ROBACKER, D. C. AND W. C. HART. 1985. Courtship and territoriality of laboratory-reared Mexican fruit flies, *Anastrepha ludens* (Diptera: Tephritidae), in cages containing host and nonhost trees. Ann. Entomol. Soc. Am. 78: 488–494.

SHAW, J. G. 1962. Species of the *spatulata* group of *Anastrepha* (Diptera: Tephritidae). J. Kansas Ent. Soc. 35: 408–414.

———, F. LOPEZ AND D. L. CHAMBERS. 1970. A review of research done with the Mexican fruit fly and the citrus blackfly in Mexico by the Entomology Research Division. Bull. Entomol. Soc. Amer. 16: 186–193.

STEYSKAL, G. C. 1975. *Anastrepha obliqua* (Macquart) the prior name for *Anastrepha mombinpraeoptans* Sein. U.S. Dept. Agr. Coop. Econ. Ins. Rpt. 25: 357–358.

———. 1977a. Pictorial key to species of the genus *Anastrepha* (Diptera: Tephritidae). Entomol. Soc. Washington Special Publ. 35p.

———. 1977b. Two new neotropical fruit flies of the genus *Anastrepha*, with notes on generic synonymy (Diptera: Tephritidae). Proc. Entomol. Soc. Washington. 79: 75–81.

STONE, A. 1942. The fruit flies of the genus *Anastrepha*. USDA Misc. Publ. No. 439. Washington. 112p.

TELES DA SILVA, M., J. POLLONI AND S. BRESAN. 1985. Mating behavior of some fruit flies of the genus *Anastrepha* (Diptera: Tephritidae) in the laboratory. Rev. Brasil. Ent. 29: 155–164.

VERA-GRACIANO, J., J. L. CARRILLO-SANCHEZ, M. C. SOSA, E. L. S. VEGA Y R. A. P. HUERTA. 1979. La mosca y la palomilla del capulín en las regiones de San Miguel Tlaixpan, Chapingo y San Dieguito, México. Folia Entomol. Mexicana. 42: 1–25.

NATURAL HOST PLANT SURVEY OF THE ECONOMICALLY IMPORTANT FRUIT FLIES (DIPTERA: TEPHRITIDAE) OF CHIAPAS, MEXICO

MARTIN ALUJA
Department of Entomology
University of Massachusetts
Amherst, MA 01003 USA

JORGE GUILLÉN, GERMÁN DE LA ROSA, MARIO CABRERA, HILARIO CELEDONIO, PABLO LIEDO AND JORGE HENDRICHS
Programa Mosca del Mediterraneo
Apartado Postal 369
30700 Tapachula, Chiapas, Mexico

ABSTRACT

We provide a natural host-plant list of some of the fruit flies (Diptera: Tephritidae) reported for the State of Chiapas. Out of 92 plant species sampled, 39 species representing 12 plant families were identified as natural host of *Anastrepha distincta*, *A. fraterculus*, *A. leptozona*, *A. ludens*, *A. obliqua*, *A. serpentina*, *A. striata* and *Toxotrypana curvicauda*.

RESUMEN

Se presenta una lista de las plants que han sido identificadas como hospederas naturales de algunas de las especies de moscas de la fruta (Diptera: Tephritidae) reportadas en el estado de Chiapas, México. De 92 especies vegetales muestreadas, 39 especies, pertenecientes a 12 familias fueron identificadas como hospederas naturales de *Anastrepha distincta, A. fraterculus, A. leptozona, A. ludens, A. obliqua, A. serpentina, A. striata* y *Toxotrypana curvicauda.*

Fruit flies (Diptera: Tephritidae) are well known in Mexico for the devastating impact they can have on commercial fruit production. Entire fruit growing regions have been forced out of business due to heavy infestations of these widely distributed insects (Aluja and Liedo 1986). Larvae-infested fruit usually drop from the tree and rot, rendering them useless for human consumption. The presence of these insects also elicits neighboring regions and countries to apply severe quarantine restrictions to prevent their introduction to fruit growing regions free of fruit flies. Even though economic damage is basically restricted to semicommercial and commercial orchards and isolated backyard trees, fruit flies infest a wide variety of wild native host plants and even small populations serve as reservoirs from which commercial fruit orchards are invaded. Aluja and Liedo (1986) proposed a series of ecologically based management practices such as habitat manipulation, trap crops and orchard designs, where emphasis is placed on trying to stop the continuous flow of populations from one host to another. They nevertheless noted that one prerequisite that must be fulfilled before even attempting to experimentally achieve this goal, is the complete identification of all cultivated and wild host plants for each of the fruit fly species causing economic damage.

