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Problems in *Ceuthorrhynchus* spp. Control on Rapeseed in the Region of Serbia

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SUMMARY

A global trend of intensive rapeseed production as a sustainable source of energy has also been accepted in our region, but intensified production results have increased pest populations in that crop. Central European countries with a long tradition of rapeseed production have ample data on pest biology, control and effects of insecticide applications, but such data are almost nonexistant under our regional conditions. In the light of this fact, the objective of our study was to determine the optimal time for insecticide applications for controlling pest species of the genus *Ceuthorrynchus*.

Trials were set up using standard OEPP methods with certain adaptations concerning the pest species. The insecticides based on chlorpyrifos + bifenthrin, applied at the rates of 0.5 l/ha and 0.75 l/ha, and deltamethrin at 0.3 l/ha, were applied a) once – at maximum abundance of adults, and b) twice – first at maximum abundance, and then eight days later. The trials were set up at two localities – Kać and Kovilj. Insecticide effects were evaluated based on the number of adults per 20 plants, the number of damaged plants and the number of larvae per plant.

After single application of the insecticides chlorpyrifos + bifenthrin (0.5 and 0.75 l/ha) and deltamethrin (0.3 l/ha) in the locality of Kać, the percentage of infested plants was 1.25%, 36% and 75% (respectively), and 95% in untreated plots; while 75% and 22.5% of the plants were infested in the locality of Kovilj after chlorpyrifos + bifenthrin application, 95% after deltamethrin application, and 97.5% in untreated plots. Insecticide effect estimated by the number of larvae/plant was 0 and 0.4 for chlorpyrifos + bifenthrin, 1.4 for deltamethrin and 3.3 for untreated surface in the locality of Kać; while in the locality of Kovilj the effect of chlorpyrifos + bifenthrin was 1.4 and 0.1, deltamethrin 3.9, and 5.2 larvae/plant in untreated plots. After two insecticide applications in Kać, the percentage of infested plants was 13.7% and 16.2% after chlorpyrifos + bifenthrin treatment, 62.5% after deltamethrin and 95% in untreated plots. In Kovilj, the percentage of infested plants was 22% and 17% after the application of chlorpyrifos + bifenthrin, 79% after deltamethrin, and 97.5% on untreated surface. The insecticide effect shown by the number of larvae/plant was 0.12 and 0.13 for chlorpyrifos + bifenthrin, 1.7 for deltamethrin and 3.3 on untreated surface in the local-

ity of Kać. In Kovilj, the corresponding data were 0.16 and 0.08 for chlorpyrifos + bifenthrin, 1.4 for deltamethrin and 5.2 larvae/plant for the untreated surface.

Keywords: Rapeseed; *Ceuthorrhynchus* spp.; Insecticides; Chlorpyrifos + bifenthrin; Deltamethrin; % of infested plants; Adult abundance; Number of larvae/plant

INTRODUCTION

The existing global trend of intensive production of rapeseed as a sustainable source of energy has also been accepted in our region. However, intensified production (more rapeseed fields, winter and spring sowing) results in an increased number of insect pests, such as *Meligethes aeneus* F., *Ceuthorrhynchus quadridens* Panz., *C. napi* Gyll., *C. assimilis* Payk. and *Athalia rosae* L. The examination of causes of low seed yields of rapeseed has pointed at pests and harmful microorganisms as the most significant factors of yield loss of this crop (Sekulić and Kereši, 2007). A short breeding history of this species has revealed a new problem in its protection, a necessity to determine the optimal time of insecticide application against *Ceuthorrhynchus* spp. under our regional conditions, as the production of this crop became highly endangered after the emergence and population density of those pests in 2008 and 2009. Vuković et al. (2007) studied the insecticidal effects of alpha-cypermethrin and tau-fluvalinate in controlling *M. aeneus,* but high population of *Ceuthorrhynchus* spp. was again observed. Considering the place of damage (stem and leaf), there was up to 60% of plants on average infested by *C. quadridens*. A more significant percentage decrease, compared to untreated plants, was recorded only after the application of insecticides based on tau-fluvalinate. Plants with signs characteristic of a presence of *C. napi* (growth disorder, spiral stem curl, shrubby look, stem decomposition) were not detected on the experimental field. Preliminary studies have shown that damage reduction is possible by monitoring outbreaks, evaluating population abundance and applying insecticides, considering the factors mentioned and the phase of plant development.

The objective of this paper was to determine the optimal time for insecticide application to control pest species of the genus *Ceuthorrynchus*.

MATERIAL AND METHODS

A *Ceuthorrhynchus* spp. population was monitored under field conditions by trapping dishes that showed the number of trapped adults. Deadlines for insecticide applications were determined based on the recorded number of adults in trapping dishes, temperature conditions and the phase of plant developement.

