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Efficacy of Various Pesticides for the Control of Insect Pest Complex of Cottbn and Their Cost Benefit Ratio

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Abstract: A field trial was conducted during 1996 and 1997 to control the insect pest complex through the spray of five different insecticides i.e., Chemothoate, Nuvacron, Baythroid T.M., Monitor and Talstar. Maximum seedcotton yield was obtained when the crop was sprayed thrice. The yield was decreased with the increase in number of insecticides spays. Among sprayed treatments, five sprays produced lowest yield and increased whitefly population. According to economic analysis, two and three sprays not only increased the seedcotton yield but also decreased cost and there by resulted in increase of profits. The highest net return of Rs. 4,5051 = per hectare over control was recorded in case of two applications compared to Rs. 4,242/ = per hectare (three applications) over control. The studies concluded that two to three sprays are sufficient to meet the requirement of essential plant protection measures for getting better seedcotton yield at the minimum cost.

Key words: Cotton, insect pest complex, pesticides, cost benefit ratio

Introduction

Cotton is an important cash crop of Pakistan and contributes 60 percent of export earnings to the national exchequer. Efforts, therefore, are needed to rise per hectare yield through the adoption of modern production technology. Technology components include proper seedbed preparation, use of quality seed of high yielding varieties suited to local climatic condition, and protection of crop against weed and pest infestation (Chaudhry and Sarwar, 1999; Soomro *et al*., 1999). Besides other factors, the insect pest complex of cotton inflicts heavy losses to the cotton crop by reducing yield and quality of seedcotton (Amer *et al*., 1999). Cotton is attacked from seedling stage to harvest by different pests and annually suffers the loss of 20 to 30 percent or even more in the seedcotton yield. Ali *et al*. (1982) concluded that due to insect pests attack and diseases the losses are estimated up to 30 percent of the real potential of the cotton crop. Bishara (1982) reported that due to bollworm attack only, loss estimates ranged between 6 to 39 percent on farmers field. Schwartz (1985) reported that losses caused by pests when controlled and not controlled were calculated as 8 and 19 percent respectively. Insect pests are responsible for million of rupees worth of damage to cotton crop and are basic cause of worry and financial loss to the growers. Number of sprays has a positive influence on the physiomorphic characteristics as well as on the yield of seedcotton (Ahmad, 1993; Iqbal, 1993). However, pesticide application to control these pests has been increased up to alarming stage and ranges between 6 to 8 sprays. This indiscriminate use of spray has created many problems such as insect resistant, disturbance of biological equilibrium as well as health hazards (Horowitz *et al*., 1994). Moreover, pest species become resistant to chemicals when expose too frequently (Starn, 1997). This means that these compounds become less effective and therefore more expensive.

Insecticides application is a very drastic control measure and should only be used as a last resort, when other methods are not successful to keep the insect pest below its economic threshold level. Present studies therefore were carried out to know that do we actually need five or more sprays? Also to compare the role of spray regime/number of sprays against untreated crop with the main emphasis on cost benefit ratio.

Materials and Methods

Commercial cotton variety CRIS-9 was sown on 08-6-1996 and 11-6-1997 on the experimental field of Central Cotton Research Institute, Sakrand. The plot size was 50' x 30' per treatment. The design of experiment was Randomized Complete Block with six treatments and three replications. The agronomic practices were maintained uniform. The treatments were:

Treatment	Spray Schedule	No. of sprays
TI	1st spray starting after 50-55 days of planting	5
12	1st spray starting after 60.65 days of planting	4
T3	1st spray starting after 70-75 days of planting	3
T4	1st spray starting after 80-85 days of planting	2
T5	1st spray starting after 90-95 days of planting	1
T6	Control (No spray)	

Subsequent sprays were done after every fifteen days

Details of the pesticides used:

Treatments	1st spray	2nd spray	3rd spray	4th spray	5th spray
T1	Chemothrate	Nuvacron	Monitor	Baythroid Tm	Talstar
T2	Nuvacron	Monitor	Baythroid TM	Talstar	-
T3	Monitor	Baythroid TM	Talstar	-	-
T4	Baythroid TM	Talstar	-	-	-
T5	Talstar	-	-	-	-
T6	Control (No spray)				

