Cruciferous stem and seed weevils as the main pests of winter oilseed rape

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Abstract

Major share of oilseed rape areas in Latvia are concentrated in central part of the country, where large agricultural holdings account for producing 73% of the total oilseed rape. Until recent research on oilseed rape pests in Latvia has been limited, therefore the aim of this research is to clarify the distribution of pests in winter oilseed rape (WOSR) in Latvian agroclimatic conditions. Monitoring of Ceuthorhynchus spp. was done by using yellow Moerike water traps placed on the edges of the field and in the field. 3547 crucifer pests have been collected in year 2009 using yellow water traps. Meligethes spp., Dasineura brassicae, Psylliodes chrysocephala and Ceuthorhynchus spp. (53%) have been identified; also five different species of Ceuthorhynchus spp. were trapped. Activity time of the particular weevils is long and there are different ways they damage the plants.

Research confirms that Ceuthorhynchus spp. is one of the dominating WOSR pests and in the next steps of the research identification of the damage levels and possible control measures will be done for the particular species.

Key words: winter oilseed rape, Ceuthorhynchus spp., pest, weevil

Introduction

Oil crops attract a large number of insect species (Narits, 2006). Most pests damage generative organs of oil crops (Huges, 1999; Naritis, 2006). The major inflorescense pests of oilseed rape which feed in the flowering canopy and lay their eggs in the buds and young pods respectively (Naritis, 2006) are pollen beetles (Meligethes spp.), cabbage seed weevil, C. assimilis (Paykull) = C. obstrictus (Marsham) and brassica pod midge (Dasineura brassicae, Winnertz) (Ahelsen, 2009). Cabbage stem flea beetle (Psylliodes chrysocephala , Linneaus) and a number of Ceuthorhynchus spp. are also classified as oilseed rape pests and can endanger the yield greatly (Marczali, 2006, 2007;Williams, 2004, 2010; Alford, 2003).

Weevils (Coleoptera: Curculionoidea) on rapeseed are specific pests, because of time of their activity and different ways they damage the plants (Milovac, 2010). Weevils cause considerable damage in years when their settling is followed by variable weather, cool and warmer periods alternating each other (Ferguson, 2003; Marczali, 2007). Cabbage seed weevil, C. assimilis whose imago are observed in springtime during the oilseed rape flowering, damage pods (Hiiesaar, 2003), cabbage stem weevil C. pallidactylus (Marsham) = C. quadridens (Panzer), rape stem weevil C. napi Gyll. and winter rape stem weevil C. picitarsis (Gyllenhal), damaging stalks are named as the main pest when comparing weevils (Toshova, 2009; Williams, 2004). C. typhae (Herbst) = C. floralis (Paykull) and C. sulcicollis (Paykull) are not widespread or abundant on cultivated crucifers, preferring wild cruciferous plants (Veromann, 2006), however infestations on oilseed rape (Hiiesaar et al, 2003; Toshova, 2009) were also reported.

Until now there has been little research on the entomological situation in the oilseed rape community in Latvia. Pest control is mainly used as a preventive measure, combining the insecticide sprays with application of fungicides or herbicides. The aim of the research is to identify the most important winter oilseed rape pests, especially Ceuthorhynchus spp. species in Latvian agroclimatic conditions

Materials and methods

Four commercial farms in Zemgale region were monitored. Zemgale is the main oilseed rape production area in Latvia - 32% of the area produces 73% of the total oilseed rape harvest. Intensively cultivated winter oilseed rape fields' account for more than 25% of the total agricultural lands in the monitored farms. Winter oilseed rape is cultivated in a 4- year crop rotation - after maize, winter wheat and winter barley. Classical soil tillage was used – ploughing followed by harrowing. Seeding in 2008 was done from August 15 – 23, using varieties Banjo F_1 and Excalibur F_1. None of the monitored fields bordered crucifer crops. The field size was 34 – 59 ha.

