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*Ivan L. Sivčev*¹, *Miklós Tóth*²,
*Ivan Tomašev*¹, *István Ujváry*³

¹ Institute for Plant Protection & Environment, T. Drajzera 9
YU-11000, Belgrade, Serbia and Montenegro

² Plant Protection Institute, Hungarian Academy of Science
Budapest, Pf 102, H-1525, Hungary

³ Institute of Biomolecular Chemistry, Chemical Research Center
Hungarian Academy of Science, Budapest
Pusztaszeri út 59—67, H-1025, Hungary

EFFECTIVENESS OF DIFFERENT TRAP DESIGN IN MASS TRAPPING OF *BOTHYNODERES PUNCTIVENTRIS* GERMAR.*

ABSTRACT: The discovery of an aggregation attractant for *Bothynoderes punctiventris* Germ. raised several questions for possible improvements of IPM of *Bothynoderes punctiventris* in sugar beet. First results on exploration of possibilities for its use for monitoring purposes as well as for mass trapping of adults of the pest are described in this paper. Trap design effectiveness was evaluated in the overwintering fields of sugar beet weevil for two years in localities in Serbia and Hungary. Among trap designs tested, it was proved that baited CSALOMON® TAL trap design was optimal.

KEY WORDS: aggregation attractant, *Bothynoderes punctiventris*, sugar beet, traps

INTRODUCTION

Sugar beet weevil is an important sugar beet pest (Čamprag, 1963, 1973). In some years it can cause severe damages by cutting young sugar beet plants. Adult insects are relatively large and they are good flyers during the warm weather. Its control is difficult and mainly based on chemical insecticides (Sekulić et al., 1997). Critical period of insect activity is during warm sunny weather, early in the spring — during April, when adults are capable of flying and infesting fields with newly emerged sugar beet plants. Due to very frequent and long-term intensive use of chemicals, sugar beet weevils lowered

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sensitivity to applied insecticides is already registered in some localities in Serbia (Inđić et al., 1995).

New administrative regulations within EU market as well as environmental concerns and demands for more ecological pest management and less polluted environment has as the consequence the reduction of market — available chemical insecticides used, so far, as standard control means against sugar beet weevil (Anonymous, 2002).

All these facts created the basis and need for exploring new methods which can fulfill requirements for environmentally safe and sustainable sugar beet production and protection.

The discovery of an aggregation attractant for *B. punctiventris* facilitated research on its properties and possible means of application (Tóth et al., 2002 a, b, c). Our goal in this paper was to investigate the use of formulated aggregation attractant in different trap designs in order to find out an optimal trap which can be recommended and used for monitoring the population density changes and for mass trapping of *B. punctiventris* adults.

MATERIAL AND METHODS

Trap designs, field tested for their effectiveness are represented in Figure 1.

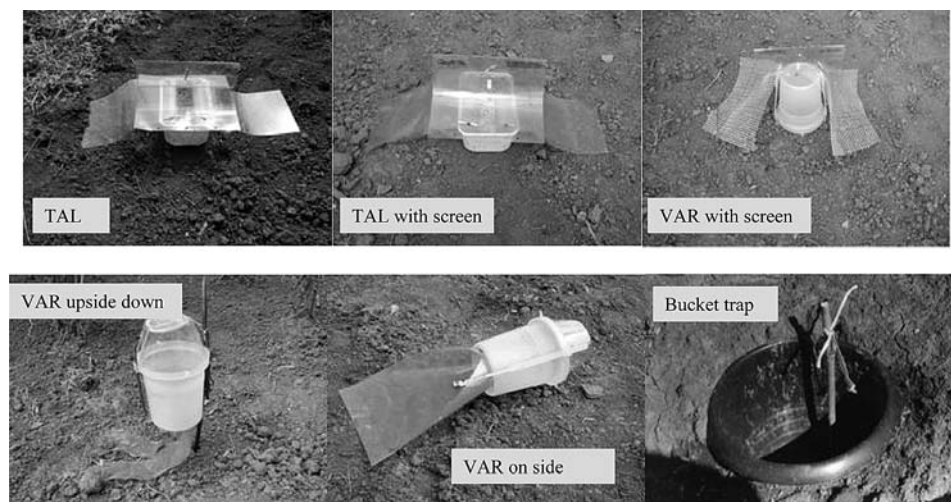


Figure 1. Trap designs used for trap efficiency testing in Serbia and Hungary 1999 and 2000

