

# Pests and their natural enemies within organic winter oilseed rape (*Brassica napus* L.).

Daniel Nerad<sup>1</sup>, Josef Škeřík<sup>1</sup>, Petr Baranyk<sup>2</sup>, Perla Kuchtova<sup>2</sup>, Jan Kazda<sup>3</sup>

<sup>1</sup>Union of Oilseeds Growers and Processors (SPZO), Jankovcova 18, 170 37 Prague, Czech Republic

<sup>2</sup>Department of Crop Protection, Czech University of Agriculture, Prague (CUAP), 165 21 Czech Republic

<sup>3</sup>Department of Crop Production, Czech University of Agriculture, Prague (CUAP), 165 21 Czech Republic  
Email: baranyk@af.czu.cz

## Abstract

The 92 % of 250,000 ha of organically cultivated land in the Czech Republic consists of pastures and permanent grass cultures. The part of arable land is only 8 % and oilseed crops there practically absent. To the contrary, growing areas of conventionally produced winter oilseed rape has fluctuated at about 300,000 ha in recent years (10–12 % of total arable land in the CR). Problems with growing oilseed rape in organic agriculture are predominantly related to the spread of weeds, pests and diseases under the influence of prevailing conventional technology. This study aims to specify optimal methods of growth development and weeds reduction by oilseed rape within organic production technology. Also, the occurrence of natural enemies (Hymenoptera) was monitored to determine their importance for oilseed rape pest reduction. The small-plot trials (10 m<sup>2</sup>) with winter organic oilseed rape (OOR) were conducted since 2002 at the experimental station of the CUAP in Prague – Uhřetíněves, on the officially certified field for organic production. The occurrence of pests and parasitoids was monitored weekly during end of April till end of June on a weekly basis, using a 250 mm sweep net. The numbers of pest larvae and level of their parasitization were monitored weekly during half of May till half of July on a weekly basis, using water traps. The yield characteristics were also assessed. Compared were organically grown plots and those with conventional crop protection.

The results confirmed the capacity of successful OOR growing, using wide rows and a higher sowing density. Under optimal conditions, the total yield potential of OOR could achieve 60–70 % of yields commonly reached by conventional technology. Numerous oilseed rape pest parasitoids were found during flowering: namely *Tersilochus* and *Phradis* (Ichneumonidae) – parasitoids of pollen beetles (*Meligethes* spp.); *Trichomalus* and *Mesopolobus* (Pteromalidae) – parasitoids of cabbage seed weevil (*Ceutorhynchus assimilis*); *Platygaster* (*Platygastridae*) – parasitoids of brassica pod midge (*Dasineura brassicae*). The difference in occurrence of parasitoids, pests and level of their larval parasitization was found between organically grown plots and those with conventional chemical crop protection. The consequences for integrated oilseed rape pest management are discussed.

**Key words:** organic oilseed rape, growing technology, pests, parasitoids, Hymenoptera, *Meligethes aeneus*, *Ceutorhynchus assimilis*

## Introduction

Problems with growing oilseed rape in organic agriculture are predominantly related to the spread of weeds, pests and diseases under the influence of prevailing conventional technology. This study aims to specify optimal agrotechnical methods of growth development and weeds reduction by oilseed rape within organic production technology. Also, recently, the occurrence of natural enemies (Hymenoptera) was monitored to determine their importance for oilseed rape pest reduction.

## Methods

The small-plot trials (10 m<sup>2</sup>) with winter oilseed rape were conducted since 2002 at the experimental station of the Czech University of Agriculture in Prague – Uhřetíněves, on the officially certified field for organic production. Two cultivars of winter oilseed rape (hybrid cv. Baldur, standard cv. Aviso) were sown in two different row distances (12.5 and 25 cm) and three sowing densities (40, 80, 120 seeds/m<sup>2</sup> for cv. Baldur; 60, 120, 180 seeds/m<sup>2</sup> for cv. Aviso). The yield characteristics were assessed. Also, the occurrence of pests and parasitoids was monitored weekly from 11 May 2005 to 21 June 2005 on a weekly basis, using a 250 mm sweep net. The numbers of pest larvae and level of their parasitization were monitored weekly during half of May till half of July on a weekly basis, using water traps. Compared were organically grown plots and those with conventional crop protection.

