

Update of Host Plant List of *Anastrepha fraterculus* and *Ceratitis capitata* in Argentina

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ABSTRACT: The study displays a complete picture of the host range of the two economically important fruit fly species in Argentina, the native *Anastrepha fraterculus* (Wiedemann) (South American Fruit Fly) and the exotic *Ceratitis capitata* (Wiedemann) (Mediterranean Fruit Fly or Medfly). This work provides information on the fruit type of each plant species, associated tephritid species, habitat where the fruit was collected, geographical location of each fruit collection area (latitude, longitude, and altitude), phytogeographic regions where each area is located, as well as a general description of the landscape characteristics of those habitats where the fruit samples with fly larvae were collected. A complete, detailed bibliographic review was made in order to provide all the relevant information needed for host use in natural setting.

Key Words: Medfly, South American fruit fly, ecology, habitats, fruit trees

INTRODUCTION

Anastrepha fraterculus (Wiedemann) (South American Fruit Fly) and *Ceratitis capitata* (Wiedemann) (Mediterranean Fruit Fly or Medfly) are the only two economically important fruit fly species found in Argentina (Aruani et al. 1996). *Ceratitis capitata* was introduced to Argentina probably via Buenos Aires or through natural dispersal from Brazil (Ovruski et al. 2003). Both fly species are serious pests of a wide range of commercial fruit crops, and severely limit the export of fruit due to quarantine restrictions (Aruani et al. 1996). Medfly is widely distributed throughout Argentina, whereas the native *A. fraterculus* is mainly restricted to NW Argentina (Tucumán, Salta, Jujuy, Catamarca), NE Argentina (Misiones, Corrientes, Entre Ríos) and in fruit cultivation areas of La Rioja, San Juan and Buenos Aires. In all these provinces *A. fraterculus* and *C. capitata* apparently coexist in wild and commercially grown, native and exotic fruits.

Both tephritids are polyphagous species that attack several families of fruit species in

many countries. The number of host plants cited for *A. fraterculus* is approximately 80 species (Norrbohm 2004), whereas for *C. capitata* the number is higher than 300 species in the world (Liquido et al. 1991; Copeland et al. 2002). Regarding Argentina, several regional lists of known or potential host plants for *C. capitata* and *A. fraterculus* have been made, primarily to meet the needs of quarantine personnel in the fruit-growing regions (Rust 1916, 1918; Ogloblin 1937; Hayward 1942, 1944, 1960; Aczél 1949; Vergani 1952; Turica and Mallo 1960, 1961; Blanchard 1961; Ceruso 1967; Turica et al. 1971; Nasca et al. 1981, 1996; Putruele 1996; Vaccaro 2000; Ovruski 2004a, 2004b). However, several of those reports did not follow standard procedures to ascertain host plant status unequivocally. According to Norrbom and Kim (1988) and Aluja (1999), a host record should only be validated if the plant and fly species was identified by an expert taxonomist (the author cites the name and affiliation of the person performing the identification), if the infestation occurred under natural conditions (i.e., field), and if host records were also accompanied by information on levels of infestation (i.e., larvae per fruit or kg of fruit), fruiting phenology and

accurate information on cultivar type. Moreover, some *C. capitata*/*A. fraterculus* host plant data cited in Lahille (1915), Domato and Aramayo (1947), Ratkovich and Nasca (1953), Rosillo (1953), Costilla (1967), Nasca (1970), Nasca et al. (1978), Manero et al. (1989), and Vattuone et al. (1999) are based on adult flies captured in traps placed in trees rather than fruit infestation. In the most recent and complete studies on ecology of *C. capitata*/*A. fraterculus*, such as the articles published by Ovruski (2002), Ovruski et al. (2003, 2004), Schliserman and Ovruski (2004), and Oroño et al. (2005) for NW Argentina, Segura et al. (2004) for central east Argentina, and Segura et al. (2006) for different Argentinean ecological regions, host plants are only included on the basis of field infestation data.

As part of a larger project on patterns of host utilization by frugivorous Tephritidae in NW Argentina, the aim of this study is to draw a more complete picture of the host range of the two economically important fruit fly species in Argentina. A complete, detailed bibliographic review was made in order to provide all the relevant information needed for host use in natural setting.

MATERIAL AND METHODS

In order to collect information on host plants to *C. capitata* and/or *A. fraterculus* registered in Argentina and for the areas where the collections were carried out, a thorough analysis on all the data available in specialized literature was made. Once the information was gathered, the first step was to make a list of species of valid host plants, which were put in alphabetical order according to the taxonomic family to which they belonged. This list also displays information on the fruit type of each plant species, associated tephritid species, habitat where the fruit was collected, as well as bibliographic references. The latter are indicated by an Arabic number in parentheses,

which, in turn, is at the end of the respective article in the cited literature. The second step was to make a list of the reference locations according to Argentinean region and province. This table also indicates the geographical coordinates of each fruit collection area (latitude, longitude, and altitude) and the phytogeographic regions where each area is located. A third table includes a general description of the landscape characteristics of those habitats where the fruit samples with fly larvae were collected. The data in Table 1 are complemented by the information in Tables 2 and 3.