We define a natural host as a plant bearing fruit or any other tissue where female fruit flies lay eggs in nature and the emerging larvae are able to survive and reach the adult stage with varying degrees of fitness. Some host plant records in the literature are misleading because they are based on oviposition induced under artificial conditions on fruits presented to flies which had been deprived of an oviposition substrate for days. Such practices have led researchers to report fruits such as prickly pear (*Opuntia* sp.), banana (*Musa* sp.), squash (*Cucurbita mexicana*), walnut (*Juglans regia*), papaya (*Carica papaya*) and garden bean (*Phaseolus vulgaris*) as hosts of *Anastrepha ludens* (Baker et al. 1944, Ebeling 1950 and Weems 1963). Such reports are sometimes used in quarantine protocols to limit the movement of these and other fruits from one country to another, an unfortunate fact since it is almost impossible for these plants to serve as hosts under natural conditions.

Some host plant records for fruit flies found in Mexico are commonly cited in the literature but, unfortunately, many are very old and have not been confirmed since their first publication (Arriaga-Martinez 1979, Baker et al. 1944, Bush 1957, 1962, Coronado 1964, Greene 1934, McPhail and Berry 1936, Plummer et al., 1941, Ramos 1975, Shaw 1947, Stone 1942 and Weems 1963). We suspect that some host records may be the result of misidentifications of both plant and fly species. Ballou (1945), Blanchard (1937), Briceño (1975), Caraballo (1981), Cuculiza and Torres (1975), Eskafi and Cunningham (1987), Fernandez-Yepez (1953), Guagliumi (1966), Herrera and Viñas (1977), Jirón and Zeledón (1979), Korytkowski and Ojeda-Peña (1968), Lima (1934), Lutz and Lima (1918), McAlister (1936), Malavasi et al. (1980), Martorell (1939), Norrbom (1982), Olarte (1980), Rosillo (1953), Wasbauer (1972) and Whervin (1974) also published records for hosts that although not necessarily found in Mexico are nevertheless attacked by fruit fly species occurring in that country. Norrbom (1985) provides an excellent summary of most of the published host records for all *Anastrepha* species.

In this paper, we provide an updated list of the natural host plants of some of the fruit flies identified by Aluja et al. (1987) in the State of Chiapas.

Materials and Methods

The study area comprised the Soconusco Region and the Mazapa Valley in the State of Chiapas, Mexico. A detailed description of these areas is given in Aluja et al. (1987).

Fruits from known and potential host plants were collected in commercial and semicommercial orchards, backyard gardens and areas covered with wild native vegetation from March 1982 to December 1985. Individual samples consisted of fallen fruit (80%) and fruit still on the tree (20%) and ranged in number from 1 to 120 fruits depending on the availability of a particular species or variety. The degree of ripeness varied from very green to very ripe. Samples were individually labeled, placed in plastic bags and transported to the laboratory in well cushioned and aereated styrofoam boxes to avoid mortality of inmatures due to overheating and physical contact.

In the laboratory each bag was weighed and the number of fruits per sample recorded. Fruits were then immersed for 5 seconds in a 10% solution of sodium benzoate and water (to inhibit growth of fungi and decomposing bacteria) and placed in "maturation chambers". These are 18 by 33 by 25 cm styrofoam boxes, adapted to hold a wire screen basket on which fruits were placed (Fig. 1). The bottom of each box was covered with vermiculite or sawdust to provide an adequate pupation substrate for the third instar larvae dropping from infested fruit. The cover of the "maturation chamber" had a 10 by 28 cm screen that permited air to flow freely but stopped any emerging fruit flies or fruit fly parasitoids (see Aluja 1985 for details). It is important to note that when collecting fruit from the tree, care should be taken to prevent the fruit from falling to the ground. If the fruit ruptures, high larval mortality may be caused by the sodium benzoate solution. Figure 2 shows a tool that is very useful for the collection of fruit from tall branches.

