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Using Floral Baited Colour Traps for Detection and Seasonal Monitoring of *Oxythyrea funesta* (Poda) (Coleoptera: Cetoniidae) in Bulgaria

***Mitko Subchev*[1], *Teodora Toshova*[1], *Radoslav Andreev*[2], *Vilina Petrova*[3], *Vasilina Maneva*[4], *Teodora Spasova*[5], *Nikolina Marinova*[5], *Petko Minkov*, *Dimitar Velchev*[6]**

[1] Institute of Biodiversity and Ecosystem Research, 2 Gagarin str., 1113 Sofia, Bulgaria
[2] Agricultural University, 12 Mendeleev str., 4000 Plovdiv, Bulgaria
[3] Institute of Agriculture, Sofijsko shose, 2500 Kyustendil, Bulgaria
[4] Institute of Agriculture, 1 Industrialna str., 8400 Karnobat, Bulgaria
[5] Institute of Mountainous Animal Breeding and Agriculture, 281 Vasil Levski str., 5600 Troyan, Bulgaria
[6] Maize Research Institute, 5835 Knezha, Bulgaria

Abstract: A new tool for detection and seasonal monitoring of *Oxythyrea funesta* (Poda), floral baited colour traps, a commercial product of Plant Protection Institute, Center for Agricultural Research, HAS, Budapest, Hungary, was used for studying the distribution and patterns of seasonal appearance of the pest in eight sites in Bulgaria in 2009 and 2010. The most numerous catches of *O. funesta* were recorded in Plovdiv in both years and in Troyan in 2010. Catches ranging from 21 to 52 beetles were recorded also in Dryanovo, Karnobat, Kyustendil, Petrich and Troyan in 2009; Knezha and Troyan in 2010. In 2009 the earliest catches of *O. funesta* were recorded in Petrich for the period April 12 – April 20. In 2010 the first catches were recorded in Knezha for the period April 16 – April 22. The latest catches for the two years were recorded on September 6, 2010 in Troyan. The traps showed low selectivity especially in sites where another cetoniid pest, *Tropinota* (*Epicometes*) *hirta* (Poda), attracted to the same traps, occurred.

Key words: *Oxythyrea funesta*, detection, seasonal monitoring, Bulgaria, floral baited traps

Introduction

Oxythyrea funesta (Poda) is a common species distributed through whole Europe from UK to Caucasus and from Sweden to Mediterranean region; it occurs also in North Africa and Asia Minor (Baraud 1992). The species has been known in Bulgaria since the very beginning of XX century and it is widely distributed in this country (Nedyalkov 1906, Buresh, Lazarov 1956, Popova 1961, Zaharieva 1965, Zaharieva-Stoilova 1969, 1974, Zaharieva, Dimova 1975).

O. funesta is known as a polyphagous pest (Hurpin 1962). The species was included in the list of harmful fauna of the apple orchards (Tuca *et al.* 2009) and vineyards (Stan *et al.* 2009) in S. D. Banu Mărăcine, South Roumania. According to Razov *et al.* (2009) *O. funesta* together with some other cetoniid species can cause locally and economically important damage in peach orchards in Croatia. Padiy (1972) mentioned this species also as a forest pest. According to Popova (1961) *O. funesta* is a widely distributed pest in Bulgaria. She listed 24 cultivated plant species and 12 wild plant species as hosts of the pest in this country (Popova 1961). Later Nikolova (1968) reported *O. funesta* also as a permanent pest on *Rosa x damascena* Mill. in Bulgaria. Grigorov (1972) stated that *O. funesta* damages mainly vegetables and field crops but also orchards.

When comparing traps of different colour Toth *et al.* (2005) found that *O. funesta* beetles are

attracted mostly to yellow and fluorescent yellow coloured traps. Later, as a result of intensive electrophysiological and field investigations, Vuts *et al.* (2008) described a binary bait for *O. funesta* comprising 2 phenylethanol and (±)-lavandulol. These findings leaded to the development of a floral baited colour traps for the pest which are offered as a commercial product for practical use by Plant Protection Institute, Budapest, Hungary.

