

**International Organization for Biological and Integrated Control  
of Noxious Animals and Plants (IOBC)**

West Palaearctic Regional Section (WPRS)



***Centre of Excellence  
in Plant Agrobiolgy and Molecular Genetics  
PAGEN***



**International Workshop**

**Integrated Control  
in Oilseed Crops**



QLK5-CT-2002-30379

**Poznań 2005**

# **“Integrated Control in Oilseed Crops”**

International Workshop, 11 - 12 October 2005, Poznań, Poland

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**11 October 2005**

**12 October 2005**

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- J-02** Oilseed crops in Poland – history and prospects
- J-03** Integrated Pest Management in oilseed crops in Pakistan
- J-04** Integrated control of oilseed crops in Belarus
- J-05** Occurrence of bees (*Apoidea*) on winter oilseed rape - implications for pest control
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- J-07** SECURE – Stem Canker of oilseed rape: Molecular methods and mathematical modeling to deploy durable resistance (QLK5-CT-2002-01813)

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- P-02** Effects of mineral fertilisers and crop protection programmes on diseases of winter oilseed rape in Poland
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- P-04** Detection of *Pyrenopeziza brassicae* (light leaf spot) infection of winter oilseed rape leaves
- P-05** Development of light leaf spot and phoma stem canker on a range of current and historical oilseed rape cultivars at Rothamsted in 2003/4 and 2004/5 growing seasons
- P-06** Phomadidacte: a computer-aided training program for the severity assessment of phoma stem canker of oilseed rape
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- P-11** Studies on the contribution of cultivar resistance to the management of stem canker (*Leptosphaeria maculans*) in Europe
- P-12** Controlling the deployment of a new specific resistance Rlm7 to *Leptosphaeria maculans* in a small production area in the Centre of France

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- P-13** Effects of temperature on Rlm6-mediated resistance to *Leptosphaeria maculans* in *Brassica napus*
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- p-02** Importance of application mode for the efficacy of CONTANS (*Coniothyrium minitans*) in biocontrol of *Sclerotinia sclerotiorum*
- p-03** Analysis of systemic signals in the xylem of *Brassica napus* infected with *Verticillium longisporum*
- p-04** *Verticillium longisporum* in winter oilseed rape - Impact on plant development and yield
- p-05** Significance of *Leptosphaeria maculans* and *Sclerotinia sclerotiorum* incidence of Winter Rapeseed in the Czech Republic
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- p-08** *In vitro* comparison of fitness of AvrLm1 vs. avrLm1 *Leptosphaeria maculans* isolates
- p-09** Molecular detection of *L. maculans* and *L. biglobosa* spores from Burkard tapes
- p-10** Effect of temperature on development of lesions caused by *Alternaria* spp. on leaves of oilseed rape
- p-11** Effect of differentiated fertilization with sulphur on health status of winter oilseed rape
- p-12** Health status of winter oilseed rape depending on differentiated fertilization with nitrogen and sulphur
- p-13** The incidence of *Alternaria* spp. on seeds of chosen population and hybrid oil seed rape cultivars
- p-14** Effectiveness of combined application of insecticides and fungicides for control of winter oilseed rape pests and diseases in the period of flowering and pods formation according to the time and frequency of applications
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### Entomology Sessions

- E-01** Insect problems in European oilseed rape cultivation, and how to deal with them: the OSR farmers' perspective
- E-02** Efficacy of *Trichogramma chilois* (Ishii) and some new chemistry insecticides against *Helicoverpa armigera* (Hübner) in Sunflower
- E-03** First steps to analyse pyrethroid resistance of different oil seed rape pests in Germany
- E-04** Resistance of Pollen beetle (*Meligethes aeneus* F.) to pyrethroids, chloronicotinyls and organophosphorous insecticides in Poland
- E-05** Responses of pollen beetles (*Meligethes aeneus*) to conspecific odours
- E-06** Responses of pollen beetles (*Meligethes aeneus*) to petal colour
- E-07** Predation rates and assessment of *Staphylinidae* larvae from oilseed rape flower stands and their role in regulation of *Meligethes* larvae
- E-08** Oilseed rape pests and their parasitoids in Estonia
- E-09** Phenology of parasitoids (Hym., *Ichneumonidae*, *Tersilochinae*) of oilseed rape pests in northern Germany in 1995-1997
- E-10** Upwind anemotaxis of the parasitoid, *Tersilochus obscurator*, during its migration flights to oilseed rape
- E-11** *Phradis morionellus* on *Meligethes aeneus*: long-term patterns of parasitism and impact on pollen beetle populations in Finland
- E-12** Study of harmful *Anthomyiidae* in oilseed rape fields with different drilling dates
- E-13** Sex determination of insect pests of oilseed rape for behavioural bioassays

### Entomology Posters

- e-01** Damage of registered Polish winter oilseed rape cultivars caused by pests
- e-02** The endanger of oilseed rape with pests in Poland
- e-03** The damages of seeds and seedlings of winter oilseed rape cultivars caused by *Deroceras reticulatum* (Müller) (Gastropoda: Pulmonata: Agriolimacidae) and *Arion lusitanicus* Mabilie (Gastropoda: Pulmonata: Arionidae)
- e-04** The Influence of Glucosinolate Content Variability in the Seed and Green Matter of Winter Rapeseed on the Attack by Selected Pests
- e-05** Subsequent effect of pyrethroids Karate and Mavrik to carabid beetles (Coleoptera, Carabidae) activity in winter rapeseed crop
- e-06** Adult activity and larval abundance of stem weevils and their parasitoids at different crop densities of oilseed rape
- e-07** Larval parasitism of *Ceutorhynchus napi* Gyll. and *Ceutorhynchus pallidactylus* (Mrsh.) in plots of different crop density of oilseed rape
- e-08** Impact of rape stem weevil, *Ceutorhynchus napi*, on infections of oilseed rape stems by *Phoma lingam*
- e-09** Effectiveness of combined application of insecticides and fungicides for control of winter oilseed rape pests and diseases in the period of flowering and pods formation according to the time and frequency of applications

## LIST OF PARTICIPANTS

# Programme

## “Integrated Control in Oilseed Crops”

International Workshop, 11 - 12 October 2005, Poznań, Poland

### Biannual Meeting IOBC Working Group

#### *Integrated Control in Oilseed Crops*

Poznan, Poland 11<sup>th</sup>-12<sup>th</sup> October 2005

#### Schedule of the Meeting

<b>10 October</b>			<i>Arrival, Registration, mounting of posters</i>
<b>11 October</b>			
08:30 - 10:30	Joint section	Session <b>J1</b>	+ <i>General / Plenary presentations</i>
10:30 - 11:00	<b>Coffee break</b>		
11:00 - 13:00	Subsections	Pathology <b>P1</b>	+ <i>General aspects of oilseed rape pathogens</i> + <i>Effects of fertilizers on oilseed rape plant health</i> + <i>Light leaf spot / Leptosphaeria sp. Part 1</i>
		Entomology <b>E1</b>	+ <i>Pest damage to oilseeds – Problems</i> + <i>Pest damage to oilseeds – Solutions (I) Insecticides and issues regarding insecticide resistance</i> + <i>Pest damage to oilseeds – Solutions (II) Integrated pest management: manipulating pest behaviour</i>
13:00 - 14:00	<b>Lunch break</b>		
14:00 - 16:15	Subsections	Pathology <b>P2</b>	+ <i>Leptosphaeria sp. Part 2</i>
		Entomology <b>E2</b>	+ <i>Pest damage to oilseeds – Solutions (III) Integrated pest management: Predators &amp; Parasitoids</i>
16:15 - 16:45	<b>Coffee break</b>		
16:45 - 18:00	Poster Session		
19:00	<b>Conference Dinner</b>		
<b>12 October</b>			
08:15 - 10:00	Subsections	Pathology <b>P3</b>	+ <i>Sclerotinia</i> + <i>Verticillium</i>
09:00 - 10:00		Entomology <b>E3</b>	+ <i>Techniques</i> + <i>Discussion</i>
10:00 - 10:30	<b>Coffee break</b>		
10:30 - 12:00	Joint section	Session <b>J2</b>	+ <i>Interactions between pests and diseases and their management in oilseeds</i> + <i>Progress status reports</i> + <i>Close</i>
12:00	<b>Excursion</b> ( <i>Plant Breeding Strzelce, Branch Malyszyn" and "Bat reserve", -Packed lunch on the bus</i> )		
<b>13 October</b>	<b>Departure</b>		

