

**United States
Department of
Agriculture**

**Animal and
Plant Health
Inspection
Service**

**Plant Protection
and Quarantine**

**Cooperating State
Departments of
Agriculture**

September 1984

ACTION PLAN

MELON FLY

Dacus cucurbitae Coquillett

This PPQ Action Plan or New Pest Response Guideline has not been updated since its publication date. The actions or guidelines recommended may not be appropriate now, new survey tools may be available, and chemical pesticides named may no longer be registered. This documents is posted until updated versions can be drafted and as such are only guidelines that represent the state of knowledge at the time they were written. Please consult PPQ and/or your State Plant Regulatory Official prior to implementing any recommendations listed herein.

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AUTHORIZATION

This Action Plan provides guidelines and actions for the eradication of a melon fly infestation. This Action Plan supplements information contained in the Plant Protection and Quarantine (PPQ) Treatment Manual and Emergency Programs and Administrative Cadre Manuals.

It is to be used in conjunction with other manuals when conducting emergency program activities. The information and instructions contained in this Action Plan were developed with and approved by representatives of cooperating States, the U.S. Department of Agriculture's Agricultural Research and Cooperative State Research Services, and affected industry.

All program technology and methodology employed is determined through discussion, consultation, or agreement with the cooperating State officials.

NOTICE

Recommendations in this Action Plan which involve the use of pesticides concern products which are registered or exempted under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), as amended. Precautions on the pesticide label and all instructions in this Action Plan must be carefully followed.

Federal and/or State personnel may not make any warranty or representations, expressed or implied, concerning the use of these products and shall not be responsible for any loss, damage, or injury sustained as a result of the use of any product as specified in this Action Plan.

The use of trade names in this Action Plan does not imply an endorsement of those products or of the manufacturers thereof by Federal-State pest control programs.

H. L. Ford

Deputy Administrator
Plant Protection and Quarantine

8/18/82
Date

Carl W. Michals

Chairman
National Plant Board

8/18/82
Date

I. GENERAL INFORMATION

A. Action Statement

The information contained in this document is intended for use only when a melon fly infestation is known to exist. This Action Plan is to be used for guidance in implementing eradication procedures and in preventing spread to other locations. This Action Plan provides technical and general information needed to implement any phase of a melon fly eradication program. Specific emergency program action is to be based on information available at that time.

B. Background Information

The melon fly is a native to Asia. The melon fly occurs in Africa, Burma, Ceylon, China, Guam, Hawaii, India, Indonesia, Malaya, New Guinea, Okinawa, Philippine Islands, Rota, Siam, Southeastern Asia, and Taiwan. It was introduced into Hawaii in 1895. The larvae of the melon fly have been recorded worldwide in the fruit of around 100 different hosts (see Addendum C). Fruit injury occurs through oviposition punctures and subsequent larval feeding in host.

The melon fly occurs in Africa, Burma, Ceylon, China, Guam, Hawaii, India, Indonesia, Malaya, New Guinea, Okinawa, Philippine Islands, Rota, Siam, Southeastern Asia, and Taiwan.

Development from egg to adult in optimum temperature 82° F. (27° C.) and 70 percent relative humidity takes approximately 12 days. The adult may become sexually mature approximately 11 days after eclosion. Under optimum conditions, the period of time for one generation is around 21 days. Females live 3 to 5 months. All life stages are prolonged by cooler temperatures and other restrictive environmental factors (type of food, lack of food, etc.).

C. Life Cycle Application

Insect development is temperature dependent. The egg, larval, and adult reproductive development is influenced by air temperatures. The pupal development is influenced by soil temperatures. In both environments, a minimum temperature is established below which no measurable development takes place. An air temperature model can be designed to use air temperature data for all insect stages and to predict the entire life cycle. A number of degrees accumulated above the developmental thresholds for a life stage are called day degrees. Using the air model, a specific number of day degrees must be accumulated before a life cycle has been completed.

Program actions are guided in part by the insect life cycle data. Eradication treatments, length of trapping activities, and regulatory functions are impacted primarily by the length of time it takes to complete each phase of the life cycle.

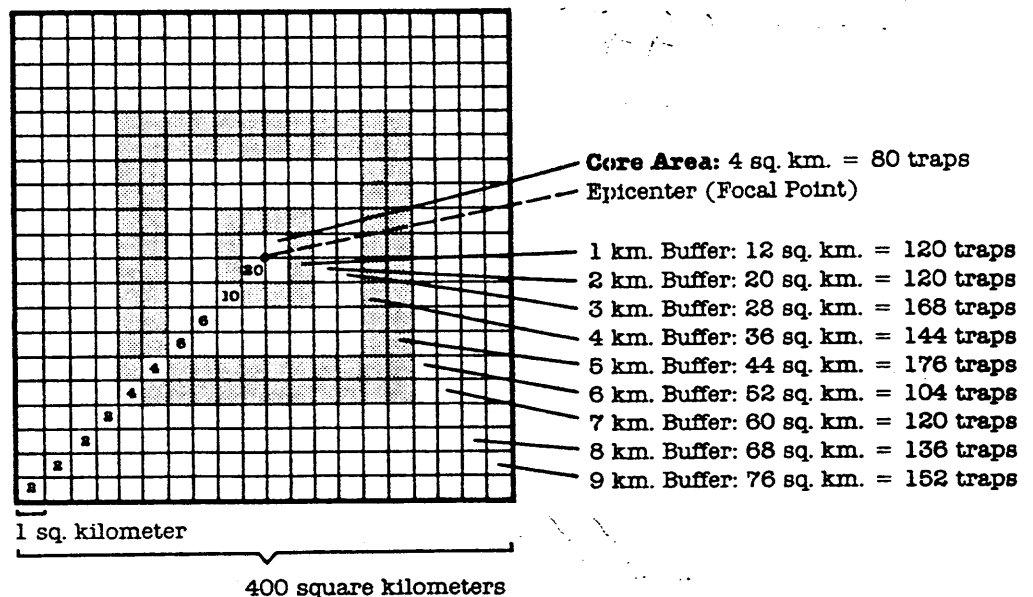
Temperature data is available from the National Oceanic and Atmospheric Administration, U.S. Department of Commerce, private, State, university, or industry sources or generated by strategically placed soil probes and thermometers.

