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Effects of Different Weeding Regimes on Performance of Okra (*Abelmoschus esculentus*) in Borno State, Semi-Arid Region of Nigeria

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***Abstract**: An experiment was carried out to determine the effects of different weeding regimes on growth and yield of okra in semi-arid region of Maiduguri, Borno State. The experiment was conducted during the raining season of 2023 at the Integrated Teaching and Research Farm of the Department of Agriculture Technology, Ramat Polytechnic, Maiduguri, Borno State. The experiment consists of four treatments; weedy check (T_1), weed free (T_2),weeding after two weeks (T_3), and weeding after three weeks (T_4) arranged in a Randomized Complete Block Design (RCBD) replicated three times. The result shows that weeding regime at every two and three weeks (T_3 and T_4) gave the tallest plant height, highest number of leafs/plant, largest leafs area/plant, earliest days to first flower and 50% flowering. Weeding after two and three weeks (T_3 and T_4) also gave the best fruit yield and number of okra at all the sampling period. Weedy check (T_1) recorded the shortest plant height, least number of leafs/plant, smallest leafs area/plant, and longest days to first flower and 50% flowering, Weedy check (T_1) also recorded the least fruits yield at all the sampling periods. From the results of the present study, it is recommended that due to the tedious nature of weeding, weeding at every three weeks (T_4) which also gave the highest yield is best for production of okra in Maiduguri, Borno State.*

***Keywords:** Performance of Okra, Semi Arid Region Nigeria, Different Weeding Regime, Effects of Weeding.*

INTRODUCTION

Okra (*Abelmoschus esculentus*) is a vegetable crop belonging to the family of *malvaceae.* Knowledge of the critical period of weed competition in okra helps growers implement effectively and timely weed management practices. A critical period of weed control can be defined in two ways namely: the weed competition period and the weed free time required. The weed competition period defines the maximum period in which weeds can be allowed to compete with the crop without resulting in an unacceptable yield loss that is, defines the beginning of the critical period of weed control. The weed-free time requirement referred to as the minimum amount of the time a crop must be maintained free of weeds to prevent crop yield loss (the end of the critical period of weed control) Havoc caused by weeds differed from one geographical location to another, types of crop species planting date, cropping pattern and crop density

(Ali M.A, 2010). The frequency of hoe weeding is high in okra as a result of the plant inability to developed adequate canopy cover that would effectively shade the ground to prevent weed growth at its early stages of establishment. High weed frequency has also been reported in other vegetable crop like carrot, pepper and tomato. Uncontrolled weed growth caused yield reduction of 88-90% in okra farm when compared to weed free. Okra and weed compete for growth resources light, moisture and nutrients. The accurate time to weed might help to reduce the competition and lesson weed completion. In the life cycle of crop, not all the growth stages of a crop are susceptible to weed competition. However, there is a misunderstanding that weeding at any period during plant growth will subdue the issues of competition with weeds, hence, he knowledge of the critical period of weed control will assist farmers to known the weed appropriate time to weed a farm so as to attained optimum yield noted that the critical period of weed competition in okra occurred between 3 and 7 weeks after planting. Keeping the crop weed free until 3 weeks after planting (WAP) reduced okra performance because of the harmful consequence of succeeding weed growth while weed growth up to 3 WAP and subsequently keeping the plots weed-free had no harmful consequence on okra (Adegun Y. 2014).

