

United States
Department of
Agriculture

Animal and
Plant Health
Inspection
Service

Plant Protection
and Quarantine

Cooperating State
Departments of
Agriculture

June 1984

ACTION PLAN

SOUTH AMERICAN FRUIT FLY
Anastrepha fraterculus (Wiedemann)

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 South American fruit 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. P. Ford

Deputy Administrator
Plant Protection and Quarantine

8/18/82

Date

Carl W. Nichols

Chairman
National Plant Board

8/18/82

Date

I. GENERAL INFORMATION

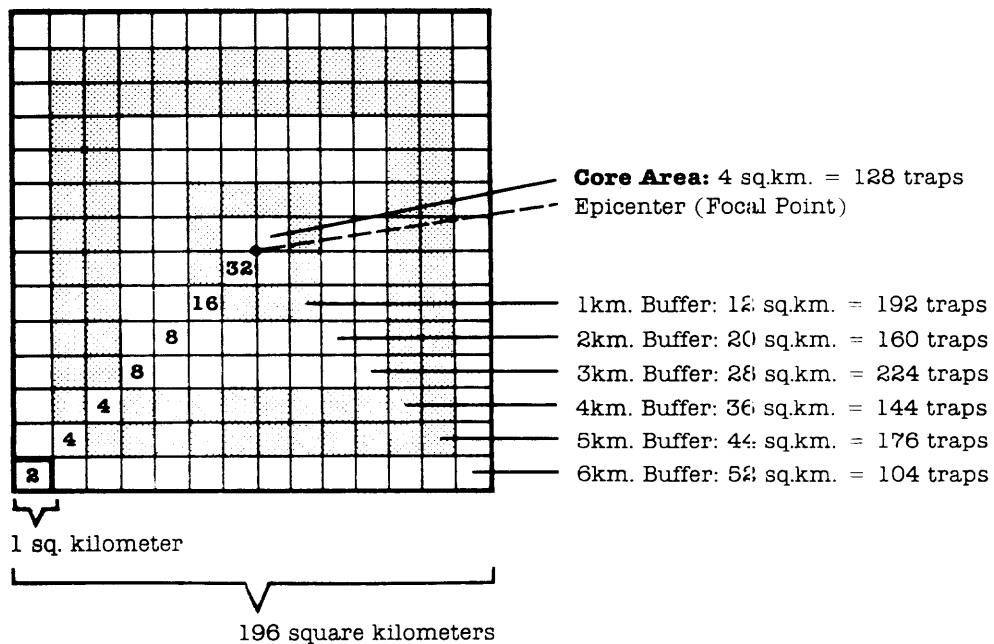
- A. Action Statement
The information contained in this document is intended for use only when a South American fruit fly infestation is known to exist. This Action Plan is to be used for guidance in implementing eradication procedures and in preventing spread to other locations. This Action Plan provides technical and general information needed to implement any phase of a South American fruit fly eradication program. Specific emergency program action is to be based on information available at that time.
- B. Background Information
Taxonomists divide the species Anastrepha fraterculus into a number of geographic groups, including the Brazilian form and Mexican form. The Brazilian form is a serious pest of citrus throughout South America. The Mexican form, occurring in Central America, Mexico, and Texas prefers peaches, quava, and rose apple, and is not known to attack citrus. The South American fruit fly occurs throughout South America, Central America, Mexico, United States (the Rio Grande Valley of Texas), Trinidad, and Tobago.
- Under tropical conditions the South American fruit fly life cycle can be as short as 34 days. Minimum life stage developmental times are: Egg stage 3 days, larval stage 9 days, pupal stage 12 days, and preoviposition period 10 days. Adults can live 3 to 5 months.
- The adult female can oviposit as many as 400 eggs over a period of 45 days. The female oviposits an average of 13 eggs per day and usually mates only once. The males mate repeatedly.
- 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. Temperature data is available from the National Oceanic and Atmospheric Administration, U.S. Department of Commerce, or can be generated by strategically placing thermometers on the soil surface.
- 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.

