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Effect of Chemical Control of Insects at Three Growth Stages on the Yield Parameters of Kenaf (Hibiscus cannabinus L.) in northern Nigeria.

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ABSTRACT

Three sprays of a synthetic pyrethroid, Polytrin 440 EC (cypermethrin + profonenofos) were appli fornightly to control insect pests at the vegatative, flowering and fruiting stages of Kenaf. The correspond to 2-6, 6-10 and 10-14 weeks after planting (WAP). Data gathered included the number capsules damaged by both bollworms and sap-sucking insects. At harvest, data were collected capsules, fibre and seed yield as well as stem length and diameter (butt).

The plants protected only at the vegetative stage had more capsules damaged by insec when compared with other treatments. Significantly higher seed yields were obtained fro plants sprayed against insects at the flowering stage.

INTRODUCTION

Kenaf, *Hibiscus cannabinus* L. is a crop of immense importance as an industrial and food crop. However, kenaf, like other malavaceous plants, is subjected to serious insect infestation. Unfortunately, literature concerning the entomology of kenaf in Nigeria is very scanty probably due to lack of interest in the crop coupled with scarcity of manpower. Preliminary investigations of insects associated with kenaf at Samaru (11o11'N and 07o'E, 686 m) showed a total of 136 different species of insects (Dike, 1983). These insects were found feeding on the foliage fruits, seeds and stems of the plant (Fadare, 1981; Dike, 1983). Adenuga and Adeyemi (1968) also reported an outbreak of stem-boring beetles on kenaf in south-western Nigeria. These insects cou be found feeding on kenaf during the veg tative, flowering and fuiting stages growth. There is the need to determine tl growth stage of the crop at which applic tion of insecticide would give the best yiel

MATERIALS AND METHODS

Kenaf, var. Cuba 108, was sown on the fl in mid-June at Samaru during the 1987 ai 1988 rainy seasons. The kenaf seedlin were thinned to one plant per hill at or week after sowing followed by top dressi with calcium ammonium nitrate (CAN) the rate of 125 kg/ha.

The experimental design was a completely randomized block with three insecticide treatments and a control, each replicated four times. The three insecticide treatments consisted of three applications of Polytrin 440 EC each at two-week intervals between 2-6, 6-10, 10-14 weeks after planting (WAP) corresponding to the vegetative, flowering and fruiting phases of the plant. The insecticide treatments were administered at the rate of 1 litre/ha (cypermethrin 40g + profenofos 400 g/ha) using a standard CP 3 knapsack sprayer. Plant height (in m) was taken during each of the three growth phases.

At harvest, the total number of capsules produced per plant were determined. The capsules were individually examined for signs of infestation by bollworms and sap-sucking insects. Capsules showing portions of the wall eaten by chewing insects were regarded as having suffered bollworm damage, while those showing puncture marks on the outer wall indicated damage by sap-sucking insects. The seed weight, stem length and stem diameter (butt) were also determined. Ten plants were cut from each plot at random and these were kept in a free flowing stream of water for a period of 3 weeks for retting. Fibre yield was determined after retting and sun-drying the fibres. The data gathered was subjected to analysis of variance (ANOVA).

RESULTS AND DISCUSSION

The results obtained from the two-year study are presented in Tables 1 and 2. Plants protected between 6-10 and 10-14 WAP gave the best capsule yield in 1987. In 1988, kenaf plants protected between 2-6 and 6-10 WAP had more capsules than plants protected at 10-14 WAP (fruiting). Kenaf plants protected at the vegetative phase produced more ($P<0.05$) capsules than the control plants in the two years. This result is in line with those of Fadare (1984) who obtained the best protection of Kenaf capsules through the application of carbaryl at the onset of flowering and also at 50% flowering. Significantly fewer number of capsules (11.6 and 4.6%) were damaged by bollworms on plants protected at fruiting than the vegetative and flowering phases in both years, respectively. The 12.7% capsule damage caused by *Earias* and *Heliothis* as reported by Akinlosotu (1966), is close to the figures obtained in the present study. As capsule feeding insects like bollworms (*Earias* spp. and *Diparopsis watersi* Roths.) infest kenaf plants after fruitset (Donnelly, 1966), better control of these categories of insects was achieved by protecting the plants at the fruiting phase. The percentage of capsules damaged by sap-sucking insects on kenaf plants treated with insecticides was significantly lower ($P<0.05$) than that for the control plants. There was, however, no significant difference between protecting the vegetative and the fruiting phases of the crop. The reason might be that capsules borne by plants protected at the vegetative phase were produced when the toxic effect of the insecticide had worn off.