Weed Number of pods and yield were increased by all the weed the moisture controlling weed and producing higher yield but to control weed to get higher yield and economic on okra test seedlings sociological test confirmed the present of OMV. Beetle vectors cough both from weed and from okra were infective when confirmed on highly seedling. Seem important in the spread of OMW from weeds to okra or culcutus did not appear to be an important vector because they that weeds constitute important sources of OMV for okra. Season, competition of weed with okra increases the critical period of weed interference in organic okra during the showed important or relevant competitive ability. On a similar note, weeds also take up space, which can make it harder for gardens to flourish. Invasive species in particular can disrupt a micro-ecosystem so profoundly that all other types of plants will often cease to grow there all together. Weeds increase the cost of growing vegetables reduces crop yield and quality, and impact farm management decisions, such as timing of harvest and choice of herbicide options. The growth of weeds in vegetable production system is enhanced by soil disturbance, irrigation and the application of fertilizers. Weeds harbor many vegetable disease, nematode, mites and insects especially aphids and trips that transmit viruses. Weeds, pressure is generally higher when soil conditions are poor due to heavy cropping. Weed when combined with diseases and pests, can reduce yield in vegetable crops by 10-70% by competing for water, soil nutrients, light and space that ultimately restricts the development of the plant. Yield impacts depend on crop type and stage, for example studies have shown reduction in yields of approximately 20% in broccoli, 25% in lettuce but up to 90% in carrots where no weed control activities are undertaken. Other factors that influenced yield impacts include pest type, soil type weather conditions, timing of infestation and crop management (Akobundo, I. 2017). Weed pressure for okra is an issue since okra has such a long growing season. However, controlling weeds prior to planting is the best approach to reduce competition during okra seed germination. Later, okra's mature canopy blocks out most of the sun from hitting the soil surface, this shading helps reduced weed competition. During the okra seed germination, later are determined as problem to the yield growth of okra all season long. Once a weed, like pig weed (*Amarantus spp*), which produces 10,000 to 100,000 seeds per plant (depending on the species and level of maturity) matures, it becomes a huge competitor to the okra plants. Been a competitor, it affects the future potential of thousands of pig weed plants which will compete with okra for many seasons (Raovs, 2013).

Okra is an economically important vegetable crop grown in tropical and subtropical part 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, the duration of infestation and strenuous and farmer in the study are engaged in need control without knowledge of proper management practices especially the right time to weed their farms. The consequence of these unsound practices can led to poor okra performance. This research seeks to address these challenges.

MATERIALS AND METHOD

Location of Experimental Site

The research was conducted during the dry season of 2023 at the Integrated Teaching and Research Farm in the Department of Agricultural Technology, Ramat Polytechnic Maiduguri, Borno State of Nigeria. (Latitude 11^0:4N and 130^0:4E 354m above sea level) with an annual average rainfall of 600 to 700mm. the average temperature is 28.5^0C the vegetation of the area is of sparse vegetation; a typical characteristic of an arid environment with sandy loamy textured soil.

Materials to be Used

The materials used for this project include: okra (lady's finger), ranging pole, measuring tape, rake, digital scale, weighing scale and hoe.

Sources of seeds

Seeds were purchase from the Borno State Agricultural Developments Program (BOSADP).

Treatments and Experimental Design

The experiment consists of four weeding regimes; weeding check (T_1),weed free (T_2), hoe weeding every two weeks (T_3),hoe during every three weeks (T_4) and apportioned to a Randomized Complete Block Design (RCBD) with three replications each. The experiment covered a total land area of 165^2(15m x 11m). Each plots size will be $9m^2$ (3m x 3m) and the alley (walking space) between plots is 1m. The intra and inter row spading was 20cm x 30cm respectively and data was not be collected on plant at outmost row in the plots. Therefore, the net plot size was $4.92m^2$.

Cultural Practice

The land was cleared manually using hoe, rake and cutlass to remove unwanted plant, shrubs and stumps. The soil was tilled to ensure root penetration as well as to avoid water logging. The plots were marked out by using measuring tape, hoes and ropes to ensure efficient measurement and the plots were erected to avoid run off.

Thinning

Thinning was done after full emergence of the seedling and two plants will be left for each stand, the smaller and weaker seedlings were removed leaving the strong and the vigorous ones. This was done at 2 weeks after emergence.

Collection of Data

Five plants were randomly selected from the net plot and tagged. Data for growth and yield parameters were measured and recorded from these tagged plant. The parameters measured include:

Plant height

Plant higher was measured using measuring rule from the ground level up to the apex at every 2, 4, 8 and 10 weeks after sowing (WAS). Average plant height for every plot was recorded.

Number of leafs per plant

From the tagged plant, the active leafs was counted and this was done at 2 weeks after sowing and continued at 6, 8 and 10 weeks after sowing. Average number of leafs per plot was recorded.

Leaf area

Leaf area was taken at 4, 6, 8 and 10 weeks after sowing from the 5 tagged plants. The length and breadth of each leaf was measured with a ruler and multiplied to obtain the leaf area of each leaf. The average of each plot was recorded.

Days to first flowering

This was obtained by daily inspection and recording the total days taken from the date of sowing to first flower to emerge.

Days to 50% flowering

This was also obtained by daily inspection and recording the total number of

days taken for 50% of the plants population to attainment of flowering from the date of sowing.