II. SURVEY PROCEDURES

A. Delimiting Survey

When one or more melon flies are collected in an area, a delimiting survey will be implemented immediately to determine the population distribution. Using the detection as the epicenter (focal point), Jackson traps will be set out in a 20-10-6-6-4-4-2-2-2-2 per square kilometer (sq km) trapping array sequence. This sequence is approximately equivalent to a U.S. standard system of 81 square miles (sq mi), with a core area of 1 sq mi and a similar trap stepdown. Cue-lure is the lure used in the traps. The traps are checked daily during the initial 7-day period, then serviced weekly. Traps will be maintained through three melon fly generations.

Traps Set Per Square Kilometer



To increase the effectiveness of the survey, place the traps in a shady area near major hosts (chili peppers, cowpeas, gourds, melons, bitter melons, pumpkins, squash, tomatoes, and water-melons).

As a supplement to the Jackson traps, McPhail traps, utilizing yeast tablets or a protein hydrolysate (PIB-7) in water as the attractant, can be placed in the core area and the first buffer area at the rate of two per square kilometer (five per square mile). The setting of the Jackson traps has the first priority.

**B. Monitoring/
Evaluation
Survey**

A monitoring/evaluation survey will be conducted in that area where eradication treatments are applied. The selected trap is used at a minimum rate of two traps per square kilometer (five per square mile) (place traps near major hosts). The traps are used to monitor the effectiveness of the treatment program.

1. The Jackson trap is used at a minimum rate of two per square kilometer (five per square mile) to monitor the wild melon fly population when full coverage protein bait sprays and/or male lure treatments are used.
2. The Jackson or, if not available, a dry-type trap is used at the rate of two traps per square kilometer (five per square mile), where sterile fly release or a combination of sterile fly release, protein bait, and male lure treatments are used.
3. The Jackson trap is used at least at the minimum level equal to the delimiting survey rate to verify that eradication has been accomplished. Traps will be serviced for a minimum of one melon fly generation after treatments have been completed.

**C. Fruit Cutting
Survey**

Preferred host fruit from the core area, first buffer, and surrounding preferred host areas can be surveyed, depending on host availability. Fruit from the core area is to be cut and examined at the site.

**D. Host Collec-
tion and
Holding**

Fruit (and susceptible plant parts) can be collected within 200 meters (656 ft) of a larval detection and held for at least one melon fly life cycle at optimum developmental temperatures 80° F. (27° C.) and 40 to 70 percent relative humidity. The facility where the fruit is held must be secure to prevent an inadvertent release of emerged flies. Security measures must be equal to those established for a quarantine insect rearing facility. See Animal and Plant Health Inspection Service 81-61 for detailed information.

**E. Detection
Survey**

Areas beyond the 9 km (5.6 mile) buffer are trapped (up to a 160.9-km (100-mile) radius from the core area) at the rate of two Jackson traps (using cue-lure) per five square kilometers (one per square mile). These traps are to be serviced weekly and rebaited at a maximum of 2-week intervals. The traps are to be serviced for three generations and relocated each servicing depending on availability of preferred host.

F. Orientation
of Survey
Personnel

New personnel will be trained, on the job, by experienced personnel. Three working days will be necessary to teach the many facets of melon fly survey.

G. Survey
Records

Records noting the areas surveyed, sites trapped, dates, locations, and hosts in which detections were made will be maintained. See Action Plan Addendum F for detailed instructions.

III. REGULATORY PROCEDURES

A. Instructions to Officers

Regulatory actions will be required until the pest is eradicated. Officers must follow instructions for regulatory treatments or other procedures when authorizing the movement of regulated articles. Understanding the instructions and procedures will serve as a basis for explaining such procedures to persons interested in moving articles affected by the quarantine and regulations. Only authorized treatment procedures may be used.

General instructions that are to be followed in regulatory treatments are found in the PPQ Treatment Manual.

Officers may aid shippers in selecting the authorized treatment or procedure that is most practical for the shippers. They should advise the shipper to apply selected treatments to small quantities of material prior to treating larger quantities to determine reaction or effects of treatment procedure. When treating commodities, which are particularly sensitive to the treatments selected, treat more of the commodity than is needed to allow for possible losses.

B. Regulated Articles

1. The following fresh fruits, nuts, vegetables, and berries.

<u>Common Name</u>	<u>Scientific Name</u>
Apple	<u>Malus sylvestris</u>
Avocado	<u>Persea americana</u>
Canada pumpkin	<u>Cucurbita moschata</u>
Cantaloupe	<u>Cucumis melo</u> and <u>Cucumis melo</u> var. <u>cantalupensis</u>
Cauliflower	<u>Brassica oleracea</u> var. <u>botrytis</u>
Chayote	<u>Sechium edule</u>
Chiles, peppers	<u>Capsicum annum</u>
Chinese melon	<u>Benincasa hispida</u>
Cowpea, Sitao	<u>Vigna</u> sp.
Cowpea	<u>Vigna sinensis</u>
Cowpea, yardlong	<u>Vigna sesquipedalis</u>
Cucurbit	<u>Cucumis pubescens</u> and <u>Cucumis trigonus</u>
Cucumber	<u>Cucumis sativus</u>
Eggplant	<u>Solanum melongena</u>
Fig	<u>Ficus carica</u>

