

HOST RANGE AND INFESTATION BY THE CARIBBEAN FRUIT FLY, *ANASTREPHA SUSPENS*A (DIPTERA: TEPHRITIDAE), IN SOUTH FLORIDA

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Abstract Eighty-four host fruits in 23 families have been established for the Caribbean fruit fly, *Anastrepha suspensa* (Loew). All records are based on natural field infestations. Some type of host fruit is available throughout the year. Major hosts in South Florida include the rose apple, *Syzygium jambos* (L.) Alst., cattley guava, *Psidium cattleianum* Sab., Surinam cherry, *Eugenia uniflora* L., tropical almond, *Terminalia catappa* L., common guava *Psidium guajava* L. and loquat, *Eriobotrya japonica* (Thunb.) Lindl.

Anastrepha suspensa (Loew), known as the Caribbean fruit fly, has been introduced into Florida on three occasions. The first infestation (1931) maintained itself until 1936 then disappeared. No additional specimens were collected until 1959 when 2 adults were trapped at Key West. No infested fruit was found nor were additional adults, until the present infestation was detected in Miami Springs in April 1965 (1, 2). By December, 1965 the Caribbean fruit fly was found infesting 15 hosts.

Methods

The host list was developed from fruit collected throughout the range of the fruit fly. Levels of larval infestations were ascertained from fruit collected at several localities in Dade County, but

primarily from fruit collected at 3 survey points: (1) Miami Springs, the site of the original infestation, in an older residential area having well established plantings of several kinds of hosts, (2) South Miami, in an area of parks and residences also having well established host plantings and (3) the Agricultural Research and Education Center, Homestead having the most diversified host plantings.

Attempts were made to collect fruit at least twice a month, more frequently if available and time permitted. Sample size was largely determined by the fruit available and the capacity of the holding equipment. Initially results were recorded only as larvae per fruit, but later changed to also include fruit weight.

Fruit was held in 32.5 cm x 22.5 cm x 10 cm covered polyethylene containers. Three quarters of each cover was removed and replaced by 30 mesh screen. A 4 mesh hardware cloth rack that fit into the container held the fruit. One to 2 cm of fine vermiculite containing 40 percent moisture was placed in the containers to provide a pupation medium for the emerging larvae. Fruit was removed after 12 days and the pupae removed by sifting the vermiculite through a 12 mesh sieve. Pupae were counted and placed in emergence containers with fresh vermiculite for adult verification.

Large fruit samples were placed in "fruit towers," consisting of a .66 m x .66 m x 1.22 m wooden cabinet, the bottom of which tapered down to a 11 cm opening where a gallon jar was attached to hold the emerging larvae. The cabinets contained eight, removable, wooden slat fruit holding drawers. Two to 3 cm of the fine vermiculite was placed in the jar. This vermiculite was sifted every 3 or 4 days during a 12 day period.

Discussion

Table 1 presents monthly larval infestations of the major hosts in South Florida. Although the loquat, *Eriobotrya japonica* (Thunb.) Lindl. does not develop high larval populations we consider it to be a major host because of the time of the year it fruits. Loquat, rose apple and Surinam cherry are among the few host fruits available during January to April which the Caribbean

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fruit fly can develop in to produce its usual adult peak in May.

The rose apple, *Syzygium jambos* (L.) Alst. yielded the highest mean number of larvae per kilo of fruit, 937.41, from all samples combined and the second highest, 1,300 larvae per kilo for any one month.

The cattley guava, *Psidium cattleianum* Sabine, produced a mean larvae per kilo of 709.58, the heaviest infestation occurring in October. It also yielded the highest number of larvae per kilo of fruit, 1436.36, for any one month. The cattley guava appears to be highly susceptible to drought and at times lack of rainfall seriously hinders its fruiting, thus during some years it provides little host material for the Caribbean fruit fly.

The Surinam cherry *Eugenia uniflora* L., is an excellent host for *A. suspensa* just as it was for the Mediterranean fruit fly, *Ceratitis capitata* (Wied), in Miami during 1956. It is also very susceptible to lack of rainfall. During times of drought, dried fruit with small larvae that will never develop are often found. Samples were taken from Sept. of 1969 to November of 1972. The mean number of larvae per kilo of this period was 297.81. Fruit was collected in all months of the year, although the major fruiting period is during March and April.