The effect of chemical treatment on other yield parameters of kenaf are shown in Table 2. Protecting kenaf against insects at any of the three growth stages did not significantly influence the butt diameter

Table 1. Effect of polytrin application at three growth stages on insect damage to kenaf capsules.

Treatment (Three insecticide applications	Total no. of capsules/plant capsules/plant		Mean no. of healthy bollworms (%)		Capsules damaged by sucking insects (%)		Capsules damaged by sap		Total damage to capsules (%)	
	1987	1988	1978	1988	1978	1988	1987	1988	1987	1988
Vegetative phase 2-6 WAP	18.2	20.0^{b}	12.0^{b}	16.2^{b}	31.1	17.2^{b}	1.5^{a}	0.6^{a}	33.7^{c}	18.5^{b}
Flowering phase 6-10 WAP	24.0^{c}	20.3^{b}	18.1^{c}	17.3^{b}	23.1^{a}	15.6^{b}	1.2^{a}	0.7^{a}	25.3^{b}	16.5^{b}
Fruiting phase 10-14 wAP	25.5^{c}	19.6	22.5^{d}	18.4^{b}	11.6^{a}	4.6^{a}	0.2^{a}	1.5^{a}	13.2^{a}	6.3^{a}
Control	8.1^{a}	8.7^{a}	0.0^{a}	1.5^{a}	57.7^{b}	80.3^{c}	12.6^{b}	14.3	87.4^{d}	94.5^{c}
+SED	1.469	1.609	1.817	2.084	12.23	2.326	0.5	0.367	1.561	2.149

Values followed by the same letter in column do not differ significantly (P=0.05)

during the first year of the study. Similar trends were observed in plant height. Plant heights varied from 2.3m for plants protected at fruiting and vegetative phases to 2.7m for those protected at flowering in 1987. In 1988, plant heights varied from 2.2 m to 2.5m for plants protected at vegetative and flowering phases, respectively. Differences in plant height among the insecticide-protected plants were not significant (P0.05). The results showed that plants protected against insect damage at the flowering phase produced significantly higher fibre and seed yields. The insects controlled during the vegetative phase were foliage feeders such as Podagrica dilecta (Dalm). Genung (1966) reported that despite t usually large populations of Podagrica, yie loss rarely occurs. Hence, protecting ker at the vegetative phase does not appear result in increase in yield.

In conclusion, the following recomme dations are suggested: First, where the f liage of the plant is to be used for foc insecticides with low residual effect a mammalian toxicity should be used to co trol the foliar insect pests during the veg tative phase. As is usual for purposes safety, a minimum waiting period of 2 wee should

Table 2: Effect of Polytrin application at three growth stages on some yield parameters of Kenaf

Treatment (Three insecticide applications)	Stem diameter cm		Plant height, m		Fibre yield/10 plants (g)		Seed yield/10 plants (g)	
	1987	1988	1987	1988	1987	1988	1987	1988
Vegetative phase 2-6 WAP	1.5	1.6[b]	2.3	2.2	125.0[b]	115.0[b]	88.3[b]	92.5
Flowering phase 6-10 WAP	1.6	1.7[b]	2.7	2.5	145.5[c]	130.2[d]	165.3[d]	1540
Fruiting phase 10-14 WAP	1.5	1.6[b]	2.3	2.4	128.1[b]	120.4[c]	106.3[c]	110.0
Control	1.3	1.4[a]	1.6	1.5	93.9[a]	89.5[a]	64.4[a]	56.0
+ SED	0.0839	0.0815	0.375	0.366	1.89	2.367	2.96	2.51
	NS		NS	NS				NS

Values followd by the same letter in a column do not differ significantly (P=0.05).

be observed between the last spray application and harvest of leaves for consumption. Secondly, for fibre and seed production, kenaf plants should be protected against insect attack during the flowering phase.

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