In the making of the three tables, only those bibliographic cites on fruit infested with larvae from one or both tephritid species were considered. The data from adult specimens captured in liquid traps placed on a possible host plant were ignored. Those host plants unidentified on a species level which were named simply as "sp" (e.g. *Citrus* sp) were also omitted. The present article honors Norrbom y Kim's (1988) and Aluja's (1999) concept of host plant, which states that a plant is only a natural host plant to a given tephritid species if the fruit or some of its tissue allows the larva to complete development, and the emergence of a healthy adult in nature.

RESULTS

All information available on *C. capitata*/*A. fraterculus* host plants obtained from bibliographic review is summarised in Table 1. Altogether, 51 fruit species belonging to 19 botanical families were considered as host plants. From all botanical families cited for Argentina in Table 1, only eight have native fruit species (Cactaceae, Cucurbitaceae, Fabaceae, Juglandaceae, Myrtaceae, Olacaceae, Palmaceae, and Sapotaceae). The most commonly infested families were species represented by Rosaceae (21.6% of the total number of families), Rutaceae (17.7%), Myrta-

ceae and Solanaceae (13.7%). Of the 18 plant families from which *C. capitata* was recovered (95% of the total botanical families recorded in the literature) (Table 1), only five (26%) were associated with Medfly (Actinidiaceae, Cactaceae, Cucurbitaceae, Olacaceae, Palmaceae). *Anastrepha fraterculus* was present in 14 plant families (73%) (Table 1), and from one (5%) family (Fabaceae) only this tephritid fly was recovered. Of the total host plant species listed in Table 1, 29 (57%) were recorded for both *C. capitata* and *A. fraterculus*, 18 (35%) only for *C. capitata*, and 4 (8%) only for *A. fraterculus*. In those plant families with more than three fruit species recorded as host and in which only one fruit fly species was recovered from a host, *C. capitata* was dominant in Solanaceae (86% of the total host species), Rutaceae (44%), and Rosaceae (18%), while *A. fraterculus* was only dominant in Myrtaceae (30%) (Table 1).

A total of 114 localities of Argentina were recorded as collection sites for *C. capitata* and/

or *A. fraterculus* (Table 2). Tucumán, Salta, and Buenos Aires represented 29.8%, 13.2%, and 9.6%, respectively, of the all localities where infested fruit were collected. Only these three provinces together represented 52.6% of the 114 localities sampled in Argentina. Fruit infested by *C. capitata* larvae were collected in all habitats characterized in Table 3, ranging from rainforest to xeric scrub (Table 1). Fruit infested by *A. fraterculus* larvae were collected in habitats such as rainforests, rural and urban garden, commercial and experimental fruit orchards (Table 1). Fruit samples were most commonly collected from rural gardens (RG) during fruit fly surveys, representing 67.1% of all collections recorded in Table 1, while commercial fruit orchards (CO) and urban gardens (UG) represented 11.1% and 7.6%, respectively. Natural habitats, such as Yungas and Paranaense secondary forests, and dry scrub, only represented 7.3%, 2.8%, and 0.6%, respectively. Experimental fruit orchards represented 3.5%.

Table 1. Host plant species of *Ceratitidis capitata* and *Anastrepha fraterculus* reported in the literature for Argentina.

Plant Family Botanical name	Common name	Plant origin	Fruit type ¹	Fruit Fly species	Provinces with Cc and Af-positive samples ²	Cc and Af-positive habitat ³	References ⁴
Actinidiaceae							
<i>Actinidia chinensis</i> Planch	Kiwi fruit	Exotic	Berry	Cc	Buenos Aires	EO	14, 15
Anacardiaceae							
<i>Mangifera indica</i> L.	Mango	Exotic	Drupe	Af	Tucumán	RG	10, 13
					Entre Ríos	RG	12
				Cc	Tucumán	RG	2, 10
					Entre Ríos	RG	12
<i>Spondias mombim</i> L.	Jobo	Exotic	Drupe	Af	Misiones	RG	8
Cactaceae							
<i>Opuntia ficus-indica</i> L.	Tuna	Native	Berry	Cc	Tucumán	DS	17
					La Rioja	DS	7

