Agronomía Colombiana
ISSN: 0120-9965
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Universidad Nacional de Colombia
Colombia

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Agronomía Colombiana, vol. 34, núm. 2, 2016, pp. 200-208
Universidad Nacional de Colombia
Bogotá, Colombia

Hymenopterous parasitoids of *Dasiops* (Diptera: Lonchaeidae) infesting cultivated *Passiflora* spp. (Passifloraceae) in Cundinamarca and Boyaca, Colombia

Parasitoides himenópteros de *Dasiops* (Diptera: Lonchaeidae) que infestan *Passiflora* spp. (Passifloraceae) cultivadas en Cundinamarca y Boyacá, Colombia

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ABSTRACT

Dasiops spp. are the most important pest in cultivated *Passiflora* plants. Larvae of these fruit flies are herbivores, feeding on flower buds and fruit of yellow passionfruit, sweet granadilla, banana passionfruit and purple passionfruit crops located in Cundinamarca and Boyaca, Colombia. Geographic distribution, natural abundance and percentage of parasitoidism for every *Dasiops* species by each plant species were determined. *Aganaspis pelleranoi* (Hymenoptera: Figitidae) was found to be a parasitoid of *D. inedulis* (14.19-50.00%), infesting flower buds of yellow passionfruit and fruit of sweet granadilla (7.41%). *Microcrasis* sp. (Hymenoptera: Braconidae) was found to be parasitizing both *D. gracilis* (0.83-3.13%) and *D. inedulis* (0.83%) in purple and yellow passionfruit. *Trichopria* sp. and *Pentapria* sp. (Hymenoptera: Diapriidae) were found to be parasitizing *D. inedulis* (40.00% and 4.17-20.00%, respectively) and *D. gracilis* (1.69-22.22% and 1.67-29.17%, respectively) in purple passion fruit. *Dasiops caustonae* was found to be infesting banana passionfruit only in Boyaca, naturally parasitized by *Pentapria* sp. (11.11-33.33%). Because *Pentapria* sp. had a wide geographical distribution as an idiobiont of *Dasiops* spp. pupae, in all of the assessed cultivated *Passiflora* species, despite a high selection pressure by chemical control distributed at regular calendar intervals, it would be a crucial strategy in pest management control. Collecting fallen flower buds and fruit infested by *Dasiops* spp. is important to truncate the life cycle of fruit flies and allow emergence of parasitoids. This simple cultural strategy could have important implications in reducing production costs, increased crop yields and environmental care.

Key words: Hymenoptera, fruit flies, Lonchaeidae biodiversity.

RESUMEN

Dasiops spp. son la plaga más importante de plantas cultivadas de *Passiflora*. Las larvas de estas moscas de la fruta consumen botón floral y fruto de cultivos de maracuyá, granadilla, curuba y gulupa localizados en los departamentos de Cundinamarca y Boyacá en Colombia. Se determinó la distribución geográfica, abundancia natural y porcentaje de parasitoidismo para cada especie de *Dasiops* en cada especie de planta. *Aganaspis pelleranoi* (Hymenoptera: Figitidae) fue encontrada como parasitoide de *D. inedulis* (14,19-50,00%) que infestó botón floral de maracuyá y fruto de granadilla (7,41%). *Microcrasis* sp. (Hymenoptera: Braconidae) fue encontrada como parasitoide de *D. gracilis* (0,83-3,13%) y *D. inedulis* (0.83%) en gulupa y maracuyá. *Trichopria* sp. y *Pentapria* sp. (Hymenoptera: Diapriidae) fueron encontradas parasitando *D. inedulis* (40,00% y 4,17-20,00%, respectivamente) y *D. gracilis* (1,69-22,22% y 1,67-29,17%, respectivamente) en gulupa. *D. caustonae* fue encontrada infestando curuba únicamente en Boyacá y parasitada naturalmente por *Pentapria* sp. (11,11-33,33%). Debido a que *Pentapria* sp. mostró amplia distribución geográfica como idiobionte de pupas de *Dasiops* spp., en todas las especies de *Passiflora* estudiadas, a pesar de la presión de selección por el control químico implementado tipo calendario, sería una estrategia crucial en el control de plagas. La recolección de botones florales y frutos infestados por *Dasiops* spp., es importante para cortar el ciclo de vida de las moscas de la fruta y permitir la emergencia de parasitoides. Esta simple estrategia cultural podría tener importantes implicaciones en la reducción de costos de producción, el aumento de los rendimientos de los cultivos y el cuidado del ambiente.