Depending on the ripeness or decomposition stage of the fruit samples, these were kept in the "maturation chambers" for a period of 4 to 14 days. Periodic inspections and dissections of randomly selected samples determined when most of the larvae had left the fruit. For each dissection we recorded the number and stage of remaining live or

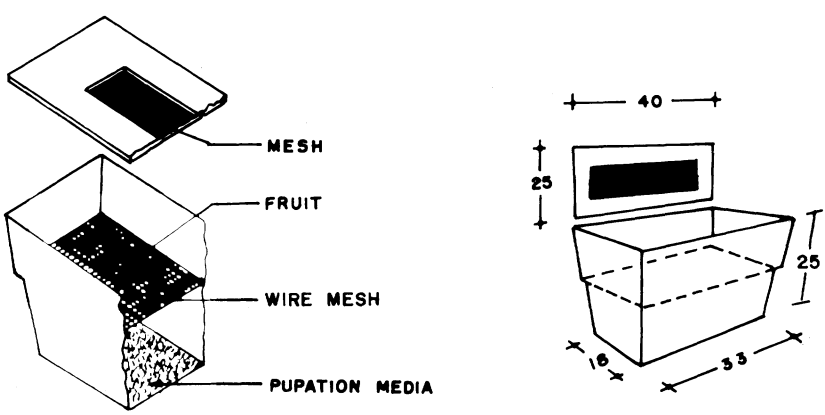

Fig. 1. "Maturation Chamber" for the collection of fruit fly larvae and pupae from infested fruit (dimensions are in cm).

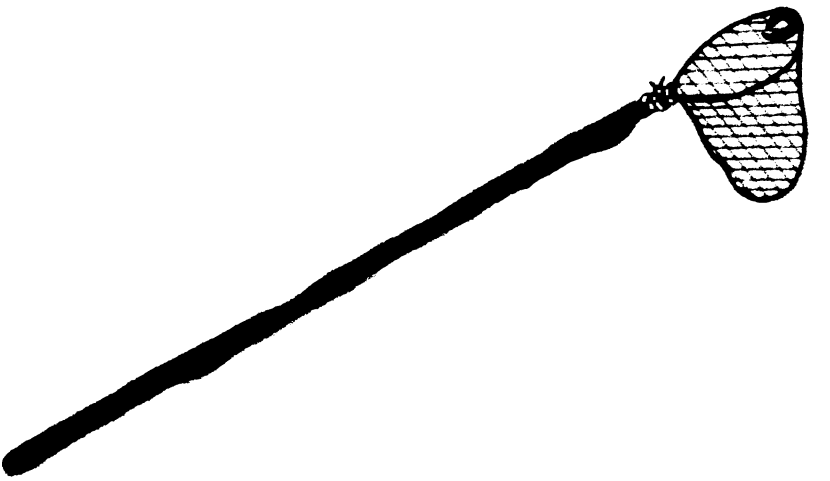

Fig. 2. Fruit collection net with sharp hook for cutting of thick pedicels.

dead larvae. At the same time the sawdust was carefully inspected and sieved to collect all pupae and larvae, which were placed in 500 ml plastic containers half filled with moist soil. Containers were covered with a fine screen capable of allowing aereation but stopping the emerging fruit flies and parasitoids from escaping. Water was regularly added to the soil in order to maintain optimal humidity conditions. The laboratory in which the plastic containers were kept had an average temperature of 28 ± 3° C and RH of 55 ± 5%.

The containers were inspected daily and any fruit fly or parasitoid that had emerged was removed. Part of this biological material was killed and identified and part used for demographic studies. The identification process is described in Aluja et al. (1987). Host plant identifications were based on Tejada (1980), Miranda (1976) and corroborated by Mario Cabrera (Universidad Autonoma de Chiapas).

