

**TECHNICAL BULLETIN
NO. 26**

**PLANS FOR
ERADICATION OF FRUIT
FLY IN THE NORTHERN
TERRITORY**

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DIVISION OF AGRICULTURE & STOCK
DEPARTMENT OF PRIMARY PRODUCTION

DARWIN

TECHNICAL BULLETIN NO 26

PLANS FOR ERADICATION OF FRUIT FLY
IN THE NORTHERN TERRITORY

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1. INTRODUCTION

Fruit flies are serious pests of fruit and some vegetables in all countries where they occur. Both commercial and backyard fruit can sustain severe damage as a result of fruit fly infestation. Strict control and quarantine methods are often enforced by governments around the world to protect fruit industries.

In December 1976, an infestation of Mediterranean fruit fly (Ceratitidis capitata) was recorded in Alice Springs. The town is isolated from other fruit-growing areas and is relatively small (population 15,000) so eradication of the pest was considered feasible.

An eradication campaign was carried out in Alice Springs between December 1976 and April 1977. This campaign was successful and this bulletin aims to detail the methods employed. PART 1 deals with a large, townwide infestation and PART 2 with a small isolated outbreak within a town. PART 3 outlines the organization required to mount such a campaign. The methodology described in Parts 1, 2, and 3 could be applicable to any future outbreaks in townships within the Northern Territory.

2. DESCRIPTIONS OF FRUIT FLIES

Fruit flies belong to the Family Tephritidae within the Order Diptera. Like all flies, they have one pair of wings only.

2.1 Mediterranean Fruit Fly (Ceratitidis capitata)

Mediterranean fruit fly is slightly smaller than a house fly. It is predominantly yellowish-brown but has white markings on a black background on the thorax. The abdomen has two light bands. The wings are marked with brownish bands and spots and, when at rest, are held in a characteristic semi-spread position.

2.2 Oriental Fruit Fly (*Dacus dorsalis*) and Queensland Fruit Fly (*Dacus tryoni*)

Both of these species are larger than Mediterranean fruit fly and are wasp-like in appearance. Oriental fruit fly has a completely black thorax or at least has black markings on a brownish background on the thorax. Black transverse markings are present on some segments of the abdomen which is predominantly brown. A black T-shaped marking is also present towards the posterior end of the abdomen. Queensland fruit fly is similar in shape and size but lacks the distinct black markings on the thorax and abdomen. It is basically rich red-brown with some dark markings on the thorax.

Both species have two yellow longitudinal stripes on the thorax. The stripes on Oriental fruit fly are almost parallel-sided and rounded posteriorly while those of Queensland fruit fly taper posteriorly and are noticeably pointed.

(Note 1 - To determine if the black markings are present, dip a specimen in ethanol, drain off excess ethanol on a tissue, and view under a microscope.)

Note 2 - Identification of fruit flies is not a simple task. Confirmation of the identity of specimens by the Division's entomologist is essential.)

3. LIFE CYCLES

Table 1 shows the duration of the life cycles of the three species mentioned. Life cycle is defined as the period from egg-laying to emergence of the adult. After the adult flies emerge, it is necessary for the flies to feed on a source of protein to allow them to become sexually mature and able to

mate and lay fertile eggs. Reaching sexual maturity requires a period of at least 7 days in the case of Mediterranean fruit fly and considerably longer for Queensland fruit fly.

TABLE 1 - DURATION OF LIFE CYCLES OF THREE SPECIES OF FRUIT FLIES

Stage	Duration of Each Stage of Life Cycles (days)		
	Mediterranean Fruit Fly	Oriental Fruit Fly	Queensland Fruit Fly
Eggs laid below skin of fruit ↕	2-4	2	2-3
Larvae hatch & commence feeding ↕	14-16	10-15	7-10
Larvae pupate in soil ↕	12-14	12-13	12-13
Adult			
Total Life Cycle	28-34	24-30	21-27

PART 1

WIDESPREAD INFESTATION

4. OUTLINE OF CAMPAIGN

A campaign is best separated into distinct but closely co-ordinated operations. These are :

- 4.1 Trapping
- 4.2 Publicity and Public Relations
- 4.3 Cover Spraying
- 4.4 Bait Spraying
- 4.5 Fruit Inspection and Destruction
- 4.6 Rearing Programme
- 4.7 Records

Staff in charge of each operation must be fully briefed about their own particular function and the related operations in general.

4.1 Trapping

Traps are set with Denthouse cotton wool rolls (wicks) which are baited with a mixture of male sex attractant (lure) and malathion (insecticide) in a ratio of 4:1. See Appendix 1 for a diagram of the trap used.

4.1.1 Purpose of Trapping

To monitor fly numbers and to help define infested areas.

4.1.2 Lures

Each of the species mentioned is attracted to a different lure, namely -
Mediterranean Fruit Fly (Medfly) to Trimedlure
Oriental Fruit Fly to Methyl Eugenol
Queensland Fruit Fly to Cue-lure

Stocks of lures are held by various State Departments of Agriculture and a working relationship for supply has been agreed upon. The NT has stocks of methyl eugenol and Cue-lure while the Queensland Department of Primary Industries (contact Dr R Drew) holds some Cue-lure. The WA Department of Agriculture (contact Mr A Sproule) can supply trimedlure.