II. SURVEY PROCEDURES

A. Delimiting Trap Survey

When one or more South American fruit flies are collected in an area, a delimiting survey will be implemented immediately to determine population distribution. Using the site of detection as the epicenter (focal point), McPhail traps will be set out in a 32-16-8-4-2 per square km trap array sequence. This sequence is approximately equivalent to a United States standard system of 81-square-miles, with a core area of 1-sq-mi and a similar trap system. The traps are to be serviced weekly.

Traps Set Per Square Kilometer



A food attractant consisting of five Sit-Khem torula yeast pellets or a protein hydrolysate (PIB-7) can be used in the traps. The attractant is dissolved in water and can be attractive to both sexes of the fly. Place the traps in a "favored" host, if possible.

B. Monitoring/Evaluation Survey

After the first application of bait has been completed in the treatment area, at least a minimum of 32 of the original 128 McPhail-type traps placed for the delimiting survey are to remain in position for monitoring purposes. These traps are to be used to monitor the effectiveness of the treatment program. Fruit collection/holding can also be used to supplement monitoring/evaluation survey.

- C. Fruit Collection and Holding Fruit samples will be collected within 200 meters (656 feet) of a larval find and held for at least one South American fruit fly cycle at optimum developmental temperatures and humidity. All immature forms obtained from fruit are to be reared to adults because only the adult females are identifiable to species. The facility where the fruit is held must be secure to prevent any 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 (APHIS) 81-61 for detailed information.
- D. Detection Survey The area beyond the 6 km (3.8 mi) buffer zone can be trapped at a minimum rate of two per 5 square km (1 per sq mi) for a distance of 8 km (5 mi) with McPhail-type traps to provide additional detection security. These traps are to be serviced on a minimum of 1-week intervals. The traps are to be relocated after each servicing depending on availability of preferred hosts.
- E. 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 important facets of the South American fruit fly survey.
- F. Survey Records Records noting the areas surveyed, sites trapped, dates, locations, and hosts in which detections were made will be maintained. See Addendum G 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>
Brazil cherry	<u>Eugenia brasiliensis</u>
Common guava	<u>Psidium guajava</u>
Custard apple	<u>Annona humboldtiana</u>
Annona	<u>Annona reticulata</u>
Grapefruit	<u>Citrus paradisi</u>
Japanese persimmon	<u>Diospyros kaki</u>
Japanese plum	<u>Prunus salicina</u>
King orange	<u>Citrus nobilis</u>
Mandarin	<u>Citrus reticulata</u>
Mango	<u>Mangifera indica</u>
Nectarine	<u>Prunus persica</u> var. <u>nectarina</u>
Peach	<u>Prunus persica</u>
Pummelo	<u>Citrus grandis</u>
Surinam cherry	<u>Eugenia uniflora</u>
Sweet orange	<u>Citrus sinensis</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 South American fruit fly and the person in possession thereof has been notified.

C. Quarantine
Actions

When detections are made, implement the following 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 7 km (4.4 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 South American fruit 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 South American fruit 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. Regulated Establishments Inspection

Efforts to detect the pest within the regulated area will be made at establishments where regulated articles are sold, handled, processed, or moved. Establishments that might be involved are: Nurseries, airports, landfill sites, fruit stands, farmers' markets, produce markets, flea markets, and any other establishments that handle regulated articles. Two McPhail traps per establishment will be utilized in the regulated area.

E. Use of Authorized Chemicals

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

F. Approved Regulatory Treatments

1. Aerial Bait Treatment: Applying bait spray by aircraft to regulated crops within the treatment area.

2. Ground Bait Treatment: Using ground spray equipment to spray regulated crops with an insecticide and protein hydrolysate bait.

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. Only one retreatment should be scheduled within the established treatment cycle. This would allow, as an example, one retreatment in any given week, if applications normally occur once a week.

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 on the regulated crops.

3. Soil Treatment: An approved insecticide applied to the soil of nursery stock and/or within the drip line of host plants.
4. Fumigation: The application of an approved fumigant as a treatment (methyl bromide, ethylene dibromide, Phostoxin®) alone or in conjunction with cold treatment procedures.
5. Cold Treatment: The use of cold temperatures as a treatment on selected products alone or in conjunction with fumigation procedures.

