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PARASITIDS OF *Phyllocnistis citrella* IN JAGUARIÚNA, STATE OF SÃO PAULO, BRAZIL, BEFORE AND AFTER THE INTRODUCTION OF *Ageniaspis citricola*¹

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ABSTRACT: The citrus leafminer, *Phyllocnistis citrella* (Gracillariidae), is among the main pests of citrus in Brazil. The objective of this work was to conduct a survey of parasitoids attacking CLM in Jaguariúna, State of São Paulo, Brazil, before and after the introduction of *Ageniaspis citricola* (Encyrtidae). Collections of new leaves were made weekly at citrus groves from July-1997 to April-1999. During the survey period, *A. citricola* was introduced in the area. Before this introduction, *Galeopsomyia fausta* (Eulophidae) was the predominant species (about 91.83% of the species composition), but *A. citricola* became predominant after its establishment (60.10% against 38.30% *G. fausta*). Other parasitoids found were *Cirrospilus* sp. C (Eulophidae), *Horismenus* sp. (Eulophidae), *Elasmus* sp. (Elasmidae), *Eupelmus* sp. (Eupelmidae) and *Conura (Ceratosmicra)* sp. (Chalcididae).

Key words: leafminer, biological control, parasitoids, citrus

PARASITÓIDES DE *Phyllocnistis citrella* EM JAGUARIÚNA, ESTADO DE SÃO PAULO, BRASIL, ANTES E DEPOIS DA INTRODUÇÃO DE *Ageniaspis citricola*

RESUMO: A larva-minadora-da-folha-dos-citros, *Phyllocnistis citrella* (Gracillariidae), é atualmente uma praga de importância econômica na citricultura nacional. O objetivo deste trabalho foi identificar o complexo de parasitóides desta praga em Jaguariúna, SP, Brasil, antes e depois da introdução de *Ageniaspis citricola* (Encyrtidae). Coletas de brotações infestadas pela praga foram realizadas semanalmente, no período de Julho/96 a Abril/99. Durante o período do levantamento, *A. citricola* foi introduzido nesta área. Antes dessa introdução, *Galeopsomyia fausta* (Eulophidae) era a principal espécie a atacar *P. citrella* (91,83% dos parasitóides encontrados), mas *A. citricola* tornou-se predominante após seu estabelecimento na área de liberação (60,10% contra 38,30% de *G. fausta*). Também outros parasitóides foram encontrados: *Cirrospilus* sp. C (Eulophidae), *Horismenus* sp. (Eulophidae), *Elasmus* sp. (Elasmidae), *Eupelmus* sp. (Eupelmidae) and *Conura (Ceratosmicra)* sp. (Chalcididae).

Palavras-chave: larva-minadora-da-folha-dos-citros, controle biológico, parasitóides, citros

INTRODUCTION

The citrus leafminer (CLM), *Phyllocnistis citrella* Stainton (Lepidoptera: Gracillariidae), was first detected in Brazil in 1996 (Feichtenberger & Raga, 1996, Gravena, 1996, Prates et al., 1996). Some parasitoid species were found attacking the CLM in Brazil and in some cases achieved high parasitism rates (Perioto 1997, Pentead-Dias et al., 1997; Sá & Costa 1997, Costa et al., 1999). Preliminary results of a survey conducted at Jaguariúna, State of São Paulo, revealed the occurrence of six species of indigenous parasitoids of CLM, with *Galeopsomyia fausta* LaSalle (Hymenoptera: Eulophidae) the predominant species (Costa et al., 1999).

The objective of this work was to conduct another survey of parasitoids attacking CLM in Jaguariúna, State of São Paulo, Brazil, before and after the introduction of *Ageniaspis citricola* Logvinovskaya, in a classical biological control program.

MATERIAL AND METHODS

Leaves were collected weekly at two citrus groves in Jaguariúna, São Paulo, Brazil, from July 1997 to April 1999. The collected leaves were taken to the "Laboratório de Quarentena Costa Lima", at "Embrapa Meio Ambiente", and maintained in cages at 25°C, 80 ± 5% relative humidity

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and a photoperiod of 12h. Parasitoids were identified using the key of Schauff et al., 1998, and confirmed by Dr. John LaSalle (Unit of Parasitoid Systematics, CABI Bioscience, UK Centre, Ascot). Specimens were deposited in the collection of the "Museu do Laboratório de Quarentena Costa Lima", and in the collection of The Natural History Museum, London, UK.

