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INTRODUCING THE NEWLY DISCOVERED ATTRACTANT FOR THE SUGARBEET WEEVIL *BOTHYNODERES PUNCTIVENTRIS* GERMAR

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*Привлекательность новой синтетической приманки для долгоносика сахарной свеклы *Bothynoderes punctiventris* Germar была подтверждена при испытаниях ловушек на нескольких участках в Венгрии и Сербии. Приманки привлекали как самцов, так и самок, и соотношение полов в ловушках, было близко к естественному. Разработана новая ловушка под кодовым названием CSALOMON® TAL. Она отличается большей уловистостью от использовавшихся ранее, но синтетический аттрактант можно успешно использовать также со старыми ловушками. Ловушки возможно использовать для мониторинга численности долгоносика, а также для массового его вылова с целью защиты урожая. Исследования показали, что этот тот же самый синтетический аттрактант возможно использовать и при работе с западным долгоносиком сахарной свеклы *Conorrhynchus tendicus*, который является важным вредителем в Западной Европе и Северной Африке.*

Abstract

Attractive activity of a new synthetic bait for the sugar-beet weevil *Bothynoderes punctiventris* Germar (Coleoptera: Curculionidae) was confirmed in field trapping tests at several sites in Hungary and Serbia. The bait attracted both males and females, and the sex ratio in the traps resembled that of the natural population at the site. A new trap design codenamed CSALOMON® TAL was developed, which was easier to set up and maintain, and performed slightly better than plastic bucket pitfall traps for detection, but the synthetic attractant could be used successfully also with bucket traps for monitoring and mass trapping. Traps baited with the synthetic attractant can be used in the future as more sensitive and powerful trapping tools in the forecasting of the sugarbeet weevil, and also through mass trapping for directly decreasing of the pest population and also damage

levels. This same synthetic attractant proved to be effective also on the western sugarbeet weevil *Conorrhynchus mendicus*, which is an important pest in Western Europe and North Africa.

Introduction

The sugar-beet weevil (*Bothynoderes punctiventris* Germar) (Coleoptera: Curculionidae) is an important pest of sugar-beet throughout the central, eastern and southeastern parts of Europe (Schegolev, 1950, Hoffmann, 1966, Manninger, 1990, Sekulic, 1997). In the areas with dryer climate it represents the most destructive pest of sugar beet causing severe losses especially during outbreak periods. In the last century *B. punctiventris* destroyed over 250.000 ha of sugar beet fields in Serbia alone (Sekulic et al., 1997).

Trapping tools suitable to detect and to monitor sugar-beet weevils would be of great importance in their control. At present detection and monitoring is done by plastic buckets dug in the soil into which randomly crawling beetles fall in and get caught. Other methods include soil sampling to estimate population density of overwintering insects in the soil, and visual scouting for adult beetles already coming out. Both methods are very time consuming and labour intensive. An attractant-baited trap could be more precise and easier to use than present methods, could enhance effectiveness of other control measures, and could reduce pest populations by mass trapping, at the same time fulfilling perfectly the requirements of an integrated pest management system.

We recently discovered a synthetic attractant for adult beetles of the sugar-beet weevil (Tóth et al., 2002a, 2002b, 2007a, Ujváry et al., 2002). In the present paper we summarize research efforts in the past decade in the research and development of this attractant and application possibilities of traps baited with this attractant in the control of the sugar-beet weevil.

Methods and Materials

Field tests were conducted at several sites in Hungary and the Republic of Serbia. Trapping tests were conducted according to internationally accepted methods for such assays. For details of single tests please refer to the respective reference cited.

Results and Discussion

In all of the tests performed traps baited with the synthetic attractant caught significantly more sugar-beet weevils than the unbaited traps, strongly confirming attractive activity of the mixture (Fig. 1) (Tóth et al., 2002c, 2005, 2007a, Sekulic et al., 2004). Weevil numbers were ca 4 to 10 times higher in baited traps vs. unbaited. Traps caught few other arthropods like spiders, centipedes, carabid beetles, etc. (which are frequently get captured in pitfall traps set at soil level), but no other organisms were recorded in larger numbers in baited than in unbaited traps.

When studying the sex of the beetles captured, at both experimental sites catches of both male and female weevils were significantly higher in baited vs. unbaited traps, suggesting that the synthetic attractant was attractive for both female and male weevils (Fig 2) (Tóth et al., 2002c, 2005, 2007a). Sex ratio in baited and unbaited traps was similar suggesting that attraction was equally strong for the two sexes, and thus sex ratio of captures in an attractant baited trap would represent the natural sex ration of the population in the field.

Taking into consideration the behaviour of the weevils, a new trap design codenamed CSALOMON[®] TAL was constructed, which is easier to set up and maintain than the usual plastic buckets used in the past for the trapping of sugar-beet weevils (Fig 3) (Tóth et al., 2002b).