In 2009-2010 an extensive field work was organized in several regions in Bulgaria for proving the potential and species-specificity of floral baited colour traps as a new tool for detection and seasonal monitoring of some cetoniid pests. After publishing the results on *Tropinota* (*Epicometis*) *hirta* (Poda) (Subchev *et al.* 2011) here we report on the results obtained for *O. funesta.*

Materials and Methods

Commercially available VARb3k traps with a fluorescent yellow upper funnel and baits for *O. funesta* containing (±)-lavandulol and 2-phenylethanol were purchased from Plant Protection Institute, Center for Agricultural Research, HAS, Budapest, Hungary and used in our field work. Two traps (together with two traps for each *T. hirta* and *Cetonia aurata* L./ *Protaetia* (*Netocia*) *cuprea* (Fabricius)) were set in 8 sites in Bulgaria (Dryanovo, Gabrovo, Karnobat, Knezha, Kyustendil, Petrich, Plovdiv and Troyan) in 2009 and/or 2010 covering all flight period of the pest (for details see Subchev *et al.* 2011). The traps, installed on the ground or at a height of 50-100 cm above the ground level, were visited weekly and the beetles caught were collected and identified in laboratory using Baraud (1992) and Medvedev (1965). Only in Gabrovo the traps were visited irregularly at 10-15 day intervals.

Results

The most numerous catches of *O. funesta* were recorded in Troyan in 2010 and Plovdiv in both 2009 and 2010. Catches ranging from 21 to 52 were recorded also in Dryanovo, Karnobat, Kyustendil, Petrich and Troyan in 2009; Knezha and Troyan in 2010. A drastical increase of the population level of the pest estimated by the catches was observed in Troyan in 2010 as compared to 2009 (Table 1).

The seasonal flight of *O. funesta* as established by catches in the traps is presented in Fig 1. Because of absence of catches in Dryanovo and realatively low number of beetles caught in Dryanovo (2009, 2010), Karnobat (2010), Kyustendil (2009, 2010) and Petrich (2010), no figures are presented for these sites and/or years. Not regular checking the catches in Gabrovo in 2009 also does not allow a correct presentation of the flight of the pest at that site. In 2009 the earliest catches of *O. funesta* were recorded in Petrich on April 20 which means that the beetles were caught between April 12 (the previous check of the traps) and April 20 (not presented). In 2010 the first catches were recorded in Knezha for the period April 16 – April 22. The latest catches for the two years were recorded on September 6, 2010 in Troyan. Even in the sites with the most numerous beetles caught, the data do not allow to speculate about presence of any peaks – the presence of some fluctuations in the catches were due most probably to meteorological variables like air temperature and rain falls and not to real changes in the population level.

The percentage of the catches of different species caught in the sites and years with most numerous catches are presented in Fig. 2. Only in Troyan in 2009 and 2010, and in Plovdiv in 2009 the catches of *O. funesta* exceeded 80% of all cetoniid beetles caught in the same traps. Relatively high percentage of the target species caught in the traps varying 28-40% was found also in Dryanovo in 2009 (not presented), Karnobat in 2009 and Plovdiv in 2010. The non target species attracted and caught into *O. funesta* traps in the highest percentage was *T. hirta*. In five from the twelve cases this percentage exceeded 90%. The other not target scarabaeid species caught in *O. funesta* traps were: *C. aurata, P. cuprea*, *Valgus hemipterus* (L.), *Blitopertha lineolata* (Fischer von Waldhein) and *T. fasciatus* (L.).

Discussion

As a faunistic object *O. funesta* was found in different regions of Bulgaria: Thrace (Zaharieva 1965), west Balkans (Zaharieva-Stoilova 1969), middle and east Balkans (Zaharieva-Stoilova 1974, the Rhodopes (Zaharieva, Dimova 1975. According to Popova (1961) the pest has a general distribution in Bulgaria. Our catches of *O. funesta* at all eight sites included in the present investigations support the latter statement. In addition our data showed also that in the sites where observations were organized the population level of the pest was relatively low or very low.

Table 1. Catches of *O. funesta* in two target traps in each of eight sites in Bulgaria during 2009 and 2010
- – test not performed.