Principal
Activities

The following identifies principal activities necessary for conducting a regulatory program to prevent the spread of the South American fruit 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. Visting 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. Movement of host materials along major highways and across quarantine boundaries.

H. Orientation
of Regulatory
Personnel

Only trained or 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.

I. Regulatory
Records

Records will be maintained, as necessary, to carry out an effective, efficient, and responsible regulatory program. See Addendum G of this Action Plan 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 South American fruit fly infestation is essential in the continental United States. Local conditions will determine the most acceptable procedure to achieve eradication.

A. Recommended
Pesticides

1. Diazinon®
2. Malathion

B. Approved
Eradication
Treatments

1. Option

a. Aerial Bait Spray: Full coverage aerial application of protein bait spray should be initiated immediately. Aerial protein bait sprays will be applied at the prescribed intervals over a period equal to two life cycles. The number of sprays will vary depending on the day degrees accumulations in the infested area. The area of full coverage bait spray will extend a minimum of 2.5 km (approximately 1.5 mi) beyond any known infestation. Weather conditions may dictate changes in spray schedule. After an estimated two generations of negative trapping, spray operations may be discontinued.

b. 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 South American fruit fly in any stage of development) on the infested property, adjacent property, and within 200 meters (m) (656 feet (ft)) of the known infestation will be sprayed at the prescribed intervals. Where inclement weather precludes the use of aerial treatments, ground treatments may be used to maintain a viable bait spray application at the detection location and within 200 m (656 ft) surrounding it. 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 objectives are to eradicate the pest and minimize environmental contamination. Any treatment or retreatment recommendations must consider these objectives.

2. Supplemental Eradication Methods

a. Fruit Stripping: Properties with larvae in the fruit will be handled as in "1a" and/or "1b" above. In addition, all preferred host fruit within 200 meters (656 feet) of the larvae site will be stripped promptly and properly disposed.

b. Soil Treatment: Sites with larvae in fruit and the 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. Eradication/ Control Method Selection

The following parameters or criteria will determine the minimum treatments to be used in achieving eradication. Expanded or additional treatment actions can be applied if mutually agreed upon by cooperating agencies. All initial actions are based on female detections as these are the only forms having distinct taxonomic characteristics that allow positive identification.

Eradication measures will continue for at least two generations and trapping will continue for at least three generations.

1. If one unmated female is detected in an urban/residential or commercial area, no eradication treatments will be initiated.

2. When a mated female or more than one unmated female is detected in an urban/residential area, aerial or ground application of bait spray, soil treatment sprays, and fruit stripping will be used. If it is found in a commercial area, all the same actions, including aerial application of bait will apply except fruit stripping.

- 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 period of 3 working days is necessary for the orderly transfer of these functions.
- E. Eradication/Control Records Records noting the location of detections, dates, number and type of treatments, and materials and formulations used will be maintained for all areas treated. See Addendum G of this Action Plan 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 at the minimum the following elements:

1. Determine efficacy of pesticide against target pest.
2. Evaluating dye cards to monitor aerial bait applications.
 - 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 effect 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 post treatments 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, Survey and Emergency Response Staff will request assistance and guidelines from other NPPS staffs.

V. CONTACTS

When a South American fruit 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 either 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. Foreign agricultural interests
- F. National, State, and local news media
- G. State and local law enforcement officials
- H. General public
- I. Public health agencies

VI. ADDENDA

Addendum A--Definitions

Aerial Bait Treatment:	Applying bait spray by aircraft over a treatment area.
<u>Anastrepha fraterculus</u> (Wiedemann):	The scientific name of the South American fruit fly, including all races.
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 South American fruit fly infestations.
Buffer Area:	The area extending beyond the boundary of the core--1-km, 2-km, 3-km, 4-km, 5-km, and 6-km, (0.6-mi, 1.2-mi, 1.9-mi, 2.5-mi, 3.1-mi, and 3.9-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 by a recognized expert of a submitted of a submitted life form (specimen) as South American fruit fly.
Core Area:	A minimum distance of 1 km (0.6 mi) beyond any confirmed South American fruit fly detection.
Day Degrees:	An accumulation of heat units above a specified developmental temperature threshold during a life stage.
Delimiting Survey:	Determining the extent of the infestation in an area where South American fruit fly has been detected.
Detection:	The collection of any life stage of South American fruit fly.