Palabras clave: Hymenoptera, moscas de la fruta, Lonchaeidae, biodiversidad.

Introduction

The species of cultivated *Passiflora* that are the most widespread and important in the national and international markets are yellow passionfruit (*Passiflora edulis* f. *flavicarpa* Deg.), sweet granadilla (*P. ligularis* Juss.), purple passionfruit (*P. edulis* Sims and banana passionfruit (*P. tripartita* var. *mollissima* Nielsen & Jorgensen) (MADR, 2015).

Received for publication: 5 February, 2016. Accepted for publication: 30 June, 2016. Doi: 10.15446/agron.colomb.v34n2.55616

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The flies of the *Dasiops* Rondani (Diptera: Lonchaeidae) genus are the insect pests of major economic importance in cultivated *Passiflora*, due to the habit of the larvae consuming the internal structures of flowers bud and fruit (Santamaria *et al.,* 2014; Castro *et al.,* 2012). They are responsible for causing production losses in excess of 50% (Castro *et al.,* 2012).

Different species of flies of the *Dasiops* genus that infest cultivated *Passiflora* are currently recognized. *Dasiops inedulis* Steyskal infests flower buds of purple passionfruit, sweet granadilla and yellow passionfruit. Specific infestations exist regarding the vegetal species: *D. yepezi* Norrbom and McAlpine in sweet granadilla, *D. gracilis* Norrbom and McAlpine in purple passionfruit and *D. caustonae* Norrbom and McAlpine in banana passionfruit (Santamaría *et al.,* 2014; Castro *et al*., 2012).

To control *Dasiops* spp., most farmers implement conventional strategies based on the application of synthetic chemical insecticides on a calendar basis (Wyckhuys *et al.,* 2012). However, this management has affected the sustainability of the crops and has deteriorated the biodiversity that provides ecosystem services such as biological control (CDB, 2010).

The natural enemies of pest populations are crucial in the context of sustainable agriculture because it provides benefits at an economic, social and environmental level (Gliessmann, 2006; Thomson and Hoffmann, 2010). Among their natural enemies, parasitoids of the Hymenoptera order are particularly significant due to the specificity they have for their hosts. For this reason, they have been used extensively for biological control (Heraty, 2009). The idea is to consider the parasitoids that act naturally because they constitute model systems that provide benefits for natural control (Ehler, 1994) and do not represent the irreversible problems of exotic introductions (Haye *et al.,* 2005; Basso and Grille, 2009).

The aim of this study was to determine the natural parasitoid flies of the *Dasiops* genus and the relationship with four plant species of economically interesting *Passiflora* to estimate the trophic association between parasitoid, host, plant and the percentages of natural parasitism in the departments of Cundinamarca and Boyaca in Colombia.

Materials and methods

Study sites

Productive farms of passion fruit, purple passion fruit, sweet granadilla and banana passion fruit located in five municipalities of Cundinamarca and two municipalities of Boyaca were selected on records based on *Dasiops* spp., infestation. On each farm, samples were taken every 15 d for 17 months (Tab. 1). In all cases, the agronomic crop management was based on conventional chemical strategies. The geographical coordinates and altitude were determined by a global positioning system using GPS 40 Garmin device (Garmin, Schaffhausen, Switzerland).

Recovery of natural parasitoids and their association with each crop and Dasiops species

On each of the farms, 1 ha of the crop was selected to collect all floral buds and fruit infested by *Dasiops* spp., in accordance to specific symptoms of each species (Santamaría *et al*., 2014). These plant structures were placed separately in 30x40x15 cm white plastic containers, covered with 1 cm of sifted soil obtained from the crop and labelled flower bud traps (TB) or fruit traps (TF). Each trap was placed within the crop, 2 m from the edge in order to expose the larvae and pupae of the flies to the natural parasitoids (Tab. 1).