In Serbia, trials were set up during 1999 and 2000, early in the spring. In the vicinity of Zemun Polje, former sugar beet field as overwintering site for *B. punctiventris* Germ. was chosen. In both years, sets of five different traps were tested in five replicates. Replicates were located 100 m from each other. Traps in each replicate were placed in a circle and 15 m apart from one another. In 1999, traps were placed in the field on 17th March and the number of

beetles caught was registered up to 5th April. In 2000, traps were operated between 28th March up to 5th May.

Field trials of trap design efficiency in Hungary were set up in 1999, in locality Pusztaszabolcs and traps were in the field from April 23rd to May 20th and in 2000, in localities Adony, April 1st—May 5th and Debrecen, April 12th—May 9th. Tested traps were placed in the field according to the same protocol and design as described above.

In order to compare efficiency of the optimal trap design with other means of population estimation methods, we organized field trials in Serbia, Žarkovci, April 9th—May 25th, 1999 and in locality Pančevo, April 13th—Jun 20th. In these trials, we used 10 standard baited TAL traps and 10 unbaited TAL traps and visual population density estimation using wooden frame of 1m². Traps were placed on the 1 ha of newly planted sugar beet field in zig-zag pattern, while visual checking was done during each inspection date.

Bait longevity test was done in Serbia, locality Žarkovci May 28th—July 8th. For this purpose, we used baits in traps already exposed in the sugar beet field for 2 months as well as fresh ones. There were 14 baits, two months old and 11 fresh baits placed in the field in zig-zag order.

RESULTS

During preliminary tests, it was estimated that adults are avoiding sticky surface so, at the beginning of designing traps for testing, sticky traps were omitted. Besides that, adult size and behavior predetermined the use of traps without glue. Since sugar beet weevil adults are crawling on the soil, it was clear that there has to be some kind of support for the insects before they fall down to the pot of the trap. Therefore, variations of TAL and VAR (funnel) traps with and without supporting screen for crawling insects were tested.

Results obtained in field test in Serbia during 1999 showed that among six different designs, the most efficient was the standard TAL trap. Its efficiency was not statistically different from TAL trap covered with screen, bucket trap and VAR placed on side (Figure 2). Based on these results, we omitted ineffective designs from further testing and during 2000, we tested TAL trap, bucket trap and VAR with screen trap with and without bait. Results showed that the highest number of sugar beet weevil adults was caught in bucket traps and TAL traps. The difference between these two designs and others in the trial was statistically significant. The bucket trap effectiveness improvement was due to proper placement of the traps edge on the level of the soil surface. It is noticeable that with TAL design, there were no similar problems since these traps contain support for crawling insects to enable entering the trap. These trials also showed significant differences between baited and unbaited traps.

Results of the tests done in Hungary during 1999 showed that TAL traps with and without supporting screen are catching significantly more adults of *B. punctiventris* than other designs. Also, unbaited traps are catching significantly less number of beetles than baited (Figure 3).