The efficacy of the insecticides was determined by taking weekly observations for sucking complex, Twenty leaves i.e., upper, middle and lower from randomly selected ptants of each treatment were- examined with magnifying glass for sucking insects Thrips, -lassie, and whitely) population. As regards bollworm complex, stick method was adopted where in all one-stick sample/treatment was taken and then all the fruiting parts i.e. healthy and damaged were recorded separately and the calculations- were made accordingly. Net benefit/loss aver control for each treatment was calculated by deducting the cost of insecticide application plus revenue of the untreated plot form revenue of that treatment.

Results and Discussion

The data presented in Table 1 indicate that during 19-96 cotton season, maximum number of thrips (0.68)' jassid (1.02) and whitefly (11.01), was recorded fro treatments where three sprays, one spray and five sprays were made respectively, while the minimum number of th rips (0.49), jassids (0.58) and whitelly (3.84) was observed in treatments where five sprays, five sprays and no sprays was made respectively. The maximum whitefly population was noted on those plots where the maximum sprays were made (5 sprays). Ntaxirnurri' bollworm damage percentage was noted 41 untreated plot. During this year 1996, the seedcotton yield was increased when the insecticides were applied twice and thrice, but it was decreased with further increase in number of sprays. Thus, minimum yield after control was obtained where 5 sprays were made.

The data of 1997 season are presented in Table 2. The sucking complex data demonstrate that maximum number of trips (0.72)' jassid (0.83) and whltefly (13.43) was recorded in treatments where no spray, no spray and five sprays were made respectively. The presence of high yvhitetly population in 5 sprays treatment may be due to destruction of natural enemies or resistance of the insect against pesticides. Bottworm damage percentage followed the carne pattern as recorded during 1996 and maximum damage was observed in untreated plot.

Table 1: Population trend and yield obtained from different pesticides application during 1996

Treatments	A.v. sucking pest population per leaf			Av. Bollworm complex		Yield	Yield increase
	Thrips	Jassid	Whitefly	Bollworm darriage(%)	Live larvae (%)	kg/ha	over control (%)
T1	0.49	0.58 c	11.01a	4.25	0.44 b	2059	1.88
T2	0.52	0.60 b	10.95 a	4.90	0.57ab	2164	7.07
T3	0.08	1.0 a	6.07 b	4.87	0.7 7a	2260	11.83
T4	0.59	0.97 a	4.38 bc	4.88	0.69a	2273	12.47
T5	0.63	1.02 a	4.09 be	4.71	0.67a	2081	2.97
T6	0.55	0.96 a	3.84c	5.13	0.78a	2021	
F. Test	N.S.			N. S.		N. S.	

Means with similar letters are not sigMfiica-nmly different from each other according to DMR test

Table 2: Population trend and yield obtained from. thtferent pesticides application during 1997

Treatments	A.v. sucking pest population per leaf			Av. Bollworm complex		Yield	Yield increase
	Thrips	Jassid	Whitefly	Bollworm darriage(%)	Live larvae (%)	kg/ha	over control (%)
	0.53.	0.61	13.4a	3.67	0.33	1866	3.55
T2	0.51	0.6.8	1.1.91	3.69	0.58	1914	6.22
T3	0.71	0.68	5.91	3..03	0.51	2296	27.41
T4	0.69	0.77	3.57	3.50	0.59	2224	23.42
T5	0.65	0.81	3.21	3.58	0.59	2056	14.10
T6	0.72	0.83	2.68	4. 11	0.76	1802	
F. Test	N.S.	N. S.	-	N.S.	N.S.	N.S.	