Every fortnight, the trap substrate was inspected to recover pupae of fruit flies. These were washed with clean water to remove adhering soil and pathogens and placed individually into plastic jars (10 cm in diameter x 6 cm high) containing 2 mm of sterilized river substrate sand and covered by a mesh top. The samples were maintained under controlled laboratory conditions to recover parasitoids that emerged. The conditions had an average temperature of 18°C, average relative humidity of 60% and a photoperiod of 12 h light/12 h dark.

The taxonomic identification of *Dasiops* species was based on morphological characters (Korytkowski, 2003) and Cheslavo Korytkowski from Panama University, as expert of this group, confirmed each one. Taxonomic classification of parasitoids was carried out based on morphological characteristics according to taxonomic keys and related scientific literature (Guimarães *et al*., 2003; Buffington and Ronquist, 2008; Sharkey and Wahl, 2006; Campos and Sharkey, 2006; Dix, 2009; Masner, 2006 a, b; Masner and García, 2002). Additionally, experts were consulted: Carlos Sarmiento of the Instituto de Ciencias Naturales Unal (Institute of Natural Sciences), Bogota ; Paul Hanson, Professor at the Universidad de Costa Rica (University of Costa Rica) ; Marta Loiacono of the Museo de La Plata, Division Entomologia (La Plata Museum, Entomology Division), Argentina; and Valmir Antonio Costa of the Centro Experimental do Instituto Biologico Heitor Penteado (Heitor Penteado Experimental Centre of the Biological Institute) Campinasm, Brazil. The levels of parasitoid presence were analyzed according to the mortality rate, which compared

TABLE 1. Number of traps for flower buds and fruit in accordance with the species of *Passiflora* spp. cultivated assessed in Cundinamarca and Boyaca departments in Colombia.

Plant species	Department	Municipality	Geographical coordinates	Altitude (m a.s.l.)	Life zones*	Number of traps installed		Number of flower per trap	Number of fruits per trap
Common and scientific name						TB	TF		
Yellow passionfruit *P. edulis* f. *flavicarpa*	Cundinamarca	Tena	4°40´07´´N 74°21´24´´W	966	LM-WP	1	1	10	38
		La Mesa	4°40´01´´N 74°31´26´´W	845	LM-WP	5	0	77	0
Subtotal yellow passionfruit (n)						6	1	87	38
Purple passionfruit *P. edulis* f. *edulis*	Cundinamarca	Fusagasuga	4°12´11´´N 74°12´38´´W	1,932	PM-WP	1	4	6	311
		Tibacuy	4°21´11´´N 74°28´14´´W	1,843	PM-WP	1	3	5	58
	Boyaca	Buenavista	5°31´08´´N 73°57´06´´W	2,100	PM-PHP	0	5	0	109
Subtotal purple passionfruit (n)						2	12	11	478
Sweet granadilla *P. ligularis*	Cundinamarca	San Bernardo	4°06´00´´N 74°12´22´´W	1,937	PM-WP	2	2	39	27
		Tena	4°40´07´´N 74°21´24´´W	1,781	PM-WP	1	1	21	12
	Boyaca	Buenavista	5°31´08´´N 73°57´06´´W	2,030	PM-PHP	4	4	35	18
Subtotal sweet granadilla (n)						7	7	95	57
Banana passionfruit *P. tripartita* var. *molissima*	Boyaca	Umbita	4°40´07´´N 74°21´24´´W	2,709	PM-PHP	0	5	0	59
Subtotal banana passionfruit (n)						0	5	0	59
Total						**15**	**25**	**193**	**632**

Life zones: premontane wet forest (PM-WP), lower montane wet forest (LM-WP), premontane per-humid forest (PM-PHP) (Holdridge, 1967).

the number of parasitoids with the number of adult flies of the *Dasiops* genus.

Results and discussion

Parasitoids belonging to Braconidae, Diapriidae and Figitidae Hymenoptera families were recorded (Tab. 2). All of these are endoparasitoids of the Diptera immature stages (Fernández and Sharkey, 2006). *Aganaspis pelleranoi* (Bretes, 1924) (Hymenoptera: Figitidae) was found to be a parasitoid of pupae of *D. yepezi* and *D. inedulis* (Fig. 1A); parasitoids of pupae of *D. inedulis* and *D. gracilis* were found *Microcrasis* sp. Fischer, 1975 (Hymenoptera: Braconidae) (Fig. 1B), *Trichopria* sp. Ashmead, 1893 (Hymenoptera: Diapriidae) (Fig. 1C) and *Pentapria* sp. Kieffer, 1905 (Hymenoptera: Diapriidae) (Fig. 1D). *Pentapria* sp., were found parasitizing *D. caustonae* in banana passionfruit.

