QUEENSLAND DEPARTMENT OF PRIMARY INDUSTRIES
DIVISION OF PLANT INDUSTRY BULLETIN No. 730

USE OF DDT IN COMBINATION WITH ENDRIN AND PARATHION FOR CONTROLLING COTTON PESTS IN QUEENSLAND

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SUMMARY

DDT-endrin and DDT-parathion mixtures were applied weekly and fortnightly during the effective fruit form production period of cotton in the Lockyer Valley of Queensland. DDT-endrin was the more effective mixture in controlling *Heliothis* spp. and *Earias huegeli* Rog. Weekly treatments resulted in higher cotton yields than fortnightly treatments.

I. INTRODUCTION

To obtain high cotton yields in Queensland, it is important to protect the growing crop from attack by pests. Passlow (1967) listed *Heliothis* spp. and rough bollworm, *Earias huegeli* Rog., as the major pests of cotton in Queensland.

The efficacy of DDT for the control of *Heliothis* spp. was demonstrated by Passlow (1959), and Davis *et al.* (1963) showed that commercial control of the major species *Heliothis armigera* (Hubn.) and *E. huegeli* in northern Queensland and *H. punctigera* Wall. and *E. huegeli* in the south-west was possible by using DDT and endrin. Contrary to the finding of Davis *et al.* (1963) that parathion was of little value in controlling *E. huegeli*, subsequent field usage demonstrated that the chemical could give control of the species if applied to the crop every 5 to 7 days.

The aim of this trial was to compare the relative efficacies of endrin and parathion applied in combination with DDT at weekly and fortnightly intervals throughout the fruit production period of the crop.

II. MATERIALS AND METHODS

The trial was laid out on the Department of Primary Industries' Gatton Research Station in an area of cotton, variety Dixie King, planted in mid October 1965 at a row spacing of 0·9 m. A 5 x 5 randomized block design with a plot size of four rows, each 36·6 m long, was employed. The plots were separated laterally by four rows of cotton and at the ends by 1·8 m of bare ground.

TABLE 1

PERCENTAGE DAMAGED FRUIT FORMS

Treatments	4 and 5 January 1966						1 February 1966					
	Squares		Bolls		Total		Squares		Bolls		Total	
	Trans. Mean*	Equiv. Mean	Trans. Mean*	Equiv. Mean	Trans. Mean*	Equiv. Mean	Trans. Mean*	Equiv. Mean	Trans. Mean*	Equiv. Mean	Trans. Mean*	Equiv. Mean
DDT-endrin weekly	0·253	6·3	0·188	3·5	0·239	5·6	0·163	2·6	0·227	5·1	0·216	4·6
DDT-parathion weekly	0·291	8·2	0·181	3·2	0·273	7·3	0·146	2·1	0·308	9·2	0·289	8·1
DDT-endrin fortnightly	0·316	9·7	0·314	9·5	0·315	9·6	0·204	4·1	0·363	12·6	0·339	11·1
DDT-parathion fortnightly ..	0·337	10·9	0·213	4·5	0·313	9·5	0·146	2·1	0·418	16·5	0·400	15·2
Check	0·587	30·7	0·790	50·5	0·613	33·1	0·597	31·6	0·656	37·2	0·616	33·4
Necessary differences for significance { 5%	0·068		0·095		0·054		0·245		0·073		0·103	
1%	0·094		0·131		0·074		0·337		0·100		0·141	

* Inverse sine transformation.

Fourteen applications of 'weekly' treatments as well as eight applications of 'fortnightly' treatments were made between 29 November 1965 and 28 February 1966 inclusive. Treatments were applied by a tractor mounted boom sprayer with inter-row droppers except on 10 and 17 December when knapsack sprayers were used because of wet soil conditions and on 10, 16 and 28 February when inter-row droppers were impracticable because of crop lodging. Dicofol was applied for control of *Tetranychus urticae* (Koch) on 27 January. The mean active constituent application rates (kg ha^{-1}) were: DDT 0·69, endrin 0·35, parathion 0·26, dicofol 0·7.

The trial area was sampled on 4 and 5 January, and on 1 February to obtain data on pest damage and infestation levels of *Heliothis* spp. and *E. huegeli*. All squares and bolls on each of 10 and 15 plants per plot were examined at the first and second sampling respectively. The trial area was mechanically harvested on 5 April and 10 May.

III. RESULTS

The percentages of damaged fruit forms on 4 and 5 January and 1 February are presented in tables 1 and 2. The yields of seed cotton are summarized in tables 3 and 4. The mean numbers of *Heliothis* spp. and *E. huegeli* larvae present in unsprayed plots on 4 and 5 January were 0·09 and 0·07 larvae per plant respectively while on 1 February counts revealed 0·05 and 0·14 larvae per plant respectively.

IV. DISCUSSION AND CONCLUSIONS

The data presented in table 1 demonstrates that all insecticidal treatments gave some protection to fruit forms. Factorial analyses (table 2) demonstrated that, on 4 and 5 January, weekly applications were significantly more efficacious in the protection of squares, bolls and total fruit forms than fortnightly applications. Also there were no significant differences between the levels of protection given by the two chemical mixtures. The change in the relative population levels of the two species at 1 February was accompanied by a change in the pattern of damage. Factorial analyses (table 2) demonstrate that DDT-endrin was significantly more effective than DDT-parathion and that weekly applications were significantly more effective than fortnightly applications in protecting bolls and total fruit forms.

