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EFFECT OF VARYING PERIODS OF WEED INTERFERENCE ON YIELD OF OKRA (Abelmoschus esculentus) IN THE HUMID TROPICAL FOREST ZONE OF SOUTH-EASTERN NIGERIA

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ABSTRACT

Studies were conducted at Umudike, Nigeria, between 1993 and 1994 to evaluate the effects of varying periods of weed interference in Okra (Abelmoschus esculentus L. Moench cv. Umuahia local). Two sets of treatments were used. In the first set, plots were kept weed free for specified periods and then weeds were allowed to grow. In the second set weeds were allowed to grow. In the second set weeds were allowed to grow initially for specified periods and were removed thereafter. Effects were assessed using fresh fruit weights of Okra. Uncontrolled weed growth caused a two year average yield loss of 93% in fresh fruit weight of Okra. Keeping the crop weed free by hand weeding every three weeks for the first 9 weeks was as good as keeping it weed free throughout the entire period of growth. On the other hand, Okra fruit yield was most critically reduced when the crop was weed infested between 3 and 9 weeks after sowing. The critical period of weed interference in Okra cv. Umuahia local was therefore 3-9 weeks from planting.

Farmers should weed their okra during this period where labour is a limiting factor.

INTRODUCTION

Okra is an important vegetable crop. The crop has a slow early growth habit (William and Warren, 1975) which makes it susceptible to early weed competition with consequent reduction in fruit yields (Iremiren, 1988). Several varieties of okra differing in maturing time, morphological and fruit characteristics

are grown in Nigeria. Plant morphological features and type of weed species had been shown as an important consideration in weed-crop interference in many crops (Akobundu and Ahisson, 1985; Akobundu and Agyakwa, 1987). Also weed competition in okra had been shown to be affected by time of planting and type of crop variety used (William and Warren, 1975).

As in other crops, weeds affect the okra plant through competition for nutrients, light, and moisture. Also they increase water management problems, harbour pests and diseases and lower human efficiency. Some tropical farmers recognized the necessity to remove weeds in their crops but do not consider this a serious problem which should be urgent and given early attention until weeds have nearly covered their crops. Other tropical farmers engage in constant weed removal by manual means and so keep their okra plant weed-free until harvest. This practice is costly in view of the huge man-hours used. Every crop has a period during which it is most sensitive to weed competition in its life time. It is necessary to identify the critical periods when weed presence is most detrimental in different varieties of okra so that efforts can be directed towards removing the weeds at that time in order to minimize yield loss caused by weeds.

The objectives of this study were:

i. to determine the critical period(s) of weed interference in okra planted sole, and
i. to determine the weed-free requirement on the okra variety.

MATERIALS AND METHODS

The trials were conducted at the teaching and research farm of the Federal College of Agriculture, Umudike (05^0 29'N, 07^0 33^0E, altitude 122m) during the 1993 and 1994 rainy seasons (April to July) to determine the effect of the duration of weed interference on the performance of okra. The soils of the experimental sites used for the two years were sand-clay loam with 0.92 and 0.52% total nitrogen and pH of 4.8 and 4.50 in 1993 and 1994 respectively. The experiments were laid out in a randomised complete block design with four replications.

The okra variety used in this experiment was Umuahia local, a potentially high yielding and popular local variety grown in Umuahia and its neighbouring towns and villages. The crop is 1 to 1.5m tall and is a medium tern maturity crop (23 to 24 weeks). It has cordate and wide leaves with

serrated margins. The leaves have netted vennation. Three okra seeds were sown per hole at 33cm intra-row on ridges spaced 100cm apart. Seven days after germination, seedlings were thinned down to one per stand to give projected population of 30303.03 plants/ha. The gross plot size was 13.2m^2, while the net plot was 5.28m^2. Planting was done between the first and second week of April each year. Basal fertilizer application was made 3 weeks after sowing and at the rate of 400kg/ha, 20:10:10 NPK. Two basic types of treatment schemes were employed within one experiment. In one scheme, weeds were controlled from sowing time by keeping the crop weed free (hand-weeding every 21 days) for different periods after sowing and then allowing it to become weedy until harvest.

In the other scheme, weeds were allowed to emerge and interfere with the crop grown for different periods after which the weeds were removed for the rest of the season by hand weeding every 21 days. Plots kept weeded and unwedded all season were included as checks. Harvesting was done every 3 days. Fresh fruits from each plot were weighed immediately after such picking. Data collected include crop vigour score, plant height and weed dry matter yield. Crop vigour rating was done visually using a scale of 0-10, where 0 was scored for a plot with completely dead plants and 10 for a plot with very vigorous plants. Data collected were analysed, and treatment means compared using Duncan's Multiple Range Test (DMRT) and standard error (SE).

