmt). India is the highest producers of the Okra (2.55Mmt). Other producing countries are Nigeria (0.74Mmt), Pakistan (0.11Mmt), Ghana (0.1Mmt), Benin (0.035Mmt), Egypt (0.085Mmt), Saudi Arabia (0.046Mmt), Turkey (0.035Mmt) and Burkina Faso (0.026Mmt) among others (FAO, 2005). In Africa, total annual production was put at (1.08Mmt), the leading producers were Nigeria, Ghana, Benin and the highest yield of the Okra was recorded in Egypt (14.17t/ha) while in Kenya (6.26t/ha) and Ghana (5.56t/ha) FAO, (2005). In Nigeria, okra is considered as a local vegetable grown as rain fed and irrigated crops. Nigeria's average yield per hectare was reported 2.6t/ha (FAO, 2005), while experimental yield ranged from 3.5 to 8.8t/ha (Akoroda, 1982, Adejonwo *et. al*., 1989). Okra is an important vegetable crop in Nigeria where it is commonly grown in mixture with legumes, cereals and roots per tuber crops (MacDonald and Low 1984). Okra required a lot of sunlight. It grows best in loose, well-drained sandy loam soil with a preferable soil pH of (6.0) - (6.8). Okra is a heat loving annual plant that requires 55 to 65 frost-free days with temperatures consistently above 85°F (29°C) for full growth, flowering, and pod development. The planting soil temperature should be at least 65°F (18°C). Yields will decrease when the air temperatures fall below 70°F (21°C).Okra is sowed at depth of (2.5cm) and a spacing of (30 to 45cm) apart. Okra does not grow well in containers. However, there is space saving verities for container growing. Okra is eaten and can add nutritional benefits to our diet, if used properly. Almost all tribes in Nigeria make use of okra to prepare traditional meals, delicious soups and sauces. Okra leafs are traditionally used to feed young farm animals and sometimes used as vegetables in similar manner to salad leafs. For long term uses, okra is grinded to powder and eaten from time to time. While it might not be as nutrient dense as vegetables such as spinach, it is packed with some valuable nutrients. It is a high fiber food, for starters: Nearly half of its nutrition is a soluble fiber in the form of gums and pectins. Nearly 10 percent of the recommended levels of vitamin B6 and folic acid are also present in a half cup of cooked okra. Okra is known as a high antioxidant, it can fight free radical. Supports and improves cardiovascular and coronary heart diseases, type 2 diabetes, digestive diseases, and even some cancers. Additionally, it is abundant in several other vitamins and minerals, including thiamine, riboflavin/vitamin B2 and zinc. (O.S Shittu, 2012). Okra is an economically important vegetable crop grown in tropical and subtropical parts of the world. Weeds are important limiting factor in tropical crop production, growing very rapidly and obnoxiously in the rainy season. Uncontrolled weed growth throughout the life of okra could reduce pod yield by 88% to 93%. Okra pod is an important yield component in Nigeria. Thus, weed infestation is a major problem in the production of okra. However, the extent of weed competition depends on the type of weed species, the severity of weed infestation, the duration of infestation and climatic conditions. The controls of such weed are time consuming and strenuous and farmers in the study are engaged in need control without any referred literature. Okra growers cultivate okra without having the good knowledge of proper management practices especially the right time to weed their farms. Physical weeding regime in crops like cucumbers whose produce are openly produced on the soil surface and devoted when it is still rare is significant, as use of herbicide to control weed in such crop is not sensible because of health risk. The consequence of these unsound practices can led to poor okra performance. This research seeks to address this issue.

Materials and Methods

Experimental Site

The experiment was conducted during rainy season of 2024 at the Teaching and Research Farm Federal Polytechnic Monguno.

Treatments and Experiment Design

The experiment consists of three (3) row patterns (1:1, 1:2, 2:1) and four (4) weeding intervals (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 are also included. The main plot is weeding interval and the sub plot is the row pattern. The treatments were laid out in a Split Plot Design replicated three times. There was total of 60 plots and each measuring 5.0 m x 7.5m (gross size of 37.5m^2) while the net plots consist of the central rows in each gross plot excluding boarder rows (14.0m^2). Within replicate block rows was separated using 1m distance and 2m between each replicate block.

Plant height (cm) of Okra

Plant height was measured from 3 WAS, 6WAS and 9WAS. Five plants were randomly selected and tagged from each net plot area and their height measured from ground level to the apex of the plant with a graduated meter rule, and average computed.

