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Soil and bunch applications of insecticides for control of the banana rust thrips

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Abstract

Banana rust thrips, *Chaetanaphothrips signipennis* (Bagnall) are important pests of bananas in north Queensland. One application of chlorpyrifos, pirimiphos-ethyl and prothiophos to the butt and surrounding soil and one application of ethoprofos to the soil surrounding the butt of banana plants each reduced the incidence of the pest and subsequent damage. Dieldrin as a treatment to the butt and surrounding soil was not effective and thrips numbers and damage were significantly higher on treated than on untreated plants. Diazinon treatments to bunches did not significantly reduce the level of fruit damage when compared to the butt-soil organophosphate treatments ($P>0.05$) but these bunches consistently had lower thrips numbers and fruit damage.

INTRODUCTION

Feeding by adults and nymphs of *Chaetanaphothrips signipennis* (Bagnall), produces the unsightly skin blemish described as rust or colour. Thrips colonise the protected areas between neighbouring fruits. Damage is therefore restricted to these areas except in extreme cases where it can extend to cover most of the fruit. Thrips activity can commence soon after bunch emergence and continue up to harvest, a period ranging from 15 to 20 weeks (B. Pinese unpub. data 1981).

The incidence of banana rust thrips had been greatly reduced by the almost universal adoption of dieldrin butt sprays to control the banana weevil borer, *Cosmopolites sordidus* (Germar), (Franzmann 1977). However, in 1979 there was increased damage to banana fruit at Mission Beach. This was first linked to neighbouring neglected plantations which were heavily infested with rust thrips. The continued presence of high populations, indicated by severe fruit rust, in the years after the main neglected plantations were removed, suggested that dieldrin no longer provided effective long term control. Dieldrin resistance in *C. sordidus* was confirmed by Swaine *et al.* (1979). The subsequent switch to organophosphate alternatives, has prompted an evaluation of these compounds for rust thrips control.

This paper reports results of a trial conducted at Mission Beach during 1984 which examined the effectiveness of soil applied organophosphates and dieldrin, and bunch applied diazinon sprays, in reducing the incidence of rust thrips damaged fruit in Cavendish bananas.

MATERIALS AND METHODS

The experiment, using a 7 treatment×3 replicate randomised block design, was carried out in a commercial non-irrigated banana plant crop which was approaching the first bunching cycle at the time of the first treatment application. All plots were 3 rows wide with from 14 to 20 datum plants in each plot. Single guard row separated plots laterally and two guard plants were used between plots within each row.

The insecticides applied in mid April 1984 to the butts and surrounding soil (to a radius of 300 mm) of individual datum plants were:

Dieldrin 0.25 g a.i. (e.c. containing 300 g/L);

Chlorpyrifos 4.0 g a.i. (e.c. containing 500 g/L);

Pirimiphos-ethyl 1.0 g a.i. (e.c. containing 250 g/L);

Prothiophos 3.0 g a.i. (e.c. containing 500 g/L);

Ethoprophos 6.0 g a.i. (granules containing 100 g/Kg).

Each emulsifiable concentrate (e.c.) of the specified active ingredient (a.i.) was diluted in 500 mL of clean water and applied evenly, using a hand-operated knapsack, to the base of the plant and suckers (to a height of 300 mm) and the surrounding 300 mm of soil. Ethoprophos granules were evenly distributed using a shaker over an area of 750 mm radius around the butt of each plant. All application rates were as recommended for *C. sordidus* control and applied to bare soil after weed and trash removal.

Diazinon (e.c. containing 800 g/L) treatments were applied to newly emerged bunches and each received four applications at approximately 11 day intervals. Diazinon treatments commenced when the soil treatments were applied and ended 88 days after soil treatments. The diazinon spray programme was based on earlier control trials (B. Pinese, unpub. data 1982) which demonstrated that with severe infestations, four applications at 10 to 14 day intervals provided economic control. Polyethelene bunch covers were not used.

Rust thrips counts (adults and nymphs) and fruit damage assessments were carried out at approximately 11 day intervals between 20 and 115 days after initial soil treatment. The assessment were made on three randomly selected hands, one each from the top, middle and bottom of the bunch. Harvest ratings were started after 131 days and ended 181 days after soil treatment applications for all datum plants in each treatment.

Colour photographs were used as standards. The damage rating scale used was modified from Franzmann (1977), and based on anticipated market response, so that: 0=no damage; 1=slight non-commercial damage; 2=minor extensive or severe localised blemish which would result in either price reduction or fruit rejection during market shortages or oversupply conditions respectively; 3=severe extensive damage causing outright fruit rejection.