The tropical almond, *Terminalia catappa* L., yielded a mean number of larvae per kilo of 293.14. The collections were made from September 1969 to October 1971. The heaviest infestation was during September, 1971, when 457.78 larvae per kilo were recorded. Because of the large seed, small pericarp and intensive oviposition, many *A. suspensa* larvae fail to mature in this fruit.

The common guava, *Psidium guajava* L., produced a mean larvae per kilo of 222.08. Since fruit is usually available all year long in Dade County and both wild and cultivated plants common, the guava is probably the most important host. Among our fruit samples from August 1969 to November 1971, the heaviest infestation was during May, 1971, when 518.68 larvae per kilo were recovered. The largest number of larvae per fruit was 74 in November 1969.

We do not have sufficient samples to determine at what time of the year a particular fruit will have its highest or lowest infestation. For example, Surinam cherry had a high of 457.50 larva per kilo in October 1970 and only 78.26 larvae per kilo in October 1971, next to the lowest infestation recovered from this fruit (Table 1). Other types of hosts in the area which fruit earlier as

well as available adult food determine to a large extent the degree of infestation in selected fruits.

The Ceylon peach, *Prunus persica* (L.) Batsch, is almost always infested and under favorable conditions supports fair larval populations, but because of its short fruiting period we do not consider it to be a major host.

The calamondin, *Citrus mitis* Blanco, is a host of some importance because some fruit is available nearly every month of the year. It does not, however, usually support high larval populations, rarely averaging more than 1 per fruit.

It must be emphasized that the decision to consider a fruit as a major or minor host is largely, if not completely, arbitrary. The fruit of the tropical almond is of little significance and the edible portion is not injured by fruit fly larvae, thus some might not consider it to be a major host. However, it is fairly abundant, capable of supporting a heavy larval infestation and ripens over 5-6 months.

Some fruits that would very likely be considered as major hosts if they were widely planted are the pitomba, *Eugenia luschnathiana* Klotzsch. Ex Berg.; the Costa Rican guava, *Psidium friedrichsthalianum* (Berg) Niedenzu; and the water apple, *Syzygium samarangense* (Blume). Ripe fruit is present on all 3 for at least 3 months and all are capable of supporting heavy larval populations.

Some host infestations have been recorded only once and others occurred only under unusual circumstances.

Several fruit of *Litchi chinensis* Sonn. were found infested on two occasions. Each time the only infested fruit were those where the exocarp was broken. This also was the case with two avocados *Persea americana* Mill. Tomato, *Lycopersicon esculentum* Mill., was found infested in one case where a backyard plant was adjacent to heavily infested Surinam cherries. Bell peppers, *Capsicum frutescens* L., however, were found infested on four occasions. Two of these sites were small plots of peppers where many peppers in each plot were attacked.

Mango, *Mangifera indica* L. was infested occasionally in this area. All known cases involved backyard fruit where there had been a high population of *A. suspensa* nearby. Larvae have been recorded from 5 cultivars, 'Anderson,' 'Floragon,' 'Haden,' 'Kent' and 'Sensation.'

Eleven *Citrus* species or cultivars have been established as hosts. In most cases these were backyard fruit in overripe condition and the

Table 1. Larval infestation of major hosts of the Caribbean fruit fly in South Florida.