Number of leaves/plant of Okra

Average number of fully expanded leave per plant was determine from 3 WAS, 6WAS and 9WAS. This was done by selecting five tagged plants from each plot and counting the fully expanded leaves and average was recorded per plot.

Number of fruits harvested/plant of Okra

This was done by taking the average of the total number of fruits harvested from each sampled plant at each harvested.

Number of leaves/plant of Cucumber

This was obtained by counting the number of cucumber leaves from three (3) randomly selected and tagged plants from the net plot and average was computed. This was done at 3, 6 and 9 WAS.

Number of fruits/plant of Cucumber

This was obtained by counting the number of fruits at harvest from the tagged plants for each treatment plot and divided by the number of plant involved.

Table 1: Effects of row pattern and weeding interval on plant height of okra in Maiduguri

	Plant Height		
Treatment	**3WAS**	**6WAS**	**9WAS**
Row Pattern (A)			
1:1	11.34^a	27.38^a	40.59^a
1:2	11.31^a	27.33^a	40.34^a
2:1	10.58^a	27.48^a	42.69^a
SE ±	0.14	0.33	0.65
Weeding Interval (B)			
Weedy Check	10.03^c	20.82^d	32.94^c
1W	11.22^a	25.89^c	40.99^b
2W	12.22^a	28.33^b	46.54^a
WF	12.73^a	29.53^a	47.42^a
SE ±	0.18	0.37	0.51

Means followed by the same letter (s) in a column are not significantly different at P=0.05 level of probability using DMRT.

Key
NS = Not significantly different at P =0.05
WAS = Weeks after sowing
1W = Hoe weeding once at 3 weeks after sowing
2W = Hoe weeding twice at 3 and 6 weeks after sowing
WF = Weed free

The effects of row pattern and weeding interval on plant height of okra in Maiduguri are shown in table 1. There is no significant effect of row pattern on plant height of okra. There was significant effect of weeding interval on plant height of okra at 3, 6 and 9WAS in Maiduguri. Generally, weed free treatment produced significantly the tallest okra plant and the shortest plants were observed in weedy check. There was no significant interaction between row arrangement and weeding regime on plant height of okra in Maiduguri.

Table 2: Effect of row pattern and weeding interval on number of leaves of okra in Maiduguri

	Number of Leaves		
Treatment	**3WAS**	**6WAS**	**9WAS**
Row Pattern (A)			
1:1	8.61[b]	12.45[b]	15.87[b]
1:2	9.31[a]	13.34[a]	16.28[a]
2:1	8.41[b]	12.32[b]	15.85[b]
SE ±	0.14	0.15	0.18
Weeding Interval (B)			
Weedy Check	7.72[c]	10.80[c]	13.34[c]
1W	8.18[b]	11.93[b]	12.91[b]
2W	8.72[ab]	12.95[ab]	15.73[a]
WF	9.01[a]	13.29[a]	15.96[a]
SE ±	0.16	0.18	0.21

Means followed by the same letter (s) in a column are not significantly different at P=0.05 level of probability using DMRT.

Key
NS = Not significantly different at P =0.05
WAS = Weeks after sowing
1W = Hoe weeding once at 3 weeks after sowing
2W = Hoe weeding twice at 3 and 6 weeks after sowing
WF = Weed free

The effect of row pattern and weeding interval on number of leaves/plant in Maiduguri is shown in table 2. There was significant effect of row pattern on number of leaves/plants of okra at 3, 6 and 9 WAS in Maiduguri. The 1:2 row pattern produced significantly highest number of leaves/plants of okra while the least number of leaves/plants of okra was observed in 1:1 and 2:1. There was significant effect of weeding interval at 3, 6 and 9 WAS. Generally, the two weeding was optimum for number of leaves/plant of okra while weedy check produced the least number of leaves/plant.

Table 3: Effect of row pattern and weeding interval on number of fruits/plant of okra in Maiduguri

Treatment	Number of Fruits/Plant
Row Pattern (A)	
1:1	14.47[a]
1:2	14.97[a]
2:1	14.36[a]
SE ±	0.22
Weeding interval (B)	
Weedy Check	
1W	14.28[c]
2W	17.19[ab]
WF	17.44[a]
SE ±	0.25

Means followed by the same letter (s) in a column are not significantly different at P=0.05 level of probability using DMRT.
NS = Not significantly different at P =0.05
WAS = Weeks after sowing
1W = Hoe weeding once at 3 weeks after sowing
2W = Hoe weeding twice at 3 and 6 weeks after sowing
WF = Weed free

The effect of row pattern and weeding interval on number of fruits/plant of okra in Maiduguri is shown in table 3. There was no significant effect of row pattern on number of fruits/plant of okra. There was significant effect of weeding interval on number of fruits/plant of okra. The least number of fruits/plant of okra was observed in weedy check. There was no significant interaction between row pattern and weeding interval on numbers of fruit/plant of okra in Maiduguri.