RESULTS AND DISCUSSIONS

The dominant weeds present in the weedy check plots at 12 weeks after sowing (WAS) were as shown in Table 1. It was observed that annual broad-leaved weeds were dominant. It thus appears that in attempting to control weeds in okra in Umudike, one had to contend with annual weeds.

Table 1: List of Common Weeds found during the growth period of okra at Umudike.

Scientific Name:	
Broad Leaves:	
	Acanthospermum hispidum
	Achyranthes aspera Linn
	Ageratum conyzoides L.
	Alternenthera sessilis (L) R. Br. Ex Roth
	Amaranthus spinosus L.
	Aspilia africana (Pers) C. D. Adams
	Centrosema pubescens Benth
	Chromolaena odorata (L.) R. M. King & Robinson.
	Cleome ciliata Schum & Thonn.
	Dissotis rotundifolia SM
	Euphorbia hirta L.
	Euphorbia hyssopifolia L.
	Fleurya aestuana (Linn). Ex Miq
	Ipomoea involucrate P. Beav
	Mimosa invisa Mart.
	Mitracarpus scabar Zucc
	Oldelandia harbaceae L. Roxb.
	Phyllantus amarus Schum & Thonn
	Portulaca oleracea Linn
	Schwenckia Americana L.
	Tridax procumbens Linn
Grasses:	Axonopus compressus (Sw) P. Beauv.
	Andropogon gavanus Kunth var. gayamus.
	Brachiaria lata (Schumanch). C. E. Hubbard.
	Cynodon dactylon (L.) Pers
	Digitaria horizontalis Willd
	Eleusine indica L. Gaertn
	Panicum maximum Jacq
	Setaria barbata (Lam) Kunth
Sedges:	Cyperus difformis Linn
	Cyperus distans Linn F.
	Cyperus esculentus L.
	Kvilinga nemoralis Forst, Dandy ex Hutch
	Mariscus alternifolius. Vahl.

Weeds in each group are listed alphabetically.

Weed growth was very rapid during the first 6 weeks from planting, but beyond this period, the weed growth increased at a diminishing rate up to 12 weeks after sowing (Tables 2 and 3). Uncontrolled weed growth significantly depressed the fruit yield and plant height of okra by 91 and 53% respectively compared with weed-free check in 1993 while in 1994 these were 93 and 54% respectively. Adejonwo et al (1989) had reported yield reduction in okra seed yield of 88-90% in un-weeded plots, while

Singh et al (1981), reported yield loss of 76%. The relationships between weeds and plant height (Table 2); weeds and shoot fresh weight (Tables 2 and 3); weeds and fruit yield (Table 3) at harvest were significant. In both years, weed infestation for 3 WAS had no adverse effect on okra plant as reflected in plant height, number of days to first flowering shoot fresh weight and fruit yield. Weed competition for 3 WAS has been reported in the Nigeria Savanna to have no significant reduction in growth and yield of okra (Adejunwo et al 1989) and pepper (Lagoke et al 1988).

Maximum two year mean okra fruit yield (6.06t/ha) was obtained in plots kept weed-free throughout the growth period. This yield was not significantly different from yields in plots weed infested for only 3 WAS. The percentage okra fruit loss at this time was only 10 and 7% in 1993 and 1994 respectively. The mean interval between sowing and first flowering in okra cv. Umuahia local kept weed-free until harvest was 70.2 days (Table 2). Time on onset of flowering was delayed by weed interference, and this led to decrease in fruit yield.

Table 2: Effect of weed Interference on weed weight crop vigour, plant height and days of flowering in okra at Umudike, 1993, 1994.