Results

A total of 28,830 samples representing 92 species from 24 plant families were taken (see Table 1). Of these, 39 species from 12 families turned out to be natural hosts of the fruit fly genera *Anastrepha* and *Toxotrypana* (see Table 2). The number of hosts identified for each fruit fly species ranged from 1 to 14: *A. ludens* (14), *A. serpentina* (11), *A. obliqua* (11), *A. fraterculus* (10), *A. distincta* (4), *A. leptozona* (2), *A. striata* (1) and *Toxotrypana curvicauda* (1).

Disccussion and Conclusions

Our results increase by 10 the number of natural hosts reported for the fruit flies of Chiapas (Aluja 1985 reports 24 natural hosts).

It is important to note that the information provided here refers only to the positive identification of a plant species as a natural host of fruit flies. It does not indicate the degree of infestation nor the relative frequency of infestation. Aluja and Liedo (1986) have shown that simply recording a plant as a host provides little information since some hosts may be only occasionally exploited. Usually it is observed that a few fruit

TABLE 1. PLANT SPECIES SAMPLED IN THE SOCONUSCO REGION AND THE MAZAPA DE MADERO VALLEY (CHIAPAS, MEXICO) TO DETERMINE THEIR STATUS AS HOST PLANTS OF THE LOCAL FRUIT FLIES.

Common name		
Spanish	English	Scientific name
Aceituno	Wild olive	*Simarouba glauca* Dc.
Aguacate	Avocado	*Persea americana* Mill.
Algodoncillo	?	?
Almendra	Tropical almond	*Terminalia catappa* L.
Anona	Sweetsop	*Annona squamosa* L.
Anona colorada	Custard apple	*A. reticulata* L.
Baricoco	?	*Micropholis mexicana* Gilly
Cachofla	?	?
Caco	Coco plum	*Chrysobalanus icaco* L.
Café	Coffee	*Coffea arabica* L.
Caimito	Star apple	*Chrysophyllum cainito* L.
Capulín	Strawberry tree	*Muntingia calabura* L.
Caspirol	Inga	*Inga lauriana* Willd.
Chachalaco	?	?
Chalúm	Inga	*Inga micheliana* Harms
Chayote	Chayote	*Sechium edule* (Jacq.) Swartz
Chelel	Inga	*Inga leptoloba* Schl.
Chico zapote	Sapodilla	*Manilkara achras* Mill.
Chileamate	?	?
Chilindrón	?	?
Chincuya	?	*Annona purpurea* Mets.
Cidra	Citron	*Citrus medica* L.
Coroso	Corozo palm fruit	*Orbignya cohune* (Mart.)
Cuajilote	Cuachilote	*Paermenteria edulis* D. C.
Cuajinicuil	Inga	*Inga spuria* H. et B.
Cuernavaca	?	*Solanum macranthum* Dunal.
Cupapé	?	*Cordia dodecandra* Dc.
Encino (zapotillo)	—	*Comepia polyandra* Rose
Granada	Pomegranate	*Punica granatum* L.
Granadilla	Passion fruit	*Passiflora edulis* Sims
Grosella	?	?
Guamuchil	?	*Pithecolobium dulce* Benth
Guanábana	Soursop	*Anona muricata* L.
Guaya	Spanish lime	*Melicocca bijuga* L.
Guayaba	Guava	*Psidium guajava* L.
Higo	Fig	*Ficus carica* L.
Huevo de mono	Inga	*Inga* sp.
Hule silvestre	?	?
Jaboncillo	Soapberry	*Sapindus saponaria* L.
Jocote	Purple mombin	*Spondias purpurea* L.
Jobo de pava	Mombin	*Spondias mombin* L.
Jushte	Breadnut	*Brosimum alicastrum* Sw.
Lechón	?	?
Lima chiche	?	*Citrus* sp.
Lima limón	Sweet lime	*C. limetta* Rissso (Christm.)
Lombricero	?	?
Maluco	?	?
Mandarina	Tangerine	*Citrus deliciosa* Tencre
Mandarina china	Chinese tangerine	*Citrus* sp.
Mandarina criolla	Creol tangerine	*C. reticulata* Blco.

