Species composition and incidence of cabbage seedpod weevil parasitoids in Georgia, U.S.A.

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Abstract

Parasitoid species composition and incidence of the cabbage seedpod weevil (*Ceutorhynchus obstrictus* Marsham (Coleoptera: Curculionidae) was examined in winter canola (*Brassica napus* L.) during 1994 – 1996 in Georgia, USA. Canola seedpods were collected weekly during the larval development period and held in the laboratory to rear parasitoids. Five families and 13 species of Chalcidoidea (Hymenoptera) were reared from cabbage seedpod weevil samples over the 3-year period. *Lyrcus maculatus* (Gahan) was the most prevalent species comprising about 86% of total parasitoid fauna. This species plus three others, *Lyrcus perdubius* (Girault), *Neocatolaccus tylodermae* (Ashmead) and *Eurytoma tylodermatis* Ashmead (Eurytomidae), account for over 96% of the total parasitoid fauna. *Ceutorhynchus obstrictus* represented a new host record for eight parasitoid taxa including *N. tylodermae* and *E. tylodermatis*. The only previously reported parasitoid of *C. obstrictus* in eastern North America, *Trichomalus perfectus* (Walker), is erroneous because of misidentification. Only six of the 13 parasitoids also are reported to parasitize *C. obstrictus* in western North America. The most common species in Georgia, *L. maculatus*, is only an incidental parasitoid of *C. obstrictus* in western North America. Conversely, two common parasitoids in western North America, *Necremnus tidius* (Walker) and *Mesopolobus moryoides* Gibson, were incidental parasitoids of *C. obstrictus* in Georgia.

Key words: Canola, cabbage seedpod weevil, *Ceutorhynchus obstrictus*, parasitoids

Introduction

The cabbage seedpod weevil, *Ceutorhynchus obstrictus* Marsham (Coleoptera: Curculionidae), was introduced from Europe to western North America about 70 years ago. Since then it has become the most important insect pest of canola and rape, *Brassica napus* L. and *B. rapa* L. (Brassicaceae), in most areas of the continent where these are grown (Cárcamo et al. 2001, Kuhlmann et al. 2002). It was first reported from eastern North America in North Carolina, United States (USDA 1960) and is now known to extend from Georgia to Quebec and Ontario in eastern Canada (Brodeur et al. 2001, Mason et al. 2004). There have been several published surveys of the introduced and native chalcid (Hymenoptera: Chalcidoidea) parasitoids of the cabbage seedpod weevil in western North America, which have been reviewed by Gibson (2005). Murchie and Williams (1998) listed 7 identified and 4 unidentified species in 9 genera and 5 families of Chalcidoidea from the literature as parasitoids of *C. obstrictus* in North America, although almost all of the names either represent misidentifications or are now recognized as junior synonyms of older names (Gibson et al. 2005). Dosdall et al. (2006) newly reported another six chalcid species as reared from *B. napus* and *B. rapa* seedpods in Alberta. Consequently, the chalcid fauna purportedly parasitizing C. obstrictus in western North America includes at least 14 species (Table 1).

In contrast, there is only a single published report of parasitoids of *C. obstrictus* in eastern North America. Buntin (1998) stated that greater than 96% of the parasitoids recovered from seedpods of *B. napus* in Georgia were *Trichomalus perfectus* (Walker) (Pteromalidae). This species is the most common biological control agent of *C. obstrictus* in Europe (Murchie and Williams 1998) and was long thought to have been introduced to North America along with the seedpod weevil. However, Gibson et al. (2005) showed that all previous reports of *T. perfectus* in western North America were misidentifications of *T. lucidus* (Walker), another European species. The primary purpose of Buntin (1998) had been to examine the effect of trap cropping on the number of seedpod weevils and its parasitoids in winter oilseed rape, but the species identities of the parasitoids had never been investigated thoroughly. The second author examined the parasitoids reared by Buntin (1998) as part of a larger study to document the diversity and identity of the chalcid parasitoids of *C. obstrictus* in North America. This paper examines the diversity of chalcid parasitoids of *C. obstrictus* in Georgia compared to western North America.

Materials and Methods

The chalcid parasitoids reared by Buntin (1998) from seedpods of *B. napus* from the Bledsoe Research Farm located near Griffin, Georgia, USA from 1994 through 1996, were removed from ethanol, critical-point dried, point-mounted and identified to genus by the senior author using relevant family keys in Gibson et al. (1997). The second author (G.A.P.G.) was responsible for all species identifications except *Eurytoma tylodermatis* Ashmead (Eurytomidae), which was identified by MWG. Information concerning the method of species identification within each genus is provided under the relevant species discussion. Voucher specimens are deposited in the Canadian National Collection of Insects and Arachnids (CNC), Ottawa,

Ontario, the University of Georgia Museum of Natural History (UGCA), Athens, Georgia, and the United States National Museum of Natural History (USNM), Washington, District of Columbia.