4.1.3 Equipment Required

Trapping log book

Appropriate lures and 118% w/v malathion

Standard eye droppers and bottles for each lure

New wicks and traps

Clear plastic screw-top tubes 8cm x 2½cm

Self adhesive labels

Forceps

Small funnel

Tie wire in lengths of about 30cm

Small visitors street map

4.1.4 Baiting Traps

In the case of Trimedlure, apply 1/3 a standard eye dropper of lure/insecticide mixture to the wick.

The lure will be effective for 14 days before rebaiting is necessary. Care must be taken not to over-bait as this lure can repel flies if the concentration of lure is too high. In the case of Cue-lure and methyl eugenol, one standard eye-dropper of lure/insecticide mixture is added to each wick.

The front of the trap should be replaced so that the gauze is horizontal. Flies momentarily rest on the gauze before entering the trap.

4.1.5 Positioning Traps

Using a map of suitable scale, subdivide the town into easily recognised geographical or suburban areas. Draw a 0.4km grid on the map and place coloured map pins in the house blocks to the grid intersections. Note down the block and house numbers and the street names. Count the number of pins and prepare that number of traps, but do not bait the traps at this stage.

Visit each block on the list. If there are no fruit trees, go to the nearest block with fruit trees, preferably stone fruits such as apricots and peaches. Note the new block and house number and the street name, cancelling the previous one.

Using a thick texta colour pen, number the trap using code letters and three numerals. For example :

MF 001 (Trap 1 for Medfly)
ME 082 (Trap 82 for Oriental fruit fly baited
with methyl eugenol)
CUE 005 (Trap 5 for Queensland fruit fly baited
with Cue-lure)

The trap number is recorded on the small visitor's street map against the house or block number.

The baited trap is hung in a fruit tree amongst the foliage in shade and at eye level. The trap must be suspended by tie wire from the branch. Where ants are a problem, grease should be used to coat the wire.

On return to the office, reposition the pins on the 1:4,800 map to coincide with the actual trap locations. Draw up a trap log using a lined book (see Appendix 2).

NB Extra traps should be sited in gardens or areas where positive fruit fly larvae identifications have been made. This helps in defining actual areas of infestation.

4.1.6 Trap Inspections

Traps are inspected and cleared weekly. To reduce driving time, plan the most efficient route by using the small visitor's street map on which the trap locations were marked.

If a trap contains flies, empty them into a clear plastic screw-top tube, using the small funnel. Write the trap number, house/block number and date of collection on a self-adhesive label and attach it to the tube. Replace the front of the trap with the gauze in a horizontal position and make sure the wick hangs free before re-hanging the trap. If a trap contains no flies, make an entry in the log book against the trap number for that date.

In the office, confirm that the flies trapped are fruit flies by comparing them with a positively identified sample under a magnifying lamp ("Maggie" lamp) or preferably a microscope. Count the flies in each tube and record the number in the trap log. All samples of trapped flies should be kept for inspection by the entomologist in charge of the programme.

The co-ordinator must be kept informed of fly numbers and locations.

4.2 Publicity

Publicising an outbreak of fruit fly and the control measures to be used should be commenced at the earliest possible date after confirmation. An information bulletin (Appendix 5) should be circularised to every house in the area to be surveyed or treated. The person responsible for publicity must work in close liaison with the co-ordinator so that misleading or incorrect information is not produced. This is a part-time function but the job requires somebody with a good working knowledge of government policy and procedures. Experience in extension work through the media would also be useful.

All avenues of the media (radio, television, newspapers) should be used. The use of a cartoon character depicting various aspects of the proposed programme proved valuable.

4.3 Cover Spraying

The trapping network will reveal the extent and degree of infestation. The entomologist in charge will decide whether a cover spray is necessary and where to apply it. Cover spraying gives a rapid knock-down of adult flies and larvae, but it is difficult to organise and administer on a large scale due to the toxicity of the chemical to birds, poultry, and fish (see Appendix 3).

Should cover spraying become essential, it is advisable to let a contract for the work to a pest control company. The entomologist or co-ordinator should regularly check the progress and be responsible for any householders' problems that might arise.

4.3.1 Procedure

Define the area to be sprayed and the number of houses and estimate the number of fruit trees involved. Enclose a copy of specifications governing the cover spraying (Appendix 4) and fix a starting date not later than seven days ahead. Call for tenders. Once a definite order has been raised, the entomologist and co-ordinator can liaise directly with the successful company.

Draw up a list of street names and house numbers to be treated from a 1:2,400 map. Leave a column for the number of fruit-bearing trees actually sprayed in each garden and another for 'comments'. The contractor and co-ordinator should each have a copy.

Advise each householder in the area to be cover sprayed by written notice in advance. Arrange for radio and newspaper announcements of the intended operation. Poultry runs, caged birds and fish may need to be moved or covered. Ensure that daily radio announcements of the streets to be sprayed each day are made one day in advance.