Number of fruit harvested per plant

This was recorded by taking the average of the number of fruit harvested from each tagged plant at each harvest up to 12 weeks after sowing.

Total fruit yield/plot

Total fruit was recorded on grams per plot basis (g/plot).

Data Analysis

Data generated for the experiment will be subjected to Analysis of Variance (ANOVA) using statistical package "statistics 8.0 and different between treatment means will be identified using LSD.

RESULTS

Table 1: Effects of Weeding Regimes on Plant Height of Okra in Maiduguri

Treatment	4WAS	6WAS	8WAS	10WAS
T_1	5.57^{c}	11.23^{c}	29.40^{c}	36.47^{c}
T_2	6.27^{b}	15.73^{b}	39.61^{b}	47.30^{b}
T_3	8.15^{a}	18.83^{a}	44.55^{a}	56.50^{a}
T_4	7.98^{a}	19.04^{a}	45.47^{a}	57.13^{a}
LSD (0.05)	0.03	0.26	0.99	0.22

Mean followed by the same letter(s) within a column are not significantly different at 5% level of probability.

T_1 = Weedy check (zero Weeding)

T_2 = Weed free

T_3 = Wedding after two weeks

T_4 = Weeding after three weeks

Table 1 shows the effects of weeding regimes on plant height of okra at 4, 6, 8 and 10 weeks after sowing (WAS). Weeding regimes had significant effects on plant height at all the sampling periods except treatment 3 and 4. The tallest plants are recorded at treatment 4 (weeding after three weeks) but is not statistically different from treatment 3 at all the sampling periods. The shortest plants are recorded at treatment 1 (Weedy Check). Treatment 3 (weeding after two weeks) was found to be optimum weeding

regime for okra production in Maiduguri. This finding is in agreement with findings of Kugbe ***et. al.,*** (2019) who also reported that weeding regimes after 3 weeks recorded tallest plant of okra.

Table 2: Effects of Weeding Regimes on Number of Leafs/Plant in Maiduguri

Treatment	4WAS	6WAS	8WAS	10WAS
T_1	4.07^c	7.30^c	11.50^c	14.50^c
T_2	5.47^b	9.20^b	16.60^b	18.73^b
T_3	6.90^a	11.77^a	11.57^a	25.97^a
T_4	7.27^a	12.60^a	20.33^a	26.30^a
LSD (0.05)	0.36	0.38	0.31	0.31

Mean followed by the same letter(s) within a column are not significantly different at 5% level of probability.

T_1 = Weedy check (zero Weeding)

T_2 = Weed free

T_3 = Wedding after two weeks

T_4 = Weeding after three weeks

Table 2 shows the effects of weeding regimes on number of leafs/plant of okra at 4, 6, 8 and 10 weeks after sowing (WAS). Weeding regimes has significant effect on number of leafs/plant at all the sampling periods across the treatments. The highest numbers leafs/plant was recorded at treatment 4 (weeding after three weeks) at all the sampling periods. The least numbers of leafs/plant are recorded at treatment 1 (Weedy Check). From this results, treatment 4 (weeding after three weeks) was found to the best for number of leafs/plant of okra. This finding is in agreement with findings of Imoloame ***et. al.,*** (2013) who also reported that weeding regimes after 3 weeks recorded highest number of leaves of okra.

Table 3: Effects of Weeding Regimes on Leaf Area/Plant in Maiduguri

Treatment	4WAS	6WAS	8WAS	10WAS
T_1	6.38^c	11.71^c	14.07^c	24.60^c
T_2	7.93^b	16.93^b	29.78^b	33.46^b
T_3	8.51^a	20.03^a	42.69^a	50.29^a
T_4	9.19^a	21.31^a	44.47^a	52.35^a
LSD (0.05)	1.72	0.74	0.66	0.59

Mean followed by the same letter(s) within a column are not significantly different at 5% level of probability.

T_1 = Weedy check (zero Weeding)

T_2 = Weed free

T_3 = Wedding after two weeks

T_4 = Weeding after three weeks

Table 3 shows the effects of weeding regimes on leaf area/plant of okra at 4, 6, 8 and 10 weeks after sowing (WAS). Weeding regime had significant effects on leaf area/plant across all the sampling periods and treatments except treatment 3 and 4. The largest leafs were recorded at T_4 (weeding after three weeks) at all the sampling periods but are not statistically different from treatment 3. The smallest leaf area/plant are recorded at treatment 1 (Weedy Check). The results revealed that treatment 3 (weeding after two weeks) was found to the optimum for leaf area/plant of okra. This finding is in agreement with findings of Kugbe ***et. al.,*** (2019) who also reported that weeding regimes after 3 weeks recorded largest leaf area/plant of okra.

