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STERILIZATION OF BANANA FRUIT INFESTED WITH BANANA FRUIT FLY

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Summary

Dipping infested bananas in fenthion (0·01 and 0·05%) or in dimethoate (0·03%) for a few seconds prevented emergence of banana fruit fly.

Introduction

North Queensland bananas are marketed in the southern States of Australia where fruit infested with fruit fly is unacceptable. The fruit for this market is picked "hard-green" and ripened after arrival in the south.

Two species of fruit flies are known to be associated with banana fruit in North Queensland. Queensland fruit fly (*Strumeta tryoni* (Frogg.)) does not infest hard-green fruit, but banana fruit fly (*S. musae* (Tryon)) may infest fruit of this kind following mechanical injury of adjacent fruit (May 1963).

Banana fruit fly is confined to North Queensland and can readily be found associated with native bananas (*Musa banksii* F. Muell.) in northern rain-forests. Stinging in cultivated bananas sometimes occurs, in the vicinity of an injured bunch.

Attacks by this species usually involve less than 1·0% of harvested fruit. Those detected are discarded when the fruit is being packed. There is still a likelihood of stung fruit escaping the attention of the packers; if detected on arrival in the south, a single stung fruit could cause the whole consignment to be rejected.

Trials have been conducted in North Queensland with the aim of obtaining some means of chemical treatment ("sterilization") of banana fruit so that only fruit free from fruit fly is marketed.

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The insecticides fenthion and dimethoate are penetrant materials and are known to kill fruit fly larvae in growing fruit (May 1962). Braithwaite (1963) used dilute solutions of these materials in dipping trials with bananas and proved that fruit infested with Queensland fruit fly could be sterilized. Fruit flavour and appearance were not adversely affected and residue tests indicated that a hazard to public health was unlikely. These materials, together with phosphamidon, were tested against banana fruit fly in several dipping trials in North Queensland.

Materials and Methods

Materials.—The following materials were used at the concentrations indicated:

Dimethoate.—A concentrate containing 30·0% w/v active constituent: 0·3 and 0·01%

Fenthion.—An emulsifiable concentrate containing 50·0% w/v active constituent: 0·05, 0·03 and 0·01%

Phosphamidon.—A concentrate containing 50·0% w/v active constituent: 0·01%

Breeding methods.—Initially, attempts were made to rear banana fruit fly in a warm-temperature cabinet (Figure 1) at Atherton for controlled production of stung fruit. May (1953) reared several fruit fly species in this way and Braithwaite (1963) used this method with Queensland fruit fly.

Fig. 1.—Warm-temperature cabinet used in the investigations.

Cabinet temperatures with banana fruit fly were maintained at 85 ± 5°F by means of a thermostat switch operating heating bulbs and with air circulation by an electric fan at the bottom of the cabinet (Figure 2).

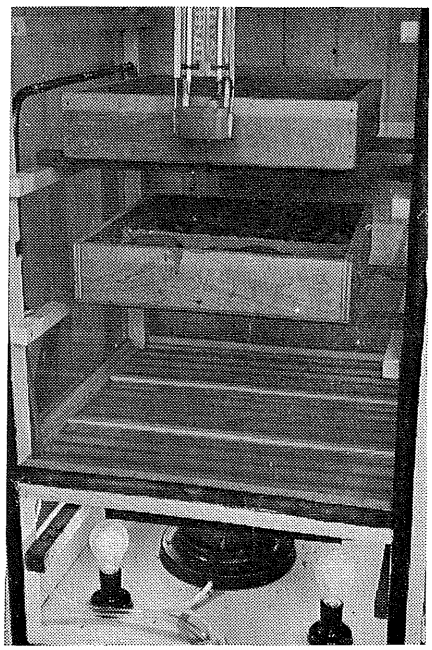

Fig. 2.—Interior of warm-temperature cabinet.

Adult flies were readily bred from stung fruit obtained from coastal plantations but little success was achieved in inducing these to feed effectively, although numerous methods were attempted. These included honey and water solutions; sugar and water solutions; honey, "Hepovite" (enzyme hydrolysate of liver protein) and water mixture; freshly cut apple fruit; freshly cut orange fruit; freshly cut banana fruit; fresh banana flowers; and agar–banana medium.

