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OBSERVATIONS ON EFFICIENCY AND ECONOMICS OF COTTON PEST CONTROL WITH DELTAMETHRIN ALONE AND ITS COMBINATIONS WITH MONOCROTOPHOS AND DDT

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Experiments were conducted to evaluate, against cotton pest complex, the efficacy of insecticide deltamethrin alone or its combinations with monocrotophos and DDT. Data obtained was statistically analysed by method described by Baluch *et. al.* [6-8, 10-11]. The results were compared with the conventional mixture of DDT and monocrotophos, taken as a standard. Deltamethrin + monocrotophos combination demonstrated the best results.

Key words: Cotton; Pyrethroids alone and combinations.

INTRODUCTION

In Pakistan insect pests cause more damage to the cotton crop than the accumulated damage of all other pest organism. Pesticide consumption data for Pakistan for past six years (1981-85) reveals that insecticides occupy nearly 90 % share of the market. FAO estimates that 50 % of the cotton production shall be ruined by insects if pesticides are not applied on the crop in the developing countries. Pakistan's own experimental data on cotton loss assessment due to pest attack reveal losses upto 80 % of the crop every year (more than 56 % by insects) [1].

Type of pesticide suitable for use on this crop in any cotton producing country is considered as one of the major factors in successfully combating the pest complex infesting it. Extremely high insecticidal activity and broad-spectrum of pest control, with favourable toxicological properties have made synthetic pyrethroids very popular with cotton growers and they occupied nearly 50 % of cotton market in Pakistan during recent years. (Overall pesticide sale was over Rs. two billion in 1985). These pesticides are effective against all stages of insects, possessing specially high larvicidal activity amongst lepidopterous pests. Ruscoe [2] reported excellent increase in yield of cotton with the use of these products (a 250-fold increase over untreated control in Tanzania). Lhuste *et. al.* [3] and Shell [5] showed upto 40 % increase in the yield of cotton when compared with standard conventional insecticides in South Africa and also reported that deltamethrin was the most effective of pyrethroids tested at very low dosage rate (below 20g/ha) on cotton. Grifee *et. al.* [6] in their study of correlation between yield and number of bolls, noted that a correlation co-efficient of + 0.40 ± 0.13. Rana [7] found the above correlation positive of +0.94. Bhandari *et. al.* [8] reported that the yield of seed cotton was significantly and positively correlated with number of bolls per plant. The purpose of the present study was to investigate the effect of use of deltamethrin alone and its individual combinations with monocrotophos and DDT. For comparison, the conventional mixture of DDT and monocrotophos was also included in the experiment.

MATERIAL AND METHODS

Qalandri variety of cotton (H-59-1) was grown in the month of May in 30′ X 30′ replicate plots as per Randomised Complete Block Design with 18″ distance between every two plants. Twenty plants from each replicate, at random, were selected for observation on plants. The experimental period stretched from May to October and a period of 2-4 months lapsed between each application of pesticide/pesticide combination(s). Dosage of the insecticide(s) applied was 18.5g. (a.i.)/ha for deltamethrin; monocrotophos @ 0.03 % a.i. and DDT @ 21lbs. (a.i.)/acre.

Method described by Ahmed, *et. al.* [4] and Mathew, *et. al.* [9] for sampling and counting of pest was followed. Economic threshold was determined by procedure described by Halimie [1].

When plants were about 8-week old, infestation of white flies, jassids, thrips and Physeta moth crossed the economic thresh-hold and Ist application of individual product (deltamethrin) and combination of pesticides was made at the dosage indicated, followed by three subsequent sprays. An additional application of binapacryl became necessary, after 3rd application, due to mite flare-up in deltamethrin treated plots. In monocrotophos +

DDT treated plots, an additional spray of the monocrotophos alone became necessary when secondary infestation of bollworms developed.

RESULTS AND DISCUSSION

Results obtained in the experiment were analysed statistically according to method described by Baluch *et. al.* [10]. Such varied characters like yield per plant, number of bolls per plant, ginning out-turn (GOT) and seed index were taken into consideration.

(i) *Yield per plant.* In this respect, there exists significant differences in values (Table 2a). The highest degree of increase was manifested by combination of deltamethrin + monocrotophos with the yield of 106gms per plant having an increase of 57.5 % over a std. combination value while the other combination i.e. deltamethrin + DDT produced an increase of only 4.31 % over the value obtained for the standard. The lowest degree of yield (60gms) was shown by deltamethrin showing a negative response over the std.