Gourds	<u>Lagenaria</u> spp. <u>Momordica</u> spp. <u>Luffa</u> spp. <u>Trichosanthis</u> spp. <u>Crescentia</u> spp. <u>Coccinia</u> spp. <u>Vitis trifolia</u> <u>Psidium guajava</u> <u>Psidium cattleianum</u> <u>Cucumis maxima</u> <u>Dolichos lablab</u> <u>Brassica juncea</u> <u>Phaseolus lunatus</u> = (<u>Phaseolus</u> <u>limensis</u>)
Mandarin	<u>Citrus reticulata</u>
Mango	<u>Mangifera indica</u>
Melon	<u>Citrullus</u> sp.
Orange, king	<u>Citrus nobilis</u>
Orange, sweet	<u>Citrus sinensis</u>
Oriental pickling melon	<u>Cucumis melo</u> var. <u>conomon</u>
Papaya	<u>Carica papaya</u>
Peach	<u>Prunus persica</u>
Pear	<u>Pyrus communis</u>
Pepper	<u>Capsicum annum</u>
Pumpkin	<u>Cucurbita pepo</u>
Scarlet wisteria tree	<u>Sesbania grandiflora</u>
Squash	<u>Cucurbita maxima</u>
Strawberry	<u>Fragaria chiloensis</u>
String bean	<u>Phaseolus vulgaris</u>
Tomato	<u>Lycopersicon esculentum</u>
Water lemon	<u>Passiflora laurifolia</u>
Watermelon	<u>Citrullus lanatus</u> = (<u>Citrullus vulgaris</u>)

2. Soil within the drip area of plants which produce the fruits, nuts, vegetables, or berries listed above.

3. Any other product, article, or means of conveyance, of any character whatsoever, when it is determined by an inspector that they present a hazard of spread of melon fly and the person in possession thereof has been so notified.

C. Quarantine
Actions

When detections are made, the following steps should be implemented in sequence:

1. With the detection site considered the epicenter, all growers and establishments that grow, handle, or process regulated articles within a minimum of 10 km (6.2 mi) will be

issued emergency action notifications requiring treatment or other approved handling procedures. Emergency Action Notifications (PPQ Form 523) and/or comparable State notifications are issued by field personnel to the property owners or managers of all establishments handling, moving, or processing articles capable of spreading the melon fly. A notification may be issued pending authoritative confirmation and/or further instruction from the Deputy Administrator.

2. If necessary, the Deputy Administrator will issue a letter directing PPQ field offices to initiate specific emergency actions under the Federal Plant Pest Act (7 U.S.C. 150dd) until emergency regulations can be published in the Federal Register.

The Federal Plant Pest Act of 1957 provides for authority for emergency quarantine action. This provision is for interstate regulatory action only; intrastate regulatory action is provided under State authority. However, if the Secretary of Agriculture determines that an extraordinary emergency exists and that the measures taken by the State are inadequate, USDA can take intrastate regulatory action provided that the Governor of the State has been consulted and a notice has been published in the Federal Register.

The Organic Act of 1944, as amended, provides the Federal Government, either independently or in cooperation with States or political subdivisions thereof, farmers' associations and similar organizations, and individuals, the authority to carry out operations or measures to detect, eradicate, suppress, control, or to prevent or retard the spread of plant pests. This Act does not provide for trespassing on private property, but relies upon State authority and willingness to use State right-of-entry authority.

All program technology and methodology employed is determined through discussion, consultation, or agreement with the cooperating State officials.

3. The Deputy Administrator, through the National Regional Directors, will notify State cooperators of the melon fly detection, actions taken, and actions contemplated.

A narrative description of the regulated area with support documents will be developed by USDA and cooperators and provided to the Regulatory Services Staff, National Program Planning Staff (NPPS). The regulated area will also be defined by the Universal Transverse Mercator grid marking system for use by the Project Manager.

4. APHIS Regulatory Coordination Staff will publish in the Federal Register emergency regulations under the Federal Plant Pest Act.

5. After a reasonable time, taking into consideration such factors as the biology of the pest, climatic conditions, and infestation spread, a proposal to promulgate a quarantine under the Plant Quarantine Act will be published. The proposal will announce a date for submitting written comments, which shall be approximately 60 days after publication.

6. After receipt of written comments, a final determination specifying the action decided upon will be published in the Federal Register. If after consideration of the comments a quarantine is warranted, it would be invoked under the Plant Quarantine Act.

D. Regulatory Trapping

Regulatory trapping will be conducted around all establishments where regulated articles are sold, handled, processed, or moved. Establishments that might be involved are: Airports, landfill sites, fruit stands, farmers' markets, produce markets, flea markets, and any other establishments that handle regulated articles. One Jackson trap (with cue-lure) per establishment in the regulated area is to be used.

E. Use of Authorized Chemicals

The PPQ Treatment Manual and this Action Plan Addendum D contain the authorized chemicals, methods and rates of application, and any special application instructions. Concurrence by the PPQ's Survey and Emergency Response Staff, NPPS, is necessary for the use of any other chemical or procedure for regulatory purposes.

F. Approved Regulatory Treatments

1. Soil Treatment: An approved insecticide (diazinon) applied to the soil of nursery stock and/or within the drip line of host plants.

2. Fumigation: The application of an approved fumigant as a treatment (methyl bromide, ethylene dibromide, Phostoxin®) alone or in conjunction with cold treatment procedures.

3. Cold Treatment: The use of cold temperatures as a treatment on selected products alone or in conjunction with fumigation procedures.

G. Principal Activities

The following identifies principal activities necessary for conducting a regulatory program to prevent the spread of the

melon fly. The extent of regulatory activity required is dependent on the degree of infestation. For example, safeguarding fruit stands throughout the entire regulated area which are engaged in only local retail activity may not be necessary when the regulations that are imposed are based on a limited and light infestation. On the other hand, mandatory checks of passenger baggage at airports and the judicious use of road patrols and roadblocks may be necessary where general or heavy infestations occur.

1. Advising regulated industry of required treatment procedures.
2. Supervising, monitoring, and certifying commodity treatments of commercial lots of regulated articles.
3. Contacting:
 - a. Security and airline personnel.
 - b. Fruit stands.
 - c. Local growers and packers.
 - d. Farmers', produce, and flea markets.
 - e. Commercial haulers of regulated articles.
 - f. Public transportation.
4. Visiting canneries and other processing establishments.
5. Monitoring the movement of waste material to and from landfills to ensure adequate disposal of regulated article refuse.
6. Monitoring the movement of regulated articles through major airports and other transportation centers.
7. Observing major highway and quarantine boundaries for movement of host materials.

H. Orientation of Regulatory Personnel

Only trained or experienced personnel will be used initially. Replacement personnel will be trained by the individual being replaced. A training period of 3 working days is necessary for the orderly transfer of these functions.