A. pelleranoi was the first recorded instance of this species as a parasitoid of the genus *Dasiops* Rondani. This parasitoid emerged from pupae of *D. inedulis* and *D. yepezi* which infested flower buds of all *Passiflora* species evaluated and fruits of sweet granadilla, respectively (Tab. 2). However, *A. pelleranoi* is recognized as a koinobiont, endoparasitoid of larva and emerges in pupa, solitary, native to the Neotropics (Ovruski *et al*., 2000) parasitizing flies of the genus *Neosilba* (Diptera: Lonchaeidae) (Diaz and Gallardo, 2001) and, in several species of the genus *Anastrepha* (Nunes *et al*., 2012). The adult female is a forager; enters fruits infested by flies, seeks and detects larvae of the host through tactile exploration with antennae and tarsi, although it can be guided by chemical signals of plants (Guimarães and Zucchi, 2004; Aluja *et al.,* 2009). Parasitism of *D. yepezi* could occur when larvae fall down from fruits to pupate on soil or pushing up from fallen flower buds by *D. inedulis* infestation.

TABLE 2. Geographic distribution and abundance of natural parasitoids of the genus *Dasiops* flies in Cundinamarca and Boyaca departments in Colombia.

Parasitoid species	Family	Type of parasitoid	Number of parasitoids		Host	Cultivated passionflowers species	Passionflower structure affected by *Dasiops* spp.	Geographic distribution		Life zone (Holdridge, 1967)
			♀	♂				Mun.	Dep.	
Aganaspis pelleranoi	Figitidae	Koinobiont larva-pupa	2		*Dasiops yepezi*	Sweet granadilla	Fruit	Ten	Cu	PM-WP
			1		*Dasiops inedulis*	Sweet granadilla	Flower bud	Ten	Cu	PM-WP
			5	2		Yellow passionfruit	Flower bud	LM	Cu	LM-WP
Total			8	2						
Microcrasis sp.	Braconidae	Koinobiont larva-pupa	6		*Dasiops gracilis*	Purple passionfruit	Fruit	Fus	Cu	PM-WP
			1		*Dasiops inedulis*	Yellow passionfruit	Flower bud	LM	Cu	LM-WP
Total			7							
Trichopria sp.	Diapriidae	Idiobiont pupa	1	1	*Dasiops gracilis*	Yellow passionfruit	Fruit	Ten	Cu	LM-WP
			4	2		Purple passionfruit	Fruit	Fus	Cu	PM-WP
			1					Bue	By	PM-PHP
			1	1	*Dasiops inedulis*	Purple passionfruit	Flower bud	Fus	Cu	PM-WP
Total			7	4						
Pentapria sp.	Diapriidae	Koinobiont larva-pupa	2		*Dasiops gracilis*	Yellow passionfruit	Fruit	Ten	Cu	LM-WP
			37	8		Purple passionfruit	Fruit	Fus	Cu	PM-WP
			1	2				Bue	By	PM-PHP
				1		Sweet granadilla	Flower bud	Ten	Cu	PM-WP
				1	*Dasiops inedulis*	Purple passionfruit	Flower bud	Fus	Cu	PM-WP
			1			Sweet granadilla	Flower bud	SB	Cu	PM-WP
			1	2	*Dasiops caustonae*	Banana passionfruit	Fruit	Umb	By	PM-PHP
Total			42	14						
Total Parasitoids			**64**	**20**						

Ten. Tena; LM: La Mesa; Fus: Fusagasuga; SB: San Bernardo; Bue: Buenavista; Umb: Umbita; Cu: Cundinamarca; By: Boyaca.

FIGURE 1. Natural parasitoids of the genus *Dasiops* flies. A, *A. pelleranoi* male; B, *Microcrasis* sp. female; C, *Trichopria* sp. female; D, *Pentapria* sp. male.