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### JOINT SECTION

**11 October**

**Joint Session 1**

**08:30 - 10:30**

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#### General / Plenary presentations

- 08:30 - 08:45    Opening  
Birger Koopmann, Sam Cook, Malgorzata Jedryczka  
*University Göttingen, Germany; Rothamsted Research, Harpenden, UK; Institute of Plant Genetics PAS, Poznan, Poland*
- 08:45 - 09:00    History and Achievements of the IOBC Working Group Integrated Control in Oilseed Crops  
Volker Paul  
J-01    *University Paderborn, Germany*
- 09:00 – 09:30    Oilseed Crops in Poland: Past and Perspectives  
Prof. Jan Krzymanski  
J-02    *Institute of Plant Breeding and Acclimatization (IHAR), Branch Poznan, Poland*
- 09:30 – 09:45    Integrated Pest Management of oilseed crops in Pakistan  
Waqas Wakil  
J-03    *University of Arid Agriculture, Rawalpindi, Pakistan*
- 09:45 – 10:30    Integrated oilseed rape protection in Belarus  
Jadviha Piliuk  
J-04    *Research Institute of Arable Farming and Plant Breeding, Zhodino, Belarus*
- 10:15 – 10:30    IOBC WG aspects: next meeting etc.  
Birger Koopmann, Sam Cook  
*University Göttingen, Germany; Rothamsted Research, Harpenden, UK*
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**10:30 – 11:00    Coffee break**

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### PATHOLOGY SUBSECTION

11 October

Pathology Session 1

11:00 - 13:00

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#### General aspects of oilseed rape pathogens

- 11:00 - 11:20 OREGIN core collection of oilseed rape fungal pathogen isolates to be managed by a relational database accessible to stakeholders via the Internet  
Paul E Hornby, Akinwunmi Latunde-Dada, Nathalie Castells-Brooke, Neal Evans, Bruce DL Fitt, and Graham J King  
P-01 *Rothamsted Research, Harpenden, UK*

#### Effects of fertilizers on oilseed rape plant health

- 11:20 - 11:40 Healthiness of winter oilseed rape in differentiated chemical protection and mineral fertilisation  
Anna Podlesna, Malgorzata Jedryczka, Elzbieta Lewartowska  
P-02 *Institute of Soil Science and Plant Cultivation (IUNG), Pulawy, Poland, Institute of Plant Genetics, PAS, Poznan, Poland*
- 11:40 – 12:00 Influence of sulphur, magnesium and boron fertilization on the level of glucosinolates and their effect on *Alternaria* spp. infestation of oil rape seeds  
L. Figas, L. Drozdowska, Cz. Sadowski, Aleksander Lukanowski  
P-03 *Department of Plant Physiology, Department of Phytopathology, University of Technology and Agriculture, Bydgoszcz, Poland*

#### Light leaf spot / *Leptosphaeria* sp. Part1

- 12:00 - 12:20 Detection of *Pyrenopeziza brassicae* (light leaf spot) infection of winter oilseed rape leaves  
Zbigniew Karolewski, Bruce Fitt, Akinwunmi Latunde-Dada, Neal Evans  
P-04 *University of Agriculture, Poznan, Poland; Rothamsted Research, Harpenden, UK*
- 12:20 – 12:40 Development of light leaf spot and phoma stem canker on a range of current and historical oilseed rape cultivars at Rothamsted in 2003/4 and 2004/5 growing seasons  
Katherine Downes, Neal Evans, Elizabeth Pirie and Bruce DL Fitt  
P-05 *Rothamsted Research, Harpenden, UK*
- 12:40 – 13:00 *Phomadidacte*: a computer-aided training program for the severity assessment of phoma stem canker of oilseed rape  
Jean-Noel Aubertot, Y Sohbi, Hortense Brun, Anette Penaud, FW Nutter  
P-06 *UMR d'Agronomie INRA/INP, Thiverval-Grignon France, UMR BIO3P, Domaine de la Motte, Le Rheu Cedex, France, CETIOM, Thiverval-Grignon, France, Iowa State University, Dep. Plant Pathology, USA*
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13:00 -14:00 **Lunch break**

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11 October

Pathology Session 2

14:00 - 16:30

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### Leptosphaeria sp. Part2

- 14:00 - 14:15 Distribution and change in *L. maculans* / *L. biglobosa* populations in Poland (2000-2004)  
P-07 Małgorzata Jedryczka, Elzbieta Lewartowska  
*Institute of Plant Genetics, PAS, Poznan, Poland*
- 14:15 – 14:30 Development of a decision support system for control of stem canker of oilseed rape in Poland  
P-08 Joanna Kaczmarek, Małgorzata Jędryczka, J. Czernichowski  
*Institute of Plant Genetics, PAS, Poznan, Poland; DuPont Poland, Warszawa, Poland*
- 14:30 – 14:45 SimMat, a new dynamic module of Blackleg Sporacle for the prediction of pseudothecia maturation of *L. maculans*/ *L. biglobosa* species complex. Parameterisation and evaluation in Polish conditions  
P-09 Jean-Noel Aubertot, MU Salam, AJ Diggle, S Dakowska, M Jedryczka  
*UMR d'Agronomie INRA/INA P-G, Thiverval-Grignon, France, Department of Agriculture, Western Australia, Centre for Cropping Systems, Western Australia; Department of Agriculture, Western Australia, Institute of Plant Genetics, PAS, Poznan, Poland.*
- 14:45 – 15:00 Prediction of the date of onset of phoma leaf spot epidemics on winter oilseed rape in the UK  
P-10 Neal Evans, Andreas Baierl, Peter Gladders, Beth Hall and Bruce DL Fitt  
*Rothamsted Research, UK; ADAS Boxworth, Cambridge, UK; Syngenta Crop Protection UK*
- 15:00 – 15:15 Studies on the contribution of cultivar resistance to the management of stem canker (*Leptosphaeria maculans*) in Europe  
P-11 Peter Gladders, Hortense Brun, Xavier. Pinochet, Małgorzata. Jedryczka, Ingrid Happstadius and Neal Evans  
*ADAS, UK, UMR BIO3P, Domaine de la Motte, Le Rheu Cedex, France, CETIOM, T.-Grignon, France; Institute of Plant Genetics, PAS, Poznan, Poland, Svalöv Weibull, Sweden, RRes, Rothamsted, UK*
- 15:15 – 15:30 Controlling the deployment of a new specific resistance Rlm7 to *Leptosphaeria maculans* in a small production area in the Centre of France  
P-12 Anette Penaud, E. Mestries, G. Sauzet, Xavier Pinochet  
*CETIOM, Centre de Grignon, Thiverval Grignon, France; CETIOM, Saint-Florent sur Cher, France*
- 15:30 – 15:45 Effects of temperature on Rlm6-mediated resistance to *Leptosphaeria maculans* in *Brassica napus*  
P-13 Yongju Huang, Renhu Liu, Ziqin Li, Neal Evans, Anne-Marie Chèvre, Regine Delourme, Michel Renard, Bruce Fitt  
*Plant Protection Institute, Inner Mongolia Academy of Agricultural Sciences, Huhhot, China; Rothamsted Research, Harpenden, UK; INRA, UMR, APBV, Le Rheu Cedex, France*
- 15:45 – 16:00 Detection and quantification of *Leptosphaeria maculans* in the petiole of *Brassica napus*  
P-14 Elizabeth J Pirie, Bruce DL Fitt, Akinwunmi O Latunde-Dada, P. Werner  
*Rothamsted Research, Harpenden, UK; CPB-Twyford, Hertfordshire, UK*
- 16:00 – 16:15 The whole genome sequencing project of *Leptosphaeria maculans*  
P-15 Marie-Helene Balesdent, Barbara J. Howlett, Thierry Rouxel  
*INRA Versailles, France, School of Botany, University of Melbourne, Australia*
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16:15 -16:45 **Coffee Break**