4.3.2 Advice to Contractor

The contractor must be advised that -

- (a) Only fruit-bearing trees are to be sprayed.
- (b) Trees too close to poultry, caged birds and fish ponds, etc should not be sprayed. The type, number and position of these non-sprayed trees are recorded in the comment's column.

- (c) In the event of complaints, the co-ordinator should personally deal with the problem.
- (d) The chemical fenthion has phytotoxic effects on some trees, especially when applied in temperatures above 35°C. All cover spraying in summer months should be done between 6am and 1pm.

4.3.3 Non-sprayed Trees

Fruit on those trees not cover sprayed, should be inspected immediately. If any fruit has been 'stung' (evidenced by small puncture holes in the skin) or contain larvae, all fruit should be stripped from the tree and destroyed by soaking in kerosene and water for five days or burning to ash.

4.3.4 Completion

When the cover spraying has been completed to the satisfaction of the entomologist or co-ordinator, tally the number of trees sprayed, and raise a Receiving Report. Attach to the invoice and forward to the Purchasing Officer for processing.

4.4 Bait Spraying

The bait spraying is the key operation of the eradication programme. It is essential that the job be done properly and on time. All staff employed must know precisely how to apply the bait and what precautions must be taken.

Bait spraying consists of a weekly application of protein attractant (protein hydrolysate), insecticide (118% w/v Malathion) and a carrier (water). This is designed to attract and kill both males and females.

4.4.1 Formulation

180 litres of water

22.5 litres protein hydrolysate

4.5 litres 118% ulv Malathion

4.4.2 Spray Unit

The unit consists of a galvanised tank fitted with drain plugs and a belt-operated agitator. The double-acting plunger type pump and 3.3 hp engine are mounted on top of the tank together with a free-running crankable hose reel. A trigger-operated, piston type hand piece with adjustable nozzle is fitted to approximately 100 metres of 9mm nylex hose. The whole self-contained unit is bolted to the tray of a conventional utility or preferably a Toyota 4x4. (Two spray units are operational and are being held in Alice Springs).

4.4.3 Storage Depot

A secure yard with a shed or covered area will be required to store 200 litre drums of protein hydrolysate and 20 litre drums of malathion. The yard should be well away from houses and have a good water supply. In Alice Springs, the Forestry Section's yard in Elder Street is ideal.

4.4.4 Staff

Each bait-spraying team should consist of three people. One, the team leader who should be on permanent staff, drives the vehicle. The other two members, both employed as casuals, man the pump and spray gun alternately.

Staff requirements are calculated on the basis that 1 team of 3 persons, (2 casuals and 1 permanent officer) are required per 1000 houses

4.4.5 Filling the Spray Units

- (a) Fill the tank with water up to the handle weld marks on the inside of the tank ie 180 litres.
- (b) Dip out the protein with a 9 litre plastic bucket and add to the water while the agitator is working.
- (c) Be careful to wash the buckets thoroughly and place them on a clean surface. The protein is very sticky and stones and grass etc can adhere to the buckets and fall into the tank, thus causing blockages.
- (d) Emulsify 4.5 litres of Malathion in a 20 litre container and add to the mixture.
- (e) Wash off any protein spilt on the tank or vehicle.

Note: (a) Fill the tanks with water and protein in the afternoons but add the malathion in the morning. Filling in the morning wastes too much time, but the malathion will be at maximum strength if added just prior to spraying.

- (b) Empty and thoroughly flush out tanks once weekly.
- (c) Change engine oil and grease pump once weekly.

4.4.6 Equipment

Each team will require the following items -

- (a) Small scale town map showing street name
- (b) Small notebook for recording locations of ripe fruit, larvae etc
- (c) Felt pen
- (d) Box of assorted tools
- (e) Spare parts
- (f) 20 litre jerry of standard fuel for the pump
- (g) Funnel
- (h) 5 litres of engine oil

4.4.7 Application

Apply the bait as a spot spray to the point of run-off to all fruit trees. Aim to apply at least 10 spots per garden of 100 sq m ($\frac{1}{4}$ acre). Spray mature, ornamental, broad-leafed trees if no fruit trees are available. At least 1 litre of bait should be applied over 1000 sq m. Flowers, vegetables and ornamental shrubs and bushes must not be sprayed because of possible phytotoxic effects.

4.4.8 Method of Application

Drive along the footpath on the 'wrong' side of the road and stop so that the reel is opposite a suitable entrance to the garden.

With the pump operating at a pressure of 900-1350 kilo pascals (100-150 psi), unwind the free running hose by holding the hose in one hand and the gun in the other. There should be no strain on the hose connection to the gun. Making sure that the hose does not rub along cars or damage property, select trees to be sprayed so that bait is evenly

The team leader is responsible for safety, proper application of bait, progress and answering queries or complaints. Any problems that may be beyond his ability must be referred to the co-ordinator.

During summer, spraying should be carried out between 6am and 1pm. This practice reduces the possibility of phytotoxic effects on trees and allows equipment to be filled and serviced in the afternoons.

Maps and notebooks are returned to the office after each days spraying. The team leader lists the names of his team together with the approximate amount of bait used and the date. The maps are then stored in date order. The notebooks will be checked by the fruit inspection staff as described under 4.5.1.