Table 1. Continuation

Plant Family Botanical name	Common name	Plant origin	Fruit type ¹	Fruit Fly species	Provinces with Cc and Af-positive samples ²	Cc and Af-positive habitat ³	Refer- ences ⁴		
Caricaceae									
<i>Carica papaya</i> L.	Papaya	Exotic	Berry	<i>Af</i>	Entre Ríos	RG	12		
						Cc	Corrientes	RG	17
							Misiones	RG	17
							Salta	RG	15
							Chaco	RG	15
Cucurbitaceae									
<i>Cucurbita asperata</i> L.	?	Native	Barry	Cc	La Rioja	RG	7		
Ebenaceae									
<i>Diospyrus kaki</i> L.	Japanese persimmon	Exotic	Berry	<i>Af</i>	Buenos Aires	RG	15		
							La Rioja	RG	7
							Misiones	RG	8, 15
							Tucumán	RG	3, 6, 10
						Cc	Buenos Aires	UG	14, 15, 17
							Córdoba	RG	16, 17
							La Rioja	RG	7
							Misiones	RG	15
		Tucumán	RG, UG	6, 10, 13					
Fabaceae									
<i>Inga marginata</i> Willd.	Pacay	Native	Legum- bre	<i>Af</i>	Tucumán	YSF	9		
Juglandaceae									
<i>Juglans australis</i> Griseb.	Wild walnut	Native	Drupe	<i>Af</i>	Tucumán	YSF, RG	5, 10, 14		
						Cc	Tucumán	YSF, RG	2, 10
<i>J. regia</i> L.	Walnut	Exotic	Drupe	Cc	La Rioja	RG	7		
Moraceae									
<i>Ficus carica</i> L.	Fig	Exotic	Syconus	<i>Af</i>	Entre Ríos	RG, UG	12		
							La Rioja	RG	7
							Misiones	RG, UG	8
							Tucumán	RG, UG	6, 10
						Cc	Buenos Aires	RG, EO	14, 15
							Catamarca	RG	15
							Entre Ríos	RG, UG	12
							La Rioja	RG, CO	7, 15
		Tucumán	RG, UG	2, 10, 17					

Table 1. Continuation

Plant Family Botanical name	Common name	Plant origin	Fruit type ¹	Fruit Fly species	Provinces with Cc and Af-positive samples ²	Cc and Af-positive habitat ³	Refer- ences ⁴
Myrtaceae							
<i>Campomanesia crenata</i> Berg		Native	Berry	Af	Misiones	PSF	8
<i>Eugenia retusa</i> Berg		Native	Berry	Af	Misiones	PSF	8
<i>E. uniflora</i> L.	Surinam cherry	Native	Berry	Af	Misiones	PSF	8
					Tucumán	YSF	2, 6, 10
				Cc	Tucumán	RG; YSF	10
<i>Feijoa sellowiana</i> L.	False guava	Native	Berry	Af	Buenos Aires	RG, EO	14, 15
					Entre Ríos	RG	15
					Misiones	RG, PSF	8, 15
					Tucumán	RG	6
				Cc	Buenos Aires	RG, EO	14, 15
					Entre Ríos	RG	15
<i>Hexachlamis edu- lis</i> (Berg) Kausel et Legrand	Ubajay	Native	Berry	Af	Corrientes	RG	15
					Misiones	PSF, RG	8
				Cc	Corrientes	RG	15
<i>Myrcianthes pun- gens</i> (Berg)	Mato	Native	Berry	Af	Tucumán	YSF	6, 13, 15
					Entre Ríos	RG	12
				Cc	Tucumán	YSF	6, 13, 15
<i>P. guajava</i> L.	Guava	Exotic	Berry	Af	Corrientes	RG	15
					Entre Ríos	RG	12
					Jujuy	RG	15
					Misiones	RG, PSF	8, 15
					Salta	RG, UG, YSF	10, 15
					Tucumán	RG, UG, YSF	5, 6, 10
				Cc	Chaco	RG	15
					Corrientes	RG	15
					Entre Ríos	RG	12, 15
					Jujuy	RG	15

Table 1. Continuation

Plant Family Botanical name	Common name	Plant origin	Fruit type ¹	Fruit Fly species	Provinces with Cc and Af-positive samples ²	Cc and Af-positive habitat ³	Refer- ences ⁴
					Misiones	RG, PSF	15
					Salta	RG, UG, YSF	10, 15
					Tucumán	RG, UG, YSF	5, 6, 10
Olacaceae							
<i>Ximenia ameri- cana</i>		Native	Drupe	Cc	La Rioja	RG	15
Palmaceae							
<i>Phoenix dactylif- era</i> L.	Dátil	Native	Berry	Cc	La Rioja	RG, CO	7
Passifloraceae							
<i>Passiflora caer- ulea</i> L.	Blue Pas- sion fruit	Exotic	Berry	Af	Entre Ríos	RG	12
					Tucumán	RG	6
				Cc	Entre Ríos	RG	12
					Tucumán	UG, RG	10
Punicaceae							
<i>Punica granatum</i> L.	Pomegran- ate	Exotic	Berry	Af	Córdoba	RG	16, 17
					Entre Ríos	RG	12
					La Rioja	RG, CO	7
				Cc	Entre Ríos	RG	19
					La Rioja	RG, CO	7
Rosaceae							
<i>Cydonia oblonga</i> Mill.	Quince	Exotic	Berry	A.f.	Entre Ríos	RG	12
					La Rioja	RG	7
					Tucumán	RG	6
				Cc	Catamarca	RG	15
					La Rioja	RG, UG, CO	7
<i>Eriobotrya japonica</i> Lindl.	Loquat	Exotic	Nucule- nous	Af	Entre Ríos	RG	12
					Misiones	RG, PSF	8, 15
					Tucumán	RG, YSF	3, 6, 10
				Cc	Córdoba	RG	17
					Entre Ríos	RG	12
					La Rioja	UG	7
					Tucumán	RG, YSF	6, 10
<i>Malus domestica</i> Mill.	Apple	Exotic	Pome	Af	Misiones	RG	8