Date	kg/fr	L/kg	# fr	L/fr	Date	kg/fr	L/kg	# fr	L/fr
<u>Eriobotrya japonica</u> (Thunb.) Lindl.					<u>Psidium guajava</u> L.				
Jan 70			300	.02	Aug 69			12	2.25
Feb			560	.07	Sept			49	19.86
	32.84	13.34	4000	.11	Oct			61	30.43
Mar			213	.10	Nov			1	74.00
	35.68	5.56			Dec			257	19.88
Apr			260	.67	Jan 70			333	1.90
	9.77	13.00			Feb			135	3.54
Feb 71	17.72	127.48	2111	1.07	Mar			255	7.80
Mar	40.00	178.38	5112	1.39	Apr			194	45.87
					July			14	66.21
<u>Eugenia uniflora</u> L.					Aug	27.33	137.54	353	10.65
Sept 69			14	2.35	Sept	25.11	209.52	242	21.74
Oct			16	.75	Oct	11.93	359.85	74	58.01
Dec			7	1.14	Nov	.34	305.88	4	26.00
Jan 70			225	.56	Jan 71	7.04	203.97	49	29.35
Feb			76	.24	Feb	2.61	134.87	65	5.42
Mar			50		Mar	3.06	223.13	70	9.79
Apr			375	.68	Apr	5.56	159.07	68	13.03
Oct	.40	457.50	85	2.15	May	.90	518.68	9	52.44
Nov	1.59	211.95	310	1.09	July	.11	109.09	4	3.00
Jan 71	.90	376.92	225	1.52	Aug	23.18	123.68	354	8.10
Mar	10.95	231.60	2035	1.25	Sept	17.98	119.90	229	9.42
Apr	4.09	257.70	1057	.99	Oct	12.95	152.74	101	19.58
May	1.02	417.65	296	1.44	Nov	.79	351.25	12	23.42
June	.68	442.65	235	1.28	<u>Syzygium jambos</u> (L.) Alst.				
July	.57	303.51	105	1.65	Mar 71	3.07	606.51	200	9.31
Aug	.65	371.21	141	1.74	Apr	2.95	989.83	154	18.96
Sept	.84	371.43	161	1.94	May	3.18	1300.00	210	19.69
Oct	.23	78.26	45	.40	July	.45	853.33	30	12.80
Nov	1.02	53.92	258	.21	Aug			75	9.81
<u>Psidium cattleianum</u> Sab.					<u>Terminalia catappa</u> L.				
July 70			1097	4.80	Sept 69			7	16.57
	4.20	760.71	702	4.55	Oct			18	5.39
Aug			1	1.00	Nov			147	3.75
Sept	1.25	519.20	181	3.59	Dec			65	1.20
Oct	.11	1436.36	50	3.16	Jan 70			3	
Mar 71	.34	211.76	65	1.16	Sept	.34	261.76	8	11.13
June	.11	918.18	19	5.32	Oct			94	9.52
July	1.48	552.70	215	3.80	Nov			45	3.78
Aug	.60	773.33	126	3.68	Jan 71	.20	140.00	6	4.67
Sept	.68	504.41	70	4.90	Sept	.45	457.78	16	12.88
					Oct	.23	313.04	8	9.00

kg/fr - kilograms of fruit

L/kg - larvae per kilogram

fr - number of fruit

L/fr - larvae per fruit

Table 2. Host list for the Caribbean Fruit Fly *Anastrepha suspensa* (Loew)