In comparison trials it appeared that captures of the TAL trap were slightly higher at low population sites, whereas no large differences were observed between the performance of the TAL and the plastic buckets at high population density situations (Sivcev et al, 2005, 2006b, Tóth et al., 2002). We conclude that the use of the TAL is more advisable if the objective is early and sensitive detection of the first appearance of the weevils, while for other purposes both the TAL and plastic buckets baited with the attractant can be applied.

Traps baited with the attractant performed well in monitoring studies. The baited traps detected ca one week earlier the first occurrence of the sugar-beet weevils, than conventional visual sampling (Fig. 4) (Sivcev et al., 2005, 2006a). The flight dynamics was followed also more reliably with the traps baited with the attractant. Visual sampling is highly weather-dependent and fairly labour intensive. Traps with the new attractant bait show promise in both detection of immigrating beetles from overwintering sites to the new crop and in monitoring population changes throughout the season.

In longevity tests we found that there was no significant difference between catches by an old attractant dispenser (aged for more than 2 months in the field) and a fresh new dispenser (Fig 5) (Sivcev et al., 2005, Tóth et al., 2005). In conclusion, all the flight period of the sugar-bet weevil can be monitored by the same attractant bait, there is no need for renewal. This makes the application of attractant-baited traps for monitoring easier from the practical point of view.

In preliminary trials aimed at studying the applicability of attractant-baited traps for mass trapping, already the density of 10 traps/ha was capable of trapping out a sizeable proportion of the population (Fig 6), while 30 trap/ha removed virtually all weevils (Tomasev et al., 2005, 2007). Farmers who owned the sugar-beet fields where the tests were set up were very satisfied with the control of the weevil at the experimental plots. The above results show perspective in the application of attractant-baited traps not only for monitoring and detection, but also for direct control through mass trapping.

This same synthetic attractant was also effective in catching the western sugarbeet weevil, *Conorrhynchus mendicus*, into traps, and showed similar application opportunities on this pest also (Tóth et al., 2007b,c). *C. mendicus*

occurs in Western Europe and North Africa, and is causing significant damages to sugarbeet there.

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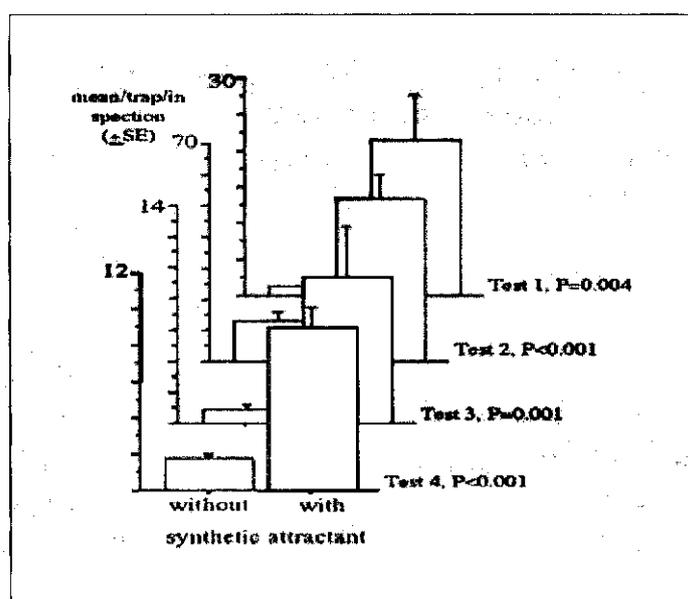


Fig 1. Catches of the sugar-beet weevil *B. punctiventris* in traps with or without the synthetic attractant in field tests in Hungary. Test 1: Pusztaszabolcs, 1996 May 23 - June 13; Test 2: Pusztaszabolcs, 1999 April 23 - May 20; Test 3: Debrecen, 2000

April 12 - May 9; Test 4: Pusztaszabolcs, 2001 April 7 - May 10. P values by Student t test.

