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University of Ljubljana
Biotechnical Faculty
Agronomy Department
Chair of Phytomedicine
Head: Prof. Ph. D. Jože Maček

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A STUDY ON *Aphelinus asychis* Walk. IN SLOVENIA

Lea MILEVOJ[1)]

ABSTRACT

The parasitoid *Aphelinus asychis* Walk. has been found in Slovenia. The present study concerns the parasitoid rearing within the green peach aphid (*Myzus persicae* Sulz.) on two Brussel sprout cultivars (*Brassica oleracea* var. *oleracea*), cvs. Hercules and Rosella. More mummies were produced on the cv. Hercules than on the cv. Rosella. *Aphelinus asychis* Walk. is an inferior competitor to the species *Aphidius* for *Myzus persicae* Sulz.

IZVLEČEK

PREUČEVANJE VRSTE *Aphelinus asychis* Walk. V SLOVENIJI

Parazitoid *Aphelinus asychis* Walk. je prvič ugotovljen v Sloveniji. Prikazano je njegovo gojenje na sivi breskovi uši (*Myzus persicae* Sulz.), na dveh kultivarjih brstičnega ohrovta (*Brassica oleracea* var. *oleracea*), 'hercules' in 'rosella'. Na cv. 'hercules' se je razvilo več mumij kot na cv. 'rosella'. *Aphelinus asychis* Walk. je v kompeticiji za *Myzus persicae* Sulz. slabši od *Aphidius* vrst.

INTRODUCTION

Aphelinus asychis Walk. (Hymenoptera, Aphelinidae) is an endophagous, solitary parasitoid, whose females lay eggs within aphids (Aphididae), which then turn black in a few days and are called mummies. Adult parasitoids emerge from mummies after two to three weeks..

This parasitoid species was studied on the aphid *Acyrthosiphon pisum* Harr. by Bai and Mackauer (1991), and on the species *Diuraphis noxia* Kurdjumov by Gonzáles, Summers and Qualset (1992), Prinsloo *et al.* (1993), Bernal and Gonzales (1993) and by Michels and Whiteaker-Derberg (1993). Kuo (1986) studied the parasitoid on wheat aphids *Metopolophium dirhodum* Walk.,

1) Associate Prof. Ph. D., SLO, 1000 Ljubljana, Jamnikarjeva 101

Rhopalosiphum padi L. and *Sitobion avenae* F. It was introduced into the US by Jackson and Eikenbary (1971) to control *Schizaphis graminum* Rond., and by Michels and Whitaker-Derberg (1993) to control *D. noxia*.

This paper reports about the discovery and the results of the first study on the parasitoid *Aphelinus asychis* Walk. in Slovenia, reared within the green peach aphid (*Myzus persicae* Sulz.), and about the interaction between this parasitoid and a parasitoid from the genus *Aphidius*.

MATERIAL AND METHODS

In 1990, in the laboratory field of the Biotechnical Faculty in Ljubljana, Slovenia, 10 pots with Brussel sprouts (*Brassica oleracea* var. *gemmifera* DC) were infested with the green peach aphid (*Myzus persicae* Sulz.) to monitor parasitoid species. In five of the pots, the cv. Hercules was grown and in the other five the cv. Rosella. On both cultivars species from the genera *Aphelinus*, *Aphidius* and *Praon* were found. The first experiment, carried out in the laboratory, was conducted to study parasitism of the green peach aphid (*Myzus persicae* Sulz.) with the species *Aphelinus*.

The raising of host plants, infestation of aphids and of parasitoids

Brussel sprouts, the cvs. Hercules and Rosella, were raised separately from seeds. Seedlings (two in each pot) were transplanted into flower pots (14 cm dia.). When the plants developed 4-5 proper leaves, ten adult subjects of the green peach aphid were transferred onto each plant using a paint-brush. They were incubated at a temperature of 25^{o}C and at a 14-hour illumination of 20,000 lux. The plants with aphids were then exposed for 48 hours to parasitoids so that females could lay eggs into them. Then each cultivar was placed into a separate insectarium and the number of non-parasitised and parasitised aphids was counted at five-day intervals. On the basis of these data, the percentage parasitism of aphids was calculated according to the following formula (Walton, 1986):

$$\% \text{ parasitism} = \frac{\text{No. of mummies}}{\text{No. of mummies} + \text{No. of live aphids}} \times 100$$

In the second experiment, carried out in a greenhouse, parasitism of the green peach aphid (*Myzus persicae* Sulz.) was studied on the parasitoids *Aphelinus* spp. and *Aphidius* spp. reared on the same cultivars as above. Host plants were raised and infested with the green peach aphid in the same way as in the first experiment. Then the plants infested with aphids were placed in the greenhouse with big openings on both sides so that parasitoids, which had been found in the vicinity, could fly inside to feed on the test plants. Twice a week, plants were examined and mummies were counted: separately those which belonged to the genus *Aphelinus* and those which belonged to the genus *Aphidius*.