Trials were set up according to standard OEPP methods (Anonymous 1997, 1999, 2006) with certain adaptations concerning the pest species. Comercial insecticide formulations based on chlorpyrifos (400 g a.i./l) + bifenthrin (20 g a.i./l), applied at 0.5 and 0.75 l/ha rates, and deltamethrin (25 g a.i./l) at 0.3 l/ha, were applied: a) once at the maximum abundance of trapped adults (March 30, 2009) and exceeding control threshold, in the phase of intensive plant growth, when their harmful effect is at a peak; b) twice – first at the maximum abundance of adults (March 30, 2009), and then eight days later (April 7, 2009).

Trials were set up in two localities (Kać and Kovilj) on the varieties Ontario and Triangle, using a randomised complete-block design with four replicates. Insecticide effects were assesed based on: the number of adults/20 plants/replicate, the number of damaged plants, and the number of larvae/plant.

RESULTS AND DISCUSSION

Restrictions concerning a more rational use of fossil fuels and increased concerns for the environment have rapidly favorized biodiesel production and, consequently, rapeseed as a basic raw material. Central European countries with a long tradition of rapeseed breeding have ample data on pest biology, control and effects of insecticide applications (Burghause und Schackmann, 2006).

Until recently, rapeseed had been a very rare crop in our region with insignificant acreage and little attention focused on problems associated with cultivation of this crop. Insecticides intended to protect it are being registered and applied, yet there is almost no written data on levels of protection and effects of application on some pest species.

In trials conducted in 2009 to determine the site of damage and manner of spreading among rapeseed plants, the most abundant pest species was *C. quadri-*

Tabela 1. Percentage of damaged plants and average abundance of *Ceuthorrhynchus* spp. larvae per plant after rapeseed treatment at maximum adult abundance (March 30, 2009)

Insecticide	Kać locality				Kovilj locality			
	Average number of adults/dish (March 30, 2009)	Number of adults after 4 days (April 3, 2009)	Percentage of infested plants (April 27, 2009)	Average number of larvae/plant (April 27, 2009)	Average number of adults/dish (March 30, 2009)	Number of adults after 4 days (April 3, 2009)	Percentage of infested plants (April 28, 2009)	Average number of larvae per plant (April 28, 2009)
Chlorpyrifos + bifenthrin (0.5 l/ha)	5.0	0	1.25	0 c	19.5	0	75.0	1.36 (±1.12) bc
Chlorpyrifos + bifenthrin (0.75 l/ha)	5.5	0	36.0	0.42 (±0.39) bc	31.0	0	22.5	0.07 (±0.08) c
Deltamethrin (0.3 l/ha)	6.0	0	75.0	1.40 (±0.32) b	27.0	0	95.0	3.90 (±2.98) ab
Untreated	3.5	14.5	95.0	3.30 (±1.24) a	39.5	20.25	97.5	5.17 (±2.34) a
LSD 5%				1.03				3.53

Tabela 2. Percentage of damaged plants and average abundance of *Ceuthorrhynchus* spp. larvae per plant after rapeseed traetment at maximum adult abundance (March 30, 2009) and eight days later (April 7, 2009)

Insecticide	Kać locality				Kovilj locality			
	Average number of adults/dish (March 30, 2009)	Number of adults after 4 days (April 3, 2009)	Percentage of infested plants (May 4, 2009)	Average number of larvae/plant (May 4, 2009)	Average number of adults/dish (March 30, 2009)	Number of adults after 4 days (April 3, 2009)	Percentage of infested plants (May 5, 2009)	Average number of larvae per plant (May 5, 2009)
Chlorpyrifos + bifenthrin (0.5 l/ha)	5.0	0	13.7	0.12 (±0.14) c	27.5	0	22.0	0.16 (±0.26) b
Chlorpyrifos + bifenthrin (0.75 l/ha)	1.0	0	16.2	0.13 (±0.16) c	35.0	0	17.0	0.08 (±0.06) b
Deltamethrin (0.3 l/ha)	1.5	0	62.5	1.70 (±0.86) b	25.5	0	79.0	1.40 (±0.27) b
Untreated	3.5	14.5	95.0	3.30 (±1.24) a	39.5	20.25	97.5	5.17 (±2.34) a
LSD 5%				1.12				1.83

dens and there was an insignificant presence of *C. picitarsis* and *C. napi*, considering the very low number of plants with the characteristic „S" symptom on the stem (Eickermann et al., 2006; Krause et al., 2006).

