



**БИОЛОГИЯ И ФЕНОЛОГИЯ НА *AGAPANTHIA OSMANLIS*  
 (COLEOPTERA: CERAMBYCIDAE), ПОТЕНЦИАЛЕН БИОАГЕНТ  
 ЗА КОНТРОЛ НА *DIPSACUS* SPP.**

**ВИЛИ ХАРИЗАНОВА, АТАНАСКА СТОЕВА, БРАЙАН РЕКТОР**

**BIOLOGY AND PHENOLOGY OF *AGAPANTHIA OSMANLIS*  
 (COLEOPTERA: CERAMBYCIDAE), A POTENTIAL CANDIDATE  
 FOR BIOLOGICAL CONTROL OF *DIPSACUS* SPP.**

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**Abstract**

The cut-leaf teasel *Dipsacus laciniatus* is an invasive weed in several states of USA and alternative methods for its control are investigated. The cerambycid beetle *Agapanthia osmanlis* Reiche is feeding only on species from Dipsacaceae and it deserves more attention in respect of its potential as biocontrol agent of the weed. The species is common in Bulgaria, Turkey, Serbia, Macedonia, Romania. It has one generation per year and overwinters as completely developed larva in the base of the old stems. The phenology was studied in the region of Plovdiv in 2005-2008. The adults emerge in April, feed and mate for a long period before laying eggs individually after stems are being formed. The adults are feeding on the leaves and the apical parts of the bolting plant while the larvae are tunneling the stem. The feeding by the adults on the rosette could be quite damaging for the plant, causing stunt development and formation of less and smaller seed heads with less seeds. Description of the stages and data about the phenology are given.

**Key words:** invasive weed species, cut-leaf teasel, biological control, longhorn beetle

**INTRODUCTION**

Common teasel *Dipsacus fullonum* L. and cut leaf teasel *Dipsacus laciniatus* L. are distributed in 43 states in USA and 4 provinces in Canada and considered invasive in 12 states and noxious in CO, IA, MO, and NM (*D. fullonum*) and in Colorado and Oregon (*D. laciniatus*) (Rector et al., 2006). So far the available

management tactics like mowing, burning, herbicides, etc. do not provide sufficient control. The two species originate from southern Europe (Verlaque, 1985). In surveys for natural control agents in Bulgaria several insects and mite species have been found to feed on *Dipsacus* and only few were oligophagous among which the longhorn beetle *Agapanthia osmanlis* Reiche and Saulcy, 1858 (Coleoptera: Cerambycidae) (Harizanova et al., 2006; Rector et al., 2006). The beetle is known to feed only on species from Dipsacaceae (Kovacs, 1998). It is reported in Romania, (Panin & Săvulescu, 1961), Hungary, (Tibor, 1997), Slovakia (Sabol, 2009), Serbia and Montenegro (Pil & Stoyanovic, 2005), in Turkey (Rejzek et al., 2001; Tozlu et al., 2003), Syria (Hoskovec & Rejzek, 2009). This species was reported in Bulgaria first by Kantardjiewa-Minkowa (1934) with no host plant mentioned, and later by Rejzek et al.(2001) on *Dipsacus fullonum* L. and by Georgiev et al. (2005) on a species from another family – Compositae – *Tragopogon* sp. Harizanova et al. (2006) listed it among the phytophagous insects, feeding on *Dipsacus laciniatus*.

Tozlu (2010) studied the biology of the beetle on *Cephalaria procera* as host plant in Northern Turkey and suggested to be used for biological control of the weed in Turkey.