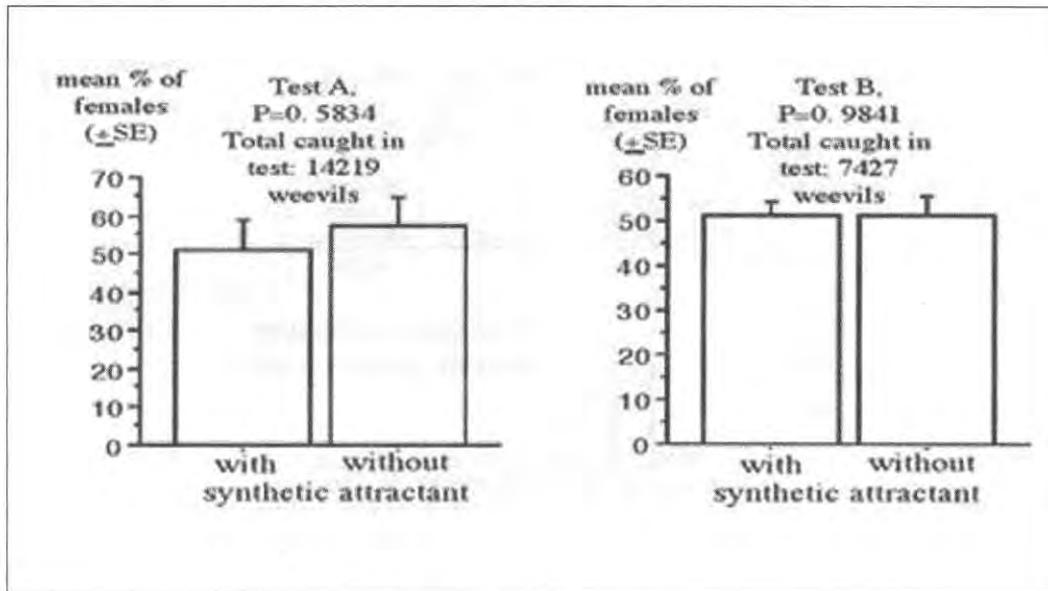


Fig 2. Sex ratio of sugar-beet weevils *B. punctiventris* in traps with or without the synthetic attractant in field tests in Serbia. Test A: Zarkovci, April 5 - May 25, 1999; Test B: Pancevo, April 8 - June 20, 2000. P values by Student t test.

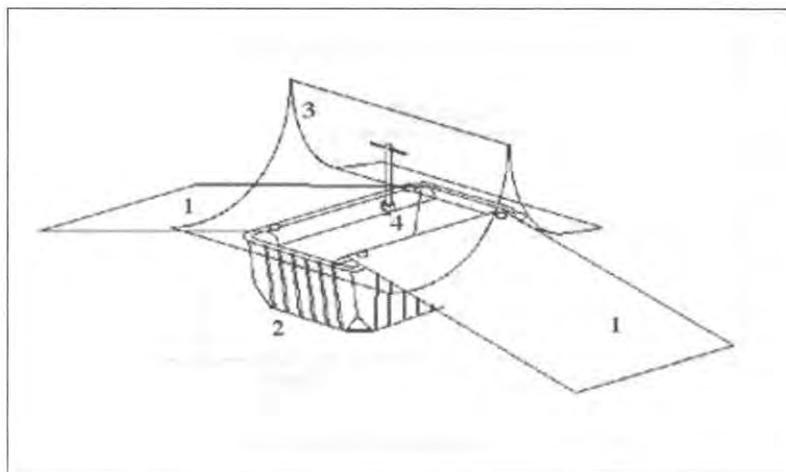


Fig 3. Diagram of the modified pitfall trap CSALOMON[®] TAL, which, baited with the synthetic attractant was specifically developed for catching the sugar-beet weevil *B. punctiventris*. 1 = plastic ramp on which the weevils can crawl up into the trap; 2 = catch container from which the weevils cannot escape; 3 = transparent plastic roof to keep out the rain; 4 = bait dispenser suspended to the inside of the trap. The TAL trap can easily be set up at the soil surface (no digging necessary), and is held in place against strong winds by placing some pieces of soil at the crawl-up ramps (1).

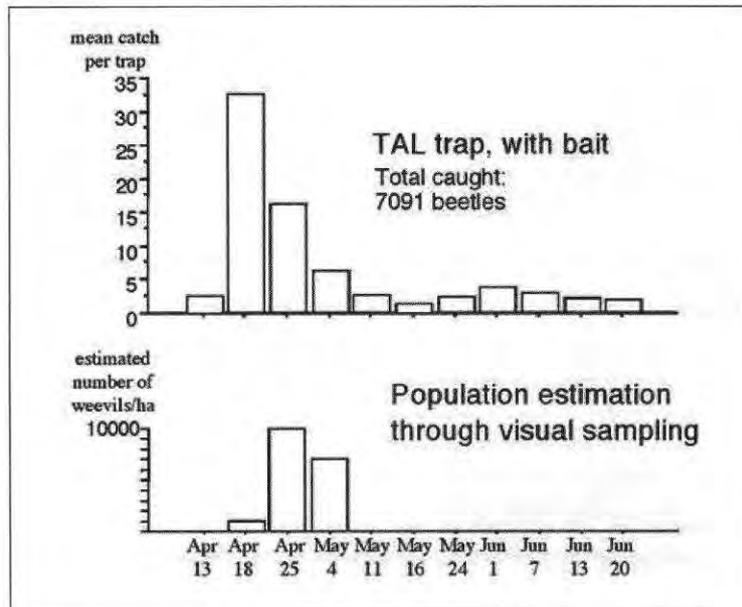


Fig 4. Suitability of traps baited with the synthetic attractant for monitoring and detection of the sugar-beet weevil *B. punctiventris*. Pancevo, SCG, 2000. After: Sivcev et al, 2005.