According to instructions for the region of Serbia, the time for insecticide application against *Ceuthorrhynchus* spp. is when 10-20 insects per day are found trapped in trapping dishes, or more than one adult per five plants, or signs of oviposition on more than 20% of the plants (Anonymous, 1983). According to instructions for insecticide application and monitoring of insect emergence, treatment was done immediately after detecting high adult abundance in order to reduce the possibility of egg laying, while repeated application was aimed to prolong this interval and protect the plants from harmful larvae.

The difference in adult abundance evidently depended on the locality. In Kać the maximum number of trapped adults per dish was 15 and in the locality of Kovilj 69-80 (March 30, 2009). Insecticide application in both localities, regardless of the insecticide used, rate of application and number of applications, resulted in complete elimination of adults within a period of four days (Tables 1 and 2). However, in assessing insecticide effects, and having in mind that the number of infested or damaged plants is in certain proportion with the number of detected larvae/plant, advantage should be given to assessments of stem damage that results in a loss of mechanical hardness and stem breakage.

Considering the percentage of infested plants and number of larvae/plant, the applied formulations based on chlorpyrifos + bifenthrin had certain advantage over the effects of deltamethrin, regardless of application rate and number of treatments. The use of deltamethrin formulation resulted in a significant decrease in the number of larvae/plant, compared to untreated plants, but the percentage of infested plants was still estimated as very high, being 62.5-95%, regardless of the number of treatments. It is important to note that *Ceuthorrhynchus* spp. are exposed to the activity of pyrethroids as nontarget organisms because six compounds from the pyrethroid group of insecticides are being used to control *M. aeneus* in our conditions (Sekulić and Savčić-Petrić, 2009). In a study by Heimbach et al. (2006, 2006a) on 25 samples of rapeseed in the area of intensive rapseed production in Germany, the species *C. napi* and *C. pallidactilis* were the only two species showing reduced susceptibility to pyrethroids. According to Muller (2008), the mortality rate after lambda cyhalothrin treatment (0.003-0.015 μg/cm^2) was 100% in 2005-2007 for most of the tested species: *Ceuthorrhynchus napi, C. assimilis, C. palidactylus, Dasineura brassicae, Phyllotreta* spp. and *Psylloides chrysocephala*.

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REFERENCES

Anonymous: Desing and analysis of efficacy evaluation trials-PP1/152 (2). EPPO Standards, Guidelines for the Efficacy Evaluation of Plant Protection Products, Vol. 1. General and Miscellaneous Guidelines, New and Revised Guidelines, OEPP/EPPO, Paris, 1999, pp. 37-51.

Anonymous: Guideline for the efficacy evaluation of insecticides *Ceutorhynchus assimilis* PP 1/107 (2) 1997. EPPO Standards, Guidelines for the Efficacy Evaluation of Plant Protection Products, Vol. 3. Insecticides and Acaricides, OEPP/EPPO, Paris, 1997, pp. 121-123.

Anonymous: Phytotoxicity assessment- PP 1/135 (3). EPPO Standards, Guidelines for the Efficacy Evaluation of Plant Protection Products, Vol. 1. General and Miscellaneous Guidelines, New and Revised Guidelines, OEPP/EPPO, Paris, 2006, pp. 31-36.

Anonymous: Priručnik izveštajne i prognozne službe zaštite poljoprivrednih kultura. Savez Društva za zaštitu bilja Jugoslavije, Beograd, 1983.

Burghause, F. and Schackmann, N.: Pyretroid-resistente Rapsglanzkäfer in Rheinland-Pfalz-Auftreten und Ausbreitung 2003-2006. Mitteilungen aus der Biologishen Bundesanstalt für Land-und Forstwirtschaft Berlin-Dahlen – 55. Deutsche Pflanzenshutztagung, Göttingen, Germany, 2006, p. 77.

Eickermann, M., Mennerich, D. and Ulber, B.: Effect of *Brassica* genotypes on larval parasitism of stem mining weevils. Mitteilungen aus der Biologishen Bundesanstalt für Land-und Forstwirtschaft Berlin-Dahlen – 55. Deutsche Pflanzenschutztagung, Göttingen, Germany, 2006, p. 112.

Heimbach, U., Muller, A. and Thieme, T.: First steps to analyse pyrethroid resistance of different oil seed rape pests in Germany. Nachrichtenblatt des Deutschen Pflanzenschutzdienstes, 58(1): 1-5, 2006.

Heimbach, U., Thieme, T. and Muller, A.: Monitoring of pyrethroid resistance of oil seed rape pests in Germany.

Mitteilungen aus der Biologishen Bundesanstalt für Land-und Forstwirtschaft Berlin-Dahlen – 55. Deutsche Pflanzenschutztagung, Göttingen, Germany, 2006a, p. 76.