## Results and discussion

Despite seasonal differences, the best results were obtained from the wide-row plots, both for hybrid and line cultivars (Figure 1, 2). This result was not fully unambiguous in hybrid rape and for high price of seed and difficult ecological propagation; because use of hybrids will be rather eliminated. In selection of the size of seed rate could be recommended carefulness in hybrid variety and sowing of maximum of twice of conventional sowing rate. Seeding into wide rows and regular weeding is a condition of successful production of OOR.

Numerous oilseed rape pest parasitoids were found during flowering: namely *Phradis* and *Tersilochus* (Ichneumonidae) – parasitoids of pollen beetles (*Meligethes* spp.) (Figure 3, 4), *Trichomalus*, *Mesopolobus* (Pteromalidae) and *Bracon*

(Braconidae) – parasitoids of cabbage seed weevil (*Ceutorhynchus assimilis*); *Platygaster* (Platygastridae) – parasitoids of brassica pod midge (*Dasineura brassicae*) (Šedivý, 1983; Goulet, Huber, 1993; Alford, 2003). Results showed much higher diversity in the incidence of all groups of insects in OOR growth. The diversity of insect species and greater and more stable representation of pest natural enemies are typical for it. Insecticide treatments may exterminate or repel them and colonizing of the stand appears lower and with time delay.

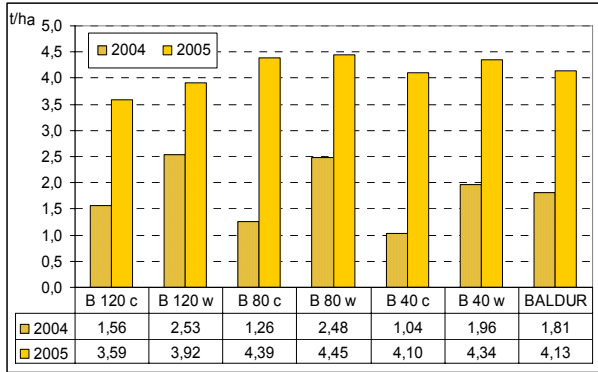


Figure 1. Average yield of cultivar Baldur (2004, 2005)

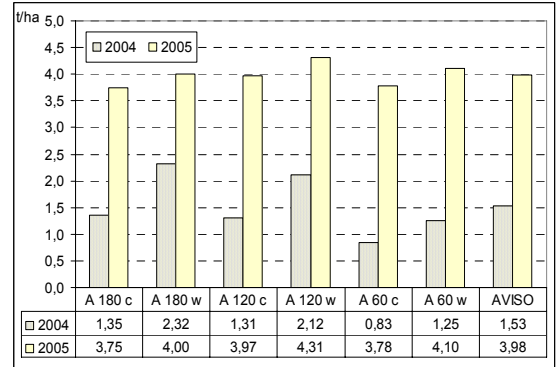


Figure 2. Average yield of cultivar Aviso (2004, 2005)

The level of parasitized larvae of pollen beetles was found between 14 – 40 % by conventionally grown oilseed rape and between 13 – 18 % by OOR. However, the total amount of pollen beetles larvae observed by OOR was more than ten time higher than by conventional oilseed rape. The level of parasitized larvae of cabbage seed weevil was found only by OOR growth, where ranged between 22 - 25 %.

