

BIOLOGY OF A NEW BRUCHID SPECIES IN HUNGARY: *ACANTHOSCELIDES PALLIDIPENNIS*

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Abstract

In July 1984, tiny bruchid adults were observed feeding until maturation on the composite flowers of sunflower, in the edges of a hybrid sunflower seed production field surrounded by forest strips. The species, emerging in high numbers, was identified as *Acanthoscelides pallidipennis* Motschulsky Fall (syn. *Acanthoscelides collusus* Fall), originating from North America. The species is monophagous. Its host plant is *Amorpha fruticosa* L. (desert false indigo), also originating from North America. Larvae develop in the seeds. Adults of the overwintering generation emerge early in the spring (end of March, beginning of April). Emergence may take a long time. Adults feed for maturation on the flowers of early weeds, e.g., *Reseda lutea* L. (weld), *Artemisia* spp., and *Orobanche major* L. (great broomrape). Following the feeding period, from the end of May until the end of August, adults lay their eggs continuously on the young pods of *A. fruticosa*. Adults of the new generation emerge in June, feed on the characteristically bursting anthers of *A. fruticosa*, but they also visit the male parent plants of the sunflower hybrid seed production fields. In these fields, pollination capacity of the damaged male parent plants is significantly reduced, especially at the field edges. Thus, within the pest fauna of sunflower, *A. pallidipennis* can be categorized as a typical pest on the edges of fields.

Introduction

The genus *Acanthoscelides* Schilsky (Coleoptera: Bruchidae) includes 10 species according to Kaszab (1967), whereas Johnson (1970) already reports 43 species. Several species of the genus were introduced in other countries with food and fodder plants. Two species were identified in Hungary (*A. obtectus* Say. and *A. mimosae* Fabr.). Both of them have pest status and are invasive species in Hungary. *Acanthoscelides pallidipennis* Motsch. (*A. collusus* Fall) was described in Hungary only in the 1970s, but not included in the list, though it was imported to Hungary well before its official description in the country. (Ádám, pers. comm.). The species is monophagous; its host plant is a deciduous shrub species, *Amorpha fruticosa* L., endemic in North America. The shrub, acclimated in Central and South Europe, grows by roads and watercourses (Polunin, 1981) but it was also deliberately planted as an ornamental plant and as an agent against erosion, especially on railway embankments (Kárpáti et al., 1969).

Considering these circumstances, *A. pallidipennis* Motsch. (*A. collusus* Fall) was most probably introduced in Europe via its host plant. The species cannot typically be considered as a pest because larvae can survive only in the seeds of *A. fruticosa*, though the adults may feed on the flowers of cultivated plants. However, adults of the species feeding in large numbers on the flowers of the male parent plants in sunflower hybrid seed production fields shall be identified as pests. These adults may significantly reduce the pollination capacity of the male parent plants, by damaging the synandrium and feeding on the pollen (Horváth, 1987). The biology of the species in Hungary is described in detail in the studies of Horváth (1984, 1985, 1986, 1987, 1988a, b, and 1989).

Materials and Methods

To study the biology, behaviour and development phases of *A. pallidipennis* Motsch. (syn. *A. collusus* Fall, *Bruchus collusus* Fall, *Mylabris collusus* Leng., *M. perplexus* Leng., *Acanthoscelides perplexus* Johnson), high numbers of pods from *A. fruticosa* were collected on 10 October 1988, in the region of Bácsalmás and Regöly (Tolna County). To investigate the possible differences in parasitism levels and emergence dynamics of the species, we collected pods from different locations. To study egg laying and fecundity, female and male adults emerging from the pods were kept in glass cylinders (11.5 x 5.5 cm) in pairs. All together 50 pairs were observed.

Emerging adults, at the beginning of the emergence period, were fed with the infusion (tea) of *A. fruticosa* pods and aggregated mixed pollen (from an apiary). Development stages (eggs, larvae, pupae) were studied in an LP-114 thermostat growth chamber at 30, 22 and 17°C.

Results

Eggs. They are 0.6 mm in length, and 0.20-0.40 mm in diameter. Transparent white, “sugar cone” shaped with a strongly striated and granular surface.