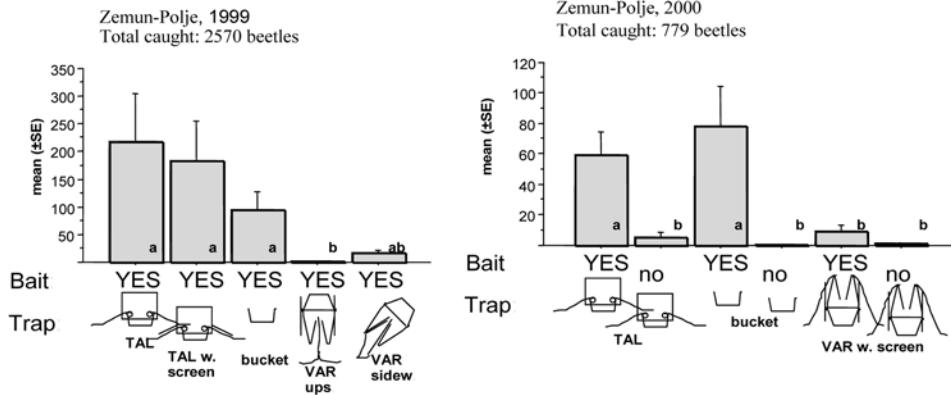


Figure 2. Efficiency of different trap designs in trials in Serbia 1999 and 2000

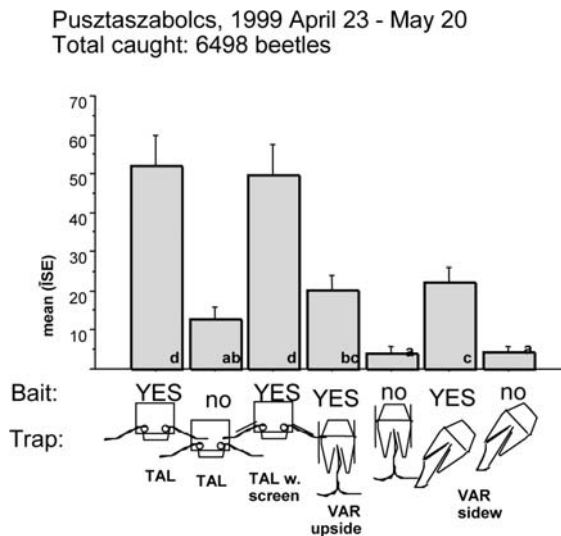


Figure 3. Efficiency of different trap designs in trial in Hungary 1999

Further tests, during 2000 in Adony and Debrecen showed that the TAL trap design was the most efficient in catching sugar beet beetles (Figure 4).

Based on the overall results, we concluded that among tested trap designs, baited TAL traps were optimal for beetle catching. Its design takes into consideration the behavior of the pest insect which makes that trap more sensitive. During the tests, it became clear that traps effectiveness is not decreasing and that trap has high catching capacity of up to 1.000 beetles.

In tests set up in Serbia during 1999 and 2000, we compared standard methods of sugar beet weevil adult population monitoring with catches on TAL traps.

Results from these trials showed the advantages of using TAL trap baited with aggregation attractant (Figure 5). Baited traps are catching more beetles than unbaited and results on insect density and activity are more consistent and realistic. Since insect activity is under high influence of temperature, which is highly variable in April and May, results on insect activity and density are much more precise than visual checking.

Bait longevity test was done in Serbia in 2000. It clearly showed that baits used in traps in the sugar beet field for two months were as attractive as fresh ones (Figure 6). This is very important since there is no need to replace baits in the traps already mounted in the sugar beet field. Baited traps retain

their activity throughout the full *B. punctiventris* flight season. Aggregation attractant is also efficient during copulation and oviposition period.