Table 1. Continuation

Plant Family Botanical name	Common name	Plant origin	Fruit type ¹	Fruit Fly species	Provinces with Cc and Af-positive samples ²	Cc and Af-positive habitat ³	Refer- ences ⁴
					Salta	RG	1, 13
					Tucumán	RG	3
				Cc	Buenos Aires	EO	14, 15
					Entre Ríos	RG	12
					Tucumán	RG	17
<i>Prunus armeniaca</i> L.	Apricot	Exotic	Drupe	Af	Catamarca	RG, CO	13, 17
					Córdoba	RG	17
					La Rioja	CO	7
					Misiones	RG	8
					Salta	RG, CO	13
					Tucumán	RG	3, 6, 10
				Cc	Buenos Aires	RG	16
					Catamarca	RG, CO	13
					Córdoba	RG	17
					Entre Ríos	RG	12
					La Rioja	RG, CO	7
					Tucumán	RG	6, 10, 17
<i>Prunus domestica</i> L.	Cultivated Plum	Exotic	Drupe	Af	Catamarca	RG, CO	13
					La Rioja	RG, UG, CO	7
					Salta	RG, CO	13
					Tucumán	RG, UG, YSF	3, 10
				Cc	Buenos Aires	RG	18
					La Rioja	RG, CO	7
					Tucumán	RG, UG, YSF	10
<i>Prunus dulcis</i> L.	Almond	Exotic	Drupe	Af - Cc	La Rioja	RG	7
<i>Prunus insititia</i> L.	Plum	Exotic	Drupe	Af	Entre Ríos	RG	12
					La Rioja	RG	15
				Cc	Buenos Aires	RG, EO	14, 15
					Entre Ríos	RG	12
					La Rioja	RG	15
<i>Prunus persica</i> (L.) Batsch	Peach	Exotic	Drupe	Af	Buenos Aires	RG, EO	15
					Catamarca	RG, CO	13, 15
					Córdoba	RG	17
					Entre Ríos	RG	12
					Jujuy	RG, CO	4, 17

Table 1. Continuation

Plant Family Botanical name	Common name	Plant origin	Fruit type ¹	Fruit Fly species	Provinces with Cc and Af-positive samples ²	Cc and Af-positive habitat ³	Refer- ences ⁴
					La Rioja	RG, CO	7
					Misiones	RG, UG	8, 15
					Salta	RG, CO	13, 17
					San Luis	RG	15
					Tucumán	RG, UG, YSF	10
				Cc	Buenos Aires	RG, CO	14, 15, 17
					Catamarca	CO	13, 17
					Córdoba	RG	17
					Corrientes	RG	17
					Entre Ríos	RG	12, 15
					Jujuy	RG, CO	4, 17
					La Rioja	RG, CO	7, 15
					Misiones	RG	15
					Salta	RG	15
					Santa Fé	RG	15, 17
					Tucumán	RG, UG, YSF	5, 10, 17
<i>Pyrus communis</i> L.	Pear	Exotic	Berry	Af	La Rioja	RG, CO	7
					Misiones	RG	8
					Tucumán	RG	6
				Cc	Buenos Aires	RG	15
					Entre Ríos	RG	12
					La Rioja	RG, CO	7
<i>Pyrus pyrifolia</i> Nakai	Asian pear	Exotic	Berry	Cc	Buenos Aires	EO	14, 15
<i>Rubus idaeus</i> L.	Raspberry	Exotic	Berry	Cc	Entre Ríos	RG	12
Rutaceae							
<i>Citrus aurantifolia</i> Swingle	Lime	Exotic	Espery- dium	Cc	La Rioja	RG	7
					Tucumán	RG	6
<i>Citrus aurantium</i> L.	Sour or- ange	Exotic	Espery- dium	Af	Entre Ríos	RG	12
					Misiones	RG	8
					Tucumán	YSF	11
				Cc	Buenos Aires	RG	17, 18
					Corrientes	RG	17
					Entre Ríos	RG	12
					Jujuy	RG	15