Constancy were calculated as indicated by Bodenheimer, 1955 (*apud* Silveira Neto et al., 1976).

RESULTS AND DISCUSSION

From to July 1997 to April 1999, 13065 *P. citrella* larvae and pupae were collected from citrus leaves sampled in the Jaguariúna region and 48.70% of them were parasitized. But during the survey period (in July 1998), *Ageniaspis citricola* Logvinovskaya (Hymenoptera: Encyrtidae) was introduced into Brazil, coming from USA, through "Laboratório de Quarentena Costa Lima", at "Embrapa Meio Ambiente", in Jaguariúna, in cooperation with the "Fundo de Defesa da Citricultura" (FUNDECITRUS), "Escola Superior de Agricultura Luiz de Queiroz (ESALQ/USP)" and "Gravena Manejo Ecológico e Controle Biológico de Pragas Agrícolas Ltda. (GRAVENA MANECOL)". In October 1998 this exotic parasitoid was liberated post-quarantine in some citrus orchards in the State of São Paulo including orchards near the area where this survey was carried out, becoming established in January 1999. Thus, there are two distinct periods: before and after the establishment of *A. citricola*.

The first period (July 1997 - December 1998) was characterized by the predominance of *G. fausta*, which accounted for 91.83% of the parasitoids collected. Other parasitoids found were *Cirrospilus* sp. C (Hymenoptera: Eulophidae), *Horismenus* sp. (Hymenoptera: Eulophidae), *Elasmus* sp. (Hymenoptera: Elasmidae), *Eupelmus* sp. (Hymenoptera: Eupelmidae) and *Conura* (*Ceratosmicra*) sp.

(Hymenoptera: Chalcididae) (TABLE 1). *G. fausta* and *Cirrospilus* sp. C were present in 96.85 and 49.61% of the samples, respectively, while the other species were only incidentally found. All species were collected by Costa et al., 1999.

The situation was greatly modified after the establishment of *A. citricola* in the area, after January 1999 (TABLE 1). This endoparasitoid soon became the predominant species, accounting for 60.10% of the species composition. The frequency of *G. fausta* and *Cirrospilus* sp. C was lowered to 38.30 and 1.60%, respectively, while the other parasitoids were not found. Also, *A. citricola* was observed in 84.62% of the samples. These numbers may indicate a good adaptation of *A. citricola* to the citrus ecosystem of the Jaguariúna region. More studies are needed to precisely evaluate the consequences of *A. citricola* introduction into the State of São Paulo. In the U.S.A. and in Australia, *A. citricola* was introduced and established with success (Neale et al., 1995 and Hoy et al., 1997a, b).

In spite of the results obtained after *A. citricola* introduction, *G. fausta* still is a serious candidate for biological control of the citrus leafminer in this region of Brazil. This species has repeatedly been identified as one of the most important indigenous parasitoids of *P. citrella* in the New World (Cano, 1996; Cano et al., 1996; Castaño et al., 1996; Cave, 1996; Cobo, 1996; de la Llana, 1996; Frias & Diez, 1996; Martínez, 1996; Ruíz et al., 1997: all as *Galeopsomyia* sp.).

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TABLE 1 - Relative frequency and constancy of *P. citrella* parasitoids in Jaguariúna, São Paulo, Brazil, before (July 1997 - December 1998) and after (January - April 1999) the introduction of *A. citricola*.

Parasitoid Species	July 1997 - December 1998			January - April 1999		
	Number	Relative Frequency	Constancy	Number	Relative Frequency	Constancy
	----- % -----			----- % -----		
<i>Galeopsomyia fausta</i>	2775	91.83	96.85	72	38.30	92.31
<i>Cirrospilus</i> sp. C	157	5.20	49.61	3	1.60	23.08
<i>Horismenus</i> sp.	62	2.05	22.05	0	0.00	0.00
<i>Elasmus</i> sp.	26	0.86	8.66	0	0.00	0.00
<i>Eupelmus</i> sp.	1	0.03	0.79	0	0.00	0.00
<i>Conura</i> (<i>Ceratosmicra</i>) sp.	1	0.03	0.79	0	0.00	0.00
<i>Ageniaspis citricola</i>	-	-	-	113	60.10	84.62

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