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11 October

Pathology Posters

16:45 - 18:00

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### Poster Session

- p-01 Impact of rape stem weevil, *Ceutorhynchus napi*, on infections of oilseed rape stems by *Phoma lingam*  
Ulrike Krause, Birger Koopmann, Bernd Ulber  
*Institute of Plant Pathology and Plant Protection, University Göttingen, Germany*
- p-02 Importance of application mode for the efficacy of CONTANS (*Coniothyrium minitans*) in biocontrol of *Sclerotinia sclerotiorum*.  
Ibriam Daoud, Katrin Hedke, Andreas v. Tiedemann  
*Institute of Plant Pathology and Plant Protection, University Göttingen, Germany, Institute of Phytomedicine, University Rostock, Germany*
- p-03 Analysis of systemical signals in the xylem of brassicaceae infected by *Verticillium* sp.  
Nadine Riediger, Birger Koopmann, Andres Schützendübel, Petr Karlovsky, Ursula Hettwer, D. Marsh, B. Angerstein, Andreas von Tiedemann  
*Institute of Plant Pathology and Plant Protection, University Göttingen, Germany; Max Planck Institute for Biophysical Chemistry, Göttingen, Germany*
- p-04 *Verticillium longisporum* in winter oilseed rape. Impact on plant development and yield  
Sarah Dunker, Harald Keunecke, Andreas von Tiedemann  
*Institute of Plant Pathology and Plant Protection, University Göttingen, Germany*
- p-05 Significance of *Leptosphaeria maculans* and *Sclerotinia sclerotiorum* incidence of Winter Rapeseed in the Czech Republic  
Lenka Odstrčilová and Eva Plachka  
*Agritec, Research, Breeding and Services Ltd.; OSEVA PRO Ltd., Research Institute of Oilseed Crops at Opava, Czech Rep.*
- p-06 Consequences of oilseed rape infection with phytoplasma like organisms  
Eligia Starzycka and Michal Starzycki  
*Institute of Plant Breeding and Acclimatization (IHAR), Poznan, Poland*
- p-07 Polymorphisms within *Leptosphaeria maculans* and *Leptosphaeria biglobosa* revealed with rep-PCR fingerprints  
Witold Irzykowski and Malgorzata Jedryczka  
*Institute of Plant Genetics, PAS, Poznan, Poland*
- p-08 *In vitro* comparison of fitness of *avrLm1* vs. *avrLm1* *Leptosphaeria maculans* isolates  
Julia Olechnowicz, Marie-Hélène Balesdent and Malgorzata Jedryczka  
*Institute of Plant Genetics, PAS, Poznan, Poland, Institute National de la Recherche Agronomique (INRA), Versailles, France*
- p-09 Molecular detection of *L. maculans* and *L. biglobosa* spores from Burkard tapes  
Anna Stachowiak, Witold Irzykowski and Malgorzata Jedryczka  
*Institute of Plant Genetics, PAS, Poznan, Poland*
- p-10 Effect of temperature on development of leaf lesions caused by *Alternaria* spp. on leaves of oilseed rape  
Aneta Gutowska, Paulina Borowczak and Malgorzata Jedryczka  
*Agricultural University, Poznan, Poland; Institute of Plant Genetics PAS, Poznan, Poland*
- p-11 Effect of differentiated fertilization with sulphur on health status of winter oilseed rape  
Czeslaw Sadowski, K. Jankowski, D. Panka  
*Department of Phytopathology, University of Technology and Agriculture, Bydgoszcz, Poland; Department of Crop Production, University of Warmia and Mazury in Olsztyn, Poland*
- p-12 Health status of winter oilseed rape depending on differentiated fertilization with nitrogen and sulphur  
Czeslaw Sadowski, K. Jankowski, L. Lenc  
*Department of Phytopathology, University of Technology and Agriculture, Bydgoszcz, Poland; Department of Crop Production, University of Warmia and Mazury in Olsztyn, Poland*

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- p-13 The incidence of *Alternaria spp.* on seeds of chosen population and hybrid oil seed rape cultivars  
Ewa Jajor and Marek Korbas  
*Institute of Plant Protection, Department of Mycology, Poznań, Poland*
- p-14 Effectiveness of combined application of insecticides and fungicides for control of winter oilseed rape pests and diseases in the period of flowering and pods formation according to the time and frequency of applications  
Gustaw Seta and Marek Mrówczyński  
*Institute of Plant Protection, Branch Sośnicowice, Poland; Institute of Plant Protection, Poznań, Poland*
- p-15 Comparison of results of a petal test and natural infection of oilseed rape with sclerotinia stem rot in Poland  
Małgorzata Jedryczka, A. Tekiel, M. Glazek  
*Institute of Plant Genetics PAS, Poznan, Poland; Institute of Plant Protection, Regional Experiment Station, Rzeszow, Poland; Institute of Plant Protection, Branch Sosnicowice, Poland*
- p-16 Patterns of *Leptosphaeria maculans/ L. biglobosa* ascospore release in the season 2004/2005 in Poland  
J. Kaczmarek, A. Maczynska, I. Kasprzyk, A. Lewandowski, Małgorzata Jędrzycka  
*Institute of Plant Genetics PAS, Poznan, Poland; Institute of Plant Protection, Branch Sosnicowice, Poland; University of Rzeszow, Poland; Research Centre for Cultivar Testing, Slupia Wielka, Poland;*
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19:00

**Conference Dinner**

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12 October

Pathology Session 3

08:15 - 10:00

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### Sclerotinia

- 08:15 – 08:30 Development of a new disease and yield loss related prediction model for *Sclerotinia sclerotiorum* in winter oilseed rape in Germany  
Simone Koch, Benno Kleinhenz, Manfred Röhrig, Hans Friesland, Andreas von Tiedemann  
P-16 *Institute of Plant Pathology and Plant Protection, University Göttingen, Germany, Central Institution for Decision Support Systems in Crop Protection (ZEPP), Bad Kreuznach, Germany; Information System for Integrated Plant Production (ISIP), Bad Kreuznach, Germany; German Meteorological Service (DWD), Braunschweig, Germany*
- 08:30 – 08:45 Petal test – success and disappointments in *Sclerotinia* stem rot forecasting in China and Poland  
Malgorzata Jedryczka, Piotr Kachlicki and Qiangsheng Li  
P-17 *Institute of Plant Genetics PAS, Poznan, Poland; Institute of Crop Research, AAAS, China*
- 08:45 – 09:00 Studies on the germination of sclerotia and formation of apothecia of *Sclerotinia sclerotiorum*  
Yong Liu, Volker Paul  
P-18 *Institute of Plant Protection, Sichuan Academy of Agricultural Sciences, China University Paderborn, Germany*