Table 1. Continuation

Plant Family Botanical name	Common name	Plant origin	Fruit type ¹	Fruit Fly species	Provinces with Cc and Af-positive samples ²	Cc and Af-positive habitat ³	Refer- ences ⁴
					La Rioja	RG	7
					Salta	RG	15
					Santa Fé	RG	15
					San Luis	RG	15
					Tucumán	RG, YSF	10, 11
<i>Citrus deliciosa</i> Tenore	Mediterranean tangerine	Exotic	Esperydium	Cc	Entre Ríos	RG	12
<i>Citrus limetta</i> Risso	Sweet lemon	Exotic	Esperydium	Cc	La Rioja	RG	7
<i>Citrus paradisi</i> Macfadyn	Grapefruit	Exotic	Esperydium	Af	Corrientes	RG	15
					Entre Ríos	RG	12
					La Rioja	RG	7
					Misiones	RG	8, 15
					Tucumán	RG, UG, YSF	3, 6, 10
				Cc	Buenos Aires	RG	15, 17
					Catamarca	RG	15
					Chaco	RG	15
					Córdoba	RG	17
					Corrientes	RG	15
					Entre Ríos	RG	12
					La Rioja	RG	7
					Misiones	RG	17
					Salta	RG, CO	15, 17
					Santa Fé	RG	15
					Tucumán	RG, UG, YSF	2, 10
<i>Citrus reticulata</i> Blanco	Tangerine	Exotic	Esperydium	Af	Buenos Aires	EO	15
					Entre Ríos	RG	15, 17
					Misiones	RG	8, 17
					Tucumán	RG, CO	6, 13
				Cc	Buenos Aires	RG, EO	14, 15, 16
					Catamarca	RG	15
					Corrientes	RG	15
					Entre Ríos	RG	12, 15
					Jujuy	RG	15
					La Rioja	RG	7
					Misiones	RG	15

Table 1. Continuation

Plant Family Botanical name	Common name	Plant origin	Fruit type ¹	Fruit Fly species	Provinces with Cc and Af-positive samples ²	Cc and Af-positive habitat ³	Refer- ences ⁴
					San Luis	RG	15
					Tucumán	RG, CO	6, 10
<i>Citrus sinensis</i> (L.) Osbeck	Sweet orange	Exotic	Espery- dium	Af	Entre Ríos	RG, CO	12
					Misiones	UG, RG	8
					Tucumán	RG	3
				Cc	Buenos Aires	RG, CO, EO	14, 15, 17
					Catamarca	RG	15
					Córdoba	RG	17
					Corrientes	RG	15, 17
					Entre Ríos	RG	12, 15
					Jujuy	RG	15, 17
					La Rioja	RG, CO	7, 15
					Misiones	RG	8
					Salta	RG	1, 17
					San Luis	RG	15
					Tucumán	RG, CO	5, 10, 17
<i>Citrus unshiu</i> Marcovich	Satsuma tangerine	Exotic	Espery- dium	Cc	Entre Ríos	RG	12
<i>Fortunella japoni- ca</i> Swingle	kumquat	Exotic	Espery- dium	Af	Buenos Aires	RG	15
					Tucumán	RG	13
				Cc	Catamarca	RG	15
					Corrientes	RG	15
					Entre Ríos	RG	19
					La Rioja	RG	7
Vitaceae							
<i>Vitis vinifera</i> L.	Grape	Exotic	Berry	Af - Cc	La Rioja	RG	7
Sapotaceae							
<i>Chrysophyllum gonocarpum</i> Engler	Aguay	Native	Berry	Af	Salta	RG, YSF	9
				Cc	Salta	RG, YSF	9
Solanaceae							
<i>Lycopersicon esculentum</i> Mill.	Tomato	Exotic	Berry	Cc	Entre Ríos	RG	12

Table 1. Continuation

Plant Family Botanical name	Common name	Plant origin	Fruit type ¹	Fruit Fly species	Provinces with Cc and Af-positive samples ²	Cc and Af-positive habitat ³	Refer- ences ⁴
<i>Capsicum annuum</i> L.	Common pepper	Exotic	Berry	Cc	La Rioja	RG	7
					La Rioja	RG	7
<i>Salpichroa orig- anifolia</i> Tell.	?	Native	Berry	Cc	Entre Ríos	RG	12
					La Rioja	RG	7
<i>Solanum diflorum</i> Vell.	?	Native	Berry	Cc	Entre Ríos	RG	12
<i>S. elaeagnifolium</i> Cav.	Wild pep- per	Native	Berry	Cc	La Rioja	RG	7
<i>S. glaucophyllum</i> Desf.	White peach	Native	Berry	Cc	Entre Ríos	RG	12
<i>Solanum sisym- briifolium</i> Lam	Tutiá	?	Berry	Af	Tucumán	?	3
				Cc	Entre Ríos	RG	Put96

¹ Fruit types. Berry: fruit with pulpy endocarp which has one or more seeds; Drupe: indehiscent fruit with pulpy meso-
carp, ligneous endocarp, and only one seed; Nuculenus: pulpy fruit which has several stones; Pome: fruit originated in
an epigynous flower which has a pulpy clamidocarp; Syconus: pseudos-fruit which consists in a puply goblet-shaped
receptacle which contains numerous flowers; Esperydium: fruit originated in a syncarpous gyneveum with axillar pla-
centation.

