

EFFECTS OF SOME INSECTICIDES ON PESTS AND BENEFICIALS IN COTTON

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Introduction

As new insecticides for cotton pests are developed, it is important that the cotton industry has its own independent assessment of their effect on beneficial fauna. This research allows an understanding of the role and fit of new products in integrated pest management. At the same time existing products are being advanced with lower rates (half and quarter) being trialed as a means of reducing a product's impact on beneficials while still achieving satisfactory pest control. Here we detail the effects of new and existing products on some common beneficial arthropods and pests in cotton, using a common industry standard product for comparison.

Methods

Three trials were conducted at Gatton Research Station (27° 32'S, 152° 20'E) to test new product/rate combinations for their effects on pest and beneficial arthropods in cotton. Each was a randomised block design with 4 blocks of 6 treatments. All test products were compared to an industry standard product (Bulldock or Folimat). The treatments were:

Trial 1

Chemical name	Treatment name	Rate (L/ha)	Rate (g ai /ha)
unsprayed			
novaluron	Rimon	0.75	75
chlorpyrifos methyl	Rescue	1.0	500
chlorpyrifos methyl	Rescue	2.0	1000
confidential product			
beta-cyfluthrin	Bulldock	0.4	10

Trial 2

Chemical name	Treatment name	Rate (L/ha)	Rate (g ai /ha)
unsprayed			
azadirachtin + synertrol	Neem	2.0 + 1.0	30
novaluron	Rimon	0.75	75
fipronil	Regent	0.03	6
naled	Dibrom	0.55	495
beta-cyfluthrin	Bulldock	0.6	15

Trial 3

Chemical name	Treatment name	Rate (L/ha)	Rate (g ai /ha)
unsprayed			
fipronil	Regent half rate	0.0625	12.5
fipronil	Regent full rate	0.125	25
imidacloprid + Pulse	Confidor	0.25 + 0.2	50
omethoate	Folimat quarter rate	0.07	56
omethoate	Folimat full rate	0.28	224

The trials were planted in December 1999 as a continuous block of 160 rows of rain-grown Siokra V16 in 1 m rows. Each trial used 52 rows. Treatments were applied by a 5 row boom on an all-terrain vehicle using TX4 hollow cone nozzles (300 kPa delivering 94 L/ha @ 5km/h) with a centre nozzle and two 50 cm side droppers per row. Plots were 10 m (= 10 rows) wide and 25 m long with a 2 row guard. Rows 3 and 8 in each plot were removed some weeks prior to spraying to ease movement of the spray equipment. Treatment application occurred in February and March 2000 when plants had been shown to have adequate numbers of some beneficial groups. All plots were sprayed for their length.

Pests and beneficial arthropods were sampled by a Stihl BG72 suction machine using the side, zigzag sampling method, over the middle 20 m in each plot (i.e., 2.5 m unsampled either end of each plot). Samples were placed into 70% ethanol for later counting in the laboratory. Green and brown mirids, present in similar numbers, and the beneficial groups: apple dimpling bugs, brown smudge bugs, black mirids, spiders and wasps were counted. Flies, although not of economic importance, contribute to arthropod community interactions and are presented here. Suction sampling occurred just prior to, then 2, 4 and 7 or 8 days after, treatment (DAT). Different rows were sampled on different dates. Data were analysed by ANOVA and differences between means compared using LSD at 5%.

Results

All groups analysed were uniformly distributed over the trial site prior to treatments being applied. Figs 1 to 5 show the effects of the treatments on green and brown mirids (trials 1 and 2) and the beneficial groups 2 and 4 days after treatments were applied.

Discussion

Trial 1

Counts of many faunal groups were low on day 4; however, Rimon was the only product to control loopers without having adverse effects on other groups. After 7 days, differences between products had become greater. All products controlled green and brown mirids and loopers. The counts for apple dimpling bugs for Rimon were lower than the control, but Rimon still did not adversely affect other groups, and the product had more flies than the control, while still controlling loopers. The apple dimpling bug can damage small squares early in squaring cotton but is generally regarded more as a heliothis egg and mite predator.