RESULTS

Thrips counts (total of nymphs and adults) and mean fruit rust assessments carried out between 20 and 115 days after treatment are shown in Figures 1 and 2 respectively. Diazinon was the most effective treatment with the number of thrips per bunch virtually zero and rising to a mean of 0.69 per bunch at 115 days after soil treatment, and 27 days after the final diazinon application. Thrips numbers in plots treated with pirimiphos-ethyl were significantly higher ($P<0.05$) than those in prothiophos treated plots at 62, 73, and 115 days after treatment but, this was not reflected in significantly higher rust damage at harvest.

Rust damage ratings for chlorpyrifos, ethoprophos, pirimiphos-ethyl and prothiophos were not significantly different and while not statistically different from these treatments ($P>0.05$) diazinon treated plots had consistently lower thrips counts and rust ratings.

The peak of thrips activity was experienced 42 days after soil treatment. This was found to occur in all treatments and in the control. The subsequent peak in rusty fruit

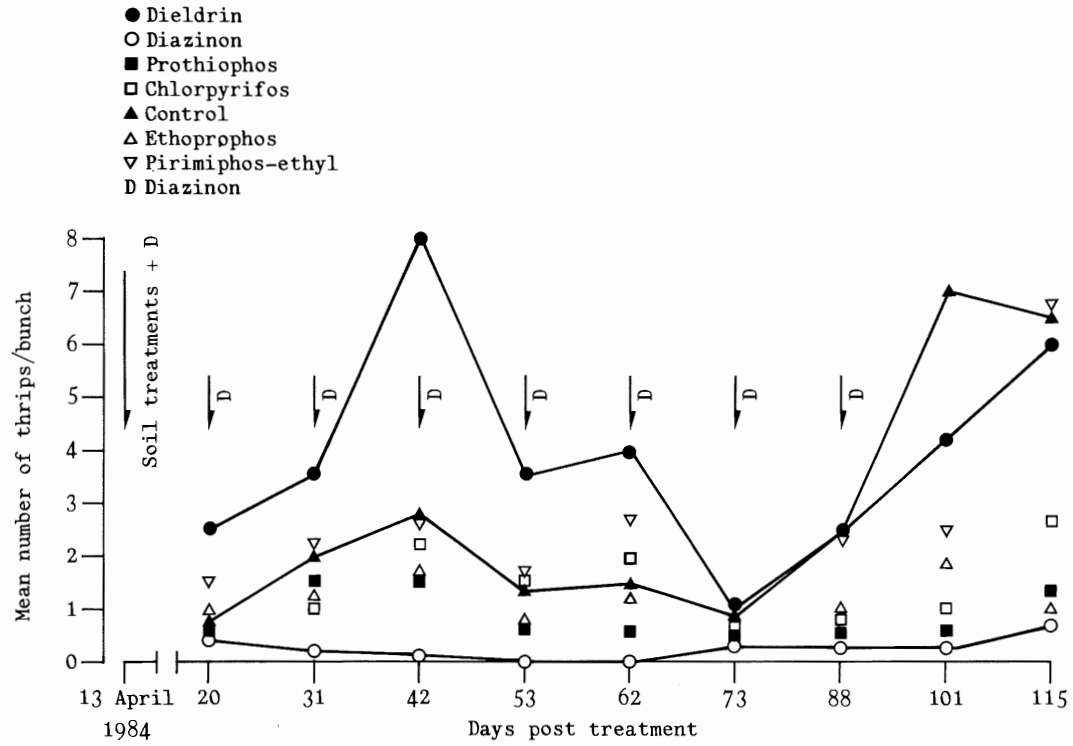

Figure 1. Mean banana rust thrips population (adults plus nymphs) on three hands one each from top, middle and bottom of the bunch.