² Cc = *Ceratitis capitata*; Af = *Anastrepha fraterculus*.

³ Complete descriptions in Table 3

⁴ See references in Literature Cited.

Table 2. Geographical coordinates, and altitudes for each fruit fly host plants collection locality in Ar-
gentina

Province	Localities	Geographic coordinates			Phytogeographical Region
		Latitude (S)	Longi- tude (W)	Altitude (m)	
Catamarca	Capayan	28° 46'	66° 03'	358	Chaqueña
	Chumbicha	28° 52'	66° 18'	377	Chaqueña
	S.F.V. Catama- rca	28° 28'	65° 47'	505	Chaqueña
	San Isidro	28'	65° 44'	514	Chaqueña
	San José	26° 78'	33° 06'	984	Chaqueña
	Santa María	26° 42'	66° 02'	1885	Monte
	Santa Rosa	28° 45'	65° 71'	512	Chaqueña
	Sumalao	28° 28'	65° 45'	518	Chaqueña
	Villa Dolores	28° 27'	65° 43'	530	Chaqueña

Table 2. Continuation

Province	Localities	Geographic coordinates			Phytogeographical Region
		Latitude (S)	Longitude (W)	Altitude (m)	
Jujuy	Calilegua	23° 47'	64° 46'	462	Las Yungas
	Caimancito	23° 44'	64° 36'	367	Las Yungas
	Ledesma	23° 50'	64° 47'	413	Las Yungas
	León	24° 02'	65° 26'	1962	Las Yungas
	Perico	24° 23'	65° 07'	897	Las Yungas
	Quebrada de Humahuaca	23° 12'	65° 21'	2919	Puna
	San Pedro	24° 14'	64° 52'	582	Chaqueña
	Yuto	23° 38'	64° 28'	346	Las Yungas
	Tucumán	Alpachiri	27° 20'	65° 46'	540
Concepción		27° 21'	65° 36'	405	Chaqueña
El Corte		26° 48'	65° 20'	650	Las Yungas
El Siambón		26° 43'	65° 27'	1185	Las Yungas
El Timbó		26° 42'	65° 08'	590	Las Yungas
Famaillá		27° 03'	65° 25'	361	Las Yungas
Horco Molle		26° 91'	65° 08'	466	Las Yungas
La Cocha		27° 47'	65° 34'	444	Chaqueña
La Florida		27° 14'	65° 34'	430	Las Yungas
La Ramada		26° 42'	64° 57'	570	Las Yungas
La Reducción		26° 58'	65° 22'	550	Las Yungas
La Rinconada		26° 51'	65° 19'	510	Las Yungas
Los Nogales		26° 42'	65° 16'	600	Chaqueña
Los Pérez		27° 23'	65° 38'	510	Chaqueña
Los Sosa		27° 09'	65° 34'	420	Las Yungas
Malvinas		26° 55'	65° 17'	550	Las Yungas
Potrero las Tablas		26° 54'	65° 25'	850	Las Yungas
Pueblo Viejo		27° 13'	65° 35'	371	Las Yungas
Quebrada de Lules		26° 56'	65° 21'	545	Las Yungas
Raco		26° 39'	65° 26'	1172	Las Yungas
Rumi Punco		28° 01'	65° 34'	440	Chaqueña
S.M. de Tucumán		26° 50'	65° 13'	426	Chaqueña
San Felipe		26° 45'	65° 16'	600	Las Yungas

