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MIGRATION OF WEEVILS (*CEUTORHYNCHUS* SPP.) IN WINTER AND SPRING OILSEED RAPE IN LITHUANIA

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Abstract

Species diversity of weevils (Ceutorhynchus spp.) and their migration activity in winter and spring rape crops were studied in Lithuanian during 2007–2012. The abundance and migration activity of weevils (Ceutorhynchus spp.) was much higher in winter oilsed rape than in spring oilseed rape. In winter and spring rape there were found six Ceutorhynchus species: *C. erysimi*, *C. obstrictus*, *C. pallidactylus*, *C. rapae*, *C. sulcicollis* and *C. typhae.* Both in winter and spring oilseed rape the following three *Ceutorhynchus* species prevailed: *C. obstrictus C. pallidactylus* and *C. Typhae*, they accounted for 82.3 –98.2% of the total individuals identified in winter oilseed rape and for 92.2 –100% in spring oilseed rape

Key words: *Ceutorhynchus spp.*, *winter and spring oilseed rape*

INTRODUCTION

In Lithuania, oilseed rape (*Brassica napus* L.) is a promising crop for food and bio-fuel industry and is a valuable rotation plant. Currently the area sown with oilseed rape is steadily increasing. In 2002, oilseed rape in Lithuania was cultivated on an area of 60 000 ha and in 2012 on 262 700 ha (Statistics Lithuania, 2013). Damage caused by *Ceutorhynchus* species is the main factor reducing oilseed rape yield. Some of the *Ceutorhynchus* species are known to be harmful to oilseed rape specific plant parts (Alford, Nilsson & Ulber, 2003).

Weevils are frequently encountered pests in oilseed rape crops (Dosdall et al., 2001; Alford, Nilsson & Ulber., 2003, Toshova, Subchew & Totth, 2009). *Ceutorhynchus pallidactylus*, *C. obstrictus*, and *C. napi* are predominant weevil species of winter and spring oilseed rape in the Czech Republic (Sedivy & Vasak, 2002). *C. pallidactylus* and *C. obstrictus* species are major pests in Hungary (Marczali et al., 2010). In Bulgaria, the most abundant species was *C. typhae*, other species were found in low numbers (*C. pallidactylus*, *C. obstrictus*, *C. napi*, *C. erysimi* and *C. picitarsis* (Toshova et al., 2009). However, in Estonia in oilseed rape crops there were distributed *C. obstrictus*, *C. rapae*, *C. pleurostigma* and *C. typhae* species (Tarnag et al., 2004). In Latvia, four weevil species (*C. pallidactylus*, *C. picitarsis*, *C. sulcicollis* and *C. typhae*) were identified in oilseed rape (Grantina, Apenite & Turka, 2011 a; b).

In spring, *C. pallidactylus* beetles migrate to oilseed rape fields and later females deposit eggs into petioles and in mid-ribs of young leaves. Larvae of weevils feed inside petioles and later invade inside stems and cause the greatest damage (Dechert & Ulber, 2004, Williams, 2010). *C. pallidactylus* is the most important stem-mining pest in oilseed rape and is distributed in Central and Northern Europe (Eickermann, 2008). *C. obstrictus* beetles migrate and feed on oilseed rape during the flowering stage (Ferguson et al., 2000; Carcamo et al., 2009, Williams, 2010). Larval feed on pods and destroy about 5 seeds in a pod (Dosdall et al., 2001).

The spatial distribution and number of insects in oilseed rape are determined by several environmental and climatic factors and agronomic practices (Free & Williams, 1979). The list of *Ceutorhynchus* spp. on oilseed rape crops is long, only a few species cause serious damage (Williams, 2004); however, in Lithuania, little is known about the harmfulness of stem and pod pests in oilseed rape. Earlier papers have reported that *Ceutorhynchus* species are not economically important to oilseed rape crops in Lithuania (Tamutis 2002). Recently the area of winter and spring oilseed rape has rapidly increased and higher invasion of *Ceutorhynchus* species is expected. Our study was aimed to investigate the abundance of weevils, identify *Ceutorhynchus* species and establish the time of *Ceutorhynchus* species arrival in winter and spring rape.

