

Enhancing the efficacy of insecticides by mixing with table salt - a soft approach to manage stinkbugs in cotton

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In recent years late season populations of stinkbugs (green vegetable bug and green stink bug) have caused considerable damage in some cotton crops (Simpson *et al.* 2000, Khan and Bauer 2001). Over the past cotton season, in different valleys including the South Burnett and Macquarie, 1 or 2 insecticide sprays were required to manage green vegetable bug (GVB). In Australia, the insecticides currently registered for control of stinkbugs are mostly non-selective and are disruptive to a wide range of beneficial species. Use of these insecticides during stage II of the Insecticide Resistance Management Strategy (IRMS) therefore undermines IPM programs aimed at conserving beneficials. Therefore, the development or evaluation of less disruptive control tactics for stinkbugs is urgent. No soft chemicals are currently available, though a number of products registered for control of other pests are. One way of making existing chemicals less disruptive is by lowering their dose, but this is not always effective. In Brazil, a mixture of salt and lower dose of chemicals is being used to enhance efficacy of the chemicals to control GVB in soybean (Corso and Gazzoni 1998, Hugh Brier pers. communication 2001). The objective of this study was to evaluate the efficacy of existing chemicals mixed with table salt and to measure their impact on beneficial insects.

Methods

Two trials were conducted in irrigated Ingard[®] cotton (Siokra V16I) in Boggabri, Namoi Valley, NSW and in Byee, South Burnett, QLD.

In the first trial 10 treatments including 4 unregistered products (A, B, C & D), an industry standard product and unsprayed control were used. The treatments were:

<u>Chemical name</u>	<u>Trade name</u>	<u>Rate</u>
emamectin	Affirm	700 mL/ha
emamectin	Affirm	350 mL/ha
emamectin+sodium chloride	Affirm + Table Salt	350 mL/ha + 10 g/L of water
sodium chloride	Table Salt	10 g/L of water
A	A	A
B	B	B
C	C	C
D	D	D
endosulfan	Thiodan	2.1 L/ha
Unsprayed control		

In the second trial treatments were:

<u>Chemical name</u>	<u>Trade name</u>	<u>Rate</u>
emamectin	Affirm	700 mL/ha
fipronil	Regent	125 mL/ha
fipronil	Regent	40 mL/ha
fipronil + sodium chloride	Regent + Table Salt	40 mL/ha + 10 g/L of water
diafenthiuron	Pegasus	800 mL/ha
indoxicarb	Steward	325 mL/ha
endosulfan	Thiodan	2.1 L/ha
Unsprayed control		

In both trials treatments were replicated 3 times in a randomised complete block (RCB) design. Each replication measured 10 m X 10 rows for the first trial and 15 m X 16 rows for the second trial. The chemicals were applied with a knapsack sprayer (500 L/ha) in the first trial and with a ground rig (100 L/ha) in the second trial.

For both trials pre treatment observations were made the day before treatments were applied. Post treatments observations were made at 3 and 7 days after treatment (DAT) and 2 and 6 DAT for the first and second trial respectively. Pests and beneficial insects were sampled by beat cloth, 3 X 1 m and 5 X 1 m row samples per replication in the first and second trial respectively. Data were analysed by ANOVA in MINITAB and means were compared using LSD at 5%.

Results

In both trials GVB was the only stinkbug present and since treatments had similar effects on GVB adults and nymphs data were pooled for analysis.

Trial 1

The results are presented in Figures 1 and 2.

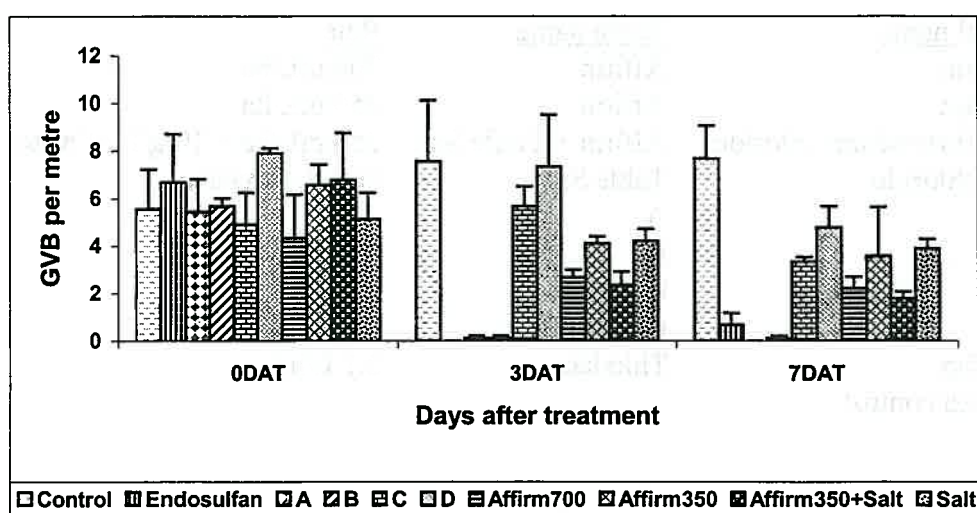


Figure 1. Effect of table salt along with other chemicals on GVB in cotton.