A. pelleranoi presented variable percentage of parasitism in accordance to *Dasiops* species and cultivated passionflower species (Tab. 3). In *D. inedulis* infesting yellow passion fruit crops in La Mesa municipality, we registered 50 to 14% of parasitoidism, while just 4.17% was observed in the municipality of Tena (Tab. 3). In *D. yepezi,* as pest of sweet granadilla fruits, 4.2% parasitoidism was recorded. Sweet granadilla crops where this parasitoid was registered were characterized by having woodland in the periphery and flowering weeds within the growing area, characteristics that are advantageous for parasitoid populations, as they provide shelter and food (Hajek, 2004). Agro-ecosystems with greater diversity encourage the presence and activity of the parasitoid as observed on *Anastrepha* spp. where

TABLE 3. Percentage of parasitoidism by species of *Dasiops* and cultivated *Passiflora* in Cundinamarca and Boyaca departments in Colombia.

Parasitoid species	Host	Cultivated *Passiflora*	Structure	Geographic distribution		Number of pupas of *Dasiops* spp.	Number of *Dasiops* spp. flies emerged	Number of parasitoids	Percentage of parasitoids per sampling
Aganaspis pelleranoi	*Dasiops yepezi*	Gr	F	Ten	Cu	27	25	2	7.41
	Dasiops inedulis	Gr	B	Ten	Cu	24	23	1	4.17
	Dasiops inedulis	Ma	B	LM	Cu	6	3	3	50.00
						11	9	2	18.18
						6	5	1	16.67
						7	6	1	14.29
Mean									18.45 ± 14.95
Microcrasis sp.	*Dasiops gracilis*	Gu	F	Fus	Cu	160	155	5	3.13
						120	119	1	0.83
	Dasiops inedulis	Ma	B	LM	Cu	120	119	1	0.83
Mean									1.60 ± 1.08
Trichopria sp.	*Dasiops gracilis*	Ma	F	Ten	Cu	9	7	2	22.22
		Gu	F	Fus	Cu	24	23	1	4.17
						160	155	5	3.13
				Bue	By	59	58	1	1.69
	Dasiops inedulis	Gu	B	Fus	Cu	5	3	2	40
Mean									14.24 ± 14.90
Pentapria sp.	*Dasiops gracilis*	Ma	F	Ten	Cu	9	7	2	22.22
		Gu	F	Fus	Cu	24	22	2	29.17
						120	113	7	5
						160	154	6	18.75
						120	90	30	1.67
				Bue	By	8	7	1	12.5
						9	8	1	11.11
						59	58	1	1.69
	Dasiops inedulis	Gu	B	Fus	Cu	5	4	1	20
		Gr	B	SB	Cu	17	16	1	5.88
				Ten	Cu	24	23	1	4.17
	Dasiops caustonae	Cu	F	Umb	By	3	2	1	33.33
						9	8	1	11.11
						4	3	1	25
Mean									14.40 ± 10.05

Ma, *maracuya* (passion fruit); Gr, *granadilla* (sweet granadilla); Gu, gulupa (purple passion fruit); Cu, *curuba* (banana passion fruit); B, flower bud; F: fruit; Ten, Tena; LM, La Mesa; Fus, Fusagasuga; SB, San Bernardo; Bue, Buenavista; Umb, Umbita; Cu, Cundinamarca; By, Boyaca.

there was found an increase of 89.9% in shaded coffee productive systems (Souza *et al*., 2005). In this context, the results found in this study are important because, if *A. pelleranoi* can be found from Mexico to Argentina (Nunes *et al*., 2012), acting as generalist and oviposits regardless of the species of fly or host plant (Sivinski *et al*., 1997), this species could be found in other regions that produce sweet granadilla and passion fruit with infestations of *D. inedulis* and *D. yepezi* evaluated by Castro *et al*., (2012). As a koinobiont, allowing *Dasiops* to feed on plants during larvae stage, it is not a promising as biocontrol agent. However, *A. pelleranoi* is contributing to control of natural population of *Dasiops inedulis* and *D. yepezi* in Tena and La Mesa in the Cundinamarca Department, one of the more important areas to produce passion fruit crops.