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MATERIALS AND METHODS

Experiments were carried out at the Institute of Agriculture, Lithuanian Research Centre for Agriculture and Forestry, during 2007–2012 in the winter and spring oilseed rape. Experimental plots were set up in the winter and spring rape fields, where no pest control products had been applied. Yellow water-traps (Moericke's dishes) were placed in 0.5 ha winter and spring oilseed rape crops. Yellow water-traps were filled with 3 litres of water and a few drops of washing liquid were added to break the surface tension and to drown the insects. Traps were emptied weekly, before the day flight activity peak of pests (at 9 a.m.). The collected beetles were kept in bottles, filled with 70% ethyl alcohol until identification. The beetles were collected from the beginning of vegetation in winter and spring oilseed rape until harvesting. Later *Ceutorhynchus* species were separated from other insects and *Ceutorhynchus* species were identified using identification keys and for the weevils we used the latest systematic catalogue of Lithuanian beetles (Smreczynski, 1972; Alford , Nilsson & Ulber 2003, Tamutis, Tamute, Ferenca, 2011). Growth stages (BBCH) were determined according to Lancashire Bleiholdez, Van dem Boom, 1991.

RESULTS AND DISCUSSION

During the growing seasons 2007 – 2012 in the yellow water-traps (YWT) we identified 9138 *Ceutorhynchus* beetles from winter rape and 912 beetles from spring rape. The abundance of *Ceutorhynchus* spp. in winter oilseed rape crops was about 10 times as high as that in spring oilseed rape crops. In winter and spring oilseed rape there were identified six *Ceutorhynchus* species. In 2007 and in 2008, the most numerous species in winter rape was *C. pallidactylus* (52.9% and 51.0%, respectively). The most frequent species in 2009 and 2010 was *C. typhae* (57.0% and 50.2%, respectively), *C. pallidactylus* was also frequent (30.1% and 34.3%, respectively). In 2011 and 2012 the predominant species was *C. pallidactylus* (64.0 % and 54.8%, respectively). Three *Ceutorhynchus* species were prevalent: *C. obstrictus C. pallidactylus* and *C. typhae* (82.3 – 98.2% of the total individuals identified). Other species *C. erysimi*, *C. rapae* and *C. sulcicollis* were rarely found (1.8 –17.7% of the total individuals identified).