Detection Survey: An activity conducted in a susceptible area not known to be infested with South American fruit fly.

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

Fruit Collection Survey: A survey conducted in the core and buffer areas of South American fruit fly detection by the collection of fruit. The fruit is held to determine the extent and nature of an infestation.

Fruit Stripping: The removal and proper disposal of all South American fruit fly host fruit from a designated area.

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 Foliar Bait Spray: Using ground spray equipment to spray host vegetation in a South American fruit fly infested area with an insecticide and a protein hydrolysate bait.

Host: A plant species that provides for reproduction of the South American fruit fly.

Infestation: The collection of two or more South American fruit flies, a larva or mated female from an area. (During an eradication effort the detection of a single adult determined to be associated with the current infestation will be sufficient to trigger expanded program activity.)

Infested Area: Three kilometers distance from all direction sites unless biological factors indicate the need for more or less area.

Monitoring/Evaluation
Survey: Using interdependent visual and trapping surveys in an area where an insecticide treatment has been applied to evaluate the effectiveness of the application.

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 sq km.

Regulated Area: An area that extends at least 7 linear km (4.4 mi) in any direction from an infested property.

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

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

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

Urban/Residential Area: Noncommercial crop production area generally containing multiple or single family dwellings.

Addendum B--Safety

Personnel and public safety must be prime considerations 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 South American fruit fly host list has been separated to indicate those that are preferred and other hosts. The hosts have been listed by common and scientific names. The common names are arranged in a manner that is indicative of their usage. The common names of a particular group or family of hosts are listed first. Any varieties of the group and their corresponding scientific names are listed beneath the group or family names. Following the variety names are colloquialized common names for which there are no known or accepted scientific names. In all instances, an attempt has been made to select the most widely recognized common name.

PREFERRED

<u>Common Name</u>	<u>Scientific Name</u>
Brazil cherry	<u>Eugenia brasiliensis</u>
Custard apple, A	<u>Annona humboldtiana</u>
Annona	<u>Annona reticulata</u>
Grapefruit	<u>Citrus paradisi</u>
Guava, Common	<u>Psidium guajava</u>
Japanese persimmon	<u>Diospyros kaki</u>
Japanese plum	<u>Prunus salicina</u>
King orange	<u>Citrus nobilis</u>
Mandarin	<u>Citrus reticulata</u>
Mango	<u>Mangifera indica</u>
Nectarine	<u>Prunus persica</u> var. <u>nectarina</u>
Peach	<u>Prunus persica</u>
Pummelo	<u>Citrus grandis</u>
Surinam cherry	<u>Eugenia uniflora</u>
Sweet orange	<u>Citrus sinensis</u>

OTHER

The literature indicates these hosts could allow for South American fruit fly 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>
Almond with husks	<u>Prunus dulcis</u>
Almond, tropical	<u>Terminalia catappa</u>
Apple	<u>Malus sylvestris</u>
Apricot	<u>Prunus armeniaca</u>
Araca	<u>Psidium guineense</u> = (<u>P. araca</u>)