Site	Total number of beetles caught	
	2009	2010
Dryanovo	25	0
Gabrovo	13	-
Karnobat	46	1
Knezha	-	52
Kyustendil	22	4
Petrich	21	-
Plovdiv	99	108
Troyan	35	439

During a three year period of observations (1957-1959) around Sofia and using field observations (no details were given) and the case method, Popova (1961) established the earliest flying *O. funesta* beetles in autumn on April 17, 1959 and the latest ones on August 26, 1959. The maximum flight period May 16/22 – June 1/6 given in the same paper was not supported by concrete data. Our present results on seasonal flight of *O. funesta* obtained by using the new precise tool – floral baited colour traps confirm as a whole Popova's (1961) observations. In addition our data showed a longer flying period – up to the first days of September.

At four from eight sites in Hungary, Croatia, Italy and Bulgaria investigated *O. funesta* was caught in percentage ranging from 87% to 35% in target yellow traps baited with (±)-lavandulol and 2-phenylethanol. In the rest of the sites this percentage was lower or no catches of the target species were observed (Vuts *et al.* 2010). As a whole our results support this finding but the species selectivity of the same traps used was even lower. The low selectivity of the traps for *O. funesta* to the target species in our present investigations is due exclusively on the catches of *T. hirta*. Toth *et al.* (2005) reported that the beetles of the latter species preferred blue coloured unbaited traps in comparison with transparent, white, yellow and fluorescent yellow traps. However, other field tests showed no significant differences in the catches of *T. hirta* in white, light blue and yellow unbaited traps although again the highest catches were recorded in the blue traps (Schmera *et al.* 2004). There is no any overlapping in the commercial Csalomon® baits used for these two species in our work: (±)-lavandulol and 2-phenylethanol for *O. funesta* and (E)-anethol and (E)-cinnamyl alcohol for *T. hirta* (Vuts *et al.* (2010). Thus the explanation for the exclusively high catches of *T. hirta* in *O. funesta* traps in our present investigations could be explained by colour attracting and the absence of repellency of any of the components in *O. funesta* bait to *T. hirta* beetles. Moreover, one of these components, 2-phenylethanol, elicited an electrantennographic response on both males and female antenna of *T. hirta* not significantly different from that elicited by (E)-anethol, a bait component of this species (Vuts *et al.* 2010), and also showed some attractivity toward the species in field (Toth et al. (2003). Thus, most probably this leaded to almost equal catches of *T. hirta* in the target traps for this species and in *O. funesta* traps, e.g. 274 and 271 beetles respectively in Troyan, in 2010, or even to higher catches of *T. hirta* in *O. funesta* traps in comparison to the catches in the target *T. hirta* traps, e.g. 2628 and 1408 beetles respectively in Knezha in 2010 (Fig. 2 in the present paper and Subchev *et al.* 2011).

Our results allow to conclude that fluorescent yellow floral baited traps for *O. funesta*, commercial product of Plant Protection Institute, Budapest, Hungary, is effective tool for detection and seasonal monitoring of this pest. However its selectivity is low especially in sites where the population level of another cetoniid pest, *T. hirta*, is high.

