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STUDIES ON NEED BASED CONTROL OF COTTON BOLLWORMS UNDER RAINFED AND IRRIGATED CONDITIONS

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Based on the economic threshold level (5% boll worm infestation) the number of insecticidal sprays could be minimized to 2 in case of decamethrin and fenvalerate, 3 in case of chlorpyriphos, 4 in case of monocrotophos and endosulfan and 5 in case of carbaryl. Irrigated HX 11 protected with decamethrin @ 0.1 kg a. i/ha at 53 and 88 days after sowing (DAS) gave highest yield (1978 kg/ha) of seed cotton as against 980 kg in the untreated check. The corresponding yields in NCT 19 were 1031 and 671 kg/ha. Timely irrigation alone increased the seed cotton yield by 44.9 % in HX 1 and 36.8 % in NCT 19 over the rainfed crops.

In India cotton is grown over an area of 8 million hectares. Although India ranks first in acrage in the world, but is fourth in terms of production. The average yield of lint cotton in India is 167 kg/ha as against 728 in USSR. The major constraints of low production is the pest control which is acute and complicated. It is estimated that nearly 50% of the pesticides are consumed in cotton although the area occupied is only 50% of the total cropped area. In normal years the production losses due to insect attack in many cotton growing areas range between. 20 and 30%, but in epidemic years it may be upto 35% (Rao, 1980). The present manner of insecticide use in the cotton crop is far from satisfactory (Abhyankar *et al*., 1980). The introduction of synthetic pyrethroids has brought a new era in the cotton insect pest control in India (Agnihothrudu and Gour, 1980; Unni, 1980; Murugesan *et al*, 1980; Bhat and Patil, 1980; Rajendran and Jayaraj, 1980; Reddy *et al*., 1980. These insecticides controlled the notorious pests of cotton even in lower doses.

With the establishment of cotton mill at Bargarh (Sambalpur) the area under this crop is steadily increasing. But no data on the incidence of various pests and their management are available to be accepted by cotton growers. Keeping this in view, a field trial was conducted at the Regional Research Institute, Chiplima during the rainy season of 1982.

MATERIALS AND METHODS

Certified cotton seeds of the variety NCT 19 and HX 1 were sown on July 5, 1982. Each sub-plot size was 6 m x 5 m. The inter-and intra-row spacings for HX 1 was 150 cm x 60 cm and for that of NCT 19 was 90 cm x 60 cm Fertilizers were applied as 100 : 50 : 50 N,P,K, Kg/ha. Nitrogen was applied in 5 splits while P_2O_5 and K_2O were given as basal. Both the varieties were grown under rainfed as well as Irrigated conditions (need based). The experiments was laid out in a split plot design with 3 replications.

Observations on the incidence of different insect pests were recorded at 7 days intervals starting from 25 DAS from 10 randomly selected plants per plot. The percentage of aphids infested plants and population of leafhopper per 3 leaves (top, middle and bottom) were

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recorded from the randomly selected plants. Bollworm infestation was recorded from the above selected plants starting from the square formation stage till the harvest of the crop. The damaged terminal shoots and bolls were also taken into account. Insecticidal applications were done at the threshold levelsi. e., when the bollworms' damage reached or exceeded 5 %(Agrawal *et al*., 1984). However to check the infestation of sucking pests like leafhoppers and aphids dimethoate @ 0.5 kg a. i./ ha was sprayed at 38 DAS on the basis of such observations. The number of insecticidal sprays and their frequency of application were worked out (Table 1). The average plant height number of branches and bolls per plant were recorded from 10 randomly selected plants. The harvest of seed cotton was done at an interval of 7 days and the yield obtained from each treatment was separately weighed and pooled together. There where 7 pickings for the rainfed crop and 9 for the irrigated one. The yield was converted to kg/ha.

RESULTS AND DISCUSSION

NCT 19 being a rainfed crop, the influence of irrigation did not bring about a marked change in the plant height, number of branches or bolls However, the Irrigated crop recorded comparatively more number of branches and bolls than the rainfed one (Table 1)

NCT 19 when grown under irrigated conditions and protected with insecticides gave an average yield of 951.17 kg/ha as against 671.0 kg from the unprotected crop. Among the insecticides, monocrotophos applied @ 0.5 Kg a i./ha on 53,67, 81 and 95 DAS gave the highest yield of 1097.0 Kg/ha. under irrigated condition while fenvalerate gave maximum yield under rainfed condition. Working on the chemical control schedule of spotted bollworms Narasinha Rao *et al*. (1980) reported that monocrotophos was quite effective against this pest. However decamethrin @ 0.1 Kg a.i /ha applied twice on 53 and 85 DAS gave next best yield. Chlorpyriphos was found effective against the boll worms, but the yield obtained was low under both rainfed and irrigated situations (Table 1). Irrigated NCT 19 protected with fenvalerate, decamethrin, monocrotophos and carbaryl gave almost parallel yields, while the chlorpyriphos and endosulfan gave significantly lower yields, as compared to the above insecticides. However, under rainfed conditions no significant difference was found between the insecticidal treatment Insecticidal protection as a whole remained significantly superior to unprotected check.

It was observed that NCT 19 was severely infested with leaf spot disease at reproductive phase of the crop. Premature leaf falls and discoluration of bolls contributed towards the lower yields of NCT 19.

The effect of irrigation had a profound influence on the growth and yield of Hx 1. The average number of branches and bolls were more in the

Table 1. Influence of irrigation and pest management on the growth and yield of NCT 10.