### Verticillium

- 09:00 – 09:15 Verticillium wilt on *Brassica* oilseed crops  
Christina Dixelius, Ingrid Hapstadius and Gunilla Berg  
P-19 *Department of Plant Biology & Forest Genetics, SLU, Uppsala, Sweden; Svalöf Weibull Svalöv, Sweden; Swedish Board of Agriculture, Plant Protection Service, Alnarp, Sweden*
- 09:15 – 09:30 Verticillium wilt in Sweden - incidence, field scoring and importance  
Gunilla Berg, Christina Dixelius and Ingrid Hapstadius  
P-20 *Swedish Board of Agriculture, Plant Protection Center, Alnarp, Sweden; Swedish University of Agricultural Sciences (SLU), Uppsala, Sweden; Svalöf Weibull AB, Svalöv, Sweden*
- 09:30 – 09:45 Determination of risk-factors for the occurrence of *Verticillium longisporum*  
Holger Kreye, Gerhard Wolf, Peter Steinbach  
P-21 *BBA Braunschweig, Germany, Institute of Plant Pathology and Plant Protection, University Göttingen, Germany, PSA Rostock, Germany*
- 09:45 – 10:00 Comparative histological studies on the interaction of *Brassica napus* with *Verticillium longisporum* and *V. dahliae*.  
Christina Eynck, Birger Koopmann, Gisela Grunewaldt- Stöcker, Andreas von Tiedemann  
P-22 *Institute of Plant Pathology and Plant Protection, University Göttingen, Germany, Institute of Plant Diseases and Plant Protection, University of Hannover, Germany*
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### ENTOMOLOGY SUBSECTION

11 October

Entomology Session 1

11:00 - 13:00

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#### Pest damage to oilseeds – Problems

- 11:00 - 11:20 Insect problems in European oilseed rape cultivation, and how to deal with them: the OSR farmers' perspective  
I. Menzler-Hokkanen, Heikki MT Hokkanen, Wolfgang Büchs, Zdzisław Klukowski, Anne Luik, Christer Nilsson, Bernd Ulber and Ingrid Williams  
E-01 *University of Helsinki, Finland; BBA Braunschweig, Germany; IPP Poznan, Poland, Estonian Agricultural University, Tartu, Estonia, SLU, Alnarp, Sweden., Institute of Plant Pathology and Plant Protection, University Göttingen, Germany, Rothamsted Research, Harpenden, UK*

#### Pest damage to oilseeds – Solutions (I) Insecticides and issues regarding insecticide resistance

- 11:20 – 11:40 Efficacy of *Trichogramma chilois* (Ishii) and some new chemistry insecticides against *Helicoverpa armigera* (Hübner) in Sunflower  
E-02 *Waqas Waki, Mansoor-ul-Hassan, Shahbaz Talib Sahi*  
*University of Arid Agriculture, Rawalpindi, Pakistan, University of Agriculture, Faisalabad, Pakistan*
- 11:40- 12:00 First steps to analyse pyrethroid resistance of different oil seed rape pests in Germany  
E-03 *Udo Heimbach, A. Müller, and T. Thieme*  
*BBA, Braunschweig, Germany, BTL Bio-Test Labor GmbH, Sagerheide, Germany*
- 12:00 - 12:20 Resistance of Pollen beetle (*Meligethes aeneus* F.) to pyrethroids, chloronicotinyls and organophosphorous insecticides in Poland  
E-04 *Pawel Wegorek*  
*IPP, Poznan, Poland*

#### Pest damage to oilseeds - Solutions (II) Integrated pest management: Manipulating pest behaviour

- 12:20-12:40 Responses of pollen beetles to conspecific odours  
E-05 *Samantha M Cook, Nigel P Watts, Ingrid H Williams*  
*Rothamsted Research, Harpenden, UK.*
- 12:40-13:00 Responses of pollen beetles to petal colour  
E-06 *Samantha M Cook, Matt P Skellern, Matthew Smith and Ingrid H Williams*  
*Rothamsted Research, Harpenden, UK.*
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13:00 -14:00 **Lunch**

## “Integrated Control in Oilseed Crops”

International Workshop, 11 - 12 October 2005, Poznań, Poland

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**11 October**

**Entomology Session 2**

**15:00-16:30**

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### Pest damage to oilseeds - Solutions (III) Integrated pest management: Predators & Parasitoids

- 14:00- – 14:20 Predation rates and assessment of Staphylinidae from oilseed rape flower stands and their role in regulation of *Meligethes* larvae  
Daniella Felsmann and Wolfgang Büchs  
E-07 *BBA, Braunschweig, Germany*
- 14:20 – 14:40 Oilseed rape pests and their parasitoids in Estonia  
Eve Veromann and Anne Luik  
E-08 *Estonian Agriculture University, Tartu, Estonia*
- 14:40 - 15:00 Phenology of parasitoids (Hym., *Ichneumonidae*–*Tersilochinae*) of oilseed rape pests in Germany  
Olaf Nitzsche, Bernd Ulber  
E-09 *Sächsische Landesanstalt für Landwirtschaft, Leipzig, Germany, Institute of Plant Pathology and Plant Protection, University Göttingen, Germany*
- 15:00 - 15:20 Upwind anemotaxis by the parasitoid *Tersilochus obscurator* (Hym., *Ichneumonidae*) on its migration flights to winter oilseed rape  
Ingrid H. Williams, Hassan Barari and Dave Frearson  
E-10 *Rothamsted Research, Harpenden, UK*
- 15:20 - 15:40 *Phradis morionellus* on *Meligethes aeneus*: long-term patterns of parasitism and impact on pollen beetle populations in Finland  
Heikki M. T. Hokkanen  
E-11 *Helsinki University, Finland*
- 15:40 – 16:15 Discussion
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**16:15 – 16:45 Coffee break**

## “Integrated Control in Oilseed Crops”

International Workshop, 11 - 12 October 2005, Poznań, Poland

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**11 October**

**Entomology Posters**

**16:45 - 18:00**

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### Poster

- e-01 Damage of registered Polish winter oilseed rape cultivars caused by pests  
Marek Mrówczyński, Henryk Wachowiak, Czesław Muśnicki, Michał Jodłowski, Stefan Heimann  
*Institute of Plant Protection, Poznan, Poland, Agricultural University, Poznan, Poland, Research Centre for Cultivar Testing, Słupia Wielka, Poland*
- e-02 The endanger of oilseed rape with pests in Poland  
Feliczyta Walczak and Marek Mrówczyński  
*Institute of Plant Protection, Poznań, Poland*
- e-03 The damages of seeds and seedlings of winter oilseed rape cultivars caused by *Deroceras reticulatum* (Müller) (*Gastropoda: Pulmonata: Agriolimacidae*) and *Arion lusitanicus* Mabilie (*Gastropoda: Pulmonata: Arionidae*)  
Tomasz Kałuski and Jan Kozłowski  
*Institute of Plant Protection, Poznań, Poland*
- e-04 The Influence of glucosinolate content variability in the seed and green matter of winter rapeseed on the attack of the selected pests  
Eva Plachká, O. Kolovrat, V. Vrbovský  
*OSEVA PRO Ltd., Research Institute of Oilseed Crops at Opava, Czech Rep.*
- e-05 Subsequent effect of pyrethroids Karate and Mavrik to carabid beetles (*Coleoptera, Carabidae*) activity in winter rapeseed crop  
Zdzisław Klukowski, and Jacek P. Twardowski  
*Agricultural University Wrocław, Poland*
- e-06 Adult activity and larval abundance of stem weevils and their parasitoids at different crop densities of oilseed rape  
Nadine Neumann and Bernd Ulber  
*Institute of Plant Pathology and Plant Protection, University Göttingen, Germany*
- e-07 Larval parasitism of *C. napi* & *C. palidactylus* in plots of different crop density of oilseed rape  
Kirsa Fisher and Bernd Ulber  
*Institute of Plant Pathology and Plant Protection, University Göttingen, Germany*
- e-08 Impact of rape stem weevil, *Ceutorhynchus napi*, on infections of oilseed rape stems by *Phoma lingam*  
Ulrike Krause, Birger Koopmann, Bernd Ulber  
*Institute of Plant Pathology and Plant Protection, University, Göttingen, Germany*
- e-09 Effectiveness of combined application of insecticides and fungicides for control of winter oilseed rape pests and diseases in the period of flowering and pods formation according to the time and frequency of applications  
Gustaw Seta  
*Institute of Plant Protection, Branch Sosnicowice, Poland*