## MATERIAL AND METHODS

Populations of *Dipsacus laciniatus* in all the administrative regions of Bulgaria were surveyed for the presence of the beetle and damage. Observations on the distribution and damage were made also in Serbia, Romania and Makedonia. The biology and phenology of the beetle were studied in 2005-2008 under field conditions in southern Bulgaria, the region of Plovdiv (42°9' N and 24°45'E, altitude 160-200 m). Stems were cut periodically from March to October to monitor pupation, egg hatching, and larval development. Stem fragments about 20 cm long containing eventually eggs or young larvae were taken to the lab and placed in plastic trays. Periodically some of the stems were opened to check the developmental stage. In September-October old plants and rosettes were dug out with the roots. They were cut and examined in the laboratory for larvae.

## RESULTS AND DISCUSSION

*A. osmanlis* is quite common in Bulgaria (Harizanova et al., 2006). It was found in high population density on the host plant *Dipsacus laciniatus* L. in all the administrative regions. In Serbia we found adults on *D. laciniatus* in the vicinity of Beograd ( 44°42'34 N and 20°24,78 E, alt. 190 m) and in Vračev gaj ( 44°52'62 N and 21°21'03 E, alt. 81 m).

**Description of the biological stages** matches the one given by Tuzlu (2010). Briefly the adults are 11-17 mm long; head, pronotum, elytra and legs metallic blue-green; antenna long, metallic dark blue with whitish pubescence in the base of segments 4 to 12. Egg is cylindrical and whitish, 3-4 mm long. The newly hatched larva is pale yellowish with brown head, pronotum with two brown spots. The older

larvae have pale brown head, the segments of the thorax and the abdomen are pale yellow to beige. The prosternal segment protruding, with the same coloration and robust brown setae. Abdomen with blunt apex with a ring of dense setae. Mature larva is 22-25 mm long. The pupa is beige-grey, libera type.

### **Biology and phenology**

Under the conditions of southern Bulgaria the species has one generation per year and overwinters as fully developed larva in the base of the stem of old plants. In spring the larva pupates (fig. 1) and the adult emerges. The adults are active during the day, spending most of the time feeding on the *Dipsacus* leaves and apical tissue and mating (fig.2). At the feeding site there are dark green to black wet excrements like threads. The adults are mating during the day and most intensively in sunny days. When the plants begin to bolt the female bites a round shallow hole 3-4 mm in diameter (fig. 3) in the green stem at height from 60 to above 100 cm and inserts a single egg (fig. 4 and 5). In some stems there is more than one egg. We have no observations if they are laid by one female or different females. Very often the female is mating while making the hole (fig.2). The larvae (fig. 6 and 7) are feeding making a tunnel inside the stem, which does not influence significantly the development of the host plant. The larvae feed until October and when completely developed remain in the stems to overwinter (fig. 7). In few cases larvae were found also in the roots of autumn rosettes (fig. 8) which were in close vicinity of old plants.

The phenological development for the region of Plovdiv is presented in tabl.1. Pupation takes place in the beginning of April. The adults are found from end of April to end of July. Egg-laying continues from mid-May until the end of June. The larvae begin to hatch from the end of May - first week of June. In August there are no adults present in the field.

### **Damage**

The larva is making a tunnel in the stem. Though the percentage of infested stems is very high (at some sites almost 100%) the plants successfully complete development and form seeds. The adults are feeding on the leaves and on the apical tissues of the bolting plants. The damage on the apical tissues is similar to the one caused by the larvae of *Endothenia gentianeana* Hübner but is not so destructive. In some cases it may cause abnormal development of the bolting stem, delayed formation of flowering stems with smaller flower heads which usually do not mature until winter.

The larvae were parasitized by *Scambus sagax* (Hartig) (Hymenoptera: Ichneumonidae). The percentage of parasitism on the larvae was not calculated but adults of the parasitoid were observed in summer in high population density visiting the plants and feeding on nectar. The same species was reared from larvae of *A. osmanlis* in the Bayburt province (Kop Mountain Pass) (Coruh & Tozlu, 2008).