4.4.9 Rostering

Rostering individuals into different teams each day helps to reduce the possibility of bad habits forming. A roster is drawn up for the week and displayed in the office. Team leaders should make sure they have the correct team numbers.

4.4.10 Duration of Bait Spraying

Bait spraying continues for at least twelve weeks after the date the last fly was trapped or last larvae was found. The entomologist will decide the final date.

4.5 Fruit Inspection

It is imperative that all ripening, mature, and fallen fruit in an infested area is inspected when an infestation is confirmed. Stone fruits which ripen through the summer

months are especially important hosts. Fly numbers can increase rapidly while these fruits are available and the effectiveness of the bait spraying will be reduced considerably if destruction of possible host fruits is not done.

4.5.1 Home Inspections

From the record books kept by the spray teams, the person responsible for fruit inspection/destruction should draw up a list of premises to be visited. A request (Appendix 6) to clear fruit and instructions on how to destroy it is given to the householder. Provision should be made for a central collection point so that the public can deposit their fruit if no facilities for its destruction exist as their place of residence.

4.5.2 Bulk Destruction

A large hole, well away from habitation will be required where bulk deposits of fruit can be burnt in a very hot fire. Old car tyres and diesel oil should be stored at the site. The car tyres are laid in the bottom of the pit followed by the fruit and diesel. It is important to reduce all the contents to an ash.

4.5.3 Presence of Larvae

If, on inspection of fruit in a garden, larvae are found, a sample of fruit should be collected in a brown paper bag for rearing purposes. The house number and street and date of collection must be recorded on the bag. The same applies to fruit that has been stung but does not yet contain larvae. Providing the baiting programme has commenced, the fruit should be stripped and destroyed.

An entry is made in the larva report book and a pin placed in the map (see 4.6.6).

4.5.4 Compliance with Ordinance

The fruit inspector must work within the terms of the existing plant disease ordinance. Written directions ordering the public to destroy fruit are desirable so that good garden hygiene may be achieved. However, any such action must comply with the existing NT Plant Diseases Control Ordinance.

4.6 Rearing Programme

4.6.1 Purpose

It is difficult to accurately identify eggs and larvae from infected fruit. By rearing adults from infested fruit, a positive identification can then be made.

Rearing adults in this way supplements the trapping programme by -

- (a) confirming the extent of an outbreak;
- (b) gauging the effectiveness of a control programme; and
- (c) providing valuable information on hosts.

4.6.2 Equipment

- (a) Cages - clear plastic food containers that can be sealed tightly are required. A suitable size has base dimensions of 125 x 200mm and a height of 100mm. A hole is cut in the plastic lid for ventilation. Gauze is glued over the hole to prevent flies escaping.

- (b) Medium - fine sawdust (sieved if necessary) is placed in the bottom of the container to a depth of 20-25mm deep. The sawdust should not be from treated timber. The sawdust should be moistened only if the fruit does not provide moisture.
- (c) CO₂ cylinder
- (d) Tubes, forceps, camel-hair brushes.

4.6.3 Infested Fruit

- (a) Private reportings - when a resident reports infested fruit, as large a sample as possible should be taken from the property and put through the rearing procedure.
- (b) Surveys - properties in the vicinity of traps catching flies should be surveyed and samples of infested fruit taken.
- (c) Spray team reportings of infested fruit on properties are followed up and fruit samples taken.

4.6.4 Method of Rearing

Infected fruit is placed in the cage on top of the sawdust. The lid is placed on firmly. Every sample brought in must be numbered and cross referenced to the larvae record book. Masking tape with the sample number on it can be stuck to the cage. As flies emerge, they are anaesthetised by CO₂ and removed for identification.

4.6.5 Incubation Period

The sample should be kept in the rearing cage for the duration of at least one complete life cycle ie about 5 weeks.

4.6.6 Records

In a record book the number allocated to each fruit sample should be recorded. Against the sample number in the book the following information should be entered.

- (a) type and number of fruit in sample
- (b) address from which sample was obtained
- (c) date of collection
- (d) dates flies emerge and the number
- (e) date when rearing is completed

4.6.7 Staff Commitment

One person is required part time. An hour or so each day should be spent inspecting the cabinets. Flies which have emerged can be removed for identification and water added if necessary. Each day's private and spray-team reportings should be followed up. Once per week following the trap inspection, gardens in the vicinity of traps yielding flies should be surveyed.

4.7 Records

Accurate records are essential to evaluate progress, plan ahead and calculate wages and total costs.

4.7.1 Telephones

A telephone with a message pad should be reserved for incoming calls. The telephone number should be

5.2 Fruit Stripping

Trees should be examined for "stung" fruit and for fruit infested with larvae. When found, all infested fruit on the tree is harvested and destroyed. Fallen fruit must also be destroyed. Unless fruit is infested, it is not advisable to completely strip all trees in one area as the flies will tend to migrate once egg-laying sites are not available.

5.3 Cover Spraying

A cover spray using fenthion can be applied to all fruit-bearing trees within the area of 200m radius of the initial siting.