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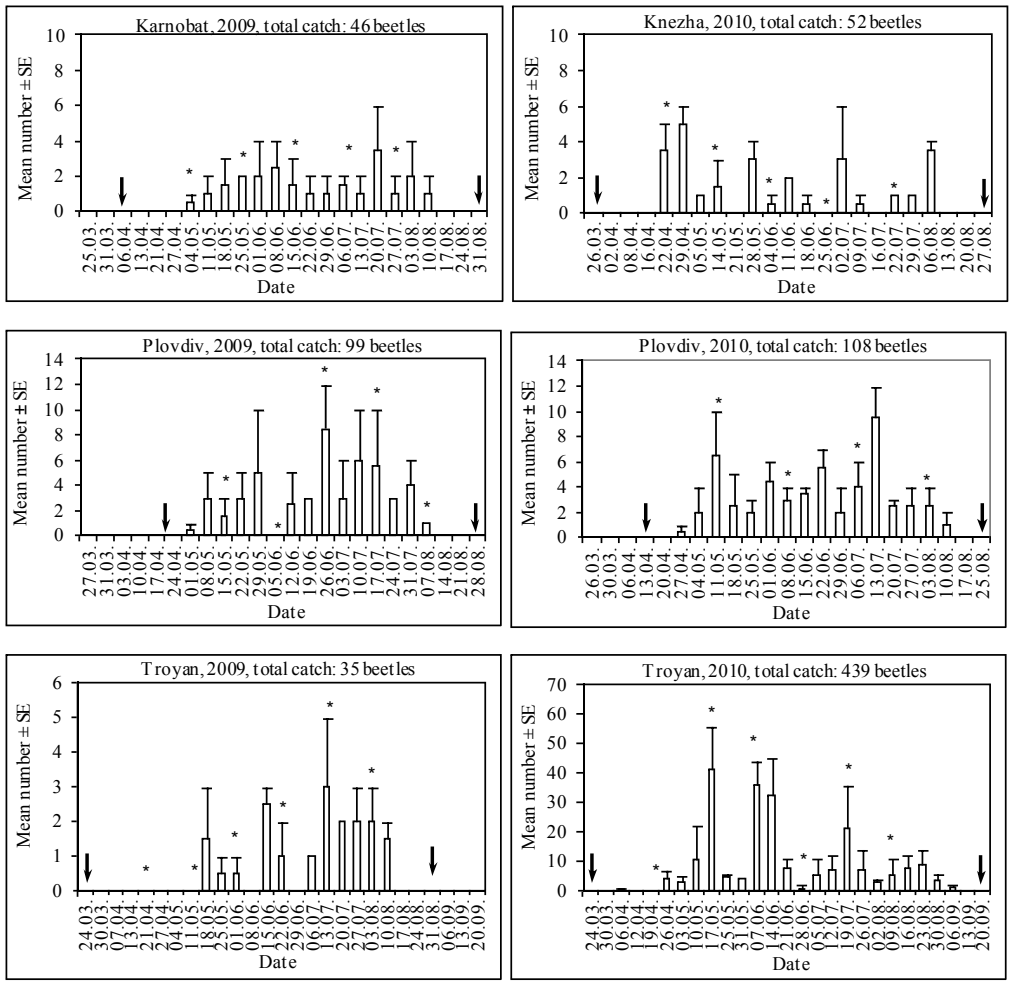

Fig. 1. Seasonal flight of *O. funesta* in four sites in Bulgaria. Arrows (↓) show the dates of installing and reinstalling the traps in the field. Asterisks (*) mark the date when the baits were renewed.

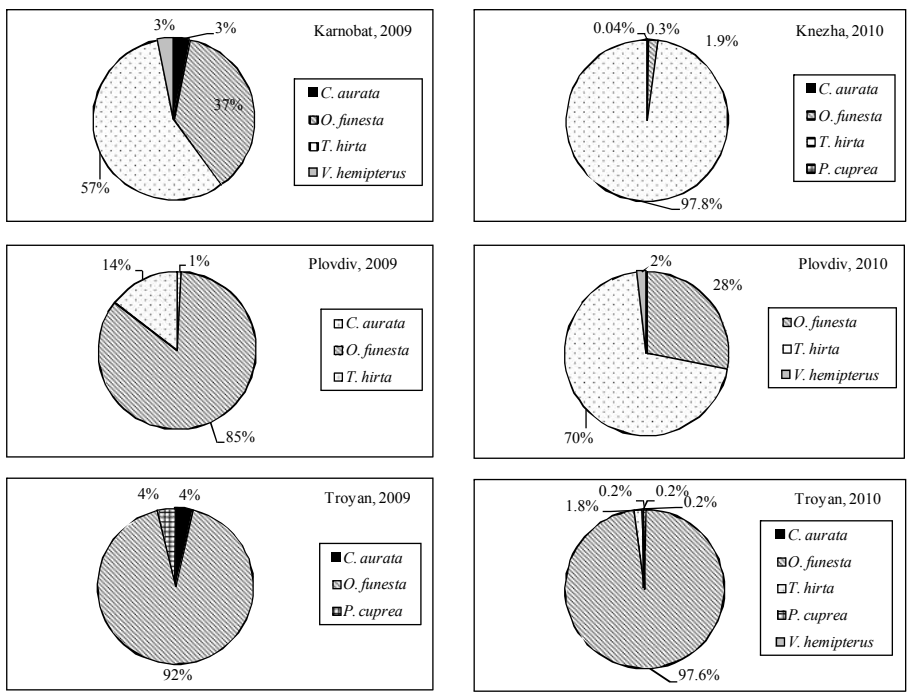

Fig. 2. Percentage distribution of scarabaeid beetles caught in traps with baits for *O. funesta* at four sites in Bulgaria in 2009-2010.

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