Insecticides with different periods of action were used in commercial winter oilseed rape fields. In each of the monitored fields different insecticide combinations were applied: **1.** - 2 applications of Decis Mega 50 (a.i. deltamethrin 50 g L^{-1}), registered dose 0.125 L ha^{-1}; applications were 08.05.; 03.06.; **2.** - Proteus 110 OD (a.i. thiacloprid 100 g L^{-1} and deltamethrin g L^{-1}), registered dose 0.75 L ha^{-1} or contact synthetic pyretroid Fastac 50 EC (a.i. alphacypermethrin 50 g L^{-1}),

registered dose 0.15 L ha^{-1}; applications were 06.05.; 06.06.; **3.** – 2 applications of systemic contact (CNI+pyretroid), Proteus 110 OD dose 0.75 L ha^{-1} applications were 04.05.; 14.06.; **4.** – non treated.

Imago monitoring was done using 10 yellow Moerike water traps (90X200X300). A few drops of oilseed rape oil were added to the water to attract the insects. Traps were placed on the field edges and 10 – 30 m away from the field's edge, installed on a white metal rod and was set according the height of the central flower head of the oilseed rape plant. Insects from the traps were collected weekly, starting with spring, when the average daily temperature reached +5 °C (10.04.2009.) and increase of insect activity was observed (Ferguson,1995), until the seed ripening phase (BBCH 70-80 of Meier, 2001) (01.07.2009.).

Trapped insects are counted, separating weevils, who are stored in 80% ethanol, and whose species are identified.

Results

In 2009 totally 3547 crucifer pests have been collected by using yellow water traps. Yellow water traps have been used in other studies to sample the coleopterous and dipterous pests of oilseed rape. Yellow is one of the most efficient colours for trapping insects. From the total number of trapped pests 53% have been identified as Ceuthorhynchus spp., 23% - Meligethes spp., 19% - Dasineura brassicae. Psylliodes chrysocephala were caught in low numbers - 5% (Fig.1). Applied control measure combinations provided the most significant impact on limiting Ceuthorhynchus spp. and Psylliodes chrysocephala control. (65.5% and 58.6%). Total number of insects is shown in Fig.1.

Five different species of Ceuthorhynchus spp. were trapped. C. pallidactylus (57%), C. assimilis (32%), C. sulcicollis (4%) and C. typhae (7%) weevils were collected. Low numbers of C. picitarsis has been observed. In springtime P.chrysocephala and C. picitarsis were observed first, when formation of the second leaves unfolded (BBCH 12). These species, which are known as oilseed rape pests in Europe, were absent in the samples because their activity on oilseed rape is from September to March (Hausammann, 1996), are mentioned as harmful is some countries and seasons (Ekbom, 1996; Williams, 2010). In springtime, when air temperature reached +6.4 ºC, and oilseed rape plants are forming side branches (BBCH 30) C. pallidactylus, C. sulcicollis and C. typhae were observed first. C. pallidactylus is the most harmful from the observed species - dominating species of all collected weevils. These species often arrive before crop flowering, immigration probably being limited only by temperature (Ferguson, 2003). Major C. pallidactylus activity has been observed starting from late April until mid May.