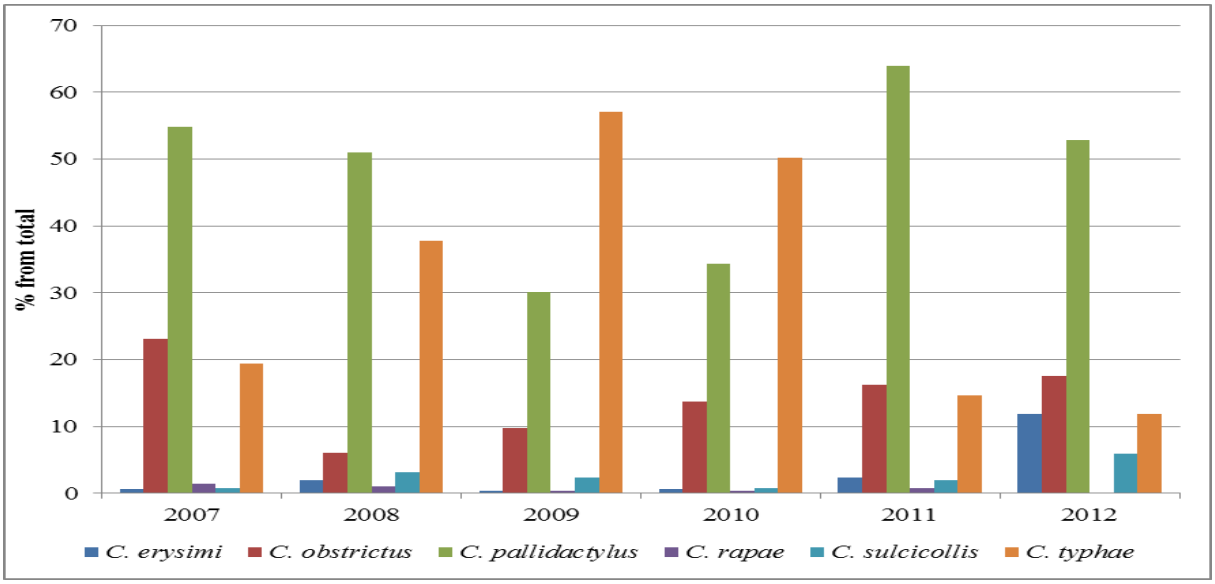

Figure 1. The diversity of *Ceutorhynchus* species in winter oilseed rape

The same six *Ceutorhynchus* species were identified in spring oilseed rape as in winter oilseed rape. In 2007, 2008 and 2009 the most numerous species in spring oilseed rape was *C. obstrictus* (68.0, 65.2 and 86.7%, respectively). The most frequently species in 2010 and 2011 was *C. typhae* (47.1% and 65.9%, respectively) and in 2012 the predominant species was *C. pallidactylus* (53.2 %). In spring oilseed rape also three *Ceutorhynchus* species were prevalent: *C. obstrictus C. pallidactylus* and *C. typhae* (92.2 –100% of the total individuals identified). Other species *C. erysimi*, *C. rapae* and *C. sulcicollis* were rarely found in spring oilseed rape (0 – 7.8% of the total individuals identified). In Lithuania, like in its neighbouring countries (Latvia and Estonia) the