Insecticidal Treatment	Dose (kg a.i./ha)	Frequency of spray (DAS)	IRRIGATED Plant height (cm)*	No.of branches*	No.of bolls*	Yield (Kg/ha)	RAINFED Plant height (cm)*	No.of branches*	No of bolls*	Yield (Ka/ha)
Fenvalerate	0.1	53 & 83	87.5	15.1	11.6	963	75.5	13.3	13.7	728
Decamethrin	0.1	53 & 83	74.6	14.3	15.0	1103	81.1	14.1	11.0	677
Monocrotophos	0 5	53,67 81 & 95	85.5	16.4	12.1	1097	73.9	12.6	8.9	602
Carbaryl	1 5	44,60,74,81 & 90	72.8	14.7	12.9	958	76.9	13 4	12.9	556
Chlorpyriphos	0.5	54,78 & 88	80.8	17.5	7 1	778	71.1	12 7	10.0	506
Endosulfan	0.7	44,60,74 & 88	75.6	15.9	15.0	880	73.1	11.8	10.1	537
Mean			79.47	15.65	12.27	951.17	75.27	13.0	11.1	600 67
Untreated check			75.1	14.3	11.9	671	68.9	12.2	8.9	434
SE(m)+ for treatment			4.53	4.1	1.7	55.2	1.8	0.68	1.6	50.64
CD(0 05)			N·S	N.S	N.S	171.9	5.6	N.S	N.S	N.S
SE(m)+ for C/R			—	—	—	71.3	—	—	—	62.9
C.D.(O.05)			—	—	—	156.95	—	—	—	138.45

* Mean of 10 Plants — Yield = Mean of three replications
DAS = Days after sowing — C/R = Control vs Rest

Table 2. Influence of irrigation and pest management on the growth and yield of Hx 1

Insecticidal Treatment	Dose (kg a.i./ha)	Frequency of application (DAS)	IRRIGATED Plant height (cm)*	No.of branches*	No.of bolls	Yield (kg/ha)	RAINFED Plant height (cm)*	No.of branches*	No.of bolls*	Yield (kg/kg)
Fenvalerate	0 1	53 & 83	91.5	15.1	28.4	1640	83.8	11.5	14.9	795
Decamethrin	0.1	53 & 83	86.6	14.3	26 5	1878	82.3	10.7	14 2	1029
Monocrotophos	0.5	53,67,81 & 95	80 1	13.3	20.9	1604	71.0	10.4	14.2	838
Carbaryl	1.5	44,60,74 81&90	85.9	14 3	21.5	1231	72.9	11 3	12 2	706
Chlorpyriphos	0.5	53.74&88	97.5	17.3	17.0	1116	78.9	11 4	10.5	748
Endosulfan	0.7	44,60,74&88	86.9	16.1	26.0	1448	75.3	12.1	16.2	728
Mean			88.10	14 9	23.8	1486 17	77.37	11.23	13.68	807.33
Untreated check			88,8	15.9	19.4	980	85.2	11.24	10.0	675
SE (m) + for treatment			9.24	1.03	2.18	75.0	4.25	1.04	1.15	46.1
C.D(0.05)			N.S	N.S	N.S	233.5	N.S	N.S.	N.S.	143.2
S.E (m)+ For C/R			—	—	—	99.7	—	—	—	95.5
C.D (0.05)			—	—	—	213.2	—	—	—	N.S.

*Mean of 10 plants — Yield = Mean of 3 replications
DAS= Days after sowing — C/R = Control vs Rest

Table 3 Kapas yield (q/ha) as influenced by pickings and Seed size.

Seed Size	Pickings P_1	P_3	P_2	P_4	P_5	Mean
S_1	28.25	29.80	22.07	20.56	18.41	23.81
S_2	24.15	25.03	19.70	18.65	16.28	20.76
S_3	24.68	26.37	21.58	19.17	16 98	21.76
Mean	25.69	27.06	21.12	19.46	17.22	

C.D (P=0.05)
Pickings (P) = 0.29 — Seed size (S) = 0.35
P x S = 0.77 — S x P = 1.73

irrigated crop as compared to the rainfed one. Other things being equal the irrigated crop recorded 44.9% more (seed cotton) yield as compared to the rainfed crop. Timely irrigation coupled with decamethrin spray @ 0.1 Kg a i./ha on 53 and 88 DAS (need based) gave the highest yield of 1878 kg/ha which varied significantly from the rest of the treatments including the unprotected check.

However fenvalerate and monocrotophos gave > 1600 kg/ha. Insecticidal protection as a whole proved significantly better over untreated check in the irrigated Hx 1. The extra yield obtained from the protected plots ranged from 236 to 898 kg/ha with an average of 506 kg/ha.

The seed cotton yield was drastically reduced under rainfed conditions. Except decamethrin no other insecticides could give > 1000 kg/ha. Even under rainfed situation, decamethrin sprayed @ 0.1kg a.i./ha on 53 and 83 DAS effectively controlled the bollworm population and gave significantly higher (1029 kg/ha) yield. From the yield point of view other insecticides remained at par to each other. Although the seed cotton obtained from the treated plots were higher as compared to untreated check, there was no significant difference between them.

From the foregoing results it becomes evident that insecticidal protection to the irrigated crop is more remunarative as compard to the rainfed crop. The water stress conditions coupled with insecticidal spray might be affecting the physiological processes of the plant which in turn reflected on the yield.

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