Having concentrated on the focus of the infestation, more traps are located in the area up to 500 metres radius from the focus to check that the outbreak has not spread. The entomologist may decide to cover spray this area, working inwards towards the focus and spraying the infested area again within 7 days.

5.4 Bait Spraying

Even though cover spraying will significantly reduce the adult fly and larval numbers, it is still necessary to undertake a bait-spraying programme based on the procedures used in dealing with a widespread outbreak. The area to be covered depends on the defined area of outbreak. If the area is small, the bait-spraying programme should cover an area of 500m radius from the centre of infestation.

PART 3

ORGANISATION

6.1 Office Requirements

It is preferable to have two rooms available. One should be used as an 'operations' room and be accessible to the public with adjacent parking facilities. Wall space is required for maps, notices, pamphlets, pin boards etc. The other room will accommodate the rearing cages (see 4.6.2). This room should be well ventilated, well lit and contain a sink with cold water supply. A large table or bench is needed to support the rearing cages.

6.2 Office Equipment

2 telephones - numbers to be publicised

2 desks with drawers (Co-ordinator and records)

1 town map showing block numbers, street names and street numbers. Preferably at a scale of 1:2,400.

2 town maps showing street names and block numbers at a scale of 1:4,800.

4 boxes map pins assorted colours

3 2½m x 1½m sheets of soft board attached to walls

1 staff time book

1 diary

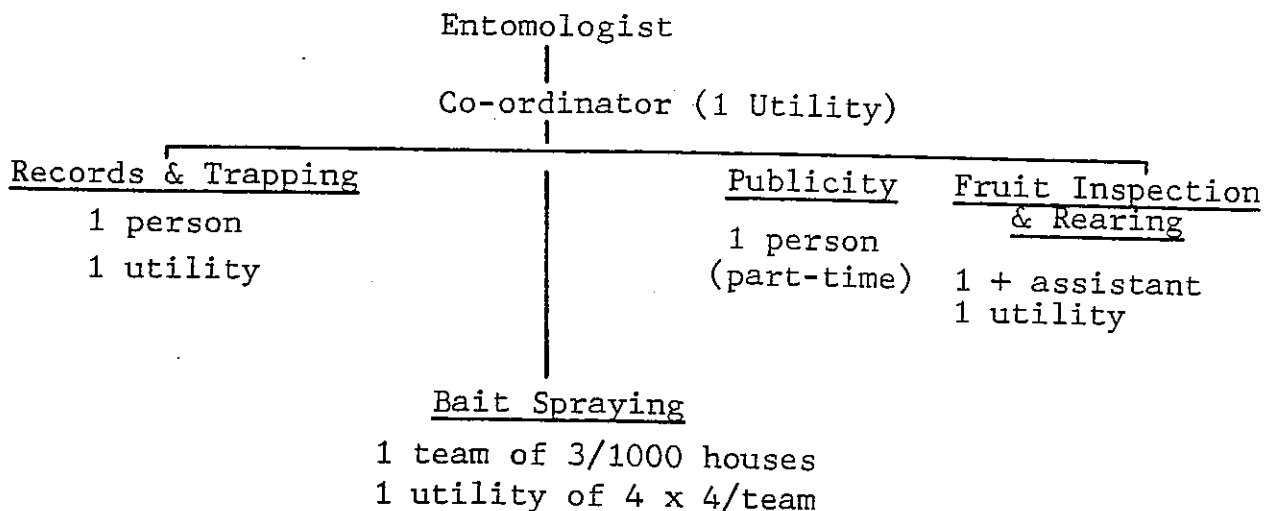
1 trap record book) 20cm x 25cm lined

1 larvae report book) approx 100 pages

1 Maggie lamp and/or microscope

Plus normal office requisites eg pens, rulers, stapler etc.

6.3 Staff and Vehicles



6.4 Legislation and Ordinance

At the time of writing, the NT Plant Disease Control Ordinance was under a review. A copy of the Ordinance should be on hand and the terms of that Ordinance must be complied with at all times before any proposed action is taken during the campaign. This applies particularly to entry to private properties for fruit surveying, trapping, and bait/cover spraying.