Means with similar letters are not significantly different from each other according to DMR test

Table 3: Pesticide cost during 1996

Sr. No.	Name of pesticide	Dose (mL/ac)	Cost of chemical per liter (Rs)	Cost of chemical per acre (Rs.)	Cost of chemical per ha (Rs)	No. of sprays	Total cost on sprays (Rs)
1.	Chemothrate	300	372/-	111-	274/-	5	3714/-
2.	Nuvacron	800	415/-	332/-	820/-	4	3440/-
3.	Monitor	600	375/-	225/-	556/-	3	2619/-
4.	Baythroid TM	500	795/-	398/-	982/-	2	2063/-
5.	Talstar	250	1750/-	438/-	1081/-	1	1081/-

Table 4: Pesticide cost during 1997

Sr. No.	Name of pesticide	Dose (mL/ac)	Cost of chemical per liter (Rs)	Cost of chemical per acre (Rs.)	Cost of chemical per ha (Rs)	No. of sprays	Total cost on sprays (Rs)
1.	Chemothrate	300	424/-	127/-	314/-	5	4151/-
2.	Nuvecron	800	472/-	3.78/-	933/-	4	3837/-
3.	Monitor	600	424/-	424/-	255/-	3	2903/-
4.	Baythroid TM	500	865/-	433/-	1069/-	2	2273/-
5.	Taister	250	1950/-	488/-	1205/-	1	1205/-

Table 5: Cost Benefit Ratio during 1996

Treatment	No. of sprays	*Cost of chemical (Rs)	**Cost of spray (Rs)	Total cost (Rs)	Total cost per ha + Income From control	***Total income per ha (Rs)	Net benefit/ loss over control (Rs)
1	5	3714/-	1200/-	4914/-	4059/-	50,387/-	46328/-
2	4	3440/-	960/-	4400/-	4400/-	49,873/-	48690/-
3	3	2619/-	720/-	3339/-	3339/-	48,812/-	50850/-
4	2	2063/-	480/-	2543/-	2543/-	48,016/-	51143/-
5	1	1081/-	240/-	1321/-	1321/-	46,794/-	46823/-
6	Nil	0	0	0	0	----	45473/-

Rate of insecticides Rs. 370, 415, 375, 795 and 1750 respectively. Rate of one spray application Rs. 240 per hectare **Cost of seedcotton Rs. 900 per 40 kg

Table 6: Cost Benefit analysis during 1997

Treatment	No. of sprays	*Cost of chemical (Rs)	**Cost of spray (Rs)	Total cost (Rs)	Total cost per ha + Income From control	***Total income per ha (Rs)	Net benefit/ loss over control (Rs)
1	5	4151/-	1500/-	5651/-	43,043/-	38,720/-	(-) 4,3231-
2	4	3836/-	1200/-	5036/-	42,428/-	39,716/-	(-1 2,7121-
3	3	2903/-	900/-	3803/-	41,195/-	47,642/-	6,447/-
4	2	22731-	6001-	2873/-	40,265/-	46,148/-	5.883/-
5	1	1205/-	3001-	1505/-	38,897/	42,662/-	3,765/-
6	Nill	-	-	-	---	37,392/-	---

Rate of insecticides Rs. 424, 472, 425, 865 and 1950 respectively ** Rate of one spray application Rs. 300 per hectare ***Cost of seed cotton Rs. 830 per 40 kg

Table 7: Average Cost Benefit analysis during 1997

Treatment	No. of sprays	*Cost of chemical (Rs)	**Cost of spray (Rs)	Total cost (Rs)	Total cost per ha + Income From control	***Total income per ha (Rs)	Net benefit/ loss over control (Rs)
1	5	3933/-	1350/-	5283/-	46,715/-	42,524/-	(-1 4,191/-
2	4	3638/-	1080/-	4718/-	46,151/-	44,203/-	(-I 1,948/-
3	3	2761/-	810/-	3571/-	45,004/-	49,246/-	4,242/-
4	2	2168/-	540/-	2708/-	44,141-	48,646/-	4,505/-
5	1	1143/-	270/-	1413/-	42,8461-	44,743/-	1,897/-
6	Nil	-	-	-	---	41,4331-	

During this year, the yield of seedcotton showed almost similar trend as was observed during 1996. Maximum seedcotton yield of 2296 Kg ha^{-1} was achieved with 3 sprays but decreased with further increase in number of sprays resulting in yield decrease. Results show that minimum yield was obtained where maximum number of sprays was done; this may be due to increased whitefly population.