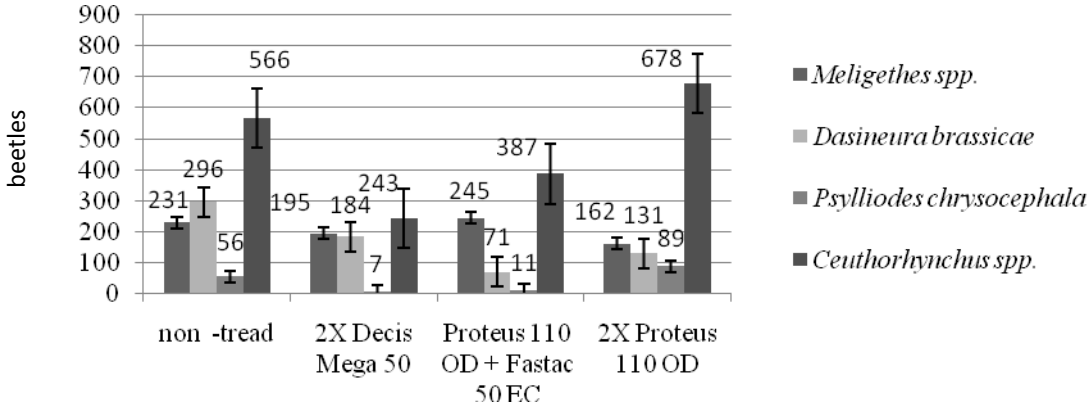

Fig. 1. Total number of identified species by different control measures

C. assimilis and Meligethes spp. larvae feed on seed inside seedpods. Activity has been observed in flowering oilseed rape (BBCH 50-55). The starting point of emergence of Dasineura brassicae was when the main and secondary racemes are lift up, but the flowers have not opened yet (BBCH 55). The peak of flying of Brassica pod midge on different farms was observed on the week 20 -24 (BBCH 75) when pods of winter oilseed rape only start to develop.

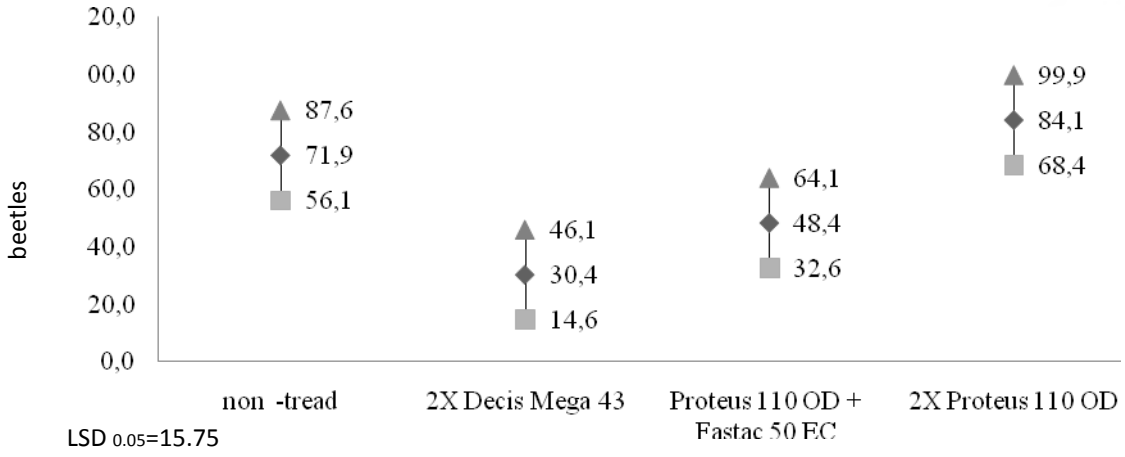

Fig.2 Average number of Ceuthorhynchus spp. imago by different control measures

Evaluating the control combinations by using dispersion analyses (Fig.2) it can be concluded that there has been an impact on Ceuthorhynchus spp. in general, F 20,1 > Fcrit 3.07 (p-value = 0,000002). Two of the used control measures 2X Decis Mega or T_1 Proteus 110 OD + T_2 Fastac 50EC (average 30.4 and 48.4) had an significant impact on the number of imago of species. Combination 2X Proteus 110 OD (average 84.1) did not provide a significant impact when compared to the control (average 71.9).

Conclusions

1. Monitoring winter oilseed rape fields in Latvia in 2009 Ceuthorhynchus spp. was identified as the key pest (53%), followed by Meligethes spp. (23%), Dasineura brassicae (19%), Psylliodes chrysocephala (5%).
2. Out of 5 identified Ceuthorhynchus spp., C. pallidactylus 57% andC. assimilis 32% were the key weevils
3. Most efficient combinations for controlling the key oilseed rape pests in 2009 were 2x deltamethrin 50 g L^{-1}; thiacloprid 100 g L^{-1} and deltamethrin g L^{-1}, T_2 alphacypermethrin 50 g L^{-1}.

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