Acta fytotechnica et zootechnica, Vol. 4, 2001, Special Number
Proceedings of the International Scientific Conference on the Occasion of the 55th Anniversary of the Slovak Agricultural University in Nitra

BIONOMICS OF *SPERMOPHAGUS SERICEUS* (GEOFFROY) (COLEOPTERA: BRUCHIDAE) - A POTENTIAL BIOLOGICAL CONTROL AGENT OF *CONVOLVULUS ARVENSIS* L.

Peter TÓTH[1] , Monika VRÁBLOVÁ[2], Ľudovít CAGÁŇ[1]
[1]Department of Plant Protection, Slovak Agricultural University, A. Hlinku 2, 94976 Nitra, Slovak Republic
[2]Department of Sustainable Agriculture, Slovak Agricultural University, Mariánska 10, 94901 Nitra, Slovak Republic

Summary

During 1997-1998, field surveys were conducted to determine the incidence of seed beetles associated with field bindweed (*Convolvulus arvensis* L.) in Slovakia. The only insect species frequently associated with *C. arvensis* seeds was *Spermophagus sericeus* (Goeffroy) (Coleoptera: Bruchidae). This species was usual in the warmest regions in the south of Slovakia and less widespread in the temperate regions. *S. sericeus* adults were recorded during the whole growing season (May-September), with maximum from May 20 to June 30. Only a few individuals were found during July and August. In September, the small blurred peak of occurrence was observed. *S. sericeus* lays its eggs externally on the pod. Egg laying started in the beginning of June. Freshly hatched larvae burrowed through the pod wall and entered the seed from mid June. Larvae remained within the seed for pupation. *S. sericeus* could be significant for the biological control of field bindweed.

Key words: *Spermophagus sericeus*, seed beetles, field bindweed, Bruchidae

Introduction

Bruchidae can be found in every continent except of Antarctica. The largest number of species live in the tropical regions (Southgate, 1979). Many species have economic importance because they breed on grain legumes and consume valuable proteins (Lamprey et al., 1974). Intense destruction of seeds reduces the numbers of seedlings.
The larvae of Bruchidae feed and develop only in seeds. The majority of species (84%) feed within family Fabaceae. Remaining (16%) species feed on plants from 32 different families. Thence, species recorded on Convolvulaceae represent 4.5% (Borowiec, 1988). There are approximately 90 species of *Spermophagus* that have been described in the Old World. Twenty-four species of *Spermophagus* have been reported to feed in species of Convolvulaceae (Romero & Johnson 2000). In Europe, *Spermophagus sericeus* (Geoffroy, 1785) is only known species to breed on seeds of *Convolvulus arvensis* L. (Southgate 1979).
C. arvensis is very successful weed in agriculture. It is deep-rooted perennial and thus can escape many chemical and mechanical weed control methods. In this context, biocontrol appears as a promising alternative against bindweeds. Rodgers & Garrison (1975) have already suggested Bruchids for use in this way as an agent of biological control. As for any biological control program, the basic need is to study all aspects of the life of the selected species, especially information about population dynamics as well as host range. It was also the main aim of this research in connection with *S. sericeus*.

Material and methods

In 1997-1998, population dynamics and biology of seed beetle *S. sericeus* associated with *C. arvensis* L. plants was studied at locality Kamenica nad Hronom (48°19´N 18°09´E; 117 a. s. l.) and Vráble (48°15´N 18°19´E; 142 a. s. l.) in south-western Slovakia.
Insects were collected every week from mid May to end of September by sweeping/catching (3 x 50 sweepings) in the areas infested by field bindweed. Collected insects were put to death, sorted and identified. Furthermore, population density and behaviour of *S. sericeus* was observed under natural conditions at Kamenica nad Hronom. Surveys were based on 30 randomly selected flowers.

Results

S. sericeus was only species reared from seeds of *C. arvensis* in the laboratory. The species were the most frequent in warm and dry climatic regions (locality Kamenica nad Hronom) and much less widespread in the temperate (locality Vráble) and cold regions of Slovakia. It was also documented by 464 adults of *S. sericeus* collected in total by sweeping (May - September) at Kamenica nad Hronom in comparison with 54 adults from Vráble.
Some *S. sericeus* adults were seen during the whole growing season, with exception of July at Vráble. However, they were most common from May 20 to June 30. Number of adults achieved in this period average of 16.7±3.8 adults per 50 sweepings at Kamenica nad Hronom on May 27 in 1998 and 2.3±1.5 at Vráble on June 15 in 1997. Only a very few individuals were found during July and August. In September, the small blurred peak of occurrence was observed.
In 1998, population density of adults per single flower was also evaluated at Kamenica nad Hronom. The highest occurrence was again from end of May to end of June and varied from 0.3-0.7 adults per flower in average.

S. sericeus lay its eggs externally on the pod. Egg laying started in the beginning of June. Freshly hatched larvae burrow through the pod wall and enter the first available seed from mid June. Larvae that remain within the seed to pupate prepare for adult emergence by cutting as close to the surface as possible. No natural enemy has been recorded in laboratory.

Discussion

The only insect taxon frequently associated with *C. arvensis* seeds was *S. sericeus* (Bruchidae) in Slovakia. This verified the fact, that genus *Spermophagus* is associated with Convolvulaceae worldwide (Jolivet 1967). In Palearctic region five species of *Spermophagus*, *S. sericeus*, *S. calystegiae*, *S. kuesteri, S. variolosopunctatus* (Decelle 1983) and *S. rufiventris* (Ishikawa et al., 1994) were reared from *C. arvensis* seeds. Notwithstanding that, *Megacerus discoidus* (Wang & Kok 1986) and *M. impiger* (Schlising 1980) were reported as native North American seed feeders of *Calystegia sepium*. In Europe, the most common one was *S. sericeus*. It has been confirmed also in Slovakia. Usually only a small percentage of seeds were attacked, but 50 percent infestation was found at Kamenica nad Hronom. Similarly as in Slovakia, 40 percent infestation, was found at Rome (Italy), and 65 percent of the seeds collected near Venice were infested (Rosenthal & Buckingham 1982). *Megacerus discoidus* destroyed about 63% of the viable seeds of *C. sepium* at Belleville (Canada) (Mohyuddin, 1969). As indicate our observations, the population density of *S. sericeus* was considerably higher in warm localities (Kamenica nad Hronom) in contrast with localities with temperate climate (Vráble). The most numerous numbers were recorded in the beginning of June. But, even one adult per flower or 17 adults per one replication of sweeping were found the infestation of seeds did not achieve high level. It seems that mainly the egg stage is very vulnerable for parasitoids, because eggs are laid on the surface of the ripening pod. For example, Bridwell (1918) noted that when the trichogrammatid egg parasite *Uscana semifumipennis* Girault was present, only six larvae reached maturity from 3000 eggs of *Caryedon serratus* (Bruchidae). Similar species, *Uscana spermophagi* (Chalcidoidea: Trichogrammatidae) was found as parasite of *S. sericeus* (Viggiani 1979). The hymenopterous parasitoids *Bruchophagus sp.* (Hymenoptera: Eurytomidae), *Dinarmus acutus* Thomson (Hymenoptera: Pteromalidae) of *S. sericeus* were also reported in Italy (Rosenthal & Buckingham 1982).
Because high potencial of seed destruction reduces the numbers of seedlings, *S. sericeus* was selected as promising candidate for biological control programs of *C. arvensis*.

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