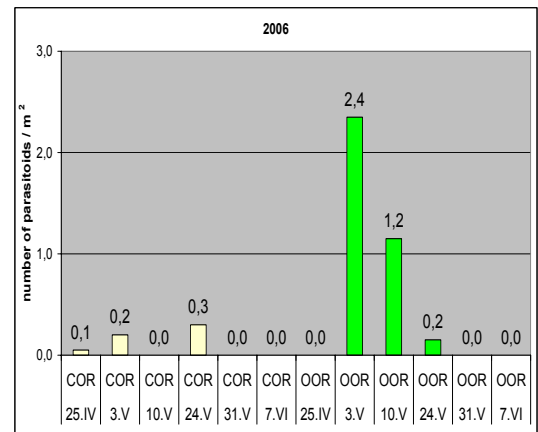
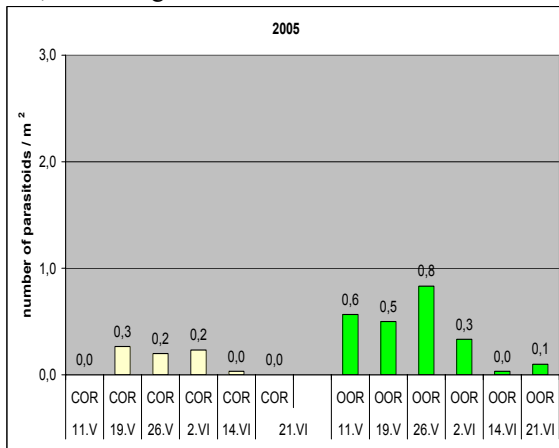


Figure 3, 4. Number of parasitoids (*Tersilochus* sp.) in 2005 and 2006 captured by sweep net in conventionally grown plots (COR) and in organically grown plots (OOR) between May and June at the experimental site in Prague Uhřetíněves. Insecticide treatment at COR: 6.4. - cypermethrin+chlorpyrifos (20.4. in 2006), 2.5. - deltamethrin.

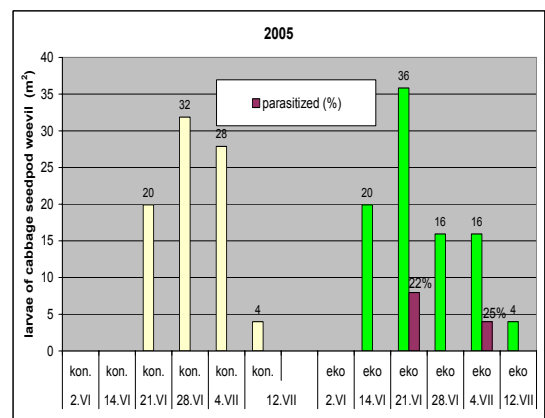
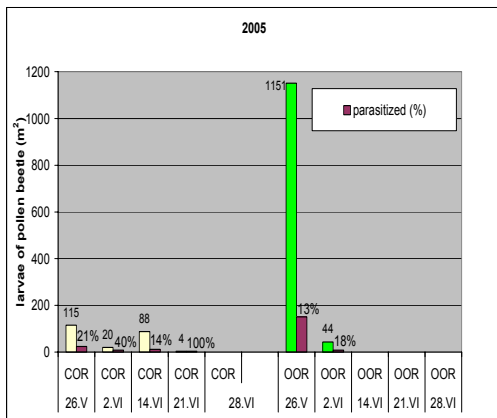


Figure 5, 6. Number of larvae of pollen beetle (5) and cabbage seedpod weevil (6) in area of 1 m<sup>2</sup> in weekly period in conventionally grown plots (COR) and in organically grown plots (OOR) between May and June 2005 at the experimental site in Prague Uhřetíněves, Czech Republic.

## Conclusions

Under optimal conditions, the total yield potential of OOR could achieve 60–70 % of yields commonly reached by conventional technology. The first observation in OOR showed higher density of population both pests and their parasitoids. However, further studies are necessary for closer determination of parasitoids influence on reducing pest populations within OOR, and also to compare populations in OOR with those in conventionally grown plots.

## Acknowledgements

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