I. Regulatory Records

Records will be maintained, as necessary, to carry out an effective, efficient, and responsible regulatory program. See Action Plan Addendum F for detailed instructions.

IV. ERADICATION PROCEDURES

Survey and Emergency Response Staff, in consultation with methods and research agencies, outlines treatments to be used and must be notified of all treatment plans. If treatments selected or proposed are not in conformance with current pesticide labels, an emergency exemption can be provided under Section 18 of the FIFRA, as amended. For further instructions, see Emergency Programs Manual, Section V, B.

Eradication of a melon fly infestation in the continental United States is essential. The following provides approved procedures available for use in most situations. These procedures include mechanical, chemical, and biological control (e.g., sterile flies). Local conditions will determine the most acceptable procedure or combination of procedures to achieve eradication.

A. Recommended Pesticides

1. Diazinon
2. Naled (Dibrom®)
3. Malathion

B. Approved Eradication Treatments

1. Male Annihilation Option

a. Spot Treatment: Apply the lure/bait using a hydraulic oil squirt can or Panama pump® gun to utility poles, trees, and fences, etc. Apply at least 2,400 evenly distributed stations per square kilometer (6,000 per square mile) or 600 to 800 to a city block. Apply treatment every 2 weeks. After two generations with negative detections, treatments can be discontinued.

b. Ground Applied Cordelito Treatment: Small lure/bait soaked cords can be applied at 2,400 evenly distributed cords per square kilometer (6,000 per square mile) or 600 to 800 on a city block. These can be used in lieu of the spot treatments. Apply treatment every 2 weeks. After two melon fly generations with negative detections, treatments can be discontinued.

c. Aerially Applied Cordelito Treatment: Small lure/bait soaked cords can be applied at 3,000 cords per square kilometer (7,500 per sq mi) evenly distributed by aerial drop methods. Apply treatment every 2 weeks. After two generations with negative detections, treatments can be discontinued.

2. Aerial Bait Spray Option

Full coverage aerial application of protein bait spray will be initiated immediately. The recommended number of applications of protein bait spray will be applied at the prescribed intervals.

The area of full coverage bait spray will extend a minimum of 2.5 km (approximately 1.5 mi) beyond any known fly detection. After an estimated two generations of negative trapping, spray operations may be discontinued. Weather conditions may dictate change in spray schedule.

3. Supplemental Eradication Methods

a. Ground Bait Spray: Ground application of protein bait spray will be initiated immediately. All hosts (fruit- or nonfruit-bearing plants or trees which provide for reproduction of the melon fly in any stage of development) on the infested property, and within 200 meters (m) (656 feet (ft)) of the known infestation will be sprayed at the prescribed intervals. Ground spraying may be discontinued after an estimated two generations of negative trapping or after the initiation of aerial treatment.

The decision to apply bait spray applications will be based on the best weather information available. In the event rain washes a bait application from the foliage, plans will be implemented to retreat the area.

Retreatment should not be considered if weather reports indicate a 50-percent or greater chance of precipitation in the 48-hour period following washoff.

The objective is to minimize environmental contamination via bait spray washoff while maintaining a viable bait spray in the eradication zone. Any treatment or retreatment recommendations will be considered based on data from the environmental monitoring effort.

b. Soil Treatment: Properties with confirmed larval infestations and environs within 200 m (656 ft) surrounding it will have approved soil treatments applied within the drip line of all host plants. Treatment will be applied at the prescribed intervals.

c. Sterile Insect Release (SIR): In situations where SIR is the most appropriate response to eliminate small incipient melon fly populations, the technique may be employed. It may

be used in conjunction with male annihilation and application of protein bait spray and soil treatment.

A trap array of two traps per square kilometer (5 per sq mi), using Jackson traps or, if not available, a dry-type trap, will be utilized in a monitoring survey throughout the operational area where sterile flies are released. The traps will be baited with cue-lure and serviced on a 1-week schedule.

Sterile release can be achieved using three methods. These methods will be utilized to ensure that no less than 200,000 adult flies are dispensed in the infested area (core area) per square km (approximately 1/2 million per sq mi) per week. No less than 10,000 adult flies per square kilometer (25,000 per sq mi) are to be dispensed in at least a 5-km (approximately 3-mi) buffer zone completely surrounding the core area. Additional flies are to be released in any square kilometer where monitoring surveys indicate that the overflooding ratio is less than 50 sterile flies to 1 native fly. The following methods will be utilized to achieve sterile fly distribution.

(1) Static Sterile Release: A total of 20 static sterile release stations will be established per square kilometer (50 per sq mi). Use the detection site as an epicenter to establish the square mile. A static release station is to be established at all positive detection sites.

(2) Roving Sterile Release: This release system involves the release of adult flies from a moving vehicle. Use of this system permits rapid dispersal of large volumes of adult flies under various favorable biological and environmental situations.

Roving sterile release is generally utilized within the core area or 1 km (0.6 mi) beyond all positive detections.

The roving sterile release method also may be used to distribute the 10,000 sterile flies per square kilometer (25,000 per sq mi) per week within the minimum 5-km (approximately 3-mi) buffer zone surrounding the core area.

Quality control data secured from the Rearing Supervisor will be used to determine how many flies to release.

(3) Aerial Sterile Release: This method of releasing sterile melon flies permits the coverage of large areas in a short period of time. Aerial sterile release also provides better general distribution over an area than static sterile or roving sterile release methods.

Fly distribution should be accomplished over the entire aerial release zone for any day aerial operations are conducted. It will be necessary to conduct additional aerial release flights over the core area to maintain the 2 to 1 ratio of populations (i.e., core area versus buffer zone) when aerial sterile release is the only method of release being utilized.

Either system (i.e., roving sterile release, aerial sterile release, or a combination of roving/aerial sterile release) is a satisfactory method of achieving desired sterile melon fly distribution. Infestation size and location will influence the release method selected. This selection is to be made by control personnel.

NOTE: Static sterile releases can be discontinued when adult sterile release systems become fully operational. Static sterile release stations provide an early and reliable method to get sterile flies into a native population due to logistical delays in the production of adult flies.