Results and Discussion

A total of 1,124 specimens could be accurately identified. Five families, 10 genera, and 13 species of Chalcidoidea (Hymenoptera) were reared from the seedpods of *Brassica napus* as putative parasitoids of *C. obstrictus* in Georgia, United States. The species are *Conura torvina* (Cresson) (Chalcididae), *Euderus glaucus* Yoshimoto and *Necremnus tidius* (Walker) (Eulophidae), *Brasema allynii* (French) n. comb. and *Eupelmus cyaniceps* Ashmead (Eupelmidae), *Eurytoma tylodermatis* Ashmead (Eurytomidae), and *Lyrcus incertus* (Ashmead), *L. maculatus* (Gahan), *L. perdubius* (Girault), *Mesopolobus moryoides* Gibson, *Neocatolaccus tylodermae* (Ashmead), *Pteromalus cerealellae* (Ashmead) and *Pteromalus* sp. (Pteromalidae) (Table 1). The only previous report of a parasitoid of *C. obstrictus* in eastern North America, *T. perfectus* (Pteromalidae), is erroneous because of misidentification (also see Gibson et al. 2005, 2006a). *Ceutorhynchus obstrictus* represents a new host record for *B. allynii*, *E. glaucus*, *E. cyaniceps*, *E. tylodermatis*, *L. incertus*, *N. tylodermae*, *Pteromalus* sp. and *P. cerealellae*. Total parasitism of *C. obstrictus* in seedpods of winter canola that was not treated with insecticides ranged from 1.28 to 6.64% during the four years of the study (Table 2).

Table 1. Chalcids putatively parasitizing the cabbage seedpod weevil in Georgia as a percent of total specimens recovered and occurrence in western North America.

Family	Taxon	Georgia(% of Total)	Western North America
Chalcididae	*Conura albifrons* (Walsh)	-	+
	? *Conura side* (Walker)[1]	-	+
	Conura torvina (Cresson)	0.8	+
Eulophidae	*Euderus albitarsis* (Zetterstedt)	-	+
	Euderus glaucus Yoshimoto[2]	0.2	-
	Necremnus tidius (Walker)	0.5	+
Eupelmidae	*Brasema allynii* (French)	0.5	-
	Eupelmus cyaniceps Ashmead	0.4	-
	Eupelmus vesicularis (Retzius)	-	+
Eurytomidae	*Eurytoma tylodermatis* Ashmead	2.2	+
Pteromalidae	*Chlorocytus* sp.	-	+
	Lyrcus incertus (Ashmead)	0.5	-
	Lyrcus maculatus (Gahan)	85.8	+
	Lyrcus perdubius (Girault)	5.3	+
	Mesopolobus bruchophagi Gahan	-	+
	Mesopolobus mayetiolae (Gahan)	-	+
	Mesopolobus moryoides Gibson	0.2	+
	Neocatolaccus tylodermae (Ashmead)	2.9	-
	Pteromalus cerealellae (Ashmead)	0.1	-
	Pteromalus spp.[3]	0.4	+
	Trichomalus lucidus (Walker)	-	+++

[1]Single record, likely a misidentification of *C. torvina*.
[2]Most likely not a parasitoid of *C. obstrictus*. [3]Different species in the two regions.

Table 2. Total parasitism of *C. obstrictus* larvae within seedpod of untreated winter canola during four years at Griffin, GA.

Year	Parasitism (%)	Parasitoids per 100 pods
1994	1.74	1.25
1995	1.54	2.31
1996	6.64	7.42
1997	1.28	0.92

From Buntin (1988) Crop Protection 17:299-305.

The parasitoid fauna in Georgia shared the same five chalcid families as reared from *C. obstrictus* in western North America, and six species apparently are shared in common (Table 1). *Lyrcus maculatus* is by far the most common parasitoid of *C. obstrictus* in Georgia, comprising about 86% of the parasitoid fauna and 96% of the Pteromalidae reared. However, *L. maculatus* appears to be only an incidental parasitoid of *C. obstrictus* in western North America (Gibson et al. 2006b). In contrast, the most common parasitoid throughout most of western North America, *T. lucidus*, was not reared in Georgia. Moreover, *N. tidius* and *M. moryoides* are common parasitoids of *C. obstrictus* in at least some parts of western North America, but were reared as only incidental parasitoids in Georgia. This is the first distribution records of these species in eastern North America. If *C. obstrictus* was introduced from western North America, these parasitoid species may have been introduced accidentally at the same time.

Euderus glaucus, *B. allynii*, *E. cyaniceps*, *L. incertus*, *N. tylodermae*, *P. cerealellae* and the unidentified *Pteromalus* female represent new putative parasitoid records for *C. obstrictus*. *Lyrcus perdubius* and *N. tylodermae* constitute the second

and third most commonly reared parasitoids, respectively, of *C. obstrictus* in Georgia and both previously have been reared only from other species of Curculionidae. Consequently, these two host records are undoubtedly accurate. The other parasitoids reared from *B. napus* seedpods in Georgia are at most incidental parasitoids and have a taxonomically more diverse host range that indicates they are more habitat than host specific if *C. obstrictus* is indeed the true host of all the species. Buntin (1998) reared the parasitoids from mass-reared seedpods and a very few *Asaphes* and *Pachyneuron* and several Aphidiinae (Braconidae) recovered show that at least aphid mummies contaminated the seedpods. It is possible that in addition to *C. obstrictus* there were other undetected rare insects within or on the pods from which one or more of the uncommon parasitoid taxa emerged, such as *E. glaucus* whose only other known host record is a lepidopteran.

Finally, at least some of the incidental species, such as *C. torvina*, *B. allynii* and *E. cyaniceps*, could be hyperparasitoids rather than primary parasitoids. In addition, *L. incertus, L. perdubius, E. cyaniceps*, *E. tylodermatis* and *N. tylodermae* have been reported previously as parasitoids of the cotton boll weevil, *Anthonomus grandis*, though not the most commonly reared parasitoid of *C. obstrictus* in Georgia, *L. maculatus*. These results suggest that the chalcid parasitoid fauna acquired by *C. obstrictus* in any area where it is introduced is partly influenced by what other curculionid species occur in the region. If so, the parasitoid fauna from eastern Canada and the southeastern United States might be expected to differ as substantially as between eastern and western North America.

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