Avocado	<u>Persea americana</u>
Blackberry, A.	<u>Rubus glaucus</u>
Brazilian guava	<u>Psidium guineense</u>
Cajamerin	<u>Spondias nigrescens</u>
Cassava	<u>Maninot esculenta</u>
Cattley guava	<u>Psidium cattleianum</u>
Ceylon gooseberry	<u>Dovyalis hebecarpa</u>
Cherimoya	<u>Annona cherimola</u>
Coffee	<u>Coffea arabica</u>
Fig, common	<u>Ficus carica</u>
Giant granadilla	<u>Passiflora quadrangularis</u>
Grape	<u>Vitis vinifera</u>
Jaboticaba	<u>Myrciaria jaboticaba</u>
Kitembilla	<u>Dovyalia hebecarpa</u>
Kumquat	<u>Fortunella japonica</u>
Loquat	<u>Eriobotrya japonica</u>
Malay apple	<u>Eugenia malaccensis</u> = (<u>Syzygium malaccense</u>)
Mombin, red	<u>Spondia purpurea</u>
Passionflower, A	<u>Passiflora alato-caerulea</u>
Passion fruit	<u>Passiflora edulis</u>
Passion fruit, banana	<u>Passiflora antioquiensis</u>
Pear	<u>Pyrus communis</u>
Plum, hog	<u>Spondias mombin</u>
Plums, general	<u>Prunus sp.</u>
Pomegranate	<u>Puncia granatum</u>
Pond apple	<u>Annona glabra</u>
Quince	<u>Cydonia oblonga</u>
Rose apple	<u>Eugenia jambos</u> =(<u>Syzygium jambos</u>)
Sapodilla	<u>Manikara zapota</u>
Soursop	<u>Annona muicata</u>
Tallow-wood	<u>Xiemenia americana</u>

Addendum D--Life History

1. SYSTEMATIC POSITION

South American fruit fly (Anastrepha fraterculus (Wiedemann)--(Diptera, Tephritidae)

Class: Insecta
Order: Diptera
Family: Tephritidae

This is one of the 155 described species of Anastrepha, a New World genus ranging from southern Texas, Florida, Central America, South America, and the Caribbean area. Closely related economic species are:

Mexican fruit fly (A. ludens Loew)
Caribbean fruit fly (A. suspensa Loew)

2. IDENTIFICATION CHARACTERS

Adults: (Identification based primarily on the female as males, in most cases, are difficult to identify.) Yellow-brown appearance, mesonotum 2.75 to 3.3 mm; median stripe widened posteriorly on humerus in front of acrostichal bristles and just including these; lateral stripe from transverse suture to bright yellow scutellum, this may have a black spot; pleura yellow to yellow-brown, metanotum and postscutellum broadly blackened laterally. Yellow-brown to black macrochaetae; pile yellow-brown; sternopleural bristle slender. Wings 5.35 to 7.2 mm long banded in yellow-orange and brown. Wing pattern; Brazil--Costal band touching S band and V band separate from S band; Mexico--V band connected with S band ovipositor sheath 1.65 to 2.1 mm long, stout, tapering apically, spiracles 0.7 mm from base. Rasper of small patch of hooks in 4 to 5 rows. Ovipositor 1.5 to 1.95 mm, stout, base widened, tip narrowed beyond oviduct end and before serrations, these blunt and rounded, extending scarcely more than 1/2 of tip or less.

Eggs: Creamy white, elongate and tapering at ends; length 1.4 mm, width 0.2 mm at midpoint. Micropylar end twisted and subapical. Diamond shaped sculpturing about micropylar end and small tuft of pile at tip. These last features distinguish A. fraterculus from many other species and make early identification possible when working with several known species, if eggs can be obtained.

Larvae: Mature; 8 to 10 mm long, 1.5 mm wide, pale-yellowish white, ventral fusiform area on anterior portion of segment 4 to 11. Head small, with medium-sized mouth hooks, the first slender, first and second parts black, third part with some brown, remainder hyaline. Anterior spiracles

small, yellow and chitinized with 15 to 17 small rounded tubules in an irregular row. Posterior spiracles small, above mediohorizontal line.

Pupae: 4.5 to 6.0 mm long, 2 to 2.5 mm wide, cylindrical, dull luteous to reddish yellow or dark red. Anterior spiracles darker than larvae; posterior spiracles medium-sized, dark reddish and in depressed hexagonal area mostly below mediohorizontal line.