	Cumulative Weed weight (t/ha) at 12 weeks		Crop vigour rating [1] at 12 weeks		Plant Height (cm) at 12 weeks		Number of days of first flowering		Shoot fresh matter (g/m²) at Harvest	
Treatments	1993	1994	1993	1994	1993	1994	1993	1994	1993	1994
Weed-free for 3 w. a. s.	1.05c	1.13e	2.5d	2.0de	38.6e	35.0e	78.0b	78.2b	177.92c	100.28cd
" " " 6 "	0.99cd	0.92e	6.9bc	6.3bc	65.8b	62.1b	72.0c	71.5c	594.91bc	393.30bc
" " " 9 "	0.89d	0.90e	9.5b	7.0b	73.4a	65.3ab	70.8c	71.0c	1100.87a	810.11a
" " " 12 "	0.83e	0.87e	8.1b	7.2b	75.3a	69.5a	70.4c	70.6c	1123.11a	836.75a
Weed free until harvest	0.79e	0.85e	10.0a	10.0a	76.5a	71.4a	70.0c	70.4c	1149.05a	927.63a
Weed infested for 3 w. a. s.	0.74e	0.75e	7.8b	7.3b	75.2a	70.3a	70.3c	70.1c	1139.79a	897.86a
" " " 6 w. a. s	1.11bc	1.82d	6.0c	5.2c	58.9bc	52.7c	78.0b	78.6b	897.00b	567.23ab
" " " 9 w. a. s.	1.25b	2.72c	3.1d	2.8d	53.7d	46.6d	79.3b	84.8a	263.17c	175.50cd
" " " 12 w. a. s.	1.52a	3.55b	2.0de	1.5de	50.3d	43.8d	82.1a	86.5a	240.93c	137.89cd
Weed infested until harvest	1.67a	4.28a	1.0e	1.0e	37.5e	34.4e	83.5a	88.0a	126.02c	81.48d
SE±	0.16	0.64	1.5	1.5	7.5	7.2	2.6	3.6	257.10	299.91

Means within the same column followed by similar letters in columns are not significantly different at 5% level of probability (DMRT).

WAS = Weeks after sowing

1 = Based on 0 – 10 rating scale, where 0 = completely dead plants and 10 = vigorous and healthy plants.

Table 3: Effects of weed interference on weed weight and okra fruit yield at Umudike, 1993, 1994.

	Cumulative weed weight (t/ha) at 12 w. a. s.		Okra fruit yield at harvest (t/ha)		Shoot fresh matter (g/m^2) at harvest	
Treatment	1993	1994	1993	1994	1993	1994
Weed-free for 3 w.a.s.	1.05c	1.13e	0.96d	0.64c	177.92c	100.28cd
" " " 6 "	0.99cd	0.92e	3.21c	2.51b	594.91bc	393.30bc
" " " 9 "	0.89d	0.90e	5.94ab	5.17a	1100.87a	810.11a
" " " 12 "	0.83e	0.87e	6.06a	5.24a	1123.11a	836.75a
Weed-free until harvest	0.79e	0.85e	6.20a	5.92a	1149.05a	927.63a
Weed-infested for 3 w.a.s.	0.74e	0.75e	6.15a	5.63a	1139.79a	897.86a
" " " 6 "	1.11bc	1.82d	4.84b	3.72b	897.00b	567.23ab
" " " 9 "	1.25b	2.72c	1.42d	1.0c	263.17c	175.50cd
" " " 12 "	1.52a	3.55b	1.30d	0.86c	240.93c	137.89cd
Weed-infested until harvest	1.67a	4.28a	0.68d	0.53c	126.02c	81.48.d
SE ±	0.16	0.64	1.20	1.13	257.10	299.91

Means within the same column followed by similar letters in columns are not significantly different at 5% level of probability by Duncan's multiple range test.
w. a. s. = weeks after sowing.

CRITICAL WEED FREE PERIOD

Keeping the crop weed-free every 21 days for 9 weeks gave a comparable fruit yield as continuing to weed until harvest. At this time deleterious effects of the weed led to fruit yield loss of only 7% in 1993 and 17% in 1994. Apparently from this point, the natural competitiveness of the crop had become sufficient to minimize further fruit yield depression from weed competition. The critical weed-free period in okra in this experiment was the first 9 WAS. This is because there were no significant fruit yield increases by keeping the plots weed-free beyond this period. In an experiment carried out in the Savanna zone, Adejonwo et al (1989), had shown that the critical weed-free period in field grown irrigated okra cv. TAE-38 was when the crop was kept weed-free for 6 WAS. This period was further reduced elsewhere to 5 weeks by planting in summer and finally to 3 weeks by using more competitive okra varieties (William and Warren, 1975).

CRITICAL DURATION OF WEED INTERFERENCE

The critical duration of weed interference in okra in this experiment was 3 WAS. This was the length of time that weeds co-existed with the crop during the growing seasons. Only 10 and 7% losses were sustained by starting weeding at the 3rd WAS in 1993 and 1994 respectively. It is likely that during early crop establishment (0-3 WAS) growth

factors had not become limiting and the young weeds offered relatively low weed competition. But as weed and crop increased their demand on limited environmental resources, competition sets in.

Since significant yield reduction in okra started at 3 WAS and further weeding beyond 9 WAS did not increase fruit yield significantly compared to the weed-free check, it could be said that the critical period of weed interference in okra cv. Umuahia local under Umudike conditions was between 3 and 9 WAS.

Farmers in this area are therefore advised to weed their okra farm at this period in order to minimize significant reduction in yield.

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