6.5 Gazettal as Inspectors

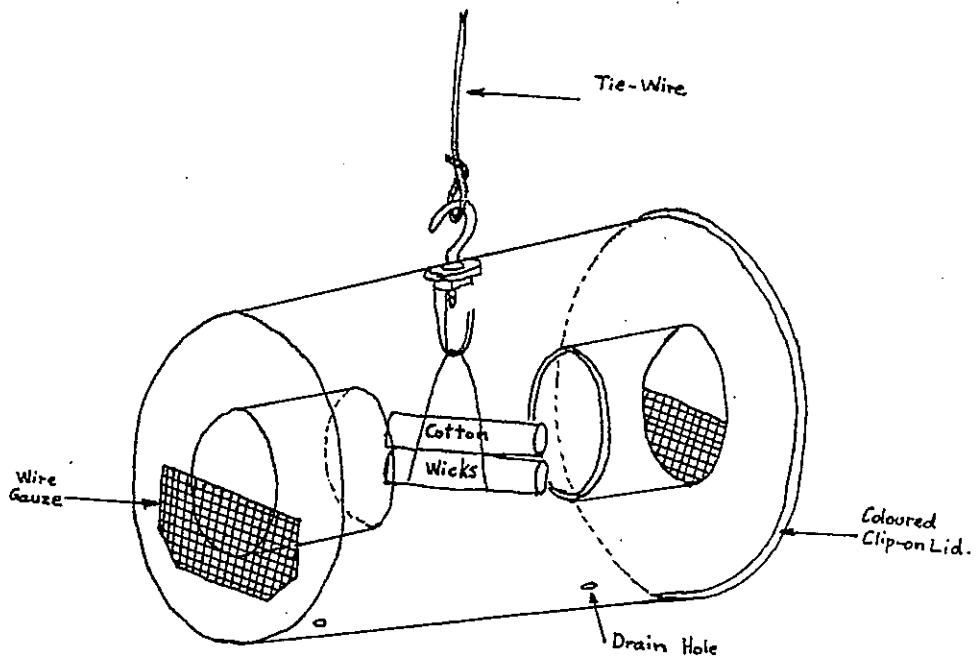
All staff, including casuals employed on spray teams, must be gazetted as Plant Disease Inspectors under the NT Plant Disease Control Ordinance.

6.6 Estimation of Costs

Appendix 7 shows the actual cost of the eradication programme conducted in Alice Springs in December, 1976 - April, 1977. It can act as a guide only but the information is considered relevant.

APPENDIX 1

DIAGRAM OF FRUIT FLY TRAP



TRAPPING LOG

Eastside Subdivision Addresses	Trap No	Block No	FLY NUMBERS					
			02.04.77	Baited 09.04.77	16.04.77	Baited 23.04.77		Baited
21 Fruit Fly Road	MF 068	1283	2	1	0	0		

APPENDIX 3

TRADE NAMES

FENTHION, BAYTEX, ENTEX, LEBAYCID, TIGUVON, MERCAPTOPHOS, QUELETOX, BAYCID.

TECHNICAL NAME

fenthion

CHEMICAL NAME

O, O-Dimethyl-O-(3-methyl-4-(methylthio) phenyl) phosphorothioate

TYPE

Fenthion is an organic phosphate insecticide-acaricide with a long residual activity.

ORIGIN

Bayer A G in Germany, 1962. Licensed to be sold in the United States by Chemagro, a division of Baychem Corp. Available from distributors of Bayer products in Australia.

TOXICITY

LD50 for rats - 190 mg/kg.

(Note : LD50 is defined as that dosage required to kill 50% of animals tested. It is expressed as milligrams per kilogram body weight).

Fenthion is more toxic to birds than animals.

FORMULATIONS

EC 4lbs active/gallons, and 9.67 lbs/gal technical material, 25 and 40% WP.

PHYTOTOXICITY

Considered non-phytotoxic when used at the recommended rates. Do not apply to Hawthorne, American linden, sugar maple or the rose variety Delightful. Some injury has occurred to certain varieties of apples and cotton.

USES

Registered for use as a mosquito larvicide, in households, on agricultural premises, alfalfa, rice, pasture grass and on ornamentals.

IMPORTANT PESTS CONTROLLED

Flies, mosquitoes, roaches, ticks, lice, bedbugs, crickets, armyworms, aphids, leafhoppers, ants and mites.

RATES

Recommended rates at 0.48 - 1.0 kg active constituent per 1000 litres of water. Rate applied during programme in Alice Springs = 0.48 kg per 1000 litres.

PRECAUTIONS

Do not spray plant foliage when temperature exceeds 35°C. Only trained personnel should use in households. Avoid excessive wetting of plastic, tile, rubber, etc. Non-compatible with highly alkaline pesticides. Don't apply as a space spray. Toxic to aquatic life and bees.

ADDITIONAL INFORMATION

Compatible with other pesticides, except those which are highly alkaline. It has given control of insects in stored products from four to sixteen months. It gave 100% control of mosquitoes after forty-two weeks when applied to the sides of barns. Sometimes mixed with paints. Tiguvon is the trade name when used on livestock. Used outside the United States to control birds

when sold under the trade name Queletox. Harmless to fish when applied at the proper concentration to control mosquito larvae. Used for treating walls made of a wide variety of materials. Doesn't colour or stain coloured surfaces. Gives residual effectiveness even on alkaline surfaces. Both a contact and stomach poison.

REFERENCE

THOMSON, W T (1973) Agricultural Chemicals - Book 1, 1973 Revision. Insecticides, Acaracides and Ovicides.

APPENDIX 4

Animal Industry & Agriculture Branch
Department of the Northern Territory
PO Box 2134
ALICE SPRINGS NT

21 January 1977

SPECIFICATIONS FOR COVER SPRAY - MEDITERRANEAN FLY CAMPAIGN

1. Chemical - 55% w/v fenthion (Trade name : Lebaycid, Baytex).
2. Formulation of spray mix - 12fl ozs of material per 100 gallons of water plus a wetting agent.
3. Application method - the chemical mix is to be applied at high volume and under high pressure only to the trees bearing fruit. Coverage should be to the point of run-off.
4. The programme is to commence as soon as possible after the public is adequately informed of what is involved. It is suggested that the programme commence not later than 27 January.
5. Details of the number of trees sprayed per housing block are to be entered on the sheets provided and payment is made on the total number of trees entered.
6. Regular spot checks on the efficiency of application and on the number of trees sprayed have to be made by an officer of the Branch. A check has to be made on housing blocks which have aviaries and poultry runs.
7. Housing blocks which have aviaries and/or poultry runs and which cannot be sprayed without possibly causing injury or death to birds should be entered on the sheets.

