Hymenopteran Parasitoids (Hymenoptera: Aphidiidae) of Cereal Aphids (Sternorrhyncha: Aphidoidea) in Winter Wheat Crops in Slovakia

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Abstract


During 1997–1999, occurrence of hymenopteran parasitoids of cereal aphids was observed in different localities in Slovakia. Altogether, seven species of aphid parasitoids were recorded. The total numbers of particular species over the last three years were as follows: *Aphidius uzbekistanicus* (160 individuals – 42.4%), *Aphidius ervi* (83 individuals – 22.0%), *Aphidius rhopalosiphi* (66 individuals – 17.5%), *Ephedrus plagiator* (40 individuals – 10.6%), *Praon volucre* (26 individuals – 6.9%), *P. gallicum* (1 individual – 0.3%), and *Aphidius picipes* (1 individual – 0.2%). The abundance of the parasitoids in each year was: 185 individuals (49.1%) in 1999, 122 individuals (32.4%) in 1998, and 70 individuals (18.6%) in 1997.

Keywords: winter wheat; cereal aphid; parasitoids

MATERIAL AND METHODS

A species spectrum of cereal aphid parasitoids was observed at seven localities in Slovakia during 1997–1999 (Figure 1). At each sampling date, 100 tillers of winter wheat infested with aphids were randomly chosen for aphid collection. The sampling was carried out twice at the development stage of milk ripeness of wheat at all sampling places. The chosen tillers were carefully cut off and transported to laboratory inside plastic boxes. This collection method of aphid parasitoids is considered as the most appropriate (Starý 1970). In the laboratory, the material was kept for 1–2 days in refrigerator at the temperature of 8 ± 2°C. All mummified aphids on the plant substrate were removed immediately and stored inside glass jars closed with nylon mesh. The jars were maintained at the temperature of 18 ± 2°C until the parasitoids hatched and released the mummified aphid bodies. All of the hatched...
insects were captured and killed by diethyl acetate. The material stored in the refrigerator was taken out and kept at the laboratory temperature. If some mummified aphids appeared on tillers, they were transferred into glass jars and treated in the same manner. This killed adult parasitoids were stored in plugged glass tubes and labelled with the sample number, locality name, date of hatching, and number of individuals.

The parasitoid genera were determined by colouration and shape of the aphid mummies. Species of the genus *Aphidius* hatch out of oval yellowish brown mummies, in genus *Ephedrus* the mummies are black, and in genus *Praon* the larvae make a white cocoon under the killed aphid.

The parasitoid species were determined by structure, shape and coloration of the wing veins as well as by other taxonomic features using the identification keys by Starý (1981) and Powell (1982). RNDr. Petr Starý, DrSc., to whom the material was provided, confirmed these findings.

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The species spectrum was evaluated and compared throughout the years and localities by the interval confidence p₁–p₂ method (Anděl 1978).

**RESULTS**

The species spectrum of cereal aphid parasitoids recorded in seven localities in Slovakia during 1997–1999 is shown in Table 1.

During the survey, seven species of parasitoids were identified (*Hymenoptera, Braconidae, Aphidius*), namely *Aphidius ervi* (Haliday 1834), *Aphidius rhopalosiphi* (De S.Perez 1902), *Aphidius uzbekistanicus* (Luzhetzki 1960), *Aphidius picipes* (Nees 1811), *Ephedrus plagiator* (Nees 1811), *Praon volucre* (Haliday 1833) and *Praon gallicum* (Haliday 1833).