Microcrasis sp., emerging from *D. gracilis* infested purple passion fruit and *D. inedulis* infested flower buds of passion fruit, is the first record as parasitoids of *Dasiops* spp. Because of seven putative species of *Microcrasis* being

registered in Colombia (Dix, 2009), *D. gracilis* and *D. inedulis* have been listed in several municipalities of Antioquia, Tolima, Meta, Huila, Caldas, Quindío, Risaralda and Valle del Cauca, where these crops are settled; the geographical distribution of these wasps should be wider (Castro *et al*., 2012). *Microcrasis* spp., are endoparasitoids koinobiont (larva-pupa) of Tephritidae fruit flies (Núñez *et al*., 2009), solitaries (Dix, 2009) and, endemic from the Neotropics (Wharton, 1997).

Over three evaluations, the percentage of parasitism of *Microcrasis* sp., on *D. inedulis* was low (0.83%), where, as in *D. gracilis. it* was affecting purple passion fruit crops (3.13%) (Tab. 3). Parasitoids of the genus *Microcrasis*, are better suited to humid agro-ecosystems associated with plants that provide shade (Núñez *et al*., 2009), then it is possible that this kind of monoculture is not the best refuge for adults of this species (Speight *et al*., 2008) or, competence with other parasitoids, as *A. pelleranoi* occupying the same niche, is affecting the efficiency of *Microcrasis* as parasitoid of *D. inedulis* (Hajek, 2004).

Male and female of *Trichopria* spp., emerging from *D. gracilis* as pest as fruits of yellow and purple passion fruit and from *D. inedulis* as pest of flower buds of purple passion fruit, (Tab. 2) constitute the first record of wasps of this genus as parasitoids of *Dasiops* spp. Eleven specimens, nine emerged from the pupae of *D. gracilis* and two from *D. inedulis*, representing seven females and four males with a sex ratio of 1:0.57, were obtained. These wasps, recognized as parasitoids of Diptera, particularly in Tephritidae species (Souza-Filho *et al*., 2007), have broad distribution derived by parthenogenesis (Harms and Grodowitz, 2011).

Trichopria sp. had inconsistent percentages of parasitoidism (Tab. 3). Parasitoidism of 40% was recorded for *D. inedulis* in purple passion fruit while on *D. gracilis*, it ranged between 1.69% and 4.17 on purple passion fruit and 22% in yellow passion fruit (Tab. 3). This parasitoid is a gregarious idiobiont parasitoid infesting pupae of several species of Diptera (García and Corseuil, 2004). In this study, every specimen obtained emerged from a *Dasiops* spp. pupa, possibly because of the high availability of hosts in the environment and the size of the pupae (Basso and Grille, 2009). However, the population dynamic of this parasitoid, endemic to the Neotropics, could be affected by the introduction of non-native (exotic) Diptera hosts (Monteiro and Prado, 2000), by high rainfall and by the variable population of native hosts.

Although *Pentapria* sp. have been registered parasitizing *D. inedulis* of sweet granadilla crops (Santos *et al*., 2009), we are presenting first records as parasitoids of *D. gracilis* and *D. inedulis* in yellow and purple passion fruit of *D. caustonae* in banana passionfruit and, of *D. inedulis* infesting flower buds of purple passion fruit (Tab. 2). Forty- two females and fourteen males were found, representing a sex ratio of 1:0.33, characterizing the most abundant natural population of parasitoid found in five of the six municipalities evaluated in this study. *Pentapria* inhabits ecosystems of high mountains, cloud forests and tundra in Neotropics and Nearctic regions (Masner and García, 2002) and, it has been registered in Colombia between 150 to 3,660 m a.s.l. (Arias-Penna, 2003). However, information on the biology, habits and rates of parasitism by this species is unknown (Masner, 2006b).

Levels of parasitism of *Pentapria* sp. varied across three species of flies in the four crops. The highest percentage of parasitoidism was recorded in banana passionfruit, with 33.3% for *D. caustonae* infesting fruits. For *D. gracilis,* a pest of purple passion fruit fruits, the percentage or parasitism ranged 1.67 to 29.17%. However, as parasitoid of pest affecting flower buds in *Passiflora*, maximum parasitoidism recorded was 5.88% in sweet granadilla and 20% in purple passion fruit (Tab. 3). *Pentapria* sp., unlike *A. pelleranoi*, *Microcrasis* sp. and *Trichopria* sp., was found in all four cultivated species of *Passiflora*, from which it can be inferred that this is the most recurrent and abundant parasitoid of flies of the genus *Dasiops*.