Payment will be made for the number of trees which would have been sprayed if birds were not present.

8. The area to be sprayed includes the East Side and Costello's farm.
9. Care must be exercised when spraying near fish ponds and swimming pools.

A J ALLWOOD

APPENDIX 5

MEDITERRANEAN FRUIT FLY

Mediterranean fruit fly has recently been found in Alice Springs. It is a serious pest of fruit, capable of causing serious damage to a wide range of citrus, stone fruit and ornamentals.

Mediterranean fruit fly, Ceratitidis capitata (Wied) (Family Tephritidae), was first described nearly 150 years ago. It occurs in almost every important fruit-growing country in the world. It ranks amongst the world's six most damaging fruit fly pests.

In Australia, it occurs in Western Australia where it is a serious orchard pest. It has been recorded as far north as Carnarvon, but in the main occurs west of a line joining Gingin, Northam, York, Balingup and Busselton.

Seasonal outbreaks occur at centres east of this line but have failed to become a permanent breeding population.

Spasmodic outbreaks occur in South Australia but, because intensive trapping programmes are continuously in operation, earling warnings of infestations are received. Such outbreaks are eradicated by using a combination of cover-spraying with fenthion and bait-spraying using protein hydrolysate and malathion.

BIOLOGY AND APPEARANCE

Mediterranean fruit fly is a two-winged insect slightly smaller than a house fly. It is mainly yellowish-brown but has white markings on a black background on the thorax. The abdomen has two lighter coloured bands. The wings are marked with brownish bands and spots. When resting, the wings are in a characteristic semi-spread position.

The adults rarely move very far from the foliage of fruit trees especially when ripe or ripening fruit is available.

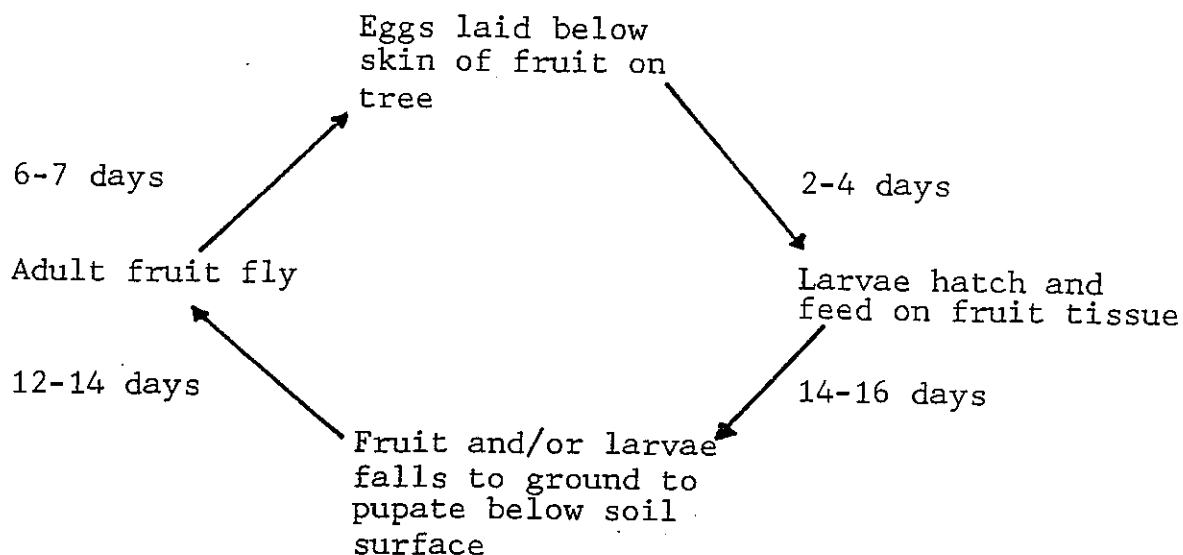
Six to eight eggs which are about 1mm long and are creamy white in colour, are laid just under the skin of ripe or ripening fruit. The female can lay as many as 300 eggs in many different sites. The eggs hatch into larvae or maggots in 2-4 days.

The larvae or maggots feed and burrow into the fruit, resulting in tissue breakdown, formation of soft spots, and finally complete decomposition of the fruit. The larvae are creamy-white and about 7-8mm when mature. It can, by turning its head to its tail and suddenly flexing itself, jump a considerable distance (20-30cm). The larvae which mature in 14-16 days, drop to the ground and burrow into the soil to pupate.

The pupa is brown and is shaped like a rounded barrel. The adult emerges in 12-14 days so the whole life cycle is completed in 28-34 days.