Figure 1 shows that the standard chemical, endosulfan, and two unregistered chemicals A and B were equally effective against GVB. Affirm at half rate plus table salt killed 30% more insects than full rate of Affirm. Table salt alone killed 20 - 30% GVB relative to the pre treatment count.

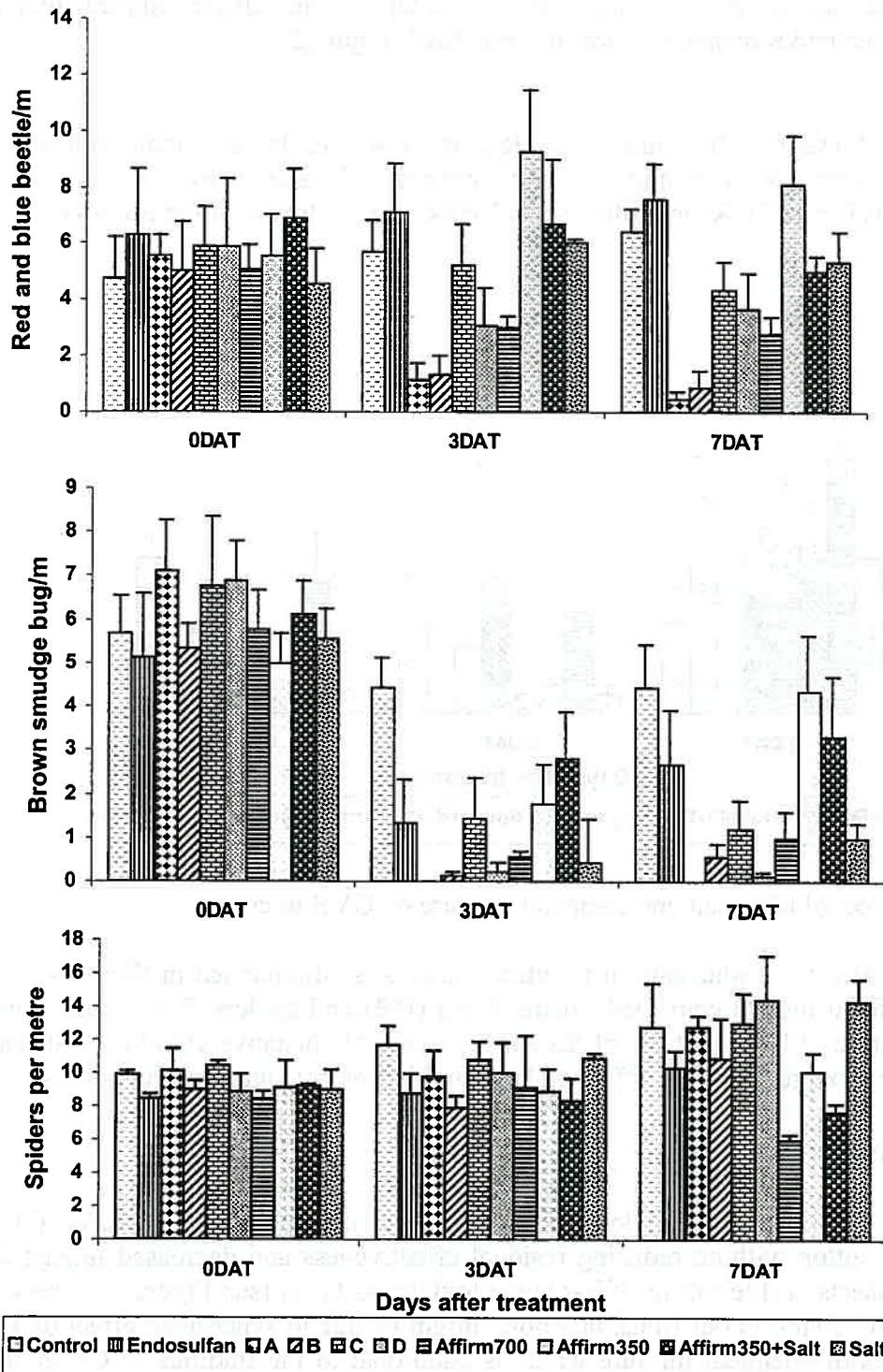


Figure 2. Effect of table salt along with other chemicals on beneficial insects in cotton.