TABLE 1. (Continued)

Common name		Scientific name
Spanish	English	
Mango	Mango	*Mangifera indica* L.
Manzanilla	Hawthorn	*Crataegus* sp.
Mapahuite	?	*Trichilia* sp.
Marachán	?	?
Marañón	Cashew nut	*Anacardium occidentale* L.
Matapalo	?	*Ficus tecolutensis* Standley
Matasano	White sapote	*Casimiroa edulis* Llave & Lex.
Matzú	?	*Cordia alba* Roem & Schult.
Melocotón	Peach	*Prunus persica* (L.) Batsch
Melón	Musk melon	*Cucumis melo* L.
Nance	Nanche	*Byrsonima crassifolia* (L.) HBK
Naranja agria	Sour orange	*Citrus aurantium* L.
Naranja dulce	Orange	*C. sinensis* (L.) Osbeck
Níspero	Loquat	*Eriobotrya japonica* Lindl.
Pacaya	Pacaya palm fruit	*Chamaedorea aguilariana* Standley & Steyerm.
Pan de la India	Jack fruit tree	*Artocarpus heterophyllus* Lam.
Pan de maría	?	?
Pan de palo	Breadfruit	*Artocarpus altilis* (Perkins.) Fosb.
Papause	Ilama	*Annona diversifolia* Saff.
Papaya commercial	Papaya	*Carica papaya* L.
Papaya silvestre	Wild papaya	*Carica cauliflora* JMacq.
Patashte	?	*Theobroma bicolor* Humb. & Bonpl.
Paterna	Inga	*Inga paterna* Harms
Pepino silvestre	Wild cucumber	*Cucumis* sp.
Pera de agua	?	*Syzygium malaceensis* L.
Piñón	?	*Jatropha curcas* L.
Pitanga	Surinam cherry	*Syzygium uniflora* L.
Pomarrosa	Rose apple	*Syzygium jambos* L.
Pomelo	Pummelo	*Citrus maxima* (Burm.) Merrill
Pozól	?	*Alchornea latifolia* Sw.
Quishtán	?	*Solanum wendlandii* Hook.
Sangre de toro	?	?
Sikajal	?	?
Taculchacha	?	?
Tempisque	?	*Mastichodendron capiri* var. *tempisque* (A. DC.) Cronq.
Tomate silvestre	Wild Tomato	*Lycopersicon* sp.
Toronja	Grapefurit	*Citrus paradisi* Macfady
Toronjil	?	*Rheedia edulis* Planch & Triana
Tuna	Prickly pear	*Opuntia tuna* (L.) Mill.
Zapote amarillo	Canistal	*Pouteria campechiana* Baehni
Zapote colorado	Mammee apple	*Calocarpum sapota* Merr.
Zapote de agua	?	*Pachira aquatica* Aubl.
Zapote negro	Black sapote	*Diospyros ebenaster* Retz.
Zunzapote	?	*Licania platypus* Fritsch

TABLE 2. NATURAL HOST PLANTS OF SOME OF THE FRUIT FLIES OF CHIAPAS, MEXICO. LISTED IN ORDER OF ECONOMIC IMPORTANCE.

Fruit fly species	Common local name of host plant	Scientific name of host plant
Anastrepha ludens	Mango	*Mangifera indica* L.
	Naranja dulce	*Citrus sinensis* L. (Osbeck)
	Naranja agria	*C. aurantium* L.
	Pomelo	*C. maxima* (Burm.) Merrill
	Mandarina criolla	*C. reticulata* Blco.
	Toronja	*C. paradisi* Macfady
	Tangerina	*C. deliciosa* Tenore
	Cidra	*C. medica* L.
	Lima limón	*C. limetta* Risso (Christm.)
	Mandarina China	*C.* sp.
	Naranja injerto	*C.* sp.
	Matasano	*Casimiroa edulis* Llave & Lex.
	Anona	*Annona squamosa* L.
	Tempisque	*Mastichodendron capiri* var. *tempisque* (A. D.C.) Cronq.
Anastrepha serpentina	Zapote colorado	*Calocarpum sapota* Merr.
	Chico zapote	*Manilkara achras* (Mill.)
	Caimito	*Chrysophyllum cainito* L.
	Zapote amarillo	*Pouteria campechiana* Baehni
	Baricoco	*Micropholis mexicana* L.
	Pomelo	*Citrus maxima* (Burm) Merrill
	Naranja agria	*C. aurantium* L.
	Naranja dulce	*C. sinensis* (L.) Osbeck
	Pozol	*Alchornea latifolia* Sw.
	Nance	*Byssonima crassifolia* (L.) HBK
	Mango	*Mangifera indica* L.
Anastrepha obliqua	Mango	*Mangifera indica* L.
	Guayaba	*Psidium guajava* L.
	Pomarrosa	*Syzygium jambos* L.
	Pera China	*S. malaceensis* L.
	Jobo de pava	*Spondias mombin* L.
	Jocote	*S. purpurea* L.
	Jushte	*Brosium alicastrum* (Ramon)
	Níspero	*Eriobotrya japonica* Lindl.
	Pozól	*Alchornea latifolia* Sw.
	Grosella	?
	Manzanilla	*Crataegus* sp.
Anastrepha fraterculus	Guayaba	*Psidium guajava* L.
	Pomarrosa	*Syzygium jambos* L.
	Pozól	*Alchornea latifolia* Sw.
	Pitanga	*Syzygium uniflora* L.
	Tempisque	*Mastichodendron capiri* var. *tempisque* (A. D. C.) Cronq.
	Almendra	*Terminalia catappa* L.
	Cafe	*Coffea arabica* L.
	Mango	*Mangifera indica* L.
	Grosella	?
	Manzanilla	*Crataegus* sp.
Anastrepha distincta	Chalúm	*Inga micheliana* Harms