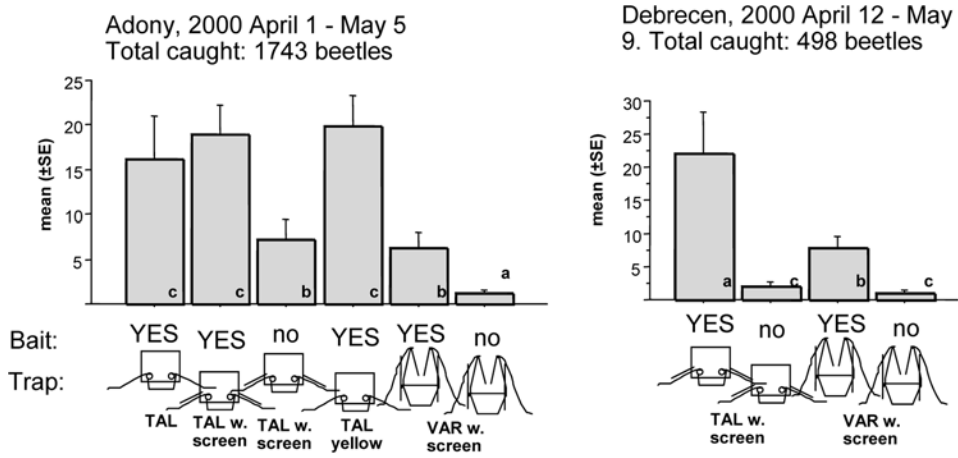


Figure 4. Efficiency of different trap designs in trials in Hungary 2000

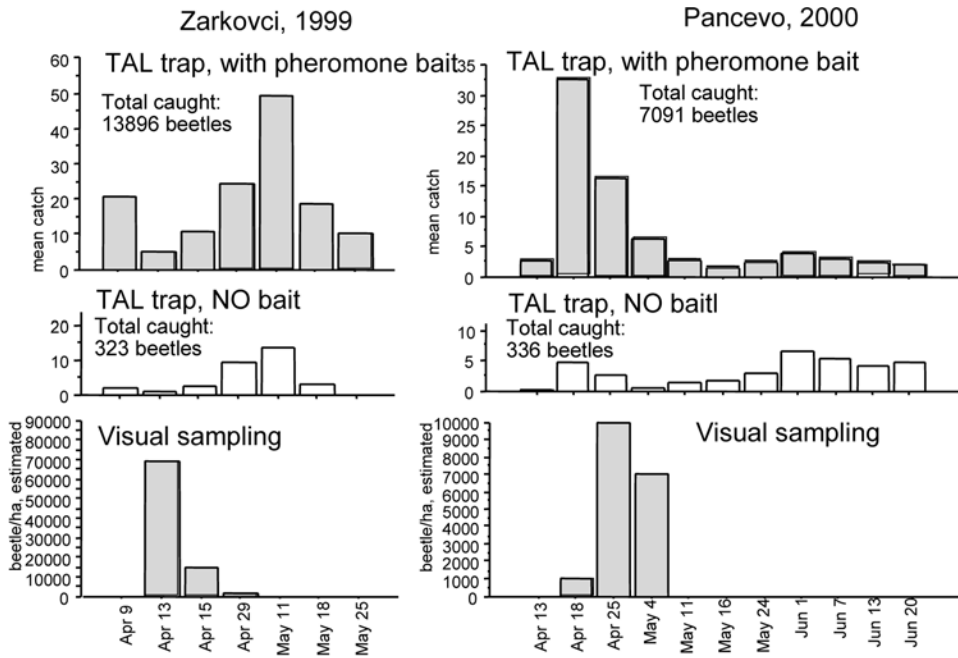


Figure 5. Number of adults in baited and unbaited TAL traps and by visual checking

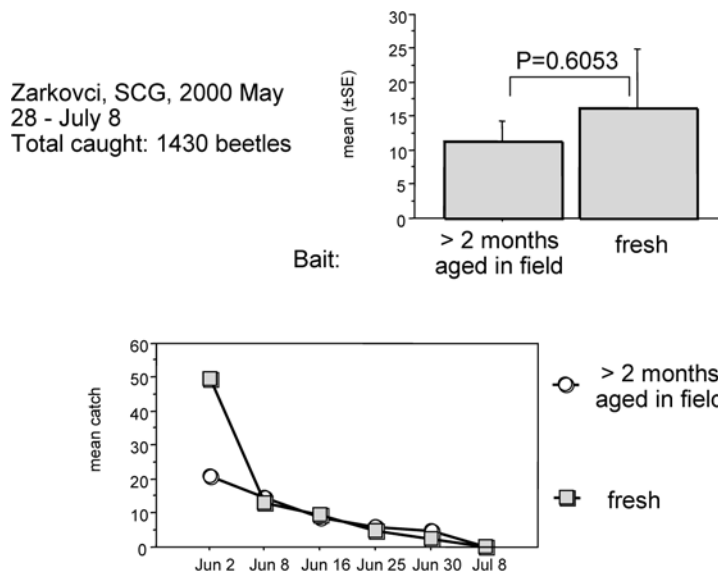


Figure 6. Baith longevity test: comparison of efficiency of 2 months old baits and fresh baits