In this trial the major beneficial insects were spiders, brown smudge bug (BSB) and red and blue beetle (RBB). Affirm at the half rate with or without salt and endosulfan had the least effect on beneficials, while all other options caused substantial reductions. Even salt alone killed substantial number of BSB (Figure 2). The two unregistered products that killed significant number of GVB (Figure 1) also killed significant number of BSB and RBB (Figure 2). All rates of Affirm reduced spiders, but other insecticides or salt mixtures had no effect (Figure 2).

Trial 2

The result shows that the mixture of Regent at 40 mL/ha and table salt killed significant number of GVB and was as effective as full rates of Regent, endosulfan and Pegasus (Figure 3). Regent plus salt killed 94% of the treated insects at 6 DAT.

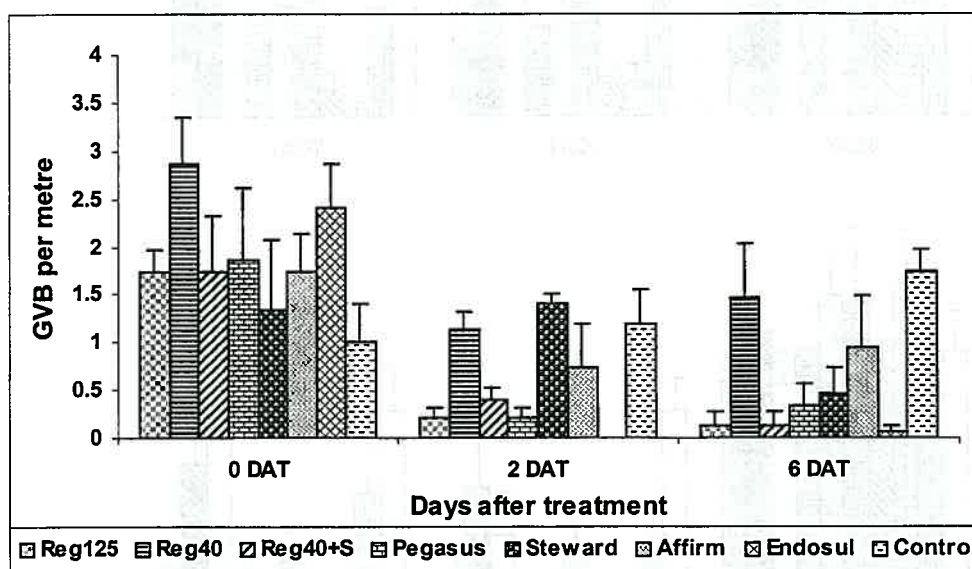
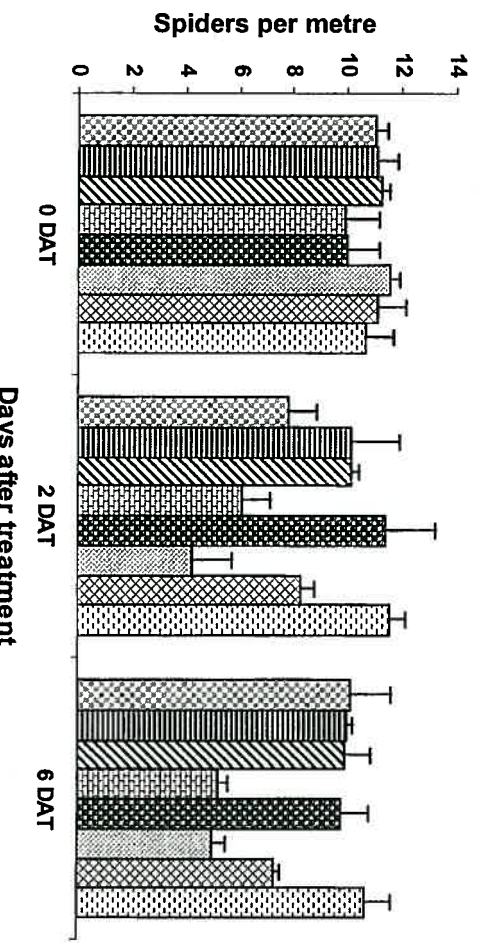
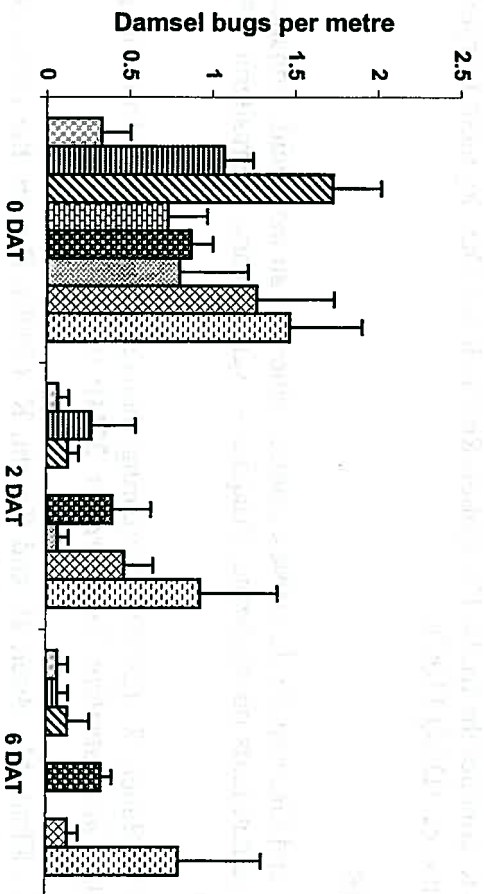
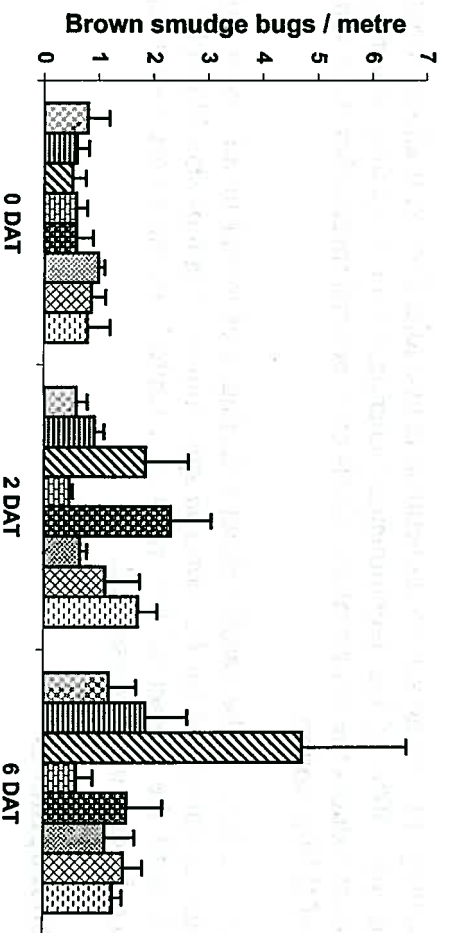