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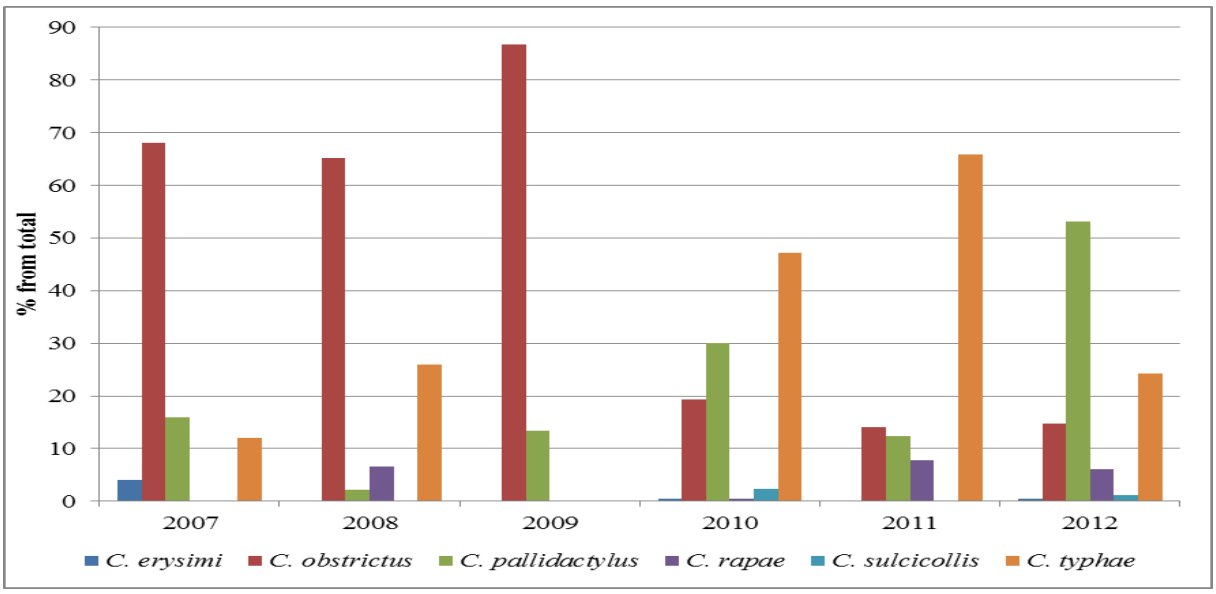
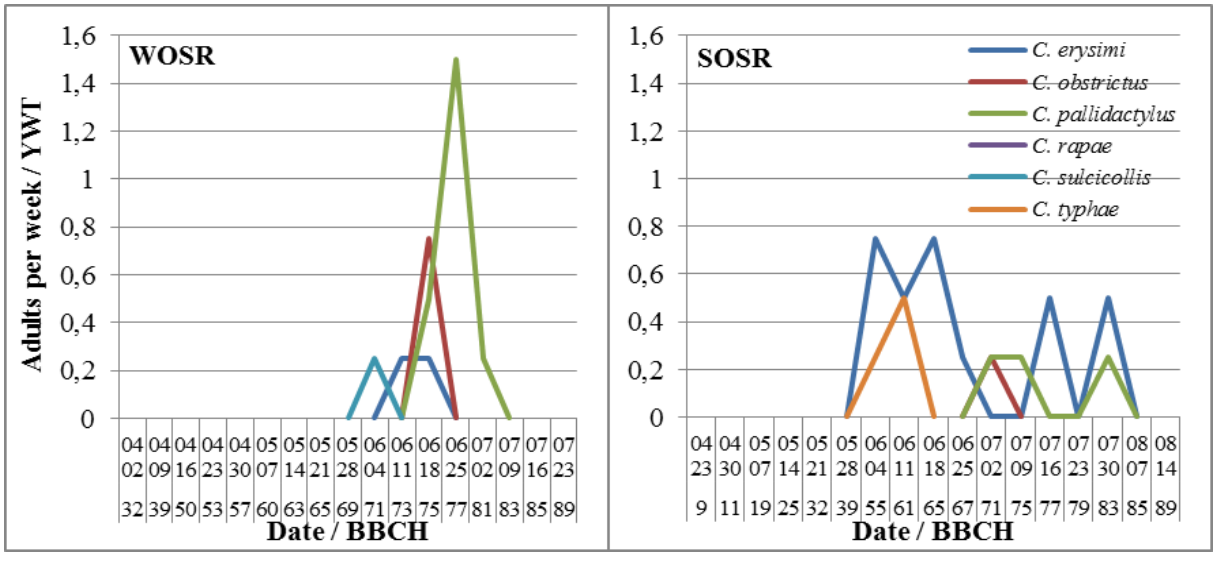
most common *Ceutorhynchus* species are *C. obstrictus C. pallidactylus* and *C. typhae* (Tarnag et al., 2004; Grantina et al., 2011 a; b).

Figure 2. The diversity of *Ceutorhynchus* species in spring oilseed rape



In winter oilseed rape in the growing season 2007, we found four *Ceutorhynchus* species: *C. erysimi*, *C. obstrictus C. pallidactylus* and *C. sulcicollis.* In spring oilseed rape we also found 4 *Ceutorhynchus* species: *C. erysimi*, *C. obstrictus*, *C. sulcicollis* and *C. typhae*. The most abundant species in winter rape was *C. pallidactylus* (1.5 adults per week per YWT) and in spring rape – *C. erysimi* (0.75 adults per week per YWT). *Ceutorhynchus* spp. abundance in winter oilseed rape was about twice as high as that in spring oilseed rape.

Figure 3. Migration activity of *Ceutorhynchus* species in winter (WOSR) and spring oilseed rape (SOSR) in the 2007 growing season



In 2008, in winter oilseed rape all six *Ceutorhynchus* species were identified and in spring oilseed rape only 4 *Ceutorhynchus* species*: C. obstrictus, C. pallidactylus, C. rapae, C. typhae* and *C. sulcicollis*. An abundant species in winter rape was *C. typhae* (4 adults per week per YWT) and in spring rape – *C. obstrictus* (2 adults

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per week per YWT) and abundance of *Ceutorhynchus* species in winter oilseed rape was twice as high as that in spring oilseed rape.