Table 4: Effect of row patter and weeding interval on number of leaves of cucumber in Maiduguri

Treatment	Number of Leaves		
	3WAS	6WAS	9WAS
Row Pattern (A)			
1:1	22.18[a]	41.58[a]	103.73[a]
1:2	22.57[a]	42.46[a]	105.09[a]
2:1	21.04[a]	41.41[a]	103.17[a]
SE ±	0.48	0.32	0.97
Weeding Interval (B)			
Weedy Check	17.31[c]	31.01[c]	82.56[c]
1W	21.77[b]	44.21[b]	107.26[b]
2W	23.38[ab]	45.88[ab]	112.60[a]
WF	23.91[a]	46.03[a]	113.56[a]
SE ±	0.56	0.37	1.12

Means followed by the same letter (s) in a column are not significantly different at P=0.05 level of probability using DMRT.
NS = Not significantly different at P =0.05
WAS = Weeks after sowing
1W = Hoe weeding once at 3 weeks after sowing
2W = Hoe weeding twice at 3 and 6 weeks after sowing
WF = Weed free

The effect of row pattern and weeding interval on number of leaves/plant of cucumber is shown in table 4. There was no significant effect of row pattern on number of leaves/plant of cucumber. There was significant effect of weeding interval on number of leaves/plant of cucumber in Maiduguri. Two weeding was optimum for number of leaves/plant and weedy check produced the least number of leaves/plant. There was no interaction between row pattern and weeding arrangement on number of leaves/plant of cucumber in Maiduguri.

Table 5: Effect of row pattern and weeding interval on number of fruits/plant of cucumber in Maiduguri

Treatment	Number of Fruits/Plant
Row Pattern (A)	
1:1	13.93[b]
1:2	15.27[a]
2:1	13.74[c]
SE ±	0.38
Weeding Interval (B)	
Weedy Check	10.83[c]
1W	12.43[b]
2W	16.13[a]
WF	16.53[a]
SE ±	0.44

Means followed by the same letter (s) in a column are not significantly different at P=0.05 level of probability using DMRT.
WAS = Weeks after sowing
1W = Hoe weeding once at 3 weeks after sowing
2W = Hoe weeding twice at 3 and 6 weeks after sowing
WF = Weed free

The effect of row pattern and weeding interval on number of fruits/plant of cucumber is presented in table 5. There was significant effect of row pattern on number of fruits/plant of cucumber in Maiduguri. Throughout the period of observations in 1:2 row pattern produced significantly the highest number of fruits/plant while 2:1 row pattern produced the least number of fruits/plant. Similarly, there was significant effect of weeding interval on number of fruits/plant of cucumber in Maiduguri. The two weeding and weed free gave significantly higher number of fruits/plant than the other weeding intervals. However, two weeding was optimum for the number of fruits/plant. The 1:2 row patterns with two

weeding was optimum for number of fruits/plant of cucumber while 1:1 and 2:1 row pattern with weedy check produced the least number of fruits/plant.

Discussion

Plant height and number of leaves/plant were found to be significantly greater for okra plants cultivated using 1:2 row Pattern than for the other row patterns used and this could be as a result of few okra populations in the 1:2 planting pattern of okra/cucumber mixture which improved more leaf formation and expansion. The cucumber in the mixture simply served as cover crop, being a trailing plant. This limits competition for the okra from resources such as light and carbon dioxide. This assertion is supported by the work of Hamma *et al* (2012) who grew okra intercropped with watermelon to serve as live mulch in Samaru Zaria and found that the okra produced higher number of leaves and controlled weeds significantly compared to when okra grown as a lone crop. Okra is tall growing crop while watermelon is a trailing crop serving as mulch for the okra. Arunah *et al*. (2013) also reported higher number of leaves and leaf area/plant when grown using 1:2 planting pattern although the mixture was with castor oil. The greater values of the okra produced by two weeding or weed free could be attributed to sufficient supply of essential elements (Adam *et al;* 2020) as there was minimum or no weed interference as evidenced by the low weed dry matter values on these weeding regimes.

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