C. Eradication/
Control
Method
Selection

The following parameters or criteria will initially determine the minimum treatments to be used in achieving eradication. Expanded or additional treatment actions can be applied if mutually agreed upon with cooperating agencies. Control measures will continue for at least two melon fly generations and trapping will continue for at least three generations.

1. If one adult male or one unmated adult female is detected, control treatments are not mandatory at that time.
2. If a mated female, a larval detection, a pupal detection, or up to five adults are detected in an urban/residential area, involving less than 12 sq km (7.4 sq mi), ground applied male lure spot application (preferred) or cords and soil treatment will be used as above, with the addition of application of bait spray. Similar fly detections in a commercial area are treated as above with the addition of aerial applications of bait spray.
3. If a mated female, a larval detection, a pupal detection, up to five adults, or five detections of any combination of life forms are detected in an urban/residential area involving more than 12 sq km (7.4 sq mi), application of bait spray, ground applied male annihilation spot applications, or cords and soil treatment are also employed. Similar fly detections in a commercial production area are treated as above with the addition of aerial applications of bait spray.

- D. Orientation of Eradication/Control Personnel Only trained and experienced personnel will be utilized initially. Replacement personnel will be trained by the individual being replaced. A training period of 3 working days is necessary for the orderly transfer of these functions.
- E. Eradication/Control Records Records noting the location, dates, number and type of treatments, and materials and formulations used will be maintained for all areas treated. See Action Plan Addendum F for detailed instructions.
- F. Monitoring An effective monitoring program will be implemented to aid in the evaluation of program efforts and environmental impact. The application and use of pesticides and other controlled substances will be assessed through the use of appropriate monitoring program criteria. The evaluation must effectively address Agency, cooperator, and public concerns.

The monitoring program will include a least the following elements:

1. Determine efficacy of the pesticide against the target pest.
2. Evaluating dye cards to monitor aerial bait application.
 - a. Droplet size information.
 - b. Droplet distribution information.
 - c. Bait deposition information.
 - d. Identification of wind drift components.
 - e. Verification of spray block boundaries.
 - f. Identification of skips.
3. Sampling to evaluate effort on environmental components.
 - a. Water sampling to detect insecticide levels through direct application, leaching, and runoff.
 - b. Soil sampling to determine insecticide levels and residues.
 - c. Foliage sampling to identify residues.
 - d. Biological organism sampling during applications and posttreatments to determine impact of insecticides.
 - e. Air sampling to determine presence of pesticides in respirable air.

The monitoring program is to be a combined effort between the State in which the emergency program is being conducted and PPQ. If specific plans need to be developed for monitoring activities, the Survey and Emergency Response Staff will request assistance and guidelines from other NPPS staffs.

V. REARING AND STERILIZING PROCEDURES

The logistics of supplying, equipping, irradiating, packaging, and monitoring sterile fly releases is a program within itself. For detailed information involving supplies, equipment, packaging, monitoring, and quality control, see the Emergency Programs Manual.

VI. CONTACTS

When a melon fly eradication program has been implemented, its success will depend on the voluntary cooperation, assistance, and understanding from other involved groups. The following is a list of groups which are involved in or must be kept informed of all operational phases of an emergency program.

- A. Other Federal, State, county, and municipal agricultural officials
- B. Grower groups
- C. Commercial interests
- D. Universities
- E. State and local law enforcement officials
- F. Public health
- G. Foreign agricultural interests
- H. National, State, and local news media
- I. General public

VII. ADDENDA

Addendum A--Definitions

Aerial Bait Treatment:	Applying bait spray by aircraft over a treatment area.
Aerial Sterile Release:	Releasing sterile melon flies over a designated area by aircraft.
Aerial Release Area:	The core area and all peripheral areas 5 km (approximately 3 mi) beyond the nearest known infestation or to a suitable natural barrier within the 5-km (approximately 3-mi) peripheral area.
Array:	The trapping pattern in a 1-sq-km (0.4 sq mi) area.
Array Sequence:	The trapping pattern (array) beginning with the core area and continuing outward through each buffer area ending with the outer buffer area.
Bait:	An attractant and food source (protein hydrolysate) mixed with an insecticide for treating melon fly infestations.
Buffer Area:	The area extending beyond the boundary of core-1-, 2-, 3-, 4-, 5-, 6-, 7-, 8-, and 9-km (0.6-, 1.2-, 1.9-, 2.5-, 3.1-, 3.8-, 4.4-, 5-, and 5.6-mi) buffer.
Cold Treatment:	The use of cold temperatures as a treatment on selected products alone or in conjunction with fumigation procedures.
Commercial Production Area:	An area where host material for commerce is grown.
Confirmed Detection:	A positive laboratory identification of a submitted life form (specimen) as melon fly.
Core Area:	A minimum distance of 1 km (0.6 mi) beyond any confirmed melon fly detection.
Day Degrees:	An accumulation of heat units above a specified developmental temperature threshold during a life stage.

Dacus cucurbitae Coquillett: The scientific name for melon fly.

Delimiting Survey: Determining the extent of the infestation in an area where the melon fly has been detected.

Detection: The collection of any life stage of melon fly.

Detection Survey: An activity conducted in a susceptible area not known to be infested with the melon fly.

Epicenter/Focal Point: The initial site of an infestation.

Fruit Collection Survey: The collection of fruit (and certain susceptible plant parts) to determine the extent and nature of an infestation.

Fruit Cutting Survey: A survey conducted by cutting fruit and examining for larvae.

Fumigation: The application of an approved fumigant as a treatment (methyl bromide, ethylene dibromide, Phostoxin®) alone or in conjunction with cold treatment procedures.

**Generation:
(Life Cycle)** The period of time for the pest to complete all stages of development predicated on day degrees or on the basis of other biological information.

Ground Bait Spray: Using ground bait spray equipment to spray host vegetation in a melon fly infested area with an insecticide and protein hydrolysate bait.

Host: A plant species that provides the potential for reproduction of the melon fly.