TABLE 3

MEAN YIELD OF SEED COTTON (KG HA^{-1})

Treatment	First Pick 5 Apr	Second Pick 10 May	Total Yield
DDT-endrin (weekly)	3 359·9	409·1	3 769·0
DDT-parathion (weekly) ..	3 200·9	348·1	3 549·0
DDT-endrin (fortnightly) ..	3 054·3	415·9	3 470·3
DDT-parathion (fortnightly) ..	2 977·7	376·6	3 354·3
Check	1 037·5	714·3	1 751·8
Necessary differences for significance 5%	189·2	99·3	174·3
Necessary differences for significance 1%	260·7	136·9	240·2

TABLE 2

MEAN PERCENTAGE DAMAGED FRUIT FORMS
EXTRACTS FROM FACTORIAL ANALYSES. CHECK PLOTS EXCLUDED

Date	Fruit Form	Insecticide							Timing						
		DDT + endrin		DDT + parathion		F†	Necessary difference for significance		Weekly Application		Fortnightly Application		F†	Necessary difference for significance	
		Trans.*	Equiv.	Trans.*	Equiv.		5%	1%	Trans.*	Equiv.	Trans.*	Equiv.		5%	1%
4 and 5 Jan	Squares ..	0·285	7·9	0·314	9·5	N.S.			0·272	7·2	0·327	10·3	Sig. (5%)	0·040	0·056
	Bolls ..	0·251	6·2	0·197	3·8	N.S.			0·184	3·4	0·263	6·8	Sig. (5%)	0·065	0·092
	Total ..	0·277	7·5	0·293	8·4	N.S.			0·256	6·4	0·314	9·6	Sig. (1%)	0·033	0·047
1 Feb ..	Squares ..	0·184	3·3	0·146	2·1	N.S.			0·154	2·4	0·175	3·0	N.S.		
	Bolls ..	0·295	8·5	0·363	12·6	Sig. (5%)	0·056	0·079	0·268	7·0	0·391	14·5	Sig. (1%)	0·056	0·079
	Total ..	0·277	7·5	0·344	11·4	Sig. (5%)	0·050	0·070	0·252	6·2	0·370	13·1	Sig. (1%)	0·050	0·070

* Inverse sine transformation.

† F values for Insecticide x Timing interaction non-significant on all occasions.

TABLE 4

MEAN YIELD OF SEED COTTON (KG HA^{-1})

EXTRACTS FROM FACTORIAL ANALYSES. CHECK PLOTS EXCLUDED

Harvest	Insecticide					Timing				
	DDT + endrin	DDT + parathion	F*	Necessary difference for significance		Weekly Applications	Fortnightly Applications	F*	Necessary difference for significance	
				5%	1%				5%	1%
First 5 Apr ..	3 207·1	3 089·3	N.S.			3 280·4	3 016·0	Sig. (1%)	138·5	194·2
Second 10 May ..	412·6	362·4	N.S.			378·6	396·3	N.S.		
Total ..	3 619·7	3 451·6	Sig. 5%	135·3	189·8	3 659·0	3 412·3	Sig. (1%)	135·3	189·8

* F values for Insecticide x Timing interactions non-significant on all occasions.

The greater efficacy of endrin in control of *E. huegeli* during the latter part of the season is further demonstrated in yields of seed cotton (tables 3 and 4). A significantly higher yield was obtained where DDT-endrin was applied weekly than in any other treatment (table 3). Factorial analysis of yields (table 4) demonstrated no significant differences between the chemical treatments at individual harvests, but, weekly applications gave significantly greater yields than fortnightly applications at the first pick. DDT-endrin produced a significantly greater total yield response than DDT-parathion, and weekly applications produced a significantly greater total yield response than fortnightly applications.

Thus the yields obtained reflected the influence of spray frequency on control of both species, but the significant increase in yield obtained from using DDT-endrin reflects the greater efficacy of this mixture in controlling *E. huegeli* populations, which were higher than *Heliothis* spp. population during the mid and late season.

In consideration of the yields obtained in this trial, it should be noted that the lodging which occurred in early February prevented mid to late season irrigation. A 'top crop' was not formed and potential yield was therefore reduced and treatment differences were probably minimized.

The efficacy demonstrated for parathion in control of *E. huegeli* is greater than that shown by Davis *et al.* (1963). The explanation of this difference is obviously that they were attempting single application control of a severe existing infestation. Parathion, when applied regularly against a relatively early instar larvae, gave reasonable results but appears to be less efficacious when used for kills of more developed larvae.

V. ACKNOWLEDGEMENTS

The assistance of Biometry Branch in providing much of the statistical analyses, and that of the staff of the Research Station, Department of Primary Industries, Gatton, for facilities used in conducting the trial, are gratefully acknowledged.

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(Received for publication 17 December 1974)

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