Figure 3. Effect of table salt and chemical mixture on GVB in cotton.

The impact of Regent plus salt on beneficial insects is summarised in Figure 4. The major beneficial insects were BSB, damsel bug (DB) and spiders. The result shows that the mixture of Regent at 40 mL/ha and salt had little negative effect on BSB and spiders. The mixture had some effect on DB but this was not significant (Figure 4)

Conclusions

These trials demonstrated that low rates of Regent plus table salt increased GVB mortality in cotton without reducing residual effectiveness and decreased impact on beneficial insects. Table salt itself has some toxicity to GVB (see Figure 1). The salt effect we have found in our trials, therefore, might be due to synergistic effect of salt and low rates of chemical mixture which is additional to the findings of Corso and Gazzoni (1998) that salt had an 'arresting' effect. Similar effects of salt have been reported against green mirids in mungbeans (Hugh Brier, pers. communication 2002).



Reg125 Reg40 Reg40+S Pegsus Steward Affirm Endosul Control

Figure 4. Effect of table salt and chemical mixture on beneficial insects in cotton

The advantage of mixing salt with chemical is two fold. Firstly, it allows a reduction of more than 50% of the recommended chemical rate, therefore lowering cost. Secondly, it reduces the impact of chemicals on beneficial insects therefore upholding the use of IPM in cotton.

However, we have to be careful about selecting a chemical to mix with salt. The chemicals recommended for *Helicoverpa* spp., mites and aphids should not be mixed with salt until the impact of low rates of chemical on the target insects and on resistance development are assessed.

Acknowledgments

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