RESULTS AND DISCUSSION

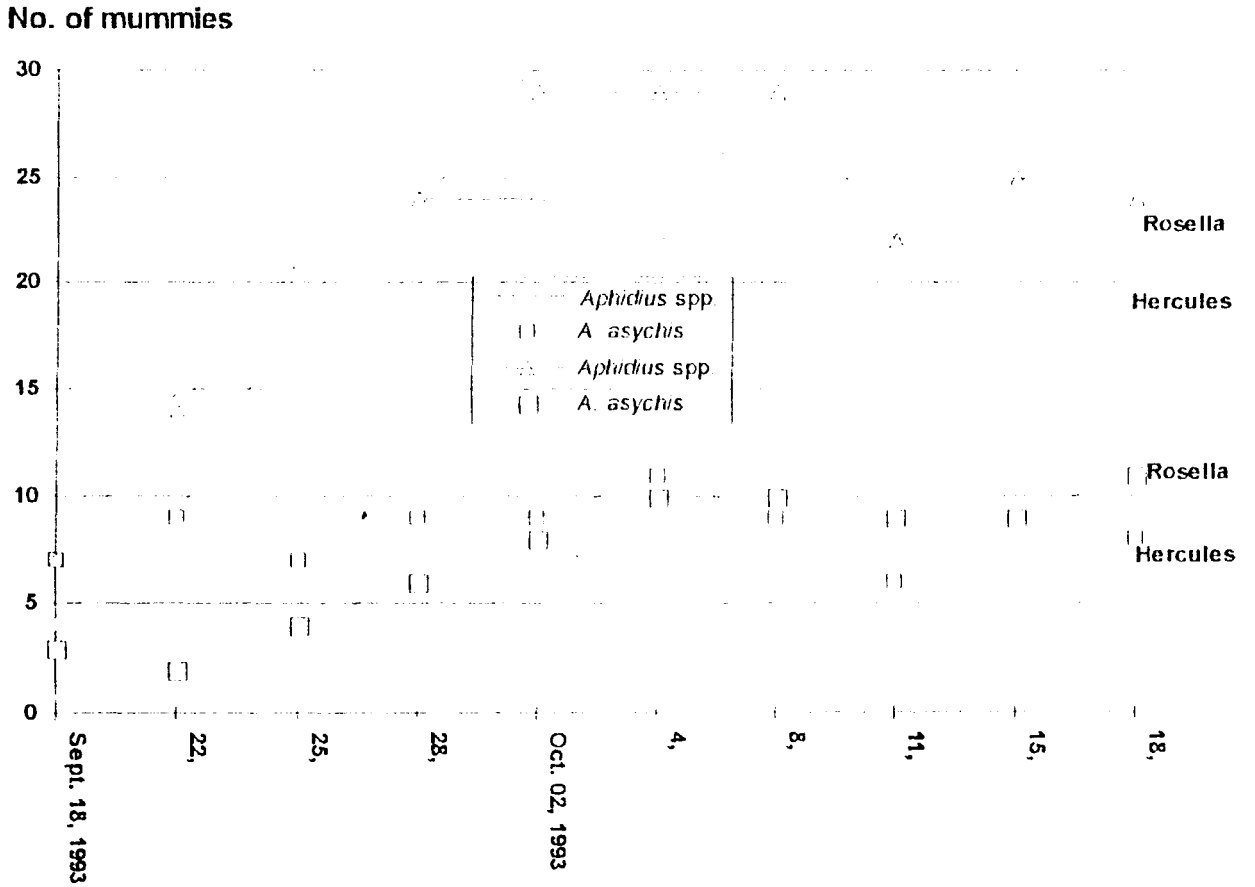
The study concerns the parasitoid species *Aphelinus asychis* Walk., which was first found in the vicinity of Ljubljana, Slovenia, in the early '90s. Taxonomically, it belongs to the order Hymenoptera, the suborder Apocrita, the superfamily Chalcidoidea and the family Aphelenidae. It is reared successfully in the laboratory within the green peach aphid (*Myzus persicae* Sulz.), as was found by the present study.

Table 1 shows the number of aphids *Myzus persicae* Sulz. and the number of mummies *Aphelinus asychis* per plant, reared on Brussel sprouts, whereby all subjects regardless their age were counted. Percentage parasitism of aphids is also shown. On December 7, 1994, the plants infested with aphids were placed in the insectaria, where they were exposed to parasitoids. The number of aphids and mummies was first counted after five days and then the count was repeated at five-day intervals. After the first and second count more aphids were found on the cv. Hercules than on the cv. Rosella, while in all the subsequent counts more aphids were found on the cv. Rosella. Contrary to this finding, the percentage parasitism of aphids was assessed higher for the cv. Hercules until the very end of the experiment, with the exception of the first count. The highest value (42.4% per plant) was attained 14 days after exposure to the parasitoids. The number of aphids in both cultivars increased especially in the last assessment and in the last but one, when the percentage parasitism decreased as well. In the last count the cv. Hercules plants had 17-19 leaves and those of cv. Rosella 17-21 leaves. The results of the laboratory experiment indicate that more eggs were laid on the cv. Hercules and that it this way the reproduction of aphids was impeded in comparison with the cv. Rosella. These findings are in agreement with those by Kuo (1986), who studied the species *A. asychis* on *Metopolophium dirhodum* reared on three oat cultivars. She found that more eggs were laid on Flämingsstern than on cv. Leanda.