Larvae. They are 2.7-5 mm long; orange, with brown mandibles, typically “bent” in the upper third of the body and have four larva stadia. The L-1 stadium has three pairs of legs; eyes are distinct. At the first moulting larvae lose their legs, only setae-like, protruding formations remain. Eyes are also lost at first moulting. From the second stadium onwards, larvae adopt the typical Curculionidae larva appearance.

Adults. They are 2.5-3.4 mm long; drop-shaped, very active, reddish-brown. Adults are characterised by white, elongated, rectangle-shaped marks within a darker region on either side of the middle region of the clavus elytra interior, a dark brown stripe on the clavus elytra lateralis and a cross-shaped mark on the pygidium. Detailed morphology of the adults is given by Horváth (1987) and Johnson (1970).

Biology and Behaviour. *Acanthoscelides pallidipennis* overwinters as an adult in the pods of *A. fruticosa* (desert false indigo). Adults emerge early in the spring, at the end of March/beginning of April. Maturation feeding takes place on early spring flowers such as *Reseda lutea* L. (weld), *Orobancha major* L. (great broomrape), *Artemisia* spp., *Asclepias syriaca* L. (milkweed) and, from the middle of May, on the bursting yellow anthers of *A. fruticosa*. Following 2-3 weeks of maturation feeding, females lay single eggs on the young pods of *A. fruticosa*. According to our results, embryonal development takes four days at

30C, nine days at 22C and 4 days at 17C. Emerging larvae dig themselves into the developing seeds of *A. fruticosa*. Larval development takes 11 days at 30C, 23 days at 22C and 53 days at 17C. Under the temperature regimes mentioned above, the pupal stage lasted 7 to 15 days. The new generation, emerging at the end of June and the beginning of July, mostly feeds on the synandrium of *A. fruticosa*, but they also visit in high numbers wild Compositae plants and cultivated sunflower that produce large amounts of pollen. The adults, emerging in large numbers, cause damage on the synandrium and not on the stigma as it is stated in some references. It is supported by observation that adults do not visit the sterile female parent plants (female flowers with stigma only) in sunflower hybrid seed-production fields. Adults can be found only on the composite hermaphrodite heads of the multi-flowered male parent plants (in the florets of the male parent plants the synandrium and the stigma occur together).

Adults can be found in numbers as high as 30-50 per head; thus they can reduce the pollination capacity of the male parent plants at an economic level by damaging the synandrium and feeding on the pollen (Horváth, 1987; 1988a; 1989).

An interesting example of the heterogeneity of the species is that 5% of the L3 and L4 larvae leave the normal place of pupation, the seeds of *A. fruticosa*. Larvae chew their way out from the single-seeded pod around the calyx, similarly to the adults. It is possible that the location of the larvae and adults in the seeds is genetically determined. The observed tendency of larvae to leave the safety of the pod was first thought to be related to parasitism, but detailed studies did not confirm this assumption. It might be possible that the species has an alternative pupation strategy so some larvae are also able to pupate in the soil. Pupation in the case of larvae leaving the pod takes an extremely long time (58 days on average). Our studies provided no explanation for this phenomenon.

Fecundity. Artificially fed overwintering adults produced 68 eggs on average. We assume this number to be higher under natural feeding regimes, as the artificial diet (mixed pollen and infusion of *A. fruticosa* pods) probably did not fully represent natural foraging conditions and taste chemicals.

Host Plants. *Acanthoscelides collusus* is a strictly monophagous species according to Johnson (1970). Its host plants are: *Amorpha fruticosa* (desert false indigo), *A. californica* Nutt. (Californian false indigo), and *Errazurizia rotundata* Woot. From the species listed above only *A. fruticosa* can be found in Hungary, so other species cannot be considered as food plants for *A. collusus* in this country.

Parasitism. Parasitism of *A. pallidipennis* was minimal in Hungary. Johnson (1970) does not mention parasitism in his monograph, either. About 0.01% of the pods were infested by Chalcididae (Hymenoptera) species.

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