Table 4: Effects of Weeding Regimes on Days to First Flowering and Days to 50% Flowering in Maiduguri

Treatment	Days to 1st flowering	Days to 50% flowering
T_1	44.33[c]	51.00[c]
T_2	51.67[b]	58.67[b]
T_3	57.00[a]	64.33[a]
T_4	58.33[a]	65.67[a]
LSD (0.05)	0.81	1.29

Mean followed by the same letter(s) within a column are not significantly different at 5% level of probability.

T_1 = Weedy check (zero Weeding)

T_2 = Weed free

T_3 = Wedding after two weeks

T_4 = Weeding after three weeks

Table 4 shows the effects of weeding regimes on days to first flowering and days to 50% flowering of okra. Weeding regime had significant effects on days to first flowering and days to 50% flowering except in treatment 3 and 4. T_1 (weedy check) flowered earliest and also 50% of the plants attained flowering earliest compared to other weeding regimes. Treatment 4 (weeding after three weeks) took the longest days to first flowering and 50% flowering and are not statistically different from treatment 3. Treatment 1 is best for days to first flower and days to 50% flower of okra. This finding is in agreement with findings of Kugbe ***et. Al.,*** (2019) who also reported that weedy check recorded earliest days to first flowering and 50% flowering similar findings were also reported by Mncube and Banda, (2017).

Table 5: Effects of Weeding Regimes on Fruit Yield (g) and Number of Okra.

Treatment	Fruit Yield (g)	Number of Okra
T_1	206.67[c]	34.00[c]
T_2	460.00[b]	40.33[b]
T_3	730.00[a]	75.00[a]
T_4	746.67[a]	77.00[a]
LSD (0.05)	153.34	13.47

Mean followed by the same letter(s) within a column are not significantly different at 5% level of probability.

T_1 = Weedy check (zero Weeding)

T_2 = Weed free

T_3 = Wedding after two weeks

T_4 = Weeding after three weeks

Table 5 shows the effects of weeding regimes on fruit yield and numbers of okra. Weeding regimes had significant effects on fruit yield and numbers of okra. The heaviest yield and most numbers of okra fruits were recorded in treatment 4 (weeding after three weeks) but it is statistically similar to treatment 3. The least fruit yield and numbers of okra fruits were recorded at treatment 1 (Weedy Check). From the present study treatment 3 (weeding after three weeks) was found to the optimum for fruit yield and numbers of okra fruit of okra. This finding is in agreement with findings of Imoloame ***et. al***., (2019), who also reported that weeding regimes after 3 weeks recorded heaviest yield and most numbers of okra fruit.

Summary

An experiment was carried out to determine the effects of different weeding regimes on growth and yield of okra in semi-arid region of Maiduguri, Borno State. The experiment was conducted during the raining season of 2023 at the Integrated Teaching and Research Farm of the Department of Agriculture Technology, Ramat Polytechnic, Maiduguri, Borno State. The experiment consists of four treatments; weedy check (T_1), weed free (T_2),weeding after two weeks (T_3), and weeding after three weeks (T_4) arranged in a Randomized Complete Block Design (RCBD) replicated three times. The result shows that weeding regime at every two and three weeks (T_3 and T_4) gave the tallest plant height, highest number of leafs/plant, largest leafs area/plant, earliest days to first flower and 50% flowering. Weeding after two and three weeks (T_3 and T_4) also gave the best fruit yield and number of okra at all the sampling period. Weedy check (T_1) recorded the shortest plant height, least number of leafs/plant, smallest leafs area/plant, and longest days to first flower and 50% flowering, Weedy check (T_1) also recorded the least fruits yield at all the sampling periods.

CONCLUSION

From the results of the present study, it can be concluded that weeding at every two and three weeks (T_3 and T_4) gave statistically similar results because both treatments gave the tallest plant height, highest number leafs, largest leaf area earliest to first flower, 50% of plants to attain flowering and heaviest fruit yield of okra plant in the study area.

RECOMMENDATION

From the results of the present study, it is recommended that due to the tedious nature of weeding, weeding at every three weeks (T_4) which also gave the highest yield is best for production of okra in Maiduguri, Borno State.

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