Botanical name	Common name	Botanical name	Common name
<i>Achras zapota</i> L.	Sapodilla	<i>Garcinia tinctoria</i> (C.C.) W. F. Wight	
<i>Annona glabra</i> L.	Pond Apple	<i>Litchi chinensis</i> Sonn.	Lychee
<i>Annona</i> hybrid		<i>Lycopersicon esculentum</i> Mill.	Tomato
<i>Annona squamosa</i> L.	Sugar Apple	<i>Malpighia glabra</i> L.	Barbados Cherry
<i>Atalantia citrioides</i> Pierree ex Guill.		<i>Malus sylvestris</i> Mill.	Apple
<i>Averrhoa carambola</i> L.	Carambola	<i>Mangifera indica</i> L.	Mango
<i>Blighia sapida</i> Koen.	Akee	<i>Manilkara bahamensis</i> (Baker) Lam. & Meese	Wild Dilly
<i>Canella winteriana</i> (L.) Gaertn.	Wild Cinnamon	<i>Mimusops roxburghiana</i> Wight.	
<i>Capsicum frutescens</i> L.	Bell Pepper	<i>Normodica charantia</i> L.	Wild Balsam Apple
<i>Carica papaya</i> L.	Papaya	<i>Muntingia calabura</i> L.	Capulin
<i>Carissa grandiflora</i> A. DC.	Natal Plum	<i>Murraya paniculata</i> Jack	Orange Jasmine
<i>Casimiroa edulis</i> Llave Tlex.	White Sapote	<i>Myrcianthes fragrans</i> (SW.) McVaugh	
<i>Chrysobalanus icaco</i> L.	Cocoplum	<i>Myrciaria cauliflora</i> Berg. in Mart.	Jaboticaba
<i>Citrus aurantifolia</i> Swingle	Lime	<i>Myrciaria glomerata</i> Berg.	
<i>Citrus aurantifolia</i> x <i>Fortunella japonica</i>	Limequat	<i>Persea americana</i> Mill.	Avocado
<i>Citrus aurantium</i> L.	Sour Orange	<i>Pimenta dioica</i> Merr.	Allspice
<i>Citrus limetta</i> Risso	Sweet Lemon	<i>Pouteria campechiana</i> (H.B.K.) Baehni	Egg Fruit
<i>Citrus limonia</i> Osbeck	Ranpur Lime	<i>Prunus persica</i> (L.) Batsch	Peach
<i>Citrus mitis</i> Blanco	Calamondin	<i>Prunus persica</i> 'Nectarina' Maxim.	Nectarine
<i>Citrus nobilis</i> 'unshiu' x <i>Fortunella</i> sp.	Orangequat	<i>Pseudanamosis umbellulifera</i> (H.B.K.) Kausel	
<i>Citrus paradisi</i> Macf.	Grapefruit	<i>Psidium cattleianum</i> Sabine	Cattley Guava
<i>Citrus paradisi</i> x <i>Citrus reticulata</i>	Tangelo	<i>Psidium freidrichsthalianum</i> (Berg) Niedenzu	Costa Rican Guava
<i>Citrus reticulata</i> Blanco	Tangerine	<i>Psidium guajava</i> L.	Common Guava
<i>Citrus sinensis</i> Osbeck	Sweet Orange	<i>Psidium</i> sp.	
<i>Citrus sinensis</i> x <i>Citrus reticulata</i>	Temple orange	<i>Punica granatum</i> L.	Pomegranate
<i>Clausena lansium</i> (Lour.) Skeels	Wampi	<i>Pyrus communis</i> L.	Pear
<i>Diospyros discolor</i> Willd.	Velvet Apple	<i>Pyrus pyrifolia</i> Nakai	Japanese Pear
<i>Diospyros kaki</i> L.f.	Japanese Persimmon	<i>Pyrus pyrifolia</i> x <i>Pyrus communis</i>	Kieffer Pear
<i>Dovyalis caffra</i> Warb.	Kei Apple	<i>Rheedia aristata</i> Griseb.	
<i>Dovyalis hebecarpa</i> Warb.	Ceylon Gooseberry	<i>Rubus</i> hybrid	Blackberry
<i>Drypetes lateriflora</i> (Su.) Krug x Urban	Gulana Plum	<i>Severinia buxifolia</i> (Poir.) Tenore	Box Orange
<i>Eriobotrya japonica</i> (Thunb.) Lindl.	Loquat	<i>Spondias cytherea</i> Sonn.	Otaheite Apple
<i>Eugenia aggregata</i> Kiaersk.	Cherry of the Rio Grande	<i>Synsepalum dulcificum</i> (Schum. et Thonn.) Daniell	Miracle Fruit
<i>Eugenia brasiliensis</i> Lam.	Grumichama	<i>Syzgium cumini</i> (L.) Skeels	Jambolan Plum
<i>Eugenia coronata</i> Schum. & Thonn.		<i>Syzgium jambos</i> (L.) Alst.	Rose Apple
<i>Eugenia ligustrina</i> (Swartz) Willd.		<i>Syzgium samarangense</i> (Blume)	Water Apple
<i>Eugenia luschnathiana</i> Kotsch, Ex Berg.	Pitomba	<i>Terminalia catappa</i> L.	Tropical Almond
<i>Eugenia uniflora</i> L.	Surinam Cherry	<i>Terminalia muelleri</i> Benth.	
<i>Ficus altissima</i> Blume		<i>Trevisia palmata</i> Vis.	
<i>Ficus carica</i> L.	Fig	<i>Triphasia trifolia</i> D.C.	Lime Berry
<i>Flacourtia indica</i> (Burm. f.) Merr.	Governor's Plum		
<i>Fortunella crassifolia</i> Swingle	Kumquat		
<i>Fortunella margarita</i> Swingle	Kumquat (oval)		
<i>Garcinia livingstonei</i> T. Anders.	Imbe		

incidence of oviposition was very low.

The following fruits were sampled with negative results: breadnut, *Brosimum alicastrum* Sw.; Indian jujube, *Zizyphus mauritiana* Lam.; Karanda, *Carissa carandas* L.; and *Calophyllum inophyllum* L. It is possible that these may prove to be hosts in the future, since we have too few fruit samples to definitely establish that they are not.

To date 84 field infested hosts in 23 families

have been established (Table 2) since the initial infestation in 1965. It is quite likely that additional hosts will be recorded in the future.

Literature Cited

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