In 1997 the most abundant species were *A. ervi* (32 individuals – 45.7%), *A. uzbekistanicus* (14 individuals – 20.0%), and *E. plagiator* (11 individuals – 15.7%); in 1998 *A. uzbekistanicus* (45 individuals – 36.9%), *A. rhopalosiphi* (35 individuals – 28.7%), and *A. ervi* (23 individuals – 18.8%); in 1999 *A. uzbekistanicus* (101 individuals – 54.6%), *A. ervi* (28 individuals – 15.1%), *A. rhopalosiphi* (24 individuals – 13.0%), and *Ephedrus plagiator* (21 individuals – 11.3%). Other species occurred in aphid populations in numbers of 1–11 (0.8–5.9%), whereas *A. picipes* and *P. gallicum* were only observed in 1998 and just one individual of both species was recorded. Overall, in the course of three-year study of parasitoid populations in Slovakia, the abundance of species was as follows: *A. uzbekistanicus* (160 individuals – 42.4%), *A. ervi* (83 individuals – 22.0%), *A. rhopalosiphi* (66 individuals – 17.5%), *E. plagiator* (40 individuals – 10.6%), *P. volucre* (26 individuals – 6.9%), *A. picipes* (1 individual – 0.3%) and *P. gallicum* (1 individual – 0.3%).

When the occurrence of aphid parasitoids was evaluated by the localities or years, the highest number of individuals was recorded in the locality of Veľaty in 1999 (85 individuals) and in the locality of Zlatná na Ostrove in 1998 (38 individuals). The parasitoids were also found quite regularly in the localities...
of Bučany (13–25 individuals), Sliač (17–22 individuals) and Bátka (10–16 individuals).

Table 2 shows the results of statistical evaluation of the abundance of cereal aphid parasitoids in 1997–1999.

The abundance of A. ervi, A. uzbekistanicus and A. rhopalosiphi was significantly different from one another and also from other species, except of combinations A. uzbekistanicus and A. rhopalosiphi (in 1997), A. ervi and A. rhopalosiphi (in 1998, 1999), A. ervi and E. plagiator (in 1999), A. rhopalosiphi and E. plagiator (in 1999) where the difference in abundance was not significant. Significant differences were not found either between the numbers of A. picipes and P. gallicum, or between E. plagiator and P. volucre.

**DISCUSSION**

The results presented in this work is in accordance with the observations of many other authors e.g., Starý and Rejmánek (1981), Barabás (1982), Rabassee and Dedryver (1983), Cameron et al. (1984) and Pankanin-Franczyk (1994). Pankanin-Franczyk and Sobota (1998) also considered that out of the hymenopteran parasitoids of cereal aphids, the spe-
Table 2. Statistical evaluation of the cereal aphid parasitoids in 1997–1999

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*significant differences; no = no significant differences

dD – lower limit; dH – upper limit
cies A. uzbekistanicus is the most abundant. Carter et al. (1980) found differences in the species structure of cereal aphid parasitoids between different years, A. rhopalosiphi being the most abundant in 1976, A. rhopalosiphi and A. ervi in 1977, and A. picipes in 1978. The differences in the species composition in different years can reside in the different thermal constant of various Aphidius species (Latteur 1976; McLean 1980). In the Netherlands, Ankersmit (1982) found that the most important species in the populations of cereal aphids was A. rhopalosiphi, and in some years, A. picipes as well.

Our results show that A. rhopalosiphi was fairly less abundant than A. uzbekistanicus or A. ervi. A. picipes was only seldom observed in aphid colonies in Slovakia. Al. Dobai et al. (1999) found similar compositions of species of cereal aphid parasitoids in Slovakia but aphid colonies were surveyed in different localities.

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References


Súhrn


Na vybraných lokalitách Slovenska sme v rokoch 1997–1999 na obilných voškách zaznamenali sedem parazitoidov. Podľa početnosti bolo nasledovné poradie zistených druhov: Aphidius uzbekistanicus (160 jedincov – 42,4 %), Aphidius ervi (83 jedincov – 22,0 %), Aphidius rhopalosiphi (66 jedincov – 17,5 %), Ephedrus plagiator (40 jedincov – 10,6 %), Praon volucre (26 jedincov – 6,9 %), P. gallicum (1 jedinec – 0,3%) a Aphidius picipes (1 jedinec – 0,2 %).

Výskyt početnosti parazitoidov podľa rokov bol nasledovný: 1999 (185 jedincov – 49,1 %), 1998 (122 jedincov – 32,4 %) a 1997 (70 jedincov – 18,6 %).

Klúčové slová: pšenica ozimná; obilné vošky; parazitoidy

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