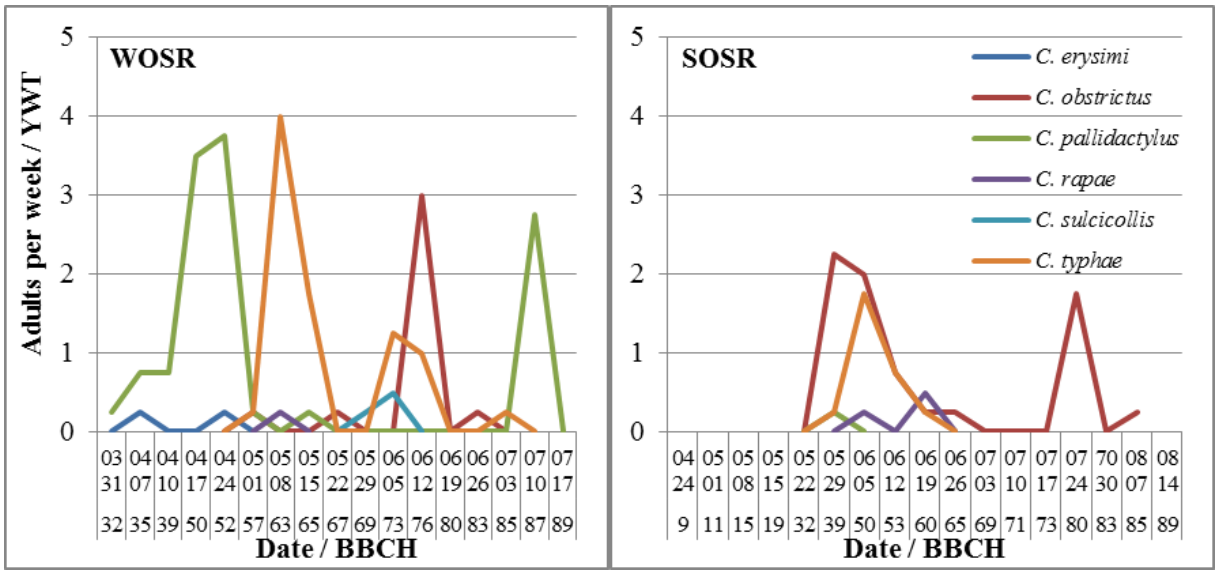

Figure 4. Migration activity of *Ceutorhynchus* species in winter (WOSR) and spring oilseed rape (SOSR) in the 2008 growing season

C. obstrictus, *C. pallidactylus*, *C. rapae*, *C. sulcicollis* and *C. typhae* species were identified in 2009 winter oilseed rape growing season. In spring oilseed rape we found just *C. obstrictus* and *C. pallidactylus* species. Most abundant species in winter rape was *C. typhae* (32.75 adults per week per YWT) and in spring rape – *C. obstrictus* (2 adults per week per YWT). The abundance of *Ceutorhynchus* spp. was 16.4 times higher in winter oilseed rape than in spring oilseed rape.