Table 2. Continuation

Province	Localities	Geographic coordinates			Phytogeographical Region
		Latitude (S)	Longitude (W)	Altitude (m)	
	San Javier	26° 47'	65° 24'	950	Las Yungas
	San Pablo	26° 53'	65° 16'	412	Las Yungas
	San Pedro de Colalao	26° 14'	65° 30'	1080	Las Yungas
	Sauce Guascho	26° 59'	65° 27'	500	Las Yungas
	Tafi Viejo	26° 44'	65° 16'	609	Las Yungas
	Taxicillo	26° 42'	65° 17'	619	Las Yungas
	Taruca Pampa	26° 35'	64° 50'	548	Las Yungas
	Villa Alberdi	27° 36'	65° 37'	390	Chaqueña
	Villa Carmela	26° 45'	65° 17'	609	Las Yungas
	Villa Padre Monti	26° 30'	64° 57'	770	Las Yungas
	Villa Quinteros	27° 15'	65° 33'	371	Chaqueña
Misiones	Caragatay	26° 36'	54° 45'	193	Paranaense
	El Dorado	26° 38'	54° 66'	227	Paranaense
	Itacuruzú	26° 90'	55° 13'	96	Paranaense
	Loreto	27° 19'	55° 32'	114	Paranaense
	Montecarlo	23° 33'	54° 47'	161	Paranaense
	Posadas	27° 22'	55° 53'	133	Paranaense
	Taruma	26° 70'	54° 66'	150	Paranaense
Entre Ríos	Chajarí	30° 45'	57° 59'	55	Espinal
	Concordia	31° 24'	58° 01'	22	Pampeana
	Humaitá	31° 78'	58° 30'	44	Pampeana
	La Criolla	31° 17'	58° 06'	38	Pampeana
	Palmar	31° 58'	58° 18'	44	Pampeana
	Paraná	31° 44'	60° 32'	71	Espinal
	Pto. Yerúa	31° 32'	58° 01'	35	Pampeana
	Villa Adela	31° 10'	58° 20'	40	Pampeana
	Villa Zorraquín	31° 19'	58° 01'	47	Pampeana
La Rioja	Chilecito	29° 10'	67° 30'	1080	Monte
	Guandacol	29° 32'	68° 32'	1053	Monte
	Los Dorados	29° 35'	67° 47'	1063	Monte
	Los Sarmientos	29° 10'	67° 29'	1072	Monte
Salta	Aguas Blancas	22° 45'	64° 22'	405	Las Yungas

Table 2. Continuation

Province	Localities	Geographic coordinates			Phytogeographical Region
		Latitude (S)	Longitude (W)	Altitude (m)	
	Cafayate	26° 06'	65° 57'	1624	Monte
	Campo Santo	24° 42'	65° 06'	580	Chaqueña
	Cerrillos	24° 55'	65° 29'	1248	Las Yungas
	Cnia. Santa Rosa	23° 22'	64° 30'	322	Las Yungas
	Embarcación	23° 13'	64° 07'	274	Chaqueña
	El Oculito	23° 06'	64° 24'	530	Las Yungas
	La Caldera	24° 37'	65° 23'	1390	Las Yungas
	Metán	25° 30'	64° 58'	803	Las Yungas
	Orán	27° 06'	65° 01'	337	Las Yungas
	Pichanal	23° 19'	64° 14'	303	Las Yungas
	Rosario de Lerma	24° 59'	65° 35'	1329	Las Yungas
	San Ramón Nueva Orán	23° 08'	64° 20'	376	Las Yungas
	Tabacal	23° 17'	64° 15'	435	Las Yungas
	Urundel	23° 33'	64° 25'	359	Las Yungas
Córdoba	Córdoba city	31° 48'	64° 22'	425	Chaqueña
	Villa Dolores	31° 57'	65° 12'	---	Chaqueña
	Yacanto	32° 03'	65° 02'	1141	Chaqueña
Corrientes	9 de Julio	28° 50'	58° 50'	55	Chaqueña
	Bella Vista	28° 31'	59° 02'	68	Chaqueña
	General Paz	27° 45'	57° 35'	75	Paranaense
	Ituzaingó	27° 35'	56° 41'	63	Paranaense
	Monte Caseros	30° 15'	57° 38'	35	Espinal
	Sombrerito	27° 70'	58° 70'	65	Paranaense
	Virasoro	28° 50'	56° 17'	112	Espinal
Buenos Aires	Cap. Federal	34° 36'	58° 25'	29	Pampeana
	Castelar	34° 39'	58° 39'	30	Pampeana
	Doyle	33° 46'	60° 10'	20	Pampeana
	Gdor. Castro	33° 40'	59° 53'	52	Pampeana
	Ituzaingó	34° 40'	58° 40'	31	Pampeana
	José C. Paz	34° 31'	58° 45'	---	Pampeana

Table 2. Continuation

Province	Localities	Geographic coordinates			Phytogeographical Region
		Latitude (S)	Longitude (W)	Altitude (m)	
	Mercedes	34° 39'	59° 26'	117	Pampeana
	Pilar	34° 28'	58° 55'	19	Pampeana
	San Nicolás	33° 20'	60° 13'	21	Pampeana
	San Pedro	33° 42'	59° 41'	15	Pampeana
	Villa Adelina	34° 32'	58° 33'	24	Pampeana
Chaco	Saenz Peña	26° 47'	60° 26'	60	Chaqueña
San Luis	Lujan	32° 22'	65° 56'	589	Chaqueña
	Merlo	32° 21'	65° 02'	808	Chaqueña
	Quines	32° 14'	65° 48'	482	Chaqueña
Santa Fé	Arocena	32° 05'	60° 58'	14	Pampeana
	Monje	32° 22'	60° 56'	15	Pampeana
	Reconquista	29° 09'	59° 40'	53	Chaqueña