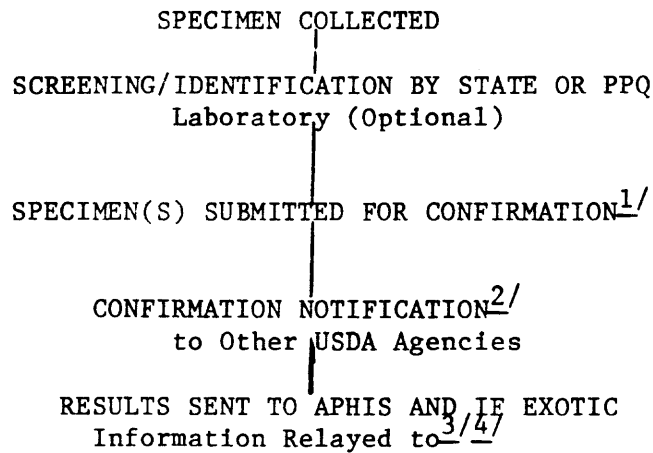
3. BIOLOGY

A mated female deposits her eggs into the fruit of a suitable host with her ovipositor. The eggs take 3 to 6 days (depending on temperature) to hatch. The developing larvae molt three times. The larval stage takes approximately 9 days in warm temperatures and up to 25 days in cold weather. It then transforms into an inactive prepupal stage within the puparium, preceding formation of a pupae. This process may occur within or on the host plant, but pupation usually occurs in the soil. The pupae takes 12 to 18 days in warm weather and up to 25 days in colder weather. In extreme cases, the pupal stage has been known to last for up to 18 months. A newly emerged adult female takes about 10 days to mature before the first eggs are produced (preoviposition period). The average life cycle is between 64 and 100 days. Females mate only once, but males will usually mate several times. The female produces an average of 416 eggs in approximately 45 days. Eggs are deposited singly and as many as 50 can be oviposited in a single fruit. Several females may also deposit eggs at different times on the same fruit. Both sexes live about 3 months, but in captivity have lived up to 5 months.

Addendum E--Identification of Specimens

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 McPhail 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



<u>1/</u>	Arizona, Louisiana, New Mexico, Texas	Mr. D. Riley PPQ, APHIS, USDA P.O. Box 306 Brownsville, Texas 7852C
	Other States West of the Mississippi River	Ms. K. Corwin California Department of Food and Agriculture 1220 N Street Sacramento, California 95814
	States East of the Mississippi River	Dr. H. Weems Florida Department of Agriculture and Consumer Services P.O. Box 1269 Gainesville, Florida 32602