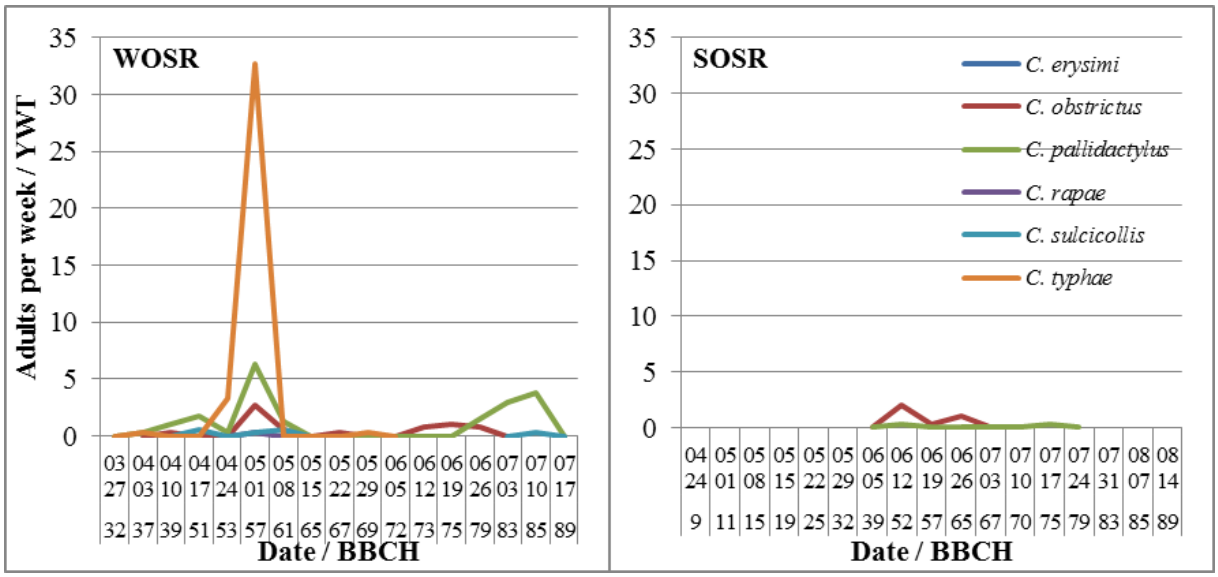

Figure 5. Migration activity of *Ceutorhynchus* species in winter (WOSR) and spring oilseed rape (SOSR) in the 2009 growing season

In 2010, in winter and spring oilseed rape we determine all six *Ceutorhynchus* species: *C. erysimi*, *C. obstrictus*, *C. pallidactylus*, *C. rapae*, *C. sulcicollis* and *C. typhae*. In winter and spring oilseed rape the most abundant

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species was *C. pallidactylus* (43.8 and 2.9 adults per week per YWT, respectively).*Ceutorhynchus* species was 15 times more frequent in winter oilseed rape than in spring oilseed rape.