The data regarding cost of pesticides used, number of sprays and total cost of sprays during 1996 and 1997 are presented in Table 3 and 4. Cost benefit analysis during the year 1996 (Table 5) and shows that maximum revenue was obtained with two sprays (Rs. 3127/-) followed by three sprays (Rs. 20381-). The net income decreased with the increase in number of sprays and resulted in negative income (Rs. 4059/- loss per hectare) when the crop was sprayed 5 times. Cost benefit analysis of 1997 year indicated almost same pattern as was during 1996. Maximum revenue was obtained with three sprays (Rs. 6,447/-) followed by two sprays (Rs. 5,883/-).

The average data of two seasons (1996 and 1997) are presented in Table 6 and 7. The maximum benefit of (Rs. 4,505/-) was observed with two sprays followed by three sprays (Rs. 4,242/-). Keeping in view the above findings, it is concluded that only 2 to 3 sprays are sufficient to get the better seedcotton yield at the minimum cost. The results are in conformity with the findings of Ahmad (1993) Denison and Barnett (1993).

From the present studies, it has been concluded that maximum use of pesticides cannot increase the yield but will only increase the input costs. Therefore, most selective insecticides at the appropriate time should be used which will be economical and safe for air pollution and in the controlling of the cotton pests.

To prevent the harmful effect of the bio agent and protection of natural enemies, resistant varieties should be grown. Small farmers and extension workers should be educated for the identification of cotton insect pests, their economic threshold levels and the safe and effective use of pesticides with correct techniques of spraying.

Early treatments with insecticides in cotton crop be avoided because of adverse effects on beneficial insects that are most abundant at that time. The pesticide should be used only as lost resort when other methods are not successful. Taking in to consideration these points the number of sprays should any how be curtailed to allow biological control, to avoid the pest resistance and to decrease the input costs, so that the growers can be benefited and be able to receive good returns from the market for cotton yields.

References

Ahmad, I., 1993. The physiomorphic influence of different doses of Tamaron/Dimecron on S-12 cotton. M.Sc. Thesis, University of Agriculture, Faisalabad.

Ali, M., Z. Ahmed and M.R. Attique, 1982. Effect of the removal of fruiting parts of field of four different varieties of cotton in Punjab. Pak. Cottons, 26: 23-30.

Amer, M., S.A.S. Hussain, L. Khan, M. Khattak and G.S. Shah, 1999. The comparative efficacy of insecticides for the control of the insect pest complex of cotton (*Gossypium hirsutum* L.). Pak. J. Biol. Sci., 2: 1552-1555.

Bishara, S.I., 1982. FAO entomologist. Pak/73/026 Terminal Reports, Central Cotton Research Institute, Multan.

Chaudhry, A.U. and M. Sarwar, 1999. Optimization of nitrogen fertilization in cotton (*Gossypium hirsutum* L.). Pak. J. Biol. Sci., 2: 242-243.

Denison, J.F. and J. Barnett, 1993. A case analysis of the cost and returns of cotton production in the Ouachita Valley of Louisiana. Proceedings of the Beltwide Cotton Conference, January 10-14, 1993, New Orleans, LA., USA., pp: 478-481.

Horowitz, A.R., G. Forer and I. Ishaaya, 1994. Insecticide resistance management as a part of IPM strategy in Israeli cotton fields. Proceedings of the World Cotton Research Conference-Volume 1, February 13-17, 1994, Brisbane, Australia, pp: 537-544.

Iqbal, M., 1993. The physiomorphic influence of some insecticidal spray schedules on FH 367 cotton. M.Sc. Thesis, University of Agriculture, Faisalabad.

Schwartz, P.H., 1985. Losses in yield of cotton due to insects. Agriculture Hand Book USDA No. 589, 358 [En, 12 pp. of ref. ARS, USDA Beltsville, Maryland USA].

Soomro, A.W., A.R. Soomro and G.H. Mallah, 1999. Recovery of nitrogen fertilizer and growth of cotton as affected by various levels of flooding. Pak. J. Biol. Sci., 2: 1507-1509.

Starn, P.A., 1997. Winrock international some basic facts about integrated pest management. Paper Presented in Cotton Seminar Sponsored by ARP2 Project.