2/ APHIS Plant Protection and Quarantine

3/ All States State and Territory Agricultural Regulatory Officials

4/ NAPPO North American Plant Protection Organization

Ground Foliage Bait Spray Application

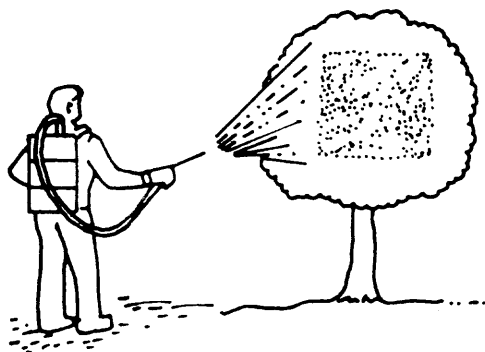


Figure 1

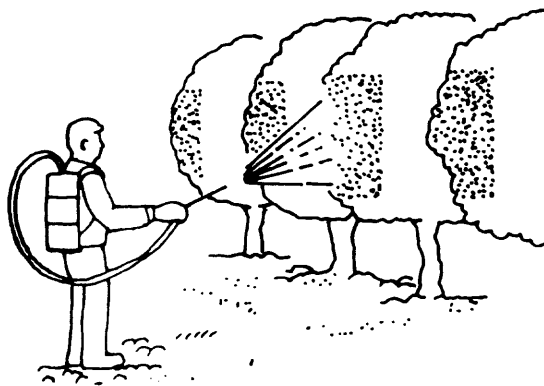


Figure 2

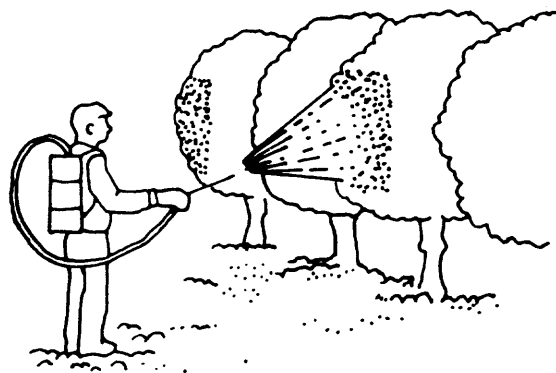


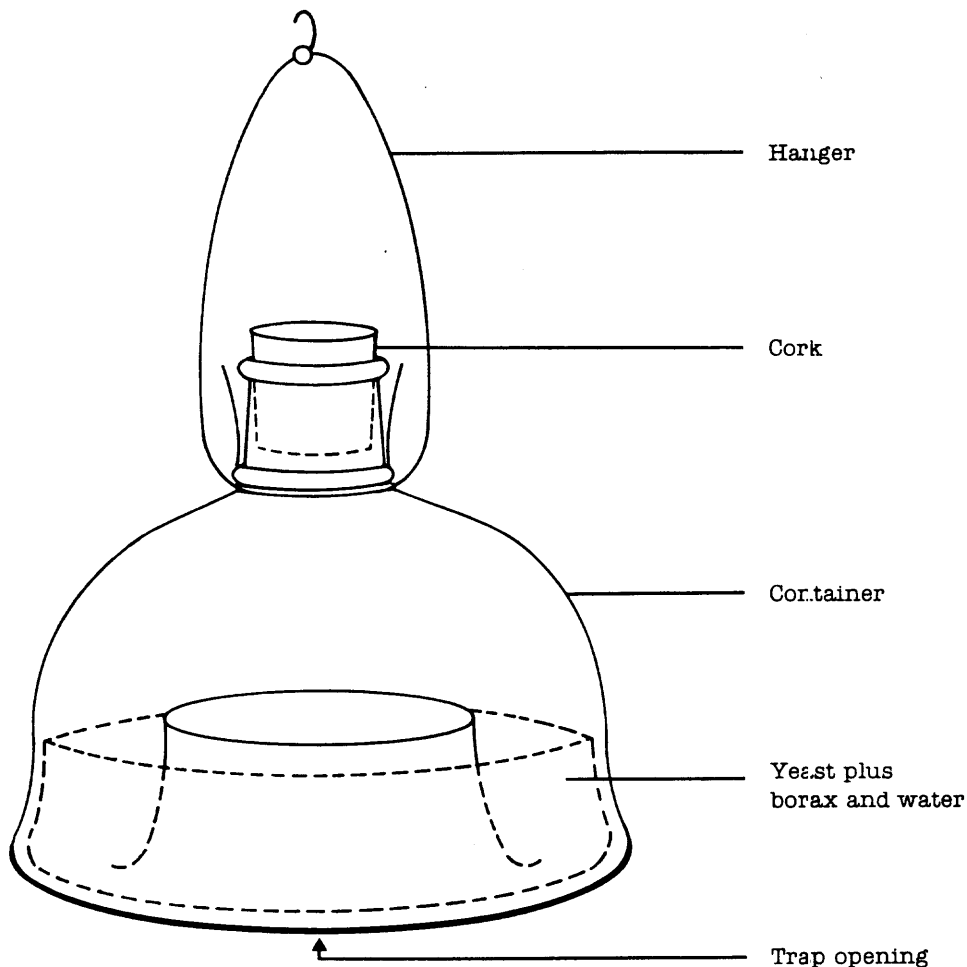
Figure 3

Addendum G--The McPhail Trap

The McPhail trap is essentially an invaginated glass jar (see Figure 4). Fruit flies attracted to the lure fly up through the bottom and once inside are trapped and drowned. A wire hanger attached to the neck permits the unit to be hung in a tree.

The trap is baited with five Sit-Khem torula yeast pellets or a protein hydrolysate in water and can be placed in the bottom with sufficient water 378.5 mm³ (12.8 oz) to dissolve the pellets. This lure attracts both male and female South American fruit flies.

Figure 4—McPhail Glass Trap



Addendum H--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	FDB 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 I--Contributors

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Addendum J--References

The literature on South American fruit fly is not large, even though this pest ranks as the most important fruit fly in South America. Much basic research needs to be carried out to even understand the specific limits of the species, which may, in fact, be a complex of many species. Very few sterile release studies have been done.

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