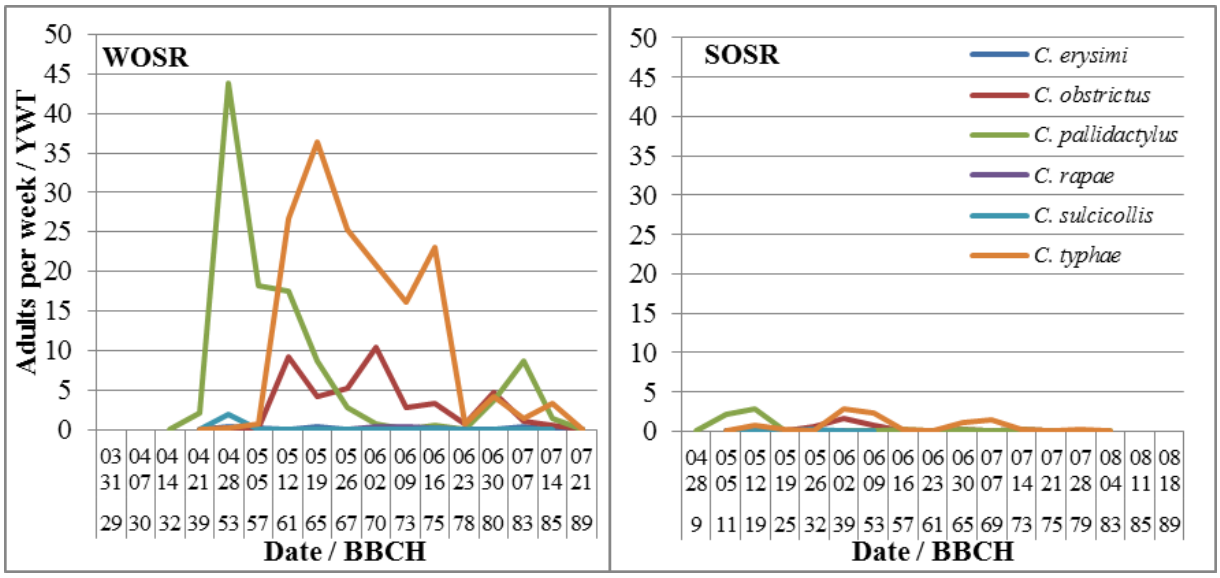

Figure 6. Migration activity of *Ceutorhynchus* species in winter (WOSR) and spring oilseed rape (SOSR) in the 2010 growing season

In the 2011 winter oilseed rape growing season there were identified all six *Ceutorhynchus* species and in spring oilseed rape four *Ceutorhynchus* species: *C. obstrictus C. pallidactylus*, *C. rapae* and *C. typhae.* The most abundant species in winter rape was *C. pallidactylus* (136.8 adults per week per YWT) and in spring oilseed rape – *C. typhae* (6.1 adults per week per YWT). In winter oilseed rape there found 22.4 times more *Ceutorhynchus* beetles than in spring oilseed rape.

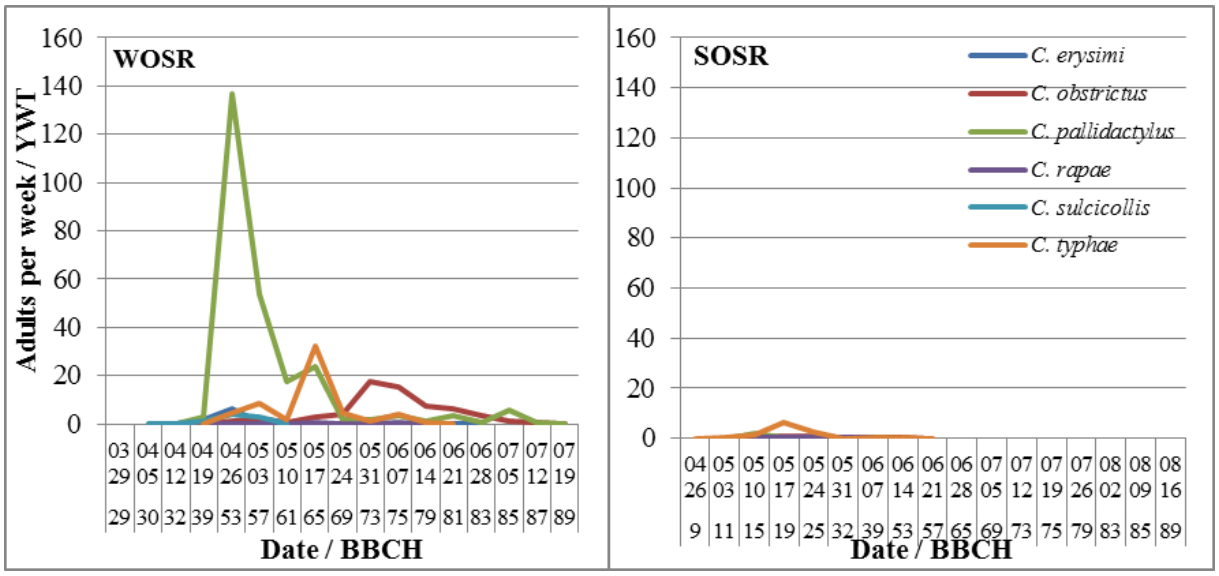

Figure 7. Migration activity of *Ceutorhynchus* species in winter (WOSR) and spring oilseed rape (SOSR) in the 2011 growing season

In 2012 in winter and spring oilseed rape there were determined the same *Ceutorhynchus* species as in 2011. The most abundant *Ceutorhynchus* species in winter and spring rape was *C. pallidactylus* (32.8 and 15.1 adults per

week per YWT, respectively) and the abundance of *Ceutorhynchus* species in winter oilseed rape was twice as high as in spring oilseed rape.