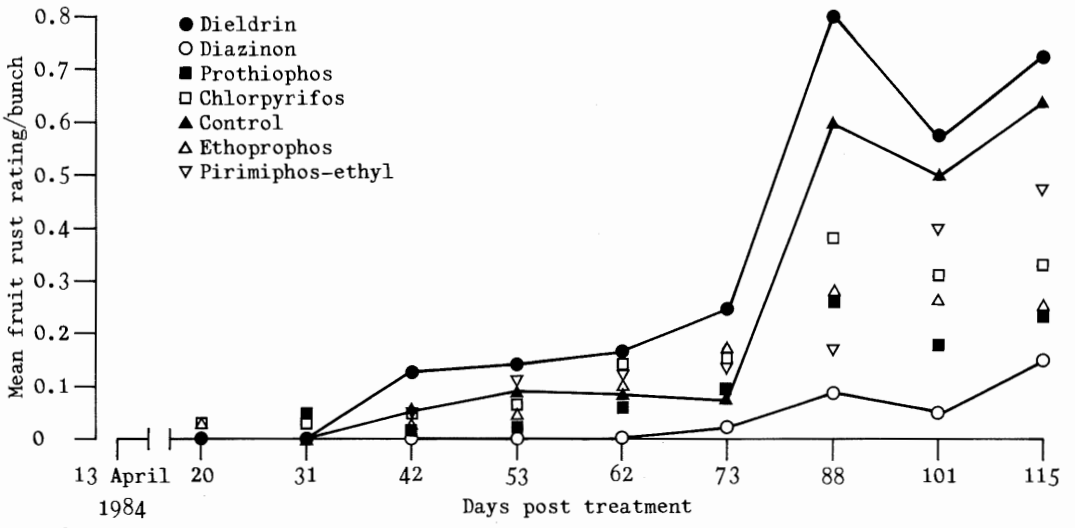

Figure 2. Mean fruit rust damage rating (0–3) on three hands one each from top, middle and bottom of the bunch.

was detected 88 days after soil treatment showing an elapsed time of 46 days for the development of rust symptoms.

Data from harvest ratings are shown in Table 1. The top hand consistently suffered the highest damage ($P<0.01$) while middle and bottom hands had similar damage levels ($P>0.05$). Damage assessments to the valuable top hand showed that soil application of organophosphates were equally effective ($P>0.05$) and diazinon bunch sprays were significantly better than ethoprophos and pirimiphos-ethyl ($P<0.05$) and equal to chlorpyrifos and prothiophos ($P>0.05$).

Table 1. Mean harvest rust thrips fruit damage (rating 0 to 3) from each of three bunch positions

	Treatment						
Bunch position	Dieldrin	Chlorpyrifos	Pirimiphos-ethyl	Prothiophos	Diazinon	Ethoprophos	Control
Top	2.04	1.05	1.11	0.83	0.77	1.15	1.59
Middle	1.43	0.76	0.93	0.52	0.61	0.70	1.17
Bottom	1.50	0.83	0.79	0.52	0.56	0.75	1.19

LSD $P=0.05$ for treatment mean=0.34

LSD $P=0.01$ for bunch position mean=0.21 (approx.)

DISCUSSION

Assessment of rust thrips damage in bananas is very difficult because most damage is situated between touching fruit and the expression of the characteristic rust is not obvious for some time after injury first occurs. Therefore rust damage assessments at harvest provided the most meaningful treatment comparisons and reflected the results obtained in assessments conducted earlier on developing fruit. Prothiophos, which is the preferred organophosphate for *C. sordidus* control, performed as well as diazinon and although not statistically different from the other organophosphates its use did provide consistently lower damage ratings.

Dieldrin as a butt-spray for weevil borer has provided cheap and long-term control for rust thrips for almost 20 years (Franzmann 1977). The results given here confirm that it no longer controls rust thrips and may contribute to an increase in pest numbers and subsequent fruit damage. No evidence has been obtained to explain this increased activity following the use of dieldrin but the possibility of an adverse effect on predators and parasites needs investigation.

Damage to the top hand was consistently higher than to the middle or bottom hands (Table 1). Damage assessments carried out on the top hand are therefore adequate, and by concentrating on the top hand assessment procedures are faster. The higher rust incidence on the top hands may be related to their larger fruit which provides the best sites for thrips to feed and breed. The top hands are also the first ones colonised by the thrips which arrive on the bunch by crawling up the pseudostem and descending down the bunch stalk.

The organophosphates tested reduced significantly the damage caused by rust thrips when compared to dieldrin and control but under commercial practice in north Queensland this is considered inadequate. The results show that soil applied organophosphates do provide a measure of thrips control. More detailed investigations are warranted to investigate the chemicals performance. If this was achieved, applications of organophosphates would provide economical control for both rust thrips and banana weevil borers and provide a viable alternative to the dieldrin treatments used previously.

Diazinon bunch sprays were consistently the most effective treatment but the added costs associated with repeated applications specifically for rust thrips have to be considered.

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