TABLE 2. (Continued)

Fruit fly species	Common local name of host plant	Scientific name of host plant
	Caspirol	*I. lauriana* Willd.
	Cuajinicuil	*I. spuria* H. et B.
	Paterna	*I. paterna* Harms
Anastrepha leptozona	Baricoco	*Micropholis mexicana* Gilly
	Manzanilla	*Crataegus* sp.
Anastrepha striata	Guayaba	*Psidium guajaba* L.
Toxotrypana curvicauda	Papaya	*Carica papaya* L.

species are prefered in any given region. We therefore suggest that any future host records also provide complete information as to how important the host is and what the host utilization patterns are in nature (Aluja et al. unpublished information).

After carefully studying the host plant records reported in the literature, we have concluded that the range of our sampling schemes need to be increased to consider more species of families that at first would not appear to be an adequate substrate for larval development. For example, the families Euphorbiaceae, Passifloraceae and Ebenaceae are very common in the Soconusco Region, but were only sampled in low numbers. An extended sampling effort may soon allow us to identify the natural hosts of *A. alveata*, *A. balloui*, *A. bicolor*, *A. chiclayae*, *A. montei*, *A. pallens* and *A. tripunctata*, the other fruit flies identified in the State of Chiapas by Aluja et al. (1987).

We consider that some of the hosts reported in the literature may be the result of misidentifications or sampling errors. It seems unlikely that *Manihot esculenta* is a host of *A. obliqua* as Guagliumi (1966) suggests. Caraballo (1981) reports *Theobroma* sp. as a host of *A. fraterculus* which is a phenomenon not observed in the varieties of *Theobroma* sp. planted in Mexico. Most of the hosts reported by Korytkowski & Ojeda-Peña (1968) had never been reported before for the species they indicate.

Acknowledgments

We gratefully acknowledge the authorization by Dr. Allen Norrbom (Systematic Entomology Laboratory, ARS, USDA) to use some of the information contained in his unpublished PhD thesis. In particular we refer to his extensive literature review on host plants of some *Anastrepha* species. Dr. Norrbom also made many useful comments to an earlier version of this paper. We want to thank Dr. Carrol Calkins (Insect Attractants, Behavior, and Basic Research Laboratory, ARS, USDA) for his important support during the publication process of this paper and Ing. Jorge Gutierrez Samperio (DGSPAF) for his constant encouragement. Partial finantial support during the publication process of this paper was provided by Dr. J. R. Aluja. This work was supported by the Mediterranean Fruit Fly Program, DGSPAF, SARH, Mexico.

References Cited

Aluja, M. 1985. Manejo integrado de las moscas de la fruta (DIPTERA: TEPHRITIDAE). Programa Mosca del Mediterraneo, DGSV-SARH. Mexico D.F. Mexico. 241 p.