Infestation: The collection of a larva, a pupa, a mated female, or two or more melon flies from within an area of 4 sq km (1.54 sq mi). (During an eradication effort the detection of a single adult determined to be associated with the current infestation will be sufficient to trigger an expanded program activity.)

Infested Area: Three kilometers distance from all detection sites.

Lure Bait:
(Cue-lure) A male lure/bait with a thickening agent and insecticide.

Male Annihilation Procedure: An eradication procedure using bait stations, consisting of male lure, thickening agent, and an insecticide, is designed to kill the adult male melon fly.

Monitoring/Evaluation Survey: A survey, using traps, conducted in an area where (1) marked sterile melon flies are released to determine the overflooding ratio between wild and sterile flies and/or (2) a pesticide treatment has been applied and the effectiveness of the treatment is being evaluated.

PPQ-APHIS-USDA: Plant Protection and Quarantine, Animal and Plant Health Inspection Service, United States Department of Agriculture.

Quadrat: One-quarter square km (0.1 sq mi).
Four quadrats per square kilometer.

Regulated Area: The regulated area will extend a minimum of 10 linear km (6.2 miles) in any direction from an infested property.

Regulatory Inspection: Trapping conducted around establishments where regulated articles are sold, handled, processed, or moved.

Roving Sterile Release: The release of sterile melon flies in an area from a motor vehicle.

Soil Treatment: The application of an approved insecticide to the soil of nursery stock and within the drip line of host plants.

Static Sterile Release: Placing pupae in protective stations for emergence of sterile melon flies.

Sterile Release: Releasing sterile melon flies in an area as a method of eradication or as one of several methods in an integrated eradication program.

Ultralow-Volume Bait Spray: A mixture of an insecticide with protein hydrolysate. This mixture is applied as droplets by aircraft.

Urban/Residential Area:

Noncommercial host crop production area
generally containing multiple or single
family dwellings.

Addendum B--Safety

Personnel and public safety must be a prime consideration at all times. Safety practices should be stressed in preprogram planning and through the duration of actual program operations. Supervisors must enforce on-the-job safety procedures. For complete instructions, see V, D, in the Emergency Programs Manual.

Addendum C--Hosts

The melon fly host list has been separated into lists that indicate those that are preferred hosts and other recorded hosts.

PREFERRED

<u>Common Name</u>	<u>Scientific Name</u>
Balsam apple	<u>Momordica balsamina</u>
Balsam pear	<u>Momordica charantica</u>
Bottle gourds	<u>Lagenaria vulgaris</u>
	<u>Lagenaria leucantha</u>
	<u>Lagenaria siceraria</u>
Canada pumpkin	<u>Cucurbita moschata</u>
Cantaloupe	<u>Cucumis melo</u> and <u>Cucumis melo</u> var. <u>cantalupensis</u>
Chayote	<u>Sechium edule</u>
Chiles, peppers	<u>Capsicum annum</u>
Chinese cucumber (gourd)	<u>Momordica</u> sp.
Chinese melon	<u>Benincasa hispida</u>
Cowpea	<u>Vigna sinensis</u>
Cowpea, sitao	<u>Vigna</u> sp.
Cowpea, yardlong	<u>Vigna sesquipedalis</u>
Cucumber	<u>Cucumis sativus</u>
Dishcloth gourd	<u>Luffa aegyptiaca</u>
Eggplant	<u>Solanum melongena</u> = (<u>Luffa</u> <u>cylindrica</u>)
Fig, common	<u>Ficus carica</u>
Guava, cattley	<u>Psidium cattleianum</u>
Hubbard squash	<u>Cucurbita maxima</u>
Hyacinth bean	<u>Dolichos lablab</u>
Lima bean	<u>Phaseolus lunatus</u> = (<u>limensis</u>)
Long melon	<u>Cucumis utillissimus</u>
Mandarin	<u>Citrus reticulata</u>
Mango	<u>Mangifera indica</u>
Melon	<u>Citrullus colocynthis</u>
Orange, king	<u>Citrus nobilis</u>
Orange, sweet	<u>Citrus sinensis</u>
Oriental pickling melon	<u>Cucumis melo</u> var. <u>conomon</u>
Papaya, common	<u>Carica papaya</u>
Peach	<u>Prunus persica</u>
Pumpkin	<u>Cucurbita pepo</u>
Ribbed gourd	<u>Luffa acutangula</u>

Scarlet wisteria tree
 String bean
 Squash melon

 Tomato
 Tree Tomato
 Water lemon
 Watermelon

Sesbania grandiflora
Phaseolus vulgaris
Citrullus vulgaris var.
fistulosus
Lycopersicon esculentum
Cyphomandra betacea
Passiflora laurifolia
Citrullus lanatus
 = (Citrullus vulgaris)

OTHER RECORDED

The literature indicates these hosts could allow for melon fruit fly development but does not disclose all the conditions under which the host/pest relationship occurs. The available data does not support inclusion of these hosts as regulated articles.

<u>Common Name</u>	<u>Scientific Name</u>
Alexander laurel	<u>Calophyllum inophyllum</u>
Apple, paradise	<u>Malus sylvestris</u> var. <u>paradisianca</u>
Apricot	<u>Prunus armeniaca</u>
Avocado	<u>Persea americana</u>
Banana, common	<u>Musa paradisiaca</u> var. <u>sapientum</u>
Bryonopsis, cutleaf	<u>Bryonopsis laciniosa</u>
Burcucumber	<u>Sicyos</u> sp.
Cabbage	<u>Brassica oleracea</u> var. <u>capitata</u>
Caimitillo	<u>Chrysophyllum oliviforme</u>
Cainito	<u>Chrysophyllum cainito</u>
Cauliflower	<u>Brassica oleracea</u>
Chilean strawberry	<u>Fragaria chiloensis</u>
Chilli	<u>Capsicum frutescens</u> var. <u>longum</u>
Chinese date	<u>Zizyphus jujuba</u>
Chinese wampee	<u>Clausena lansium</u>
Country gooseberry	<u>Averrhoa carambola</u>
Cucurbit, wild	<u>Cucumis pubescens</u>
	<u>Cucumis trigonus</u>
Custard apple	<u>Annona reticulata</u>
	<u>Annona squamosa</u>
	<u>Annona biflora cinerea</u>
	<u>Annona forskahli</u>
Date	<u>Phoenix dactylifera</u>
Granadilla, giant	<u>Passiflora quadrangularis</u>
Granadilla, sweet	<u>Passiflora ligularis</u>

