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Control of the banana scab moth (Nacoleia octasema (Meyrick)) in north Queensland

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Summary

Nine insecticide treatments were tested against the banana scab moth, *Nacoleia octasema* (Meyrick), in North Queensland, insecticides being applied to banana bunches twice each week from bunch emergence until the first bract had lifted. Chlordimeform, methidathion and monocrotophos (as 0.2% sprays) and diazinon and trichlorphon (as 0.1% sprays) gave effective control while 0.05% amitraz plus 0.05% *Bacillus thuringiensis* and 0.1% carbaryl were less satisfactory. None of the spray treatments performed consistently better than the 2.0% DDT dust and the 2.0% DDT plus 0.26% BHC dust currently available to banana growers.

1. INTRODUCTION

The banana scab moth, *Nacoleia octasema* (Meyrick) (Lepidoptera: Pyralidae) is a major pest of banana fruit in North Queensland (Franzmann 1975), the Malay Archipelago and the south-west Pacific (Paine 1964). Chemical control of *N. octasema* in these areas has involved insecticide spray and dust applications to the bunch and surrounding plant parts (O'Connor 1949, 1950; Rhodes 1960; Saunders 1961a: Franzmann 1977). In the south-west Pacific, control methods can also involve lifting and removing bracts in combination with insecticide application but these methods are too labour intensive to be feasible in Queensland. Injecting insecticide solution into the emerging bunch also controls the pest (Swaine 1968) but has not been adopted by Queensland banana growers because the injector can damage fruit. Since 1961, control in North Queensland has involved DDT or DDT plus BHC dust application weekly for 3 weeks from bunch emergence (Saunders 1961b).

The infestation period is from bunch emergence to the stage when half the bracts have lifted, with most of the infestation occurring by first bract lift (Franzmann 1979). The combination of successive exposure of oviposition sites and an egg incubation period of 3 to 4 days (Franzmann 1979) indicates that insecticide applications twice each week may be necessary to provide continuous protection for the bunch.

The experiments reported here were designed to evaluate alternative chemicals for *N. octasema* control and to compare these with the presently recommended DDT and DDT plus BHC dust products. All treatments were applied twice each week during the susceptible period.

2. MATERIALS AND METHODS

Two experiments, one in March 1976 and one in March-April 1977 were carried out in commercial banana plantations at Mission Beach near Tully, North Queensland.

Insecticides used were:

Experiment 1:

chlordimeform—a 500 g L^{-1} emulsifiable concentrate

DDT—a 20 g kg^{-1} p.p'-isomer dust

methidathion—a 400 g L^{-1} emulsifiable concentrate

monocrotophos—a 400 g L^{-1} emulsifiable concentrate

Experiment 2:

amitraz—a 200 g L^{-1} emulsifiable concentrate plus

Dipel—a wettable powder, each milligram containing 16 000 international units of potency *Bacillus thuringiensis* Berliner var. *alesti*

carbaryl—a 800 g L^{-1} wettable powder

DDT plus BHC—a dust containing 20 g kg^{-1} p.p'-isomer DDT plus 2.6 g kg^{-1} gamma BHC

diazinon—a 800 g L^{-1} emulsifiable concentrate

trichlorphon—625 g L^{-1} soluble concentrate

Experiment 1 was designed as a randomised block with five treatments and six replications, each plot being a single row of 100 plants. Experiment 2 had six treatments, four replications and single row plots each of 40 plants. Insecticides were applied by knapsack duster or sprayer at the rates shown in Tables 1 and 2. Applications were made twice weekly from bunch emergence until the first bract had lifted, with insecticide being directed towards the bunch, bunch stalk, spade leaf and throat of the plant. After the first bract had lifted, bunches were treated only if new damage was evident. On each occasion, treatments were applied only to plants with bunches in the appropriate stages of development, with a mean of 3.2 insecticide applications being made to each bunch. Of the 100 plants per plot in Experiment 1 and the 40 in Experiment 2 a mean of 22 and 24 respectively produced bunches during the experimental period.

After larval development was complete, bunches were examined for *N. octasema* damage. The damage was quantified by reference to damage standards which represented, on an area basis, different intensities of *N. octasema* damage. At harvest, five growers examined a sample of rated hands, grading them as acceptable or unacceptable for marketing. From these assessments the limit of acceptability for damage was determined as 0.25% of total surface area and used to decide the market acceptability of all the damaged hands in the experiments. Statistical comparisons between treatments were made by analysis of variance techniques.

3. RESULTS AND DISCUSSION

All insecticides, except carbaryl and amitraz plus *B. thuringiensis,* significantly reduced the incidence of damaged bunches and bunches with unmarketable hands (see Tables 1 and 2). Monocrotophos treatment produced significantly fewer bunches with unmarketable hands than did DDT and chlordimeform. Neither methidathion nor monocrotophos was superior to DDT in reducing unmarketable hands on infested bunches (see Table 1), implying that their respective plant penetrative and systemic properties (Worthing 1979) were not important in controlling *N. octasema.* In addition, particular advantage did not follow the use of treatments with recognised ovicidal activity, that is amitraz and chlordimeform.

Table 1. Experiment 1. N. octasema **infestation and damage to bananas**

Treatment	Bunches damaged (%)	Bunches with ≥ 1 unmarketable hands (%)*	Unmarketable hands on damaged bunches (%) *
Untreated	77.3 a	62.2 a	38.6 a
DDT (2.0% dust)	43.4 b	18.2 b	9.0 b
Chlordimeform (0.2% spray)	33.2 b	16.3 b	10.3 b
Methidathion (0.2% spray)	30.1 b	10.0 b c	4.5 b
Monocrotophos (0.2% spray)	27.9 b	4.4 c	3.8 b

Means followed by the same letter are not significantly different (P = 0.05).
* log (x + 1) transformation. Equivalent means are shown.

Table 2. Experiment 2. N. octasema **infestation and damage to bananas**

Treatment	Bunches damaged (%) *	Bunches with ≥ 1 unmarketable hands (%) *
Untreated	16.3 a	8.8 a
DDT + BHC (2% + 0.26% dust)	1.2 c	0.7 b
Amitraz + *B. thuringiensis* (0.05% + 0.05% spray)	8.4 a b	2.7 a b
Carbaryl (0.1% spray)	5.2 b c	3.8 a b
Diazinon (0.1% spray)	4.5 b c	0.7 b
Trichlorphon (0.1% spray)	1.6 c	1.6 b

Means followed by the same letter are not significantly different (P = 0.05).
* $\sqrt{x + ½}$ transformation. Equivalent means are shown.

The level of infestation varied markedly between the two experiments (77.3 and 16.3% damage in untreated controls) and reflected population pressures prevailing when the experiments were performed. With the higher infestation, appreciable damage occurred even in the best treatments. This is in accord with industry experience.

The results of the two experiments demonstrate that a variety of insecticides could be used as alternatives to DDT for *N. octasema* control.

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