Table 3. General Description of collection habitats in Argentina

Abbreviation	Collection habitats	Description
UG	Urban garden	Backyard gardens with mainly exotic fruit species inside the city
RG	Rural garden	Backyard gardens and small family fruit orchard with exotic and native fruit species surrounded by fruit groves or wild vegetation
CO	Commercial fruit orchard	Large extension of land cultivated with fruit of commercial value
EO	Experimental fruit orchard	Small extension of land cultivated with fruit species for agronomic studies
YSF	Yungas secondary forest	Perturbed areas of the subtropical rain forest of the northwestern Argentina (locally known as "Yungas") covered with wild, native and exotic vegetation

Abbreviation	Collection habitats	Description
PSF	Paranaense secondary forest	Perturbed areas of the subtropical rain forest of the northeastern Argentina (locally known as "Selva Paranaense") covered with wild, native and exotic vegetation
DS	Dry scrub	Hot and dry areas covered with deciduous xerophytic forests

DISCUSSION

Even though 56 plant species were recorded as hosts to *A. fraterculus* and/or *C. capitata* in Argentina, only 51 fruit species are considered here. Some host plant records are anecdotal or are based on reports of adult flies captured in liquid traps placed in fruiting trees. For example, Rust (1918) mentioned *Persea americana* Miller (Avocado; (Lauraceae), *Psidium cattleianum* Sabine, and *P. luridum* (Spreng.) Burr. (Myrtaceae) as hosts of *A. fraterculus* in NW Argentina, but this author provides no evidence for confirming the status of these three fruit species as host plants to *A. fraterculus* (Ovruski et al. 2003). Other host plant records, such as *Olea europaea* L. (Olive) (Oleaceae) and *Celtis tala* Gill. (Ulmaceae), have not been confirmed since their first publication (Nasca et al. 1996) despite conducting several fruit collections in La Rioja to date (M. Frissolo, personal communication). The few species belonging to the genus *Celtis* L. in Argentina have only been associated with fly species of *Rhagoletotrypeta* genus (Ovruski et al. 2005b). We consider that the *O. europaea* and *C. tala* records must be confirmed before these two fruit species appear in a host plant list to *C. capitata*.

The wide variety of native and exotic host fruit species growing in different habitats allow both *C. capitata* and *A. fraterculus* to make use of a wide variety of resources for maintenance and reproduction and increase of their natural populations. *Anastrepha fraterculus* and *C. capitata* can complete their life cycles

using 33 and 47 fruit species respectively as oviposition substrates.

According to bibliographic data, especially information obtained from Ovruski et al. (2003, 2004, 2005a), and Segura et al. (2006) articles, Medfly was mainly abundant in perturbed habitats such as backyard gardens in urban and rural houses, and in commercial and experimental fruit orchards in all sampled localities. In contrast, *A. fraterculus* was found mostly in association with native Myrtaceae and Juglandaceae species, and exotic "feral" fruit species such as *Psidium guajava* L. and *Prunus* spp., which form part of the wild vegetation in Yungas and Paranaense secondary forests. Similar observations were made by Malavasi et al. (1980), Malavasi and Morgante (1981), and Malavasi (2000) in Brazil. According to this information, it is clear that *C. capitata* appears to adapt well to perturbed environments with a predominance of exotic fruit species.

Unfortunately, wild native hosts of *A. fraterculus* and *C. capitata* in Argentina have been poorly studied. Only nine (17.6% of the total species cited in Table 1) and 13 native fruit species (25.5%) were recorded as hosts to *A. fraterculus* and *C. capitata*, respectively. For example, in the case of *A. fraterculus*, fruit species such as *Eugenia uniflora* L., *Myrcianthes pungens* (Berg.), and *Juglans australis* Grisebach have been reported in Tucumán by Nasca (1973), Nasca et al. (1981), Fernández de Araoz and Nasca (1984), Nasca et al. (1988), and Ovruski et al. (2003); *Myrcianthes pun-*

gens and *Hexachlamys edulis* (Berg.) Krausel and Legrand in Entre Ríos by Vergani (1952), and Putruele (1996); *H. edulis* (cited as *Eugenia myrcianthes* Berg), *Campomanesia crenata* Berg and *Eugenia retusa* Berg in Misiones by Ogloblin (1937) and Turica and Mallo (1961); *Chrysophyllum gonocarpum* (Mart. et Eich.), *Inga marginata* by Engler and Wild in Salta and Tucumán, respectively, and by Oroño et al. (2005). These data reinforce the importance of conducting fruit surveys in environments with extensive areas of native vegetation. Also, as was suggested by Aluja (1996, 1999), it is necessary to carry out fruit collections over long periods (several fruiting seasons). Consequently, the information yielded by these types of ecological studies can give support to the Argentinean National Fruit Fly Control and Eradication Program to develop management strategies in the fruit-growing regions of Argentina, where both tephritid species have numerous alternative host plants.

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