Grapes (galls (female))
Grapefruit
Guava, common
Hedgethorn
Ivy gourd
Jessamine
Kohlrabi

Leaf mustard
Lemon
Longan
Melons
Mungo bean
Okra
Onion, garden
Orange, sour
Parya-soorten
Passion flower, tagua
Passionfruit (flower†
Pear
Pepper, green

Pigeon pea
Prickly pear
Pummelo
Rose apple
Sapote, white
Snake gourd

Snake gourd, Japanese
Soursop
Surinam cherry
Walnut, California black
Walnut, english

No Common Names Available

Vitis trifolia
Citrus paradisi
Psidium guava
Carissa arduina
Coccinia cordifolia
Cestrum sp.
Brassica oleracea var.
gongyloides
Brassica juncea
Citrus limon
Euphoria longan
Citrullus sp.
Phaseolus mungo
Hibiscus esculentus
Allium cepa
Citrus aurantium
Momordica sp.
Passiflora foetida
Passiflora edulis
Pyrus communis
Capsicum frutescens var.
grossum
Cajanus cajan
Opuntia sp.
Citrus grandus
Eugenia jambos
Casimiroa edulis
Trichosanthis anguina
= (Trichosanthis
cucumerina)
Trichosanthis cucumeroides
Annona muricata
Eugenia uniflora
Juglans hindsii
Juglans regia

Endospermum malaccense
Melothria heterophylla
Passiflora seemanii
Strychnos nuxvomica

Addendum D—Life History

1. SYSTEMATIC POSITION

Melon fly, Dacus cucurbitae Coquillett (Diptera, Tephritidae). One of about 200 species of the genus Dacus, ranging from the Middle East to Australia. The other major economic species known in Dacus are:

Queensland fruit fly, Dacus tryoni (Froggatt)
Oriental fruit fly, Dacus dorsalis Hendel

There are many other of lesser or unknown economic damage potential.

2. IDENTIFICATION CHARACTERS

Larvae: A typical headless maggot, creamy-white; attains length of 10 mm; 11-segmented; very similar to other Dacus. Larvae feed inside host material in large numbers. There are three instars; third instar larvae have the ability to flip.

Puparium: Dull white to dark brown; 5 to 6 mm long. Larvae normally pupate in the soil 2 to 3 cm under the surface.

Adult: Six to eight mm long, slightly larger than house fly; reddish-yellow, brown spots along veins of otherwise clear wings. Female with slender, sharp-pointed ovipositor; deposits eggs in host material a few at a time over a period of many weeks; several hundred in lifetime.

Egg: Slender, white, elliptical, without sculpturing; up to 2 mm long, slightly curved; deposited singly or in groups up to 40 in any exposed part of host plant, especially in previous punctures or injuries.

3. BIOLOGY

A mated female may oviposit an average 15 eggs per day for a month or more, but usually oviposition periods are punctuated by frequent resting periods (cessation of oviposition). The eggs take 6 to 28 hours to hatch. The developing larvae go through three instars. The larval stage can last from 4 to 17 days, depending on temperature. The third instar can flip and exit the host. They drop to the ground and pupate 2 to 5 cm under the soil. The pupae usually require 7 to 13 days before adult eclosion, in colder weather up to 59 days are necessary for adult eclosion to occur. The newly emerged adults normally require about 11 to 12 days in the preoviposition stage and females can produce up to 1000 eggs. Adults usually live 1 to 5 months but have been known to survive a year in cool mountain localities.

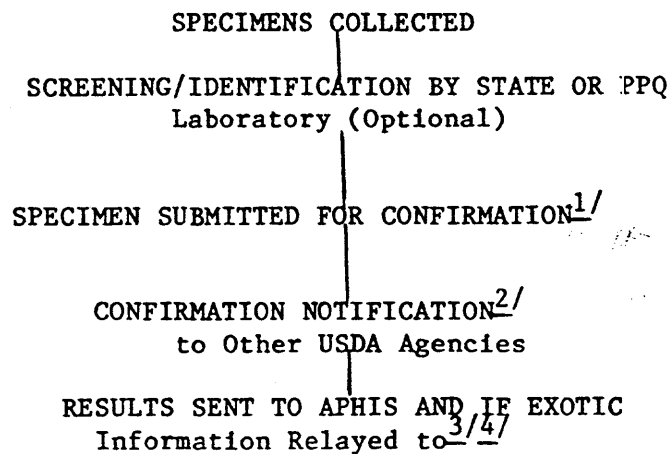
The shortest possible time for the life cycle is about 12 days, but is usually about 1 to 2 months. The longest recorded time period for the life cycle is 7 months. Adults are strong fliers and are capable of flying quite long distances.

They are generally found on plants (host and nonhost) in shady locations except when visiting the host plants to oviposit.

Since melon fly also oviposits in tender plant tissues such as terminals, unopened flowers, young stems, roots, and seedlings, it is necessary to watch for wilted runners, damaged buds, other plant parts, and dead seedlings, particularly in cucurbits.

As many specimens as possible of the pest are to be collected for screening/identification by the local designated identifier. Suspect adult specimens collected from Jackson traps should be handled carefully. The insert with the suspect fly(ies) should be folded, sticky sides in, only to the extent that it may be inserted into a paper bag. Care must be taken not to fold the sticky sides of the specimens together tightly, thus making removal and identification of the fly(ies) difficult. Suspect adult specimens collected from McPhail and Jackson traps and other insect stages should be forwarded in vials of alcohol for confirmation to 1/ below. These specimens must be accompanied by PPQ Form 391 marked "Urgent" (see PPQ Manual M390.500).