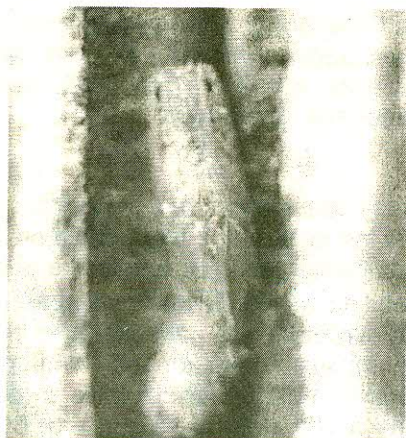


Fig. 1. Pupa in the stem

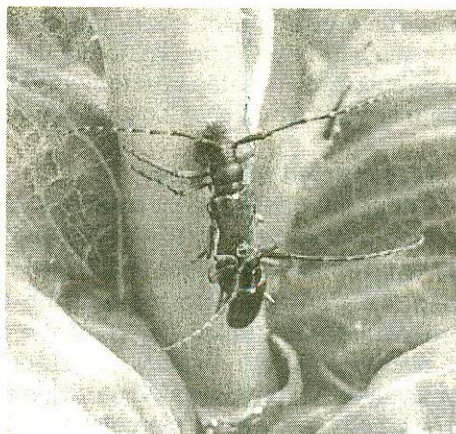


Fig. 2. Female making a hole for egg-laying while mating

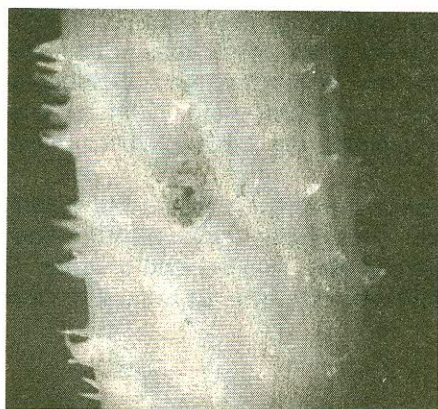


Fig. 3. A hole for laying the egg

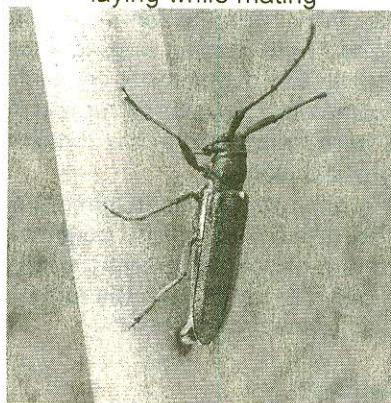


Figure 4. Female laying egg

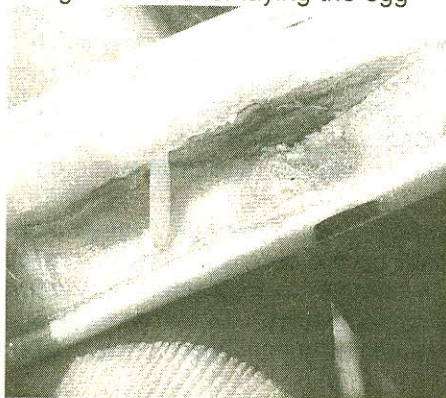


Fig. 5. Egg



Fig. 6. Newly hatched larvae



Fig. 7. Larva in the stem

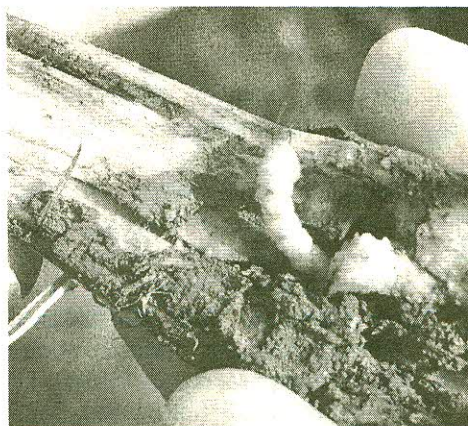


Fig. 8. Larva in the root of autumn rosette

**Table 1**

**Phenological development of *A. osmanlis* on *Dipsacus laciniatus* in the region of Plovdiv in 2007-2008**

Phenological stage of ...		Month	Note
<i>D. laciniatus</i>	<i>A. osmanlis</i>		
Dead old plants and growing winter rosettes	Overwintering larvae in the dead stems	January-April	-
	Beginning of pupation	Beginning of April	-
Beginning of bolting	Emergence of adults	End of April – beginning of May	Adult feeding and mass copulation
Mass bolting	Egg laying	Mid-May	Adult feeding, mass copulation and egg-laying
Beginning of formation of flower heads	Hatching of first larvae	End of May	Mass copulation and laying eggs
Seed formation and dead of the old plants	Larvae	August-December	No adults present in the field

## REFERENCES

1. Coruh S, Tozlu G., 2008 The first host record for *Scambus sagax* (Hartig, 1838) (Hymenoptera: Ichneumonidae) from Turkey. Pak J Biol Sci. 1;11(13):1757-8.
2. Georgiev G.,N. Simov, A. Stoyanova, D. Doychev, 2005. New and Interesting Records of Longhorn Beetles (Coleoptera: Cerambycidae) in some Bulgarian Mountains. Acta Zoologica Bulgarica, 57(2), 131-138
3. Harizanova V, B. Rector, A. Stoeva, 2006. Insect and mite species, feeding on *Dipsacus* spp. (Dipsacaceae) in Bulgaria and their potential as biocontrol agents. Plant sciences, 43, 476-480