D. inedulis has a broad distribution as it affects flower buds from sweet granadilla, yellow and purple passion fruit crops, occupying several life zones (Castro *et al*., 2012) in accordance to the Holdridge classification (Holdridge, 1967). For this pest, all families of the parasitoids (*Aganaspis pelleranoi, Microcrasis* sp.*, Trichopria* sp., and *Pentapria* sp.) registered in this study, were found attacking *D. inedulis*. Additionally, there are more species acting as natural enemies to this fruit fly, as *Basalys* sp. (Hymenoptera: Diapriidae), *Pachycrepoideus. vindemmiae* (Rondani) (Hymenoptera: Pteromalidae), *Aspilota* sp. (Hymenoptera: Braconidae), *Bracon* sp. (Hymenoptera: Braconidae), *Orgilus* sp. (Hymenoptera: Braconidae) and *Opius* sp. (Hymenoptera: Braconidae) (Santos *et al*., 2009; Chacón and Rojas, 1984; Ambrecht, 1985; Aguiar-Menezes *et al*., 2004). Coupled with cultural practices that promote the establishment of parasitoids in *Passiflora* crops, an integrated crop management can be established to further address *D. inedulis*, floral species causing early abortion affecting crop yields (Santamaría *et al*., 2014).

It is clear that the abundance of the host, characteristics of each production system (i.e stringing/wiring; density)

but particularly, characteristics of the environment where crops are established, determine the abundance of natural enemies as parasitoids (Núñez *et al.,* 2009; García and Corseuil, 2004). Additionally, the natural population of parasitoids, but particularly microparasitoids as belonging to Braconidae family, are affected by abiotic conditions as rainfall limiting their efficacy to localize their host (Núñez *et al*., 2009; Hance *et al*., 2007). In this context, landscape management, promoting shelter and foraging sites for adult parasitoids is crucial to maintaining the natural populations of the natural enemies associated with crop production systems (Straub *et al*., 2008; Landis *et al*., 2000).

Pentapria sp., showed wide geographical distribution as an idiobiont of pupae of *Dasiops* spp., in all of the assessed cultivated *Passiflora* species , despite the high pressure of selection by chemical control distributed at regular calendar intervals. This species has an important value as biocontrol of fruit flies in *Passiflora* crops; however, more studies are required to define its potential implementation. Collecting fallen flower buds and fruits infested by *Dasiops* spp. is important to truncate the life cycle of fruit flies and allow emergence of parasitoids. This simple cultural strategy could have important implications in reducing production costs, increased crop yields and environmental care.

Acknowledgments

This study was financed by the Universidad Nacional de Colombia (National University of Colombia) Bogota campus, the Research Fund of the Faculty of Agronomy and the main campus of the Corporacion Universitaria Minuto de Dios (Minute of God Corporation University) and the Faculty of Engineering. Technical; scientific and logistical support were provided by the Instituto Colombiano Agropecuario ICA (Colombian Agricultural Institute) through the project "Adjustment, validation, and transfer of phytosanitary management technologies of the lonchaeid fly - *Dasiops* spp. (Diptera: Lonchaeidae), in *Passiflora* crops in Colombia" ASOHOFRUCOL code TR-1305. Sincere thanks are given to the following academics: Carlos Sarmiento, Professor at the Instituto de Ciencias Naturales Unal (Institute of Natural Sciences) - Bogotá, Paul Hanson, Professor at the Universidad de Costa Rica (University of Costa Rica), Marta Loiácono, of the Museo de La Plata, División Entomología (La Plata Museum, Entomology Division)- Argentina and Dr. Valmir Antonio Costa, of the Centro Experimental do Instituto Biológico Rodovia Heitor Penteado (Experimental Centre of the Rodovia Heitor Penteado Biological Institute) Campinas - Brazil. We give special thanks to the *Passiflora* growers and cultivators who are the reason for this study. In memory of the scientific contributions of Professor Cheslavo Korytkowski. Many thanks to Rosie Holmes at Lincoln University, Christchurch, New Zealand for her contribution to the English translation of this manuscript.

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