ALUJA, M., AND P. LIEDO. 1986. Future perspectives on integrated management of fruit flies in Mexico. In: Pest control: operations and systems analysis in fruit fly management. Proceedings of a NATO advanced research workshop. M. Mangel ed. pp. 12-48. Springer Verlag. New York.

ALUJA, M., M. CABRERA, E. RIOS, J. GUILLÉN, G. DE LA ROSA, P. LIEDO, AND J. Hendrichs. 1987. A survey of the economically important fruit flies (Diptera: Tephritidae) present in Chiapas, Mexico. Florida Entomol. 70: 320-329.

ARRIAGA-MARTINEZ, T. 1979. Determinación de hospederas silvestres de *Anastrepha ludens* en la zona centro de Tamaulipas. Seminario de Investigación II (Unpublished). Univ. Autónoma de Tamaulipas. Cd. Victoria, México. 15 p.

BAKER, A. C., W. W. STONE, C. C. PLUMMER, AND M. MCPHAIL. 1944. A review of studies on the Mexican fruitfly and related Mexican species. USDA Misc. Publ. No. 531: 1-155.

BALLOU, C. H. 1945. Notas sobre insectos dañinos observados en Venezuela (1938-1943). III Conf. Interam. Agric. Caracas, Venezuela. No. 34: 125.

BLANCHARD, E. E. 1937. Dípteros argentinos nuevos o poco conocidos. Rev. Soc. Entomol. Argentina. 9: 36-58.

BRICEÑO, A. 1975. Distribución de las moscas de las frutas (*Anastrepha* spp., Diptera: Tephritidae) y sus plantas hospederas en los andes Venezolanos. Rev. Fac. Agron. (Univ. Zulia, Maracaibo) 3: 45-49.

BUSH, G. L. 1957. Some notes on the susceptibility of Avocados in Mexico to attack by the Mexican fruit fly. Rio Grande Valley Hort. Soc. 7: 75-78.

———. 1962. The cytotaxonomy of the larvae of some Mexican fruit flies in the genus *Anastrepha* (Diptera: Tephritidae). Psyche 69: 87-101.

CARABALLO, J. 1981. Las moscas de frutas del género *Anastrepha* Schiner, 1868 (Diptera: Tephritidae) de Venezuela. Unpubl. M.S. thesis, Universidad Central de Venezuela. Maracay, Venezuela.

CORONADO, P. R. 1964. La mosca del capulín. Una nueva plaga descubierta en la región de Texcoco, México. Fitófilo 17: 9-18.

CUCULIZA, T. M., AND V. E. TORRES. 1975. Moscas de la fruta en las principales plantas hospederas del valle de Huasnuca. Revista Peruana Entomol. 20: 107-114.

EBELING, W. 1950. Subtropical Entomology. Lithotype Process Co. San Francisco, USA. 747. p.

ESKAFI, F. M., AND R. T. CUNNINGHAM. 1987. Host plants of fruit flies (Diptera: Tephritidae) of economic importance in Guatemala. Florida Entomol. 70: 116-123.

FERNANDEZ-YEPEZ, F. 1953. Contribución al estudio de las moscas de las frutas del género *Anastrepha* Schiner (Diptera: Trypetidae) de Venezuela. II Cong. Cien. Nat. Afin. (Caracas) No. 7: 5-42.

GREENE, C. T. 1934. A revision of the genus *Anastrepha* based on a study of the wings and on the length of the ovipositor sheath (Diptera: Trypetidae). Proc. Entomol. Soc. Washington. 36: 127-179.

GUAGLIUMI, P. 1966. Insetti e Aracnidi delle plante comuni del Venezuela segnalanti nel periodo 1938-1963. Rel. Monog. Agr. Subtrop. Trop. (Inst. Agron. L'Oltramare, Firenze). No. 1-391.

HERRERA, A. J. M., AND L. E. VIÑAS. 1977. Moscas de la fruta (Diptera: Tephritidae) en mangos de chulucanas, Piura. Revista Peruana de Entomol. 20: 107-114.

JIRÓN, L. F., AND R. ZELEDÓN. 1979. El género *Anastrepha* (Diptera: Tephritidae) en las pricipales frutas de Costa Rica y su relación con pseudomiasis hummana. Rev. Trop. Biol. 27: 155-161.