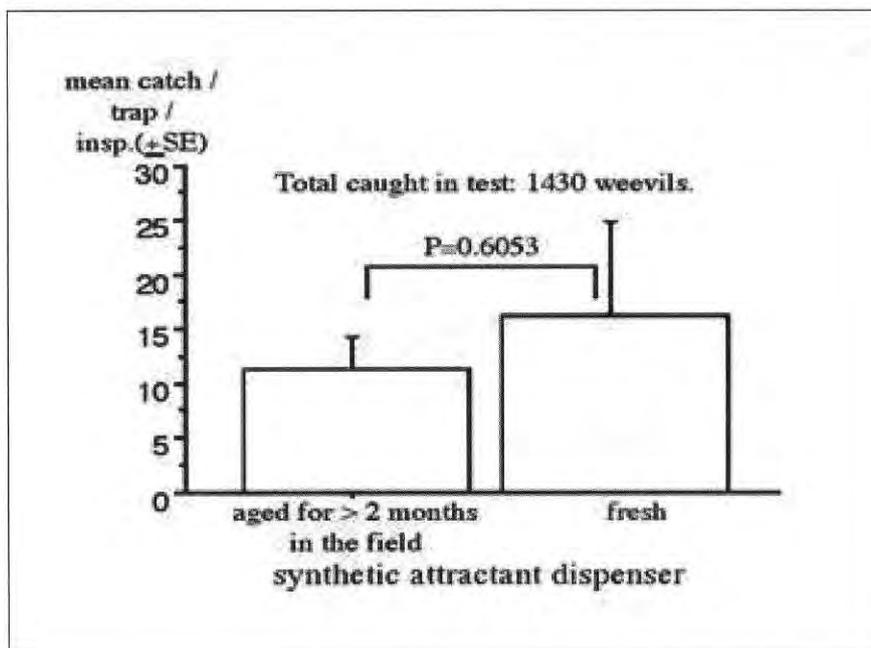


Fig 5. Catches of the sugar-beet weevil *B. punctiventris* in traps baited with fresh attractant dispensers or with dispensers aged previously for >2 months in the field. Zarkovci, SCG, May 28 - July 8, 2000.

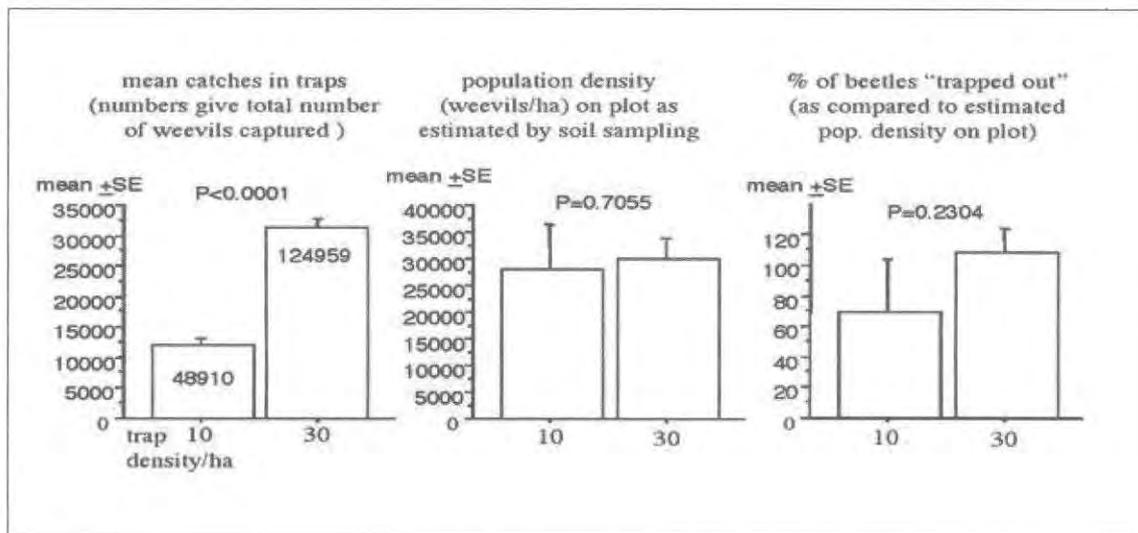


Fig 6. Mass trapping of the sugar-beet weevil *B. punctiventris* using traps baited with the synthetic attractant. Zarkovci, SCG, March 24 - April 14, 2000. Numbers within columns show actual weevil numbers captured. P values calculated by Student t test. After Tomasev et al, 2005, 2007.