DISCUSSION

In our tests it was proved that the specially designed “TAL” trap is much more sensitive in detecting the presence of the pest as well as it monitors population levels more accurately than other available methods and traps used in entomology for insect trapping and monitoring. Baited traps are very sensitive and can be reliable and useful even in the state of sugar beet weevil low population levels. It can be expected that the usage of traps for monitoring purposes is going to replace standard methods of population estimation like checking the number of overwintering adults in the randomly selected soil samples of 50 x 50 x 50 cm size. This widely recommended and standard method is time consuming, needs several workers and depends very much on the number of samples. Usually, this method was applied in large, state farms while for smaller producers with several sugar beet fields it was not appropriate and was not used frequently. Therefore, these producers were not quite aware of sugar beet weevil population density in overwintering sites (former sugar beet fields) as well as of infestation levels in newly planted sugar beet fields.

Simplicity for usage and efficiency in monitoring beetle population density is the key advantage of TAL trapping method. Effectiveness of other applied methods in sugar beet control can be enhanced. Primarily, it is a thorough, easy and precise estimation of overwintering population density, precise following of weevils settlement into newly planted sugar beet fields and especially, thorough possibility for timely insecticide application. Besides monitoring purposes, the number of sugar beet weevils caught is very high and there-

fore, the effect of mass trapping is very important as well. According to the preliminary results, proportion of trapped insects is significant and can be as high as 100% (Tomašev et al., 2003, 2005).

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ЕФИКАСНОСТ РАЗЛИЧИТИХ ОБЛИКА КЛОПКИ У МАСОВНОМ ИЗЛОВЉАВАЊУ *BOTHYNODERES PUNCTIVENTRIS* GERMAR.

Иван Сивчев¹, Миклош Тот², Иван Томашев¹, Иштван Ујвари³

¹ Институт за заштиту биља и животне средине,

Т. Драјзера 9, УУ-11000 Београд, Србија и Црна Гора

² Институт за заштиту биља, Мађарска академија наука,
Будимпешта, Pf 102, H-1525, Мађарска

³ Централни институт за хемију, Мађарска академија наука,
Будимпешта, Мађарска

Резиме

Репина пипа (*Bothynoderes punctiventris* Germar.) је важна штеточина шећерне репе. Њено сузбијање у великој мери зависи од инсектицида хемијског порекла. Интензивна употреба оваквих инсектицида довела је до појаве резистенције у неким популацијама. Новија законска решења и захтеви за бољом животном средином довели су до ограничавања броја тржишно расположивих инсектицида. Стога се намеће потреба за изналажењем стратегије и нових начина одрживог сузбијања репине пипе. Овакве методе су неопходне произвођачима шећерне репе. Откриће агрегационог атрактанта репине пипе омогућава развој и примену нових метода праћења популационе густине као и за сузбијање масовним изловљавањем.

Више типова клопки је у пољским условима поређено у циљу изналажења најефикаснијег дизајна у изловљавању гмижућих репиних пипа. Барбери посуде, које се дуго користе за изловљавања у ентомологији, модификоване су у циљу подизања њихове ефикасности и једноставности употребе. Овакав облик клопке је означен као TAL и знатно је осетљивији од класичне Барбери посуде. Током ловне сезоне може да улови до 1000 пипа док задржава активност током сезоне. Ефикасност класичних Барбери посуда повећали смо употребом посуда већих димензија са циљем да се користе у масовном изловљавању.