Krause, U., Koopmann, B. and Ulber, B.: Die Bedeutung des Großen Rapsstängelrüsslers (*Ceutorhynchus napi)* auf den Stägelbefall mit *Phoma lingam* an Winterraps. Mitteilungen aus der Biologishen Bundesanstalt fur Land-und Forstwirtschaft Berlin-Dahlen - 55. Deutsche Pflanzenshutztagung, Göttingen, Germany, 2006, p. 112.

Muller, A., Heimbach, U. and Thieme, T.: Pyrethroid sensitivity monitoring in Germany of oilseed rape pest insect other than pollen beetle. EPPO/OEPP Bulletin, 38(1): 85-90, 2008.

Sekulić, J. i Savčić-Petrić, S.: Pesticidi u prometu u Srbiji (2009). Biljni lekar, 2-3 (tematski broj), 2009.

Sekulić, R. i Kereši, T.: Repičin sjajnik (*Meligethes aeneus*), najvažnija štetočina ozime uljane repice. Biljni lekar, 4: 410-419, 2007.

Vuković, S., Inđić, D. i Turinski, I.: Efikasnost insekticida u suzbijanju repičinog sjajnika (*Meligethes aeneus* F.). Biljni lekar, 5: 516-523, 2007.

Problemi u suzbijanju *Ceuthorrhynchus* spp. u uljanoj repici u Srbiji

REZIME

Praćenje svetskog trenda, to jest intenziviranje proizvodnje uljane repice kao obnovljivog izvora energije, prihvaćeno je i u RS, međutim, intenzivnija proizvodnja povlači i povećanje brojnosti populacija štetnih vrsta u ovom usevu. Zemlje srednje Evrope sa dužom tradicijom u gajenju uljane repice raspolažu brojnim podacima o biologiji štetnih vrsta, suzbijanju i posledicama primene insekticida, međutim, za naše proizvodne uslove takvih podataka gotovo da i nema. Shodno tome, cilj rada je bio odrediti optimalno vreme primene insekticida za suzbijanje vrsta iz roda *Ceuthorrhynchus*.

Ogledi su postavljeni prema standardnim OEPP metodama uz izvesnu adaptaciju, shodno štetnim vrstama. Insekticidi na bazi hlorpirifosa + bifentrina u količini 0,5 i 0,75 l/ha i deltametrina 0,3 l/ha, primenjeni su: a) jednom – pri maksimalnoj brojnosti ulovljenih imaga; b) dva puta – prvo pri maksimalnoj brojnosti imaga, a drugo posle osam dana od prvog. Ogledi su postavljeni u dva lokaliteta, Kać i Kovilj. Ocene efekata insekticida su izvedene preko: broja imaga/20 biljaka, broja oštećenih biljaka i broja larva/biljka.

Pri primeni insekticida hlorpirifosa + bifentrina (0,5 i 0,75 l/ha) i deltametrina jednom u lokalitetu Kać, procenat napadnutih biljaka iznosio je 1,25%, 36% i 75% (respektivno), a u kontroli 95%; a u lokalitetu Kovilj 75% i 22,5% posle primene hlorpirifosa + bifentrina, 95% posle primene deltametrina, i u kontroli 97,5%. Efekat insekticida posmatran preko broja larva/biljka za hlorpirifos + bifentrin iznosio je 0 i 0,4, za deltametrin 1,4, a u kontroli 3,3 u lokalitetu Kać; a u lokalitetu Kovilj za hlorpirifos + bifentrin 1,4 i 0,1, za deltametrin 3,9, a u kontroli 5,2 larva/biljka. Primenom insekticida dva puta u lokalitetu Kać procent napadnutih biljaka je iznosio 13,7% i 16,2% posle primene hlorpirifosa + bifentrina, 62,5% za deltametrin, a u kontroli 95%. U lokalitetu Kovilj primenom hlorpirifosa + bifentrina, procenat napadnutih biljaka je 22% i 17%, primenom deltametrina 79%, a u kontroli 97,5%. Efekat insekticida posmatran preko broja larva/biljka za hlorpirifos + bifentrin iznosio je 0,12 i 0,13, za deltametrin 1,7, a u kontroli 3,3 u lokalitetu Kać; a u lokalitetu Kovilj za hlorpirifos + bifentrin 0,16 i 0,08, za deltametrin 1,4, a u kontroli 5,2 larva/biljka.

Ključne reči: Uljana repica; *Ceuthorrhynchus* spp.; insekticidi; hlorpirifos+bifentrin; deltametrin; % infestiranih biljaka; broj imaga; broj larva/biljka