The adult flies can survive for 28-112 days depending on weather conditions and availability of food and water. Mating and egg-laying takes place 6-7 days after emergence. It is during this period that flies are most susceptible to bait-spraying techniques.

LIFE CYCLE



FRUIT ATTACKED

In excess of 100 fruits, nuts and vegetables have been recorded as hosts for this fly in various parts of the world.

In Western Australia, the fly has attacked citrus fruits, apples, pears, plums, nectarines, apricots, peaches, grapes, persimmons, quinces, loquats, plantains, passionfruit, bananas, mulberries, olives, walnuts, tomatoes, sapodilla, guava, feijoa, pomegranate, clerodendron, chilli, rose, Irish strawberry, prickly pear, Osage orange, Natal plum, lily-pilly, and Barbados gooseberry.

Fruits vary in attractiveness and suitability for completing the life cycle of this fly. Many plums and grapes are too watery to allow proper development. Larvae have been found in pomegranates and passionfruit but no adults have been reared. Although not regarded as an important host, bananas have yielded larvae and adults. Complete development occurs in lemons only in very ripe fruit.

The most important host fruit are peaches, apricots, pears and figs.

Citrus fruits form an important link in the breeding capacity since, by the time fruits such as apricots, pears, peaches and figs are finished, citrus fruits are commencing, so providing ample breeding material during the cooler months. Grapefruit, oranges and kumquats are particularly attractive.

The loquat provides the final bridge between the winter citrus and the summer fruits.

CONTROL MEASURES

1. Legislation

An approach is being made to the Administrator to gazette Ceratitidis capitata as a notifiable disease under the NT Plant Disease Control Ordinance. Under the Ordinance it is the responsibility of the public to report suspected infestations, where possible, control or eradication should be undertaken and on areas around Alice Springs (50km radius of the Post Office) would be declared a quarantine area in respect to peaches, plums, nectarines, apricots, figs, and all citrus fruits. This means that none of these fruits produced in the quarantine area can be removed from the area.

2. Trapping

Plastic traps baited with a synthetic male lure (trimedlure) and an insecticide (malathion) indicate the presence or absence of flies. This does not give adequate control but does give an indication of the efficiency of the control programme.

3. Baiting

Foliage baiting using protein hydrolysate (attractant), malathion insecticide and water (carrier) is standard practice throughout the world for control of Mediterranean

fruit fly. This mixture is applied as a course spray to foliate in the infested area (not specifically to fruit bearing trees). Application is done on a weekly basis. In an urban garden, approximately 1 litre of the mixture is applied to 10 spots per housing block.

4. Cover Sprays

Sprays of fenthion or trichlorphon or dimethoate are often used to quickly reduce populations of adults and larvae or to protect fruit from initial infestation. Fenthion and dimethoate last 2-3 weeks whereas trichlorphon is significantly less persistent. It should be noted that dimethoate can cause leaf and fruit drop in apricots.

5. Sanitation

Mature fruit should not be allowed to remain on the tree and should not be permitted to remain on the ground after falling. Ripe fruit left on the tree provides an ideal breeding site.

Overripe fruit should be destroyed by boiling, burning, or soaking in water and kerosene. Burying is not recommended since larvae can burrow in soil and adults can emerge from the fruit buried in sand to a depth of one metre. If large amounts of fruit have to be disposed of, infested fruit should be dusted liberally with BHC in a pit before filling in.

FOR FURTHER INFORMATION : Phone 503272 or call at the Animal Industry & Agriculture Branch Office in Hartley Street.

PLEASE HELP CONTROL FRUIT FLY :

- * DO NOT TAKE FRUIT FROM THE ALICE SPRINGS AREA
- * BOIL AND BURN OLD FRUIT
- * ASSIST THE CONTROL PROGRAMME

APPENDIX 6

Animal Industry & Agriculture Branch
Department of the Northern Territory
PO Box 2134
ALICE SPRINGS NT

Telephone 50 3272

I called today whilst you were out and noticed that there was still ripe/fallen fruit in your yard. The Branch is requesting all householders in Alice Springs to remove and BURN all ripe and fallen fruit. Your co-operation in this matter would be appreciated.

Your yard will be inspected again next week by the spray team.

INSPECTOR OF PLANT DISEASES

CHEMICALS

Protein Hydrolysate -		
13 x 44 gall drums @ \$552/gall	3,157.44	
Malathion - 30 x 5 gall drums @ \$11.96/gall	1,794.00	
Lindane - 20 kg	263.60	
Lures	30.00	
	<u>5,245.04</u>	5,245.04

COVER SPRAY

By contract 2956 trees @ 50¢/tree	1,478	1,478
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PUBLICITY

"Agnote" 4000 copies	229.03	229.03
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TRAVEL

Entomologist - Scientific Services		
4 trips Darwin/Alice Springs @ 160 return	640	
Travel Allowance	200	
	<u>840</u>	840

TRANSPORTATION

Chemicals and Equipment Darwin to Alice Springs	413	413
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MISCELLANEOUS

Aggregate at filling depot - 10 metres	147.30	
Protective clothing	150.00	
	<u>297.30</u>	297.30

TOTAL : \$45,776.37