4. Kantardjiewa-Minkowa (1934). Die Arten der Familie Cerambycidae (Col.) in Bulgarien. II (Lamiinae). Mitteilungen der Bulgarischen Entologischen Gesellschaft in Sofia 8, 132-144.
5. Kovacs, T. 1998. Food-plants and locality data of Hungarian longhorn beetles 2. (Coleoptera: Cerambycidae). Folia Historico Naturalia Musei Matraensis. 22:247.255
6. Pil N. & D. Stojanović, 2005. New longhorn beetles (Coleoptera: Cerambycidae) from Serbia and Montenegro. Arch. Biol. Sci., Belgrade, 57(2), 143-146.
7. Pil N. & D. Stojanović, 2005. New longhorn beetles (Coleoptera: Cerambycidae) from Serbia. Arch. Biol. Sci., Belgrade, 57(4), 27-28.
8. Rector B., V. Harizanova, R. Sforza, T. Widmer, R. N. Wiedenmann, 2006. Prospects for biological control of teasels, *Dipsacus* spp., a new target in the United States. Biological control, 36: 1-14.
9. Sabol O., 2009. *Agapanthia osmanlis* (Coleoptera: Cerambycidae) – new species of a longhorn beetle for Slovakia. Klapalekiana, 44: 75-76.
10. Serafin R., S. Maican, 2008. Data on Cerambycidae and Chrysomelidae (Coleoptera: Chrysomeloidea) from Bucuresti and Surroundings. Travaux du Muséum National d'Histoire Naturelle «Grigore Antipa», Vol. LI pp. 387–416.
11. Tozlu G., 2010. Biological Observations on *Agapanthia osmanlis* Reiche & Saulcy (Coleoptera: Cerambycidae) Associated with *Cephalaria procera* Fisch & Lall. (Dipsacaceae) in Northeastern Turkey. J.Ent.Res. Soc., 12(1):9-15
12. Tozlu G.,, K. Kara, 2007. The First Host Record for *Zeuxia zejana* Kolomiets, 1971 (Diptera: Tachinidae) from Turkey. Turk. J. Zool. 31: 357-358.
13. Verlaque R., 1985. Etude biosystematique et phylogenetique des Dipsacaceae. III. Tribus des Knautiae et des Dipsaceae Rev. Cytol. Biol. Veget. Bot. 8, 171-243.