19:00 **Conference dinner**

## “Integrated Control in Oilseed Crops”

International Workshop, 11 - 12 October 2005, Poznań, Poland

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**12 October**

**Entomology Session 3**

**09:00 - 10:00**

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### Techniques discussion

- 09:00 – 09:20 Study of harmful *Anthomyiidae* in oilseed rape fields with different drilling dates  
Wolfgang Büchs, S. Prescher  
E-12 *BBA, Institute for Plant Protection in Field Crops & Grassland, Braunschweig, Germany*
- 09:20 – 09:40 Sex determination of insect pests of oilseed rape for behavioural bioassays  
Samantha M Cook, Nigel P Watts, and Ingrid H Williams  
E-13 *Plant & Invertebrate Ecology Division, Rothamsted Research, Harpenden, Hertfordshire, UK*
- 09:40 – 10:00 Discussion and Entomology subsection summary discussions
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10:00 – 10:30 **Coffee break**



## **“Integrated Control in Oilseed Crops”**

International Workshop, 11 - 12 October 2005, Poznań, Poland

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### **Joint Section**

**12 October**

**Joint Session 2**

**10:30 - 11:45**

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#### **Interactions between pests and diseases and their management in oilseeds**

10:30 - 10:45    Occurrence of bees (*Apoidea*) on winter oilseed rape - implications for pest control  
                    Maria Kelm and Tomasz Strojny  
                    J-05            *Agricultural University, Wrocław, Poland*

#### **Progress status reports**

10:45 - 11:00    MASTER – Project Progress Report  
                    Ingrid Williams  
                    J-06            *Rothamsted Research, Harpenden, UK*

11:00 – 11:15    SECURE – Project Progress Report  
                    Neal Evans  
                    J-07            *Rothamsted Research, Harpenden, UK*

#### **Close**

11:15 – 11:45    IOBC: Next Meeting, Bulletin, Close  
                    Birger Koopmann, Sam Cook  
                    *University Göttingen, Germany; Rothamsted Research, Harpenden, UK*

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**12:00**

**Excursion (Plant Breeding Strzelce, Branch Malyszyn and "Bat reserve")**

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# **Presentations**

# **Joint Sessions**

J – 01

## **Aims, History and Achievements of the IOBC/wprs Working Group on Integrated Control in Oilseed Crops from 1982-2003**

**V.H. Paul**

*University of Paderborn, Germany*

**Abstract:** A chronological review from the beginning of the working group to the present is given with aims and achievements.

During more than twenty years of continuous collaboration with colleagues from different European countries the system of two subgroups with special topics, one in pathology and one in entomology and coming together for general topics for better understanding each other was very successful.

During these two decades the aims of integrated research and development were steadily optimized due to the general set up.

Amongst many important aims and achievements one should be pointed out particularly: to bring scientists from Central and Eastern Europe together in our network of joint collaboration.

Another important achievement/aim are EU-projects. Several successful projects were carried out respectively are still running or planned (e.g. BORIS, IMASCORE and MASTER).

A third one was/is a market-place for the exchange of experiences, knowledge and plans for the future especially to help young scientists to find the right pathway.

All the achievements of the IOBC/wprs Working Group on Integrated Control in Oilseed Crops from 1982 to 2003 are collected in seven bulletins as follows:

- 1) IOBC/wprs Bulletin Vol. 13(4), 1990
- 2) IOBC/wprs Bulletin Vol. 14(6), 1991
- 3) IOBC/wprs Bulletin Vol. 16(9), 1993
- 4) IOBC/wprs Bulletin Vol. 18(4), 1995
- 5) IOBC/wprs Bulletin Vol. 21(5), 1998
- 6) IOBC/wprs Bulletin Vol. 23(6), 2000
- 7) IOBC/wprs Bulletin Vol. 25(2), 2002

J – 02

## Oilseed crops in Poland – history and prospects

Jan Krzymański

*Instytut Hodowli i Aklimatyzacji Roślin, Zakład Roślin Oleistych, 60 479 Poznań, ul. Strzeszyńska 36, Poland*

**Abstract:** Systematic study on oilseed crops after 2nd World War started in Poland in 1950, when The Oil Crop Department in Poznań was established in Plant Breeding and Acclimatisation Institute. A broad spectrum of species were examined as possible oilseed crops for Poland. Possibilities of acclimatisation and expected economical values were investigated. Then the most promising species were chosen and research works and breeding were limited to the following crops:

- winter and spring oilseed rape (*Brassica napus*), winter oilseed turnip rape (*Brassica rapa*) and sunflower (*Helianthus annuus*) – oils for edible purposes,
- linseed (*Linum usitatissimum*) and false flax (*Camelina sativa*),
- poppy (*Papaver somniferum*) – seed for nutritional purposes and raw material for pharmaceutical industry,
- yellow mustard (*Sinapis alba*) - as a spice and phytosanitary aftercrop.

The works done up to the present demonstrate that oilseed rape is the oil crop which performs best of all in agroclimatic conditions of Poland. Researches on its genetics and its biochemistry formed the base for breeding of new, so called double low varieties characterised by lack of erucic acid in oil and very low level of glucosinolates in meal. Changeover to these new varieties was done in Poland in years 1985 - 1990. Now the changeover to hybrid varieties is realised.

Desired directions for future research and breeding works:

- adaptation of fatty acid composition to fit better the different oil uses;
- increasing of fat and protein contents in seeds;
- improvement of meal by further decreasing the content of antinutritive components like: alkenyl glucosinolates, dietary fiber, sinapine, polyphenols, phytin;
- search for sources of resistance or tolerance to diseases and to pests and to stress conditions (winterhardiness, drought resistance);
- improvement of agronomic value e.g. yielding ability, resistance to lodging, resistance to shattering;
- development and use of new method like tissue culture, doubled haploid production, protoplast fusion, vegetative propagation, interspecific crosses, embryo culture,
- production of new better hybrids using CMS or SI system
- marker assisted selection, estimation of genetic distance;
- improvement of oil stability – tocoferol content.