INFORMATION FLOW FOR THE IDENTIFICATION OF SPECIMENS



1/

Arizona, Louisiana,
New Mexico, Texas

Mr. D. Riley
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P.O. Box 306
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Other States West of
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2/ APHIS

Plant Protection and Quarantine

3/ All States

State and Territory Agricultural Regulatory Officials

4/ NAPPO

North American Plant Protection Organization

Addendum F--Technical Application Data

Some pesticides and/or bait and lure formulations can damage painted surfaces, plastic and some uncoated metal surfaces. Care must be exercised when formulating and applying these compounds. The result of accidental contamination can be eliminated or minimized by promptly cleaning the affected surface.

1. GROUND FOLIAGE BAIT SPRAY APPLICATION

Malathion 50 WP-----500 g (1 pound (1b)) a.i./acre
Protein (Staley's)-----9.5 liters (2.5 gallons)

Add water to meet application equipment requirements.

The bait mix can be applied on the foliage of host plants as a bait station by means of a backpack sprayer or equivalent unit. Each host or station (approximately 2,400 per square kilometer (6,000 per sq mi)) shall be given a drench sufficient to cover a minimum 1/2-square meter of foliage until leaf surface is wet. Applications are sprayed on one side out of reach of children or pets. When applied as a full coverage foliar spray, mist blowers or similar units can be used. Treatments are to be applied 2 weeks apart.

2. SOIL TREATMENT

Diazinon--104.7 ml (3.54 oz) of Diazinon AG-4 per 77 L (20 gal) of water. of water. Apply number of prescribed treatments at 14- to 16-day intervals as per the Environmental Protection Agency specific exemption to the soil of all hosts on properties where larvae have been found and the environs within 200 m (656 ft).

Diazinon--Work Diazinon 14G (granular) into soil 25 to 50 mm (1 to 2 in) at the rate of 6.35 to 12.7 kg (14 to 28 lb) per acre or 32.83 gm (1.16 oz) per 3.65 m (12 ft) diameter drip circle 10.5 sq m (113 sq ft) with a rotary hoe, cultivator, disk, harrow, or other suitable means.

3. AERIAL BAIT SPRAY APPLICATION

ULV Malathion--0.071 L (2.4 oz) of 91 percent technical grade malathion plus 0.281 L (9.6 oz) of Staley's protein bait per acre. Apply full coverage bait spray on a 7- to 10-day schedule.

4. TOXIC MALE LURE BAIT

Naled-----30 percent Dibrom 14
Minu-gel---23 percent Minu-gel 400
Male Lure--47 percent 4-(p-acetoxyphenyl)-2-butane (cue-lure)

Apply above mixture, formulated by weight with a hydraulic oil squirt can or Panama pump® gun out of the reach of children. The lure is squirted on tree trunks, fences, utility poles, etc. at the rate of 3 to 5 mls per station, with 2,400 stations per square kilometer (6,000 per square mile). Treatment to be applied every 7 to 14 days.

Do not apply treatment to surfaces that appear greasy, wet, or stained with other substances which might interfere with the attractive and killing powers of the bait (i.e., creosote on utility poles). Certain types of trees might suffer from the application (i.e., palms will exude sap from the sprayed area).

5. CORDELITOS

Naled-----0.6 gm
Male Lure-----2 gm of cue-lure per carrier
Carrier-----30 mm of 6-ply cotton dental wick

Cords should be placed on vegetation, etc., out of reach of children and pets.

6. McPHAIL TRAP BAITS

- a. 9 percent Staley's bait--324 ml (11 fluid oz) of PIB-7
5 percent Borax-----226 gm (1/2 lb) of borax
86 percent Water-----3.8 L (1 gal) of water

- b. Five Sit-Khem Torula Yeast Tablets.

7. JACKSON TRAP LURE

A Richmond dental wick 19-mm (3/4-in) diameter and 38.2 mm (1 1/2 in) long will be installed in the trap. The wick will be baited with a mixture of cue-lure and Dibrom 14 (naled). The Dibrom 14 in the mixture will be 1 percent by volume. The initial servicing will require 6 milliliters of lure. Subsequent servicings will require adding sufficient lure to saturate the wick without dripping. A period of 16 weeks between servicings is optimum but will depend on lure evaporation under existing weather conditions.

Addendum G--Forms

	<u>Number</u>	<u>Title</u>
CONTROL	PPQ-213	Airplane Inspection Record
	PPQ-431	Treatment Test Record
	PPQ-468	Caution--Pesticide Treatment in Progress
	PPQ-552	Pesticide Samples for Chemical Analysis
	PPQ-602	Environmental Monitoring
	PPQ-603	Residue Sample for Food or Feed Product
	PPQ-802	Daily Aircraft Record
REGULATORY	PPQ-214	Warning Quarantine Label
	PPQ-244	Warning Quarantine Tag
	PPQ-254	Disposition of Plants and Plant or Animal Products
	PPQ-287	Mail Interception Notice
	PPQ-405	EDB Fumigation Record
	PPQ-468	Caution--Pesticide Treatment in Progress
	PPQ-518	Report of Violation
	PPQ-519	Compliance Agreement
	PPQ-522	Certified Under All Applicable Federal or State Cooperative Domestic Plant Quarantines Tag
	PPQ-523	Emergency Action Notification
	PPQ-524	Issuance Record--Permits and Certificates
	PPQ-527	Package Certificate
	PPQ-530	Limited Permit
	PPQ-535	Certificate of Treatment Label
	PPQ-537	Limited Permit Label
	PPQ-540	Certificate of Treatment
	PPQ-551	Regulated Establishment Record
PPQ-554	Certified Under All Applicable Federal or State Cooperative Domestic Plant Quarantine Label	
PPQ-577	Phytosanitary Certificate	
SURVEY	PPQ-343	Trapping Record
	PPQ-345	Caution Label for Trapping
	PPQ-391	Specimens for Determination
	PPQ-539	Trapping Survey Record

Addendum H--Contributors

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The aforementioned individuals were major contributors to the development, preparation, and review of the Action Plan. Other contributors and/or reviewers were research scientists of Agricultural Research Service and regional and staff personnel of Plant Protection and Quarantine.

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The ample amount of literature on melon fly precludes all but a selection of pertinent papers to be listed here.

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