(ii) *Number of bolls.* The mean value differences amongst various combinations are significant (Table 2b). Data in Table 1 shows that with deltamethrin and monocrotophos combination, number of bolls manifested positive increase of 19.04 % over the standard combination of DDT and monocrotophos. A negative response in percentage of number of bolls per plant -4.76 % and -28.6 % was obtained when deltamethrin + DDT combination and deltametrhin (alone) respectively was compared with standard i.e. DDT + monocrotophos combination.

(iii) *Ginning out-turn (GOT).* Significant differences exist in ginning out-turn against the pesticides used alone or in combinations (Table 2c). From the experimental data presented in Table 1, it is evident that deltamethrin + monocrotophos combination manifested positive increase of 24.88 % over the standard combination

Table 2. Analysis of variance

(a) Yield per plant

Source	FF	SS	MS	Fc	Ft
Total	14	9540.77	–	–	–
Replication	2	93.55	–	–	–
Treatment	4	9140.85	2285.2	59.51	3.84
Error	8	307.22	38.40	–	–

Std. error of mean difference = $\frac{2 \text{ (error MS)}}{r} = \frac{2(38.4)}{3} = 5.06$

(b) Number of bolls per plant

Total	14	4143.93	–	–	–
Replication	2	511.93	–	–	–
Treatment	4	2766.27	691.56	6.39	3.84
Error	8	865.73	108.21	–	–

Std. error of mean difference = $\frac{2(108.2)}{3} = 8.49$

(c) Ginning out turn (GOT)

Total	14	998.59	–	–	–
Replication	2	49.87	–	–	–
Treatment	4	920.24	230.06	64.6	3.84
Error	8	28.48	3.56	–	–

Std. error of a mean difference = $\frac{2(3.56)}{3} = 2.37$

(d) Seed index

Total	14	499.97	–	–	–
Replication	2	13.96	–	–	–
Treatment	4	27.92	6.98	4.15	3.84
Error	8	13.4	1.68	–	–

Std. error of mean difference = $\frac{2(1.68)}{3} = 1.12$

Table 1. Efficacy of different combinations and deltamethrin alone over std. Conventional pesticides combination of DDT + monocrotophos in respect of various characters.

Value	Pesticide and combinations	Number of plants	Yield per plant (gms)	Number of bolls per plant	Ginning out turn (GOT)	Seed index	% Increase (+) Decrease (–) over yield per plant	No: of bolls per plant	Combination No. (4) in Ginning Out Turn	Seed index
1.	Deltamethrin	60	60	30	30	6.4	–10.84	–28.6	–1.64	6.6
2.	Deltamethrin + Monocrotophos	60	106	50	38.9	6.4	57.5	19.04	24.88	6.6
3.	Deltamethrin + DDT	60	70.2	40	34.6	6.2	4.31	– 4.76	13.44	3.3
4.	DDT + Monocrotophos	60	67.3	42	30.5	6.0	–	–	–	–

(DDT and monocrotophos) and DDT + deltamethrin manifested an increase of 13.44 % over the std. value. In case of deltamethrin alone, a decrease of -1.64 % in GOT was exhibited.

(iv) *Seed index.* The data presented in (Table 2d) reveals that no significant difference between the values of different characters of various combinations and deltamethrin alone.

Based on these pilot scale experiments, the following few generalized conclusions can be drawn:

(a) Deltamethrin provided very good control of insect pest complex including boll worms, and, excepting development of mites at a stage of the crop (readily controlled by a miticide), its use resulted in production of healthy and clean bolls. Yield per plant, number of bolls per plant and GOT, however, was lowest in this case; (b) In deltamethrin + monocrotophos combination significant difference in yield per plant and production of increased number of bolls was noted; (c) Yield-wise (seed cotton and number of bolls) deltamethrin + DDT combination, follows deltamethrin + monocrotophos combination with slight edge over DDT + monocrotophos.

The experiment, however, draws attention to the need of subjecting all pesticide combinations, particularly OP combinations with various synthetic pyrethroids, to scientifically designed field investigations before permitting their large scale use.

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