Quick increase of rapeseed production is expected in Poland in next years. It is connected with possibilities

## **Integrated Pest Management in Oilseed Crops in Pakistan**

**Waqas Wakil<sup>1</sup> and Shahbaz Talib Sahi<sup>2</sup>**

<sup>1</sup>*Department of Entomology, University of Arid Agriculture, Rawalpindi, Pakistan. E-mail: [waqaswakeel@hotmail.com](mailto:waqaswakeel@hotmail.com), <sup>2</sup>Department of Plant Pathology, University of Agriculture, Faisalabad, Pakistan*

**Abstract:** In Pakistan the oilseed crops are Seed cotton, Rapeseed, Sunflower, Sesame seed, Groundnut, Soybean, Linseed, Castor bean, Coconut and Safflower. Over the last about half century (from 1961 to 2004), area under oilseed crops has increased by about 100% i.e. from 1,963,980 hectares in 1961 to 3,964,266 hectares in 2004. Although the yield of oilseed crops is quite low as compared to many other countries of the world, yet it has increased by about 270 percent (from 1054 Hg/Ha in 1961 to 2951 Hg/Ha in 2004), during the period under discussion. Abiotic and biotic factors responsible for lower yield in Pakistan are discussed, with particular emphasis on pests. Different approaches for integrated pest management in practice in Pakistan are discussed in this paper.

**Keywords:** Integrated management, oilseed crops, Pakistan

J – 04

## Integrated oilseed rape protection in Belarus

Piluk J.E., Radaunia U.A.

*Institute of Arable Farming and Plant Breeding of the NAS of Belarus*

**Abstract:** The main oil crop in Belarus is winter and spring rape and it's cultivated on 80-140 th. ha area or 2,5-3,0% in a ploughed field structure. Totally there are 1,2 ml. ha of soils in Belarus fitted for cultivation of winter rape and 2,8 ml. ha for spring rape. Thus, a in perspective rape can cover 400-450 ml. ha in Belarus annually with a rape field in a crop rotation.

The crop capacity of winter rape oilseeds in average in 2005 was 18 c/ha, spring rape – 16 c/ha. A lot of farms receive 25-35 c/ha and even 40-50 c/ha.

In dependence on a hibernation of winter rape sowing areas of spring rape cover 45-80%. For the last 10 years in our republic winter rape winter-killed on 80-90% in 1994, 1999 and 2003 years. At the same time to 30% of winter rape plants were lost because of the break of crop technology cultivation (soils preparation, sowing terms, sowing norms and so on).

Annually rape in Belarus affected with a complex of diseases, the most significant of which are the following:

Alternaria blight (*Alternaria*) which development annually achieves to 20-80%, seed infection – 37-100%, sclerotinosis (*Sclerotinia sclerotiorum*), fusarial wilting of *F. oxysporum*, gray mould (*Botrytis cinerea*). On spring rape in sprouts period – wire stem (*Rhizoctonia*, *Pythium*, *Olpidium*, *Botrytis*), on winter rape in a period of hibernation – snow mould (*Fusarium nivale*, *Typhula incarnata*, *Sclerotinia trifoliorum*), bacteriosis (*Xanthomonas Pseudomonas*), root rots, phomosis (*Phoma lingam*). Potentially the dangerous diseases are disease caused by *Cylindrosporium* (*Cylindrosporium concentricum*), blue mould (*Peronospora brassicae*), powdery mildew (*Erysiphe cruciferarum*).

The last years on 95-98% of winter and spring rape sowing areas varieties of institute's breeding are cultivated in Belarus. All of them are tolerant to the most wide-spread diseases.

5 fungicides are permitted in Belarus, however they are very seldom used in production. For rape seeds dipping preparations WITAVAX 200, VINCIT are used favorably. A great importance in disease control have a crop rotation and a cultivation technology directed for plants strengthening.

The most harmfulness in rape sowings shows a rape curculio (*Meligethes aeneus*). Yield's losses when to refuse from insecticides are 20-35%. Spring rape in a high extent affected with this pest, yield's losses achieves to 35-60%. Cruciferous flea-beetle (*Phyllotera* spp.) is the most danger in spring rape sowings. Increases the number of stem and seed seedpod weevil (*Ceutorhynchus pallidactylus*, *Ceutorhynchus obstrictus*). In some years in winter rape sowings a rape sawfly (*Athalia rosae*) was observed. The development of other pests is limited. In dry years cabbage aphid (*Brevicoryne brassicae*) damages a lot. In Belarus conditions rape sowings treated 2-3 times with insecticides, favorably KARATE, DECIS, FASTAK.

Application of preparations are permitted in Belarus sowings. The most wide-spread of them are BUTISAN 400 (metazachlor), TROFI (acetochlor), TREFLAN (trifluralin), TERIDOX (dimetachlor).

**J – 05**

## **Occurrence of bees (*Apoidea*) on winter oilseed rape - implications for pest control**

**Maria Kelm and Tomasz Strojny**

*Department of Plant Protection, Agricultural University, Cybulskiego 32, 50-205 Wrocław, POLAND*

**Abstract:** Apifauna on winter oilseed rape crops is one of the most rich in agroecosystems. In Poland 105 species have been recorded as visiting flowering crops. In this guild dominated honey bee *Apis mellifera* L. and early-spring bees from family *Andrenidae*, *Halictidae* and *Bombus* spp. Their activity start usually at the end of march when average day temperature increase to 80C. In previous research (Kelm et.al. 2003, 2005) the bees were caught to the yellow water traps. Mainly wild bees have been numerous on oilseed rape not only during flowering time, but also earlier at the beginnig of plant vegetation.

The study was conducted in 2004-2005 in Niciszów, near Wrocław. For elimination of trap attractiveness, bees presence was observed using visual counting coupled with the line transects method. Each year 3 fields with different area (0,66-20ha) and in different landscape (open area surrounding by late crops, adjoined to bushes, river bank and railway embankment) were look over on 3 transects 1m x 200m in 20 minutes walking.

Occurrence of bees on crops before flowering time was confirmed. Only honey bees was recorded mainly at inflorescence (82%). From *Andrenidae*, (second numerous group), 34% and 32% of *Bombus* spp. were recorded at crop at its green stages. The highest density of bees was noticed on the smallest field (0,66), the lowest one on the field in open area (4,5 ha). In all fields the number of bees in the middle transects was four times less than at edges transects. The lowest number of *Bombus* sp. before flowering and the highest one at inflorescence was observed at field (6 ha) with *Salix* sp and *Corylus* spp. bushes along edges.

The results show a necessity to improve prevention program to protect bees pollinators.



J – 06

## **The EU project MASTER: integrating biological control into integrated pest management strategies**

**I.H. Williams<sup>1</sup>, W. Büchs<sup>2</sup>, H. Hokkanen<sup>3</sup>, Z. Klukowski<sup>4</sup>, A. Luik<sup>5</sup>, I. Menzler-Hokkanen<sup>3</sup>, C. Nilsson<sup>6</sup> & B. Ulber<sup>7</sup>**

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**Abstract:** The EU-funded project 'Integrated pest management strategies incorporating bio-control for European oilseed rape pests' (QLK5-CT-2001-01447) (acronym MASTER for Management Strategies for European Rape pests) is targeting six major European Rape Pests. This paper reports progress on the project's five scientific objectives: 1. To determine the identity, status and potential of bio-control agents (parasitoids, predators and pathogens) for rape pests in Europe, 2. To develop economically-viable, environmentally-acceptable management strategies that maximise bio-control of target pests and minimise pesticide use, 3. To determine the socio-economic feasibility, importance and economic efficiency of the IPM strategies in Europe and to assess the socio-economic factors influencing their adoption, 4. To construct Phenological Models for the parasitoids, relating occurrence on the crop to growth stage and climatic/weather conditions, 5. To produce Technical Guidelines on the IPM strategies for end-users. Further information can be found on the project website [www.iacr.bbsrc.ac.uk/pie/master/master.htm](http://www.iacr.bbsrc.ac.uk/pie/master/master.htm).

J – 07

## SECURE – Stem Canker of oilseed rape: Molecular methods and mathematical modeling to deploy durable resistance (QLK5-CT-2002-01813)

Neal Evans<sup>1</sup>, Bruce Fitt<sup>1</sup>, Frank van den Bosch<sup>1</sup>, Yong-Ju Huang<sup>1</sup>, Zbigniew Karolewski<sup>1,10</sup>, Thierry Rouxel<sup>2</sup>, Marie-Helene Balesdent<sup>2</sup>, Isabelle Fudal<sup>2</sup>, Lilian Gout<sup>2</sup>, Hortense Brun<sup>3</sup>, Didier Andrivon<sup>3</sup>, Lydia Bousset<sup>3</sup>, Peter Gladders<sup>4</sup>, Xavier Pinochet<sup>5</sup>, Annette Penaud<sup>5</sup>, Malgorzata Jedryczka<sup>6</sup>, Piotr Kachlicki<sup>6</sup>, Anna Stachowiak<sup>6</sup>, Julia Olechnowicz<sup>6</sup>, Anna Podlesna<sup>8</sup>, Ingrid Happstadius<sup>7</sup>, Jan Meyer<sup>7</sup> and Michel Renard<sup>9</sup>

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**Abstract:** SECURE aims to deliver a model for deployment of cultivars with resistance to *Leptosphaeria maculans* (phoma stem canker/blackleg) to improve durability of resistance and minimise risk that the resistance will break down. The project has four main parts. Firstly, a life-cycle model for *L. maculans* has been developed and this is currently being validated. Secondly, the fitness of virulent/avirulent races of the pathogen is being investigated and these indicate a fitness penalty with respect to loss of avirulence function for at least two resistance alleles. Genomic analysis of avirulence and virulence loci of the pathogen is also being done. Thirdly, the effects of plant genetic background and environmental factors on durability of resistance are being analysed. This is being done in the field at a number of sites across Europe and also under controlled conditions. Lastly, models are being developed to investigate the effects of different methods of resistance deployment on durability of resistance so that recommendations can be made for a sustainable strategy for managing the disease. Results are being disseminated using a website ([www.secure.rothamsted.ac.uk](http://www.secure.rothamsted.ac.uk)), scientific and popular publications and workshops. The SECURE project is supported by the European Commission under the Fifth Framework Programme (QLK5-CT-2002-01813).

# **Pathology Sessions**

P – 01

## **OREGIN core collection of oilseed rape fungal pathogen isolates to be managed by a relational database accessible to stakeholders via the Internet**

**Paul E Hornby, Akinwunmi Latunde-Dada, Nathalie Castells-Brooke, Neal Evans, Bruce DL Fitt, Graham J King.**

*Rothamsted Research, Harpenden, Herts, AL5 2JQ, UK*

**Abstract:** One aim of the Defra-funded Oilseed Rape (OSR) Genetic Improvement Network (OREGIN) is to establish, characterise and catalogue a collection of *Leptosphaeria maculans* (phoma stem canker) and *Pyrenopeziza brassicae* (light leaf spot) pathogens from around the world to determine genetic diversity in the worldwide populations of these OSR pathogens. Four hundred and eighty isolates of *Leptosphaeria maculans* and 194 isolates of *Pyrenopeziza brassicae* have been assembled at Rothamsted Research from sources representative of the world-wide distribution of OSR phoma stem canker and light leaf spot.

Information on these isolates (including geographical location; fungal origin; host species; cultivar; pathogenicity group; resistance rating; mating type and other properties such as stock type [slope culture/ glycerol spore stocks/DNA]) is now being collected and saved to a Rothamsted Research MySQL open source relational database server. This is being made accessible to the research community and other stakeholders via the OREGIN website ([www.oregin.info](http://www.oregin.info)) using the PHP server-side scripting language to develop web pages for end-users to search for and display isolates of interest. Once characterized and described, the isolates will be available and the website will generate the appropriate Materials Transfer Agreement (MTA) forms.

The OREGIN website is being expanded to include access to information relating to public domain plant resources being made available via OREGIN. This includes information about the Brassica Diversity Fixed Foundation Sets (DFFS) and reference genetic mapping populations that are held in secure storage at Warwick HRI.

## Effects of mineral fertilisers and crop protection programmes on diseases of winter oilseed rape in Poland

**Anna Podlesna**<sup>1</sup>, **Malgorzata Jedryczka**<sup>2</sup>, **Elżbieta Lewartowska**<sup>2</sup>

<sup>1</sup> Institute of Soil Science and Plant Cultivation (IUNG), Czartoryskich 8, 24-100 Puławy, Poland,

<sup>2</sup> Institute of Plant Genetics, Polish Academy of Sciences, Strzeszynska 34, 60-479 Poznan, Poland

**Abstract:** Oilseed rape is attacked by various diseases, which may cause considerable loss of yield. Amongst the most important ways of reducing the risk of damaging fungal infections without adverse effect on the environment is to plough stubbles, use resistant varieties and optimise mineral fertilisation of plants. Fungicides are widely used to control diseases, but they may have adverse effects on environment. Research effort is currently being directed to finding ways of reducing pesticides usage. The aim of these experiments was to evaluate different chemical plant protection schemes as well as the effects of sulphur and nitrogen fertilisation on diseases of winter oilseed rape before harvest.

Field experiments were located at two Agricultural Experiment Stations of IUNG: Baborowko (near Poznan, west Poland) and Grabow (near Pulawy, east Poland). The experiments were done at three consecutive seasons (from 1999/2000 to 2001/2002). Nitrogen fertilisation was applied at 6 levels: control without N, 40, 80, 120, 160 and 200 kg N/ha. The control included seed dressing and one application of insecticide (variant A). The variant B contained full protection against insects, the variant C had full protection against insects and autumn fungicide application against stem canker of crucifers (*Leptosphaeria maculans*). Variant D had full protection against insects and diseases (autumn and spring fungicide applications) without sulphur and variant E contained the same plant protection treatments with mineral sulphur fertilisation and the use of fungicide with sulphur. Sulphur doses were derived from the amounts present in NPK fertilisers applied in the autumn. In variants with no S, the NPK fertilisers contained no sulphur. The experiment was conducted with two replicates in the randomised blocks system. Two winter oilseed rape varieties: Kana (Plan Breeding Strzelce, Poland) and Lisek (Deutsche Saatveredelung, Germany) were used, respectively in Grabow and Baborówko. Disease assessments were done for the following doses of nitrogen fertilisation: season 2000/2001 0, 80, 120 and 200 kg N/ha and season 2001/2002 – for all 6 levels of nitrogen. The evaluation was done for 100 randomly chosen plants per each individual plot. The final disease assessment was performed at crop maturity, just before harvest.

During the experiment, the following fungal pathogens occurred on winter oilseed rape plants: *Leptosphaeria biglobosa* and *L. maculans* (*Phoma lingam*), *Alternaria* spp., *Botrytis cinerea*, *Peronospora parasitica*, *Erysiphe cruciferarum*, *Pyrenopeziza brassicae* (*Cylindrosporium concentricum*), *Sclerotinia sclerotiorum* and *Verticillium* spp. There were considerable differences between fungal disease incidence and these depended on region, fertilisation dose and plant protection chemical system applied. The plant infestation by diseases was decreased most by the full chemical protection programme. Sulphur fertilisation decreased some, but not all, fungal pathogens. In general, nitrogen fertilisation increased disease severity.

P – 03

## Influence of sulphur, magnesium and boron fertilization on the level of glucosinolates and their effect on *Alternaria* spp. infestation of oil rape seeds

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**Abstract:** The major objectives of research were: 1) to determine the effects of sulphur, magnesium, and boron on the level of glucosinolates in oil rape seeds and 2) to determine a correlation between the level of glucosinolates in ‘Margo’ oil rape seeds and the rate of its infection by *Alternaria* spp. The experiment was conducted at the Chrzastowo Agricultural Experiment Station in north-central Poland in 2001, 2002, and 2003. The experiment was conducted as a randomized complete block with 4 replications. The treatments included: sodium sulphate (Na<sub>2</sub>SO<sub>4</sub>) applied to either the soil or foliage, sodium sulphate supplemented with boron (borax), sodium sulphate supplemented with magnesium sulphate (MgSO<sub>4</sub> 7H<sub>2</sub>O), and a control. Total glucosinolates, alkenyl glucozylates and indole glucozylates were not affected by fertilization with sulphur, sulphur supplemented with boron, and sulphur supplemented with magnesium. Occurrence of *Alternaria* spp. on seeds showed strong negative correlation between total amount of glucosinolates and seed resistance to *Alternaria brassicae*. There was no correlation between level of glucosinolates and seed infection with *A. alternata*.

P – 04

## **Detection of *Pyrenopeziza brassicae* (light leaf spot) infection of winter oilseed rape leaves**

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**Abstract:** After initial infection of winter oilseed rape leaves in autumn by air-borne ascospores, *Pyrenopeziza brassicae* has a long symptomless phase until the first visible necrotic lesions appear, in January/February in the UK or March/April in Poland. Assessment of *P. brassicae* symptomless infection visually is not reliable before necrotic lesions appear, unless plants are first incubated for several days at high humidity, in polyethylene bags, to encourage sporulation. Visual methods of assessment of light leaf spot (*P. brassicae*) in winter oilseed were compared with PCR detection of infection. PCR diagnosis on leaves sampled from field experiments was more sensitive than visual assessments, even after incubation, with symptomless infection of leaves detected 2 months earlier by PCR than by incubation.

**P – 05**

**Development of light leaf spot and phoma stem canker on a range of current and historical oilseed rape cultivars at Rothamsted in 2003/4 and 2004/5 growing seasons**

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**Abstract:** Field experiments in successive growing seasons (2003/4 and 2004/5) with 42 different oilseed rape cultivars/breeding lines indicated a range of responses to both light leaf spot (*Pyrenopeziza brassicae*) and phoma stem canker (*Leptosphaeria maculans* and *L. biglobosa*). For both diseases, some cultivars/lines were very susceptible whilst others were resistant, with the majority of cultivars/lines giving a moderate response. For example, during the 2003/4 season, a season when the stem canker epidemic was not generally severe, cvs Synergy and Brownowski developed the most severe stem canker, with severity ratings of 1.8 and 1.7, respectively (0-4 scale; 0 = no stem canker, 4 = 100% stem girdled/plant dead) at harvest. In contrast, cvs Pollen and Aviso both had stem canker severity ratings of 0.2. Stems of cvs Jet Neuf, Primor and Tapidor developed severe light leaf spot (*P. brassicae*), with the % stem area affected by light leaf spot 29.8, 29.6 and 28.3%, respectively. However, the line PR4SW05 and cv Cobra developed little light leaf spot, with the % stem area affected 1.7 and 2.0%, respectively. There was very little phoma spotting on pods. However, light leaf spot did develop on pods in the 2003/4 season; the cultivars/lines showed a range of responses, from 2.2 % pod area affected (Surpass 400) to 55.4% pod area affected (Tapidor).



## Phomadidacte: a computer-aided training program for the severity assessment of phoma stem canker of oilseed rape

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**Abstract:** Phoma stem canker (caused by *Leptosphaeria maculans*) is one of the main diseases that affect oilseed rape world-wide. The disease is usually characterised by the visual assessment of the severity of cankers created by the pathogen at the crown level of the plants. In order to avoid arbitrary categories and to maintain standardisation of assessment keys, a rating scale based on the percentage severity estimates of cross-section cankered crowns has been recently proposed in France. This scale consists in 6 severity classes defined as a function of the percentage of the discoloured cross-section: 1, healthy plant, no visible lesions; 2, [0-25%] of discoloured cross-section; 3, [25-50%] of discoloured cross-section; 4, [50-75%] of discoloured cross-section; 5, [75-100%] of discoloured section; 6, section without any living tissue, plant lodged or broken at the crown level during sampling. However, like many other rating systems for the severity of diseases, rater bias effects have been reported. The aim of this communication is first to give a description of Phomadidacte, a computer-aided training program to guide raters on how to use this rating scale; and second, to report an evaluation of its efficacy to train raters. The basic principle of this program consists of displaying pictures of cankered cross-sections of oilseed rape that are to be rated by the user. These pictures have been previously rated by a panel of eight experts from four different research or extension units (2 INRA units, 1 CETIOM unit, 1 GEVES unit), and to compare the two sets of assessments. At the end of a training session, the program will either suggest to keep on training or will declare that there is a good agreement between the experts and the user, based on two evaluation thresholds: the percentage of pictures correctly rated (75%) and the percentage of pictures for which the severity class given by the user and the expert differ by more than one severity grade (5%). A graph summarising the differences between the user and the experts' grades is displayed and an ASCII file containing the data of the training session is created. The user can then browse all the pictures to compare the grades that the user gave with the experts' grades. Phomadidacte runs under Windows® and an on-line version of it is available. An experiment was conducted to test the efficacy of Phomadidacte. This experiment compared the grades given by two groups of ten raters who have been trained either with or without using Phomadidacte with those given by a panel of three experts (INRA, CETIOM, GEVES) on actual diseased field samples. The group trained without Phomadidacte used one picture per severity grade and diagrams illustrating the diversity of symptoms that can be encountered. Plants were first graded by experts who chose twenty plants for each severity grade. The plants were ordered randomly and then independently rated by all raters. The distribution of errors (experts-rater's grade) was significantly different between the two groups of raters (Kolmogorov-Smirnov test,  $P < 10^{-4}$ ). The group trained without Phomadidacte was in agreement with the experts in 62% of the cases, whereas the group trained with Phomadidacte achieved 69% agreement. Three raters succeeded in having a percentage of agreement with experts greater than 75% within the Phomadidacte group, whereas none of the raters in the other group succeeded in achieving this threshold. No rater, within the two groups, had more than 4.2% of the cases with a difference with the experts that was greater than one severity class, which indicates that the scale is quite easy to assimilate. The generic method described in this paper could be successfully applied to other pathosystems that are difficult to characterise visually.

P – 07

## Distribution and change in *L. maculans* /*L. biglobosa* populations in Poland (2000-2004)

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**Abstract:** For four seasons (from 2000/01 to 2003/2004) we have collected fragments of oilseed rape plants with symptoms of infection with *Phoma lingam*. In 2000/01 samples were collected from 157 fields, in 2001/02 from 222 fields, 2002/2003 from 46 fields and in 2000/01 from 158 fields on winter oilseed rape. Sampling was done in most of main areas of intensive cultivation of oilseed rape, including Lower Silesia, Opole region, West Pomerania and Pomerania with Zulawy (delta of Vistula river), Kujavia and Great Poland. Less intensive sampling was done in Lublin region, Varmia and Mazuria, Upper Silesia and the Lodz region located in central Poland. Sampling was done three times a year: in the autumn at rosette stage (symptoms on leaves), in the spring after start of vegetation (symptoms on leaves and stems) and before harvest (stems). Pathogens were isolated after surface sterilisation with ethanol and calcium hypochlorite. In total, isolations resulted in 2841 fungal strains with 962, 256, 666 and 957 isolates for respective subsequent growing seasons. Isolates were characterised with colony morphology and pigment production on Czapek-Dox or Fries liquid media and identified as *Leptosphaeria maculans* and