Attempts were made to feed the solutions through cotton wicks, in open dishes, and by spraying them onto the glass panels of the cabinet. With these methods the flies ingested the solutions until their abdomens were quite extended. Always, however, they regurgitated the material after a few minutes. No oviposition occurred and this method of culturing was discontinued.

In all trials, therefore, field-stung fruit were used; these were obtained from the Mission Beach–Tully area.

Treatment methods.—Replicates in all trials consisted of 10 fruit. The fruit were dipped in dilute solutions of the insecticides, for 3 min in trials 1 and 2 and for not more than 5 sec in trial 3. The fruit were allowed to dry and then each replicate was placed over a liberal quanity of sawdust in a plastic bag (Figure 3). A special gauze screen over a metal ring was fitted into the mouth of each bag and the whole held in a horizontal position for fly emergence.

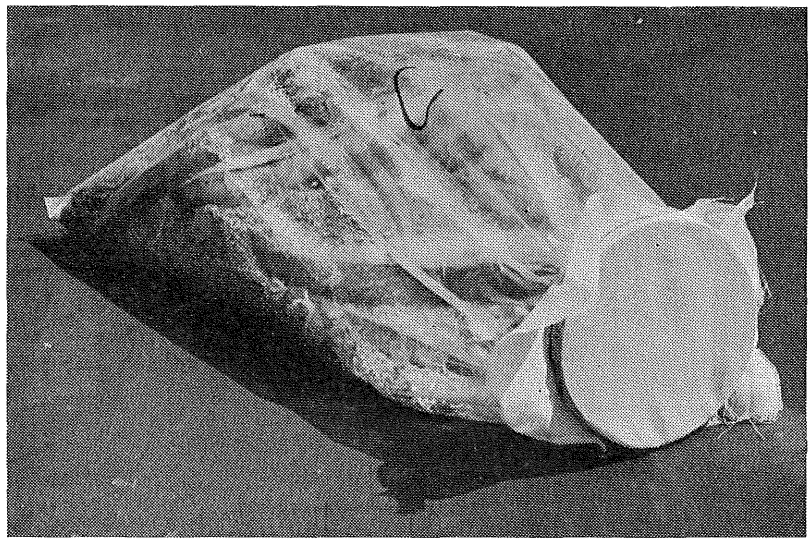

Fig. 3.—Showing plastic bag breeding cage enclosing banana fruit.

Though Braithwaite (1963), working with Queensland fruit fly, made larval counts, this method was not practicable with banana fruit fly. Therefore, in each of the trials the numbers of emerging flies were counted daily. Emergences occurred over a period of 16 days.

Results and Discussion

In these trials, control by the insecticides was considered inadequate for any figure less than 100% mortality—i.e. nil emergence of flies.

The results (Table 1) compare favourably with those of Braithwaite (1963), who achieved sterilization of fruit infested with Queensland fruit fly with dips of fenthion 0·05% and dimethoate 0·03%.

TABLE 1

NUMBER OF ADULT FLIES (*Strumeta musae*) EMERGING FROM BANANA FRUIT

Trial 1 (3-min dip)*		Trial 2 (3-min dip)†		Trial 3 (5-sec dip)‡	
Dimethoate 0·01% ..	Nil	Dimethoate 0·01% ..	14	Dimethoate 0·03% ..	Nil
Dimethoate 0·03% ..	Nil				
Fenthion 0·01% ..	Nil	Fenthion 0·01% ..	Nil	Fenthion 0·01% ..	Nil
Fenthion 0·05% ..	Nil			Fenthion 0·03% ..	Nil
		Phosphamidon 0·01%	63		
Water	8	Water	169	Water	126
No dip	7	No dip	78	No dip	54
* 10 fruit per treatment; no replications		† 40 fruit per treatment; total of 4 replications		‡ 30 fruit per treatment; total of 3 replications	

No banana fruit flies emerged from any treatment with fenthion at a concentration of either 0·05 or 0·01% and a dipping time as brief as a few seconds.

No flies emerged from treatments with dimethoate at 0·03% even with a dipping period of not more than 5 sec, but some emergence occurred in one trial using 0·1% and a 3-min dipping time. Phosphamidon at 0·01% for 3 min allowed fly emergence. In each trial, normal fly emergence occurred from fruit either untreated or dipped only in water.

The ratio of male to female flies emerging from treated and untreated fruit in trial 2 was approximately 1:1.

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