Graph 1 shows the ratio between the number of mummies from two different parasitoid genera reared on the green peach aphid. The genus *Aphidius* was found to be more aggressive, having more mummies, while *Aphelinus asychis* showed interspecific host discrimination, since females laid fewer eggs in aphids. If parasitism of aphids on the cv. Hercules and the cv. Rosella is compared, it is evident that *A. asychis* developed better within aphids reared on the cv. Hercules than on the cv. Rosella. Bai and Mackauer (1991) found that *Aphelinus asychis* was an inferior competitor to *Aphidius ervi* for *Acyrthosiphon pisum.*

Table 1: The number of aphids *Myzus persicae* Sulz. and the number of mummies *Aphelinus asychis* Walk. on Brussel sprouts

Assessment dates:	Hercules		Rosella	
	No. of aphids No. of. mummies	% parasitism	No. of aphids No. of. mummies	% parasitism
Dec. 11, 1994	49 1	2.0	24 1	4.1
Dec. 16, 1994	152 41	21.2	73 18	19.7
Dec. 21, 1994	68 50	42.4	96 22	18.6
Dec. 26, 1994	51 29	36.2	87 17	16.3
Dec. 31, 1994	177 61	25.6	580 51	8.0
Jan. 05, 1994	279 49	14.9	1051 111	9.5



Graph 1: The comparison of the number of mummies of the species *Aphelinus asychis* Walk. and *Aphidius* spp. on *Myzus persicae* Sulz.

CONCLUSIONS

1. The parasitoid *Aphelinus asychis* Walk. has been discovered in the vicinity of Ljubljana, Slovenia.
2. For research purposes, it is successfully reared on the green peach aphid (*Myzus persicae* Sulz.).
3. Fewer aphids *Myzus persicae* Sulz. and more mummies *Aphelinus asychis* Walk. were produced on the cv. Hercules while more aphids but fewer mummies were produced on the cv. Rosella.
4. *Aphelinus asychis* Walk. loses in competition for *Myzus persicae* Sulz. to *Aphidius* spp.

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REFERENCES

Bai, B.,/ Mackauer, M. 1991. Recognition of heterospecific parasitism: competition between aphidiid (*Aphidius ervi*) and aphelinid (*Aphelinus asychis*) parasitoids of aphids (Hymenoptera: Aphidiidae, Aphelinidae).- Journal of Insect Behaviour 4, 3, p. 333-345.

Bernal, J.,/ Gonzáles, D. 1993. Temperature requirements of four parasites of the Russian wheat aphid *Diuraphis noxia*.- Entomologia Experimentalis et Applicata 69 (2), p. 173-182.

Gonzáles, D.,/ Summers, G. G.,/ Qualset, C. O. 1992. Russian wheat aphid natural enemies, resistant wheat offer potential control.- California Agriculture 46, 1, p. 32-34.

Jackson, H. B./ Eikenbary, R. D. 1971. Bionomics of *Aphelinus asychis* (Hymenoptera: Eulophidae) an introduced parasite of the sorghum greenbug.- Ann. Entomol. Soc. Am. 64, p. 81-85.

Kuo, H. L. 1986. Resistance of oats to cereal aphids: Effects on parasitism by *Aphelinus asychis* Walker. In: Boethel, D. J., R. D. Eikenbary (Ed.) Interaction of Plant Resistance and Parasitoids and Predators of Insects, Ellis Harwood Ltd., Chichester, p. 125-137.

Michels, G. J.,/ Whitaker-Derberg, R. L. 1993. Recovery of *Aphelinus asychis*, an imported parasitoid of Russian wheat aphid, in the Texas panhandle.- Southwestern Entomologist 18 (1), p. 11-17.

Prinsloo, G. J.,/ Hewitt, P. H.,/ Westhuizen, M. C. 1993. The effect of temperature on ovipositoin behaviour and success of two parasitoids of the Russian wheat aphid, *Diuraphis noxia* (Kurdjumov) (Hemiptera: Aphididae).- African Entomology 1, (2), p. 189-193.

Walton, M. P. 1986. The Application of Polyacrylamide Gel-Electrophoresis to the Study of Cereal Aphid Parasitoids.- Doctor Thesis, School of Natural Sciences, Hatfield, Herts, p. 29-33.