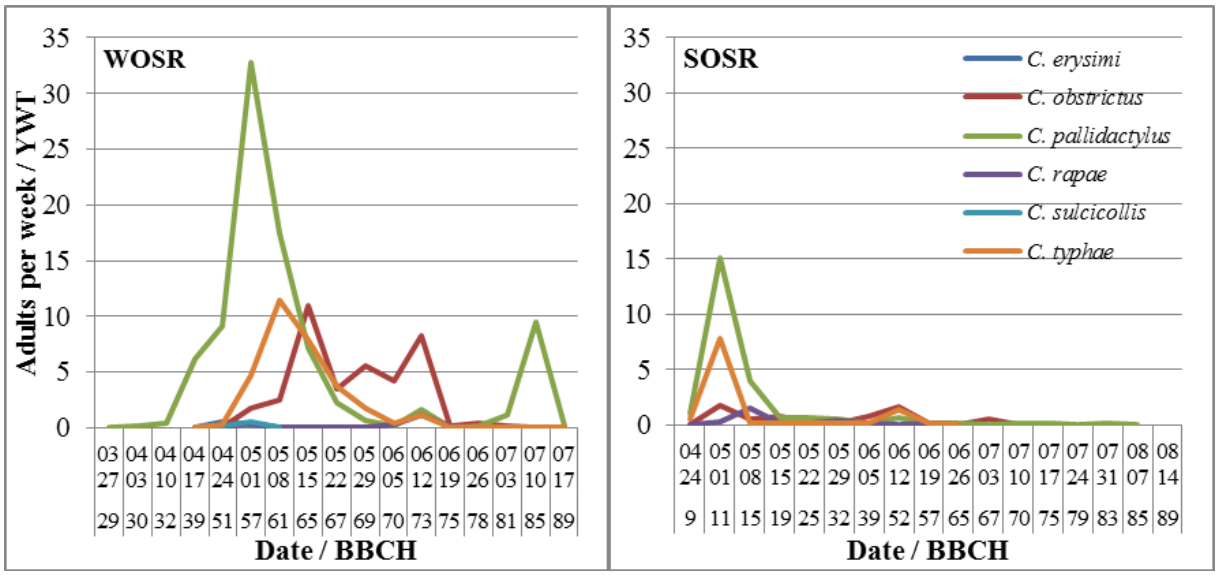

Figure 8. Migration activity of *Ceutorhynchus* species in winter (WOSR) and spring oilseed rape (SOSR) in the 2012 growing season

In our research, the most abundant *Ceutorhynchus* species were *C. pallidactylus* and *C. Obstrictus;* however, it has been reported that these two species are pests of rape stems and pods (Williams, 2010). *C. typhae* species was also abundant, but it feeds mainly on cruciferous weeds (Kuhlmann & Mason, 2002). The differences in abundance may be due to the differences in the growth habit of winter and spring oilseed rape. Spring oilseed rape has short ground rosette phenophase and fast stem elongation and such plants are unsuitable for the oviposition of *C. pallidactylus* adults that lay eggs in leaves of oilseed rape plants (Sedivy, Vasak, 2002).

CONCLUSIONS

During the 2007 –2012 growing seasons a total of 10 050 *Ceutorhynchus* beetles were collected: in winter oilseed rape – 9 138, in spring oilseed rape - 912. The abundance of *Ceutorhynchus* beetles was much higher in winter oilseed rape than spring oilseed rape. Our results show that identified beetles belong to six *Ceutorhynchus* species: *C. obstrictus*, *C. pallidactylus*, *C. typhae*, *C. erysimi*, *C. rapae* and *C. sulcicollis*. The dominating species were *C. pallidactylus*, *C. typhae* and *C. obstrictus;* however, only *C. pallidactylus* and *C. obstrictus* species are important stem and pod pests of winter and spring oilseed rape in Lithuania.

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