The confidential product showed similar effects to Bulldock, although neither product affected spiders or wasps, and had at least as many brown smudge bugs as the control. Both products controlled green and brown mirids.

Rescue controlled green and brown mirids and had adverse effects on other mirid species. It had similar counts of spiders, wasps and flies to the control. It had an anomalous count for loopers, which had increased markedly in 3 days to be similar to the control, caused by an inflated count of small larvae in one plot.

Rimon caused the least disruption to beneficials. While Rescue controlled loopers and green mirids, it displayed undesirable toxicity to many beneficial groups. No clear rate effects were observed with this chemical. Rescue should be considered further if green and brown mirid and looper control is desired without regard to disruption of beneficials.

Rimon shows promise of minor disruption to beneficials and deserves larger-scale testing.

Trial 2

All products adversely affected at least one group of beneficials 2 days after treatment. Neem caused the least disruption, only affecting wasps, but did not control loopers or green mirids. Rimon reduced counts of wasps. It did not control green mirids, but did control loopers. Apart from the standard, only Dibrom controlled both green mirids and loopers, but adversely affected 3 groups of beneficials – apple dimpling bugs, wasps and flies. The quarter rate of Regent reduced counts relative to the control for 4 beneficial groups, without controlling green mirids.

Few groups were significantly affected relative to the control after 4 days. Neem did not affect any beneficial group, but did not control loopers. All other products controlled loopers. Rimon only affected black mirids while giving excellent looper control, and giving a better result than Regent, which gave reasonable looper control while affecting apple dimpling bugs. No significant control of green mirids occurred, with the low numbers masking any treatment differences.

Rimon was the only test product controlling loopers after 7 days, while having the least disruption to beneficials (3 groups reduced). Neem, Regent and Dibrom failed to control loopers and caused the most disruption to beneficials. No significant control of green mirids occurred, with the low numbers masking any treatment differences.

Rimon had the least disruption to beneficials and controlling loopers. It failed to control green mirids after 2 days, while numbers subsequently were too low to show any definite trends. Most other products failed to give adequate control of loopers while disrupting beneficials.

This trial confirms that Rimon shows promise of minor disruption to beneficials and deserves larger-scale testing.

Trial 3

Confidor had the least impact of the test products on beneficial groups 2 day after treatment, with 2 groups having fewer individuals than the control, while 2 had more than the control. However, Confidor had no effect on loopers. The other products controlled loopers to some extent, especially Regent and Folimat at full rates. Regent at half rate affected as many groups as Regent at full rate, without giving the same looper control. Folimat had a greater effect on beneficials than Regent, but only gave similar looper control.

By day 4, loopers were as common in the Confidor plots as in the control. Confidor affected as many beneficial groups as Regent, with both rates of the latter giving good looper control. Regent's control was as good as or better than Folimat, which had a greater impact on beneficials.

Loopers increased in all test products after 8 days, largely because of an increase in the number of small larvae in the plots. Only brown smudge bugs were affected by these products, with counts for the other bug species reduced in the control, and the products having no significant effects on other groups compared to the control.

Confidor caused the least disruption to beneficials. It did not control loopers, but the product is not claimed to and is not registered for this purpose. Regent (at the full and reduced rates) had less impact on beneficials than Folimat, and gave similar looper control. The use of low rates of Regent and Folimat cannot be justified solely for reducing the impact of these products on beneficials compared to the full rate.

Although there were no significant differences in density for most beneficials between the reduced and full rates of Regent and Folimat, the full rates tended to have lower means. Whether this would be sustained over a few sprays using whole field treatments is doubtful, since recruitment into sprayed areas would be difficult under this scenario. Since 52 out of 160 rows were used for this trial, the remainder acted as a source for beneficials or pests which could reinvade the trial. Single sprays of any product (especially if using the reduced rates) might be acceptable for reduced impact on beneficials, provided good control of the target pest is obtained. However, these data suggest that the use of a less disruptive product would be preferred.

Figs 1-5. Effects of some insecticides on green and brown mirids and some beneficial fauna in cotton