KORYTKOWSKI, C., AND D. OJEDA-PEÑA. 1968. Especies del género *Anastrepha* Schiner 1868 en el nor-oeste Peruano. Rev. Per. Entomol. 11: 32-70.

LIMA, A. DA COSTA. 1934. Moscas de frutas do género *Anastrepha* Schiner, 1868 (Diptera: Trypetidae). Mem. Inst. Oswaldo Cruz 28: 487-575.

LUTZ, A., AND A. DA COSTA LIMA. 1918. Contribucao para o estudo das Tripanidas (mosca de frutas) brasileiras. Mem. Inst. Oswaldo Cruz. 10: 4-16.

McALISTER, L. C. JR. 1936. Observations on the West Indian fruit fly at Key West in 1932-33. J. Encon. Entomol. 29: 440-445.

McPHAIL, M. AND N. O. BERRY. 1936. Observations on *Anastrepha pallens* (Coq.) reared from wild fruits in the lower Rio Grande Valley of Texas during the spring of 1932. J. Econ. Entomol. 29: 405-410.

MALAVASI, A., J. S. MORGANTE, AND R. A. ZUCCHI. 1980. Biologia de "Moscas das-frutas" (Diptera: Tephritidae). I. Lista de hospederos e ocorencia. Revista Brasil. Biol. 40: 17-24.

MARTORELL, L. F. 1939. Insects observed in the state of Aragua, Venezuela, South America. J. Agr. Univ. Puerto Rico (Rio Piedras) 23: 219.

MIRANDA, F. 1976. La vegetación de Chiapas. Ediciones del Gobierno del Estado. Tuxtla Gutierrez, Chiapas, México. 2 vols.

NORRBOM, A. L. 1982. A new host record for *Rhagoletis striatella* (Diptera: Tephritidae). Melsheimer Entomol. Ser. 32: 11.

———. 1985. Phylogenetic analysis and taxonomy of the *cryptostrepha*, *daciformis*, *robusta* and *schausi* species groups of *Anastrepha* Schiner (Diptera: Tephritidae). Unpubl. PhD Thesis. Penn. State University. 355 p.

OLARTE, W. E. 1980. Dinámica poblacional del complejo constituido por las moscas de las frutas *Anastrepha striata* y *Anastrepha fraterculus* en el medio ecológico del sur de Santander. Universidad Industrial de Santander. Bucaramanga, Colombia. 75 p.

PLUMMER, C. C., M. McPHAIL, AND J. W. MONK. 1941. The yellow chapote, a native host of the Mexican fruitfly. USDA Tech. Bull. No. 775: 1-12.

RAMOS, A. 1975. Guía ilustrada para la identificación de adultos de moscas (Diptera: Tephritidae) que afectan a la fruta en México y de las especies exóticas de importancia cuarentenaria. DGSV-SARH. Mexico D.F. Mexico. 40 p.

ROSILLO, M. A. 1953. Resultados preliminares de un estudio bioecológico de los dípteros Trypetidae del noroeste argentino. Rev. Investig. Agric. 7: 97-130.

SHAW, J. G. Hosts and distribution of *Anastrepha serpentina* in Northeastern Mexico. J. Econ. Entomol. 40: 34-40.

STONE, A. 1942. The fruitflies of the genus *Anastrepha*. USDA Misc. Publ. No. 439: 1-112.

TEJADA, L. O. 1980. Estudio sobre las hospederas potenciales de la mosca del Mediterraneo (*Ceratitis capitata* Weid.), con énfasis en las presentes en el area del Soconusco, Chiapas, México. DGSV-SARH, Talleres Gráficos de la Nación. 95 p.

WASBAUER, M. 1972. An annotated host catalog of the fruit flies of America North of Mexico (Diptera: Tephritidae). Occas. Pap. Calif. Dept. Agric. Bur. Entomol. No. 19: 1-172.

WEEMS, H. V. 1963. The Mexican fruit fly (*Anastrepha ludens*). Ent. Circ. No. 16 Florida Dept. Agric.

WHERVIN, L. W. VAN. 1974. Some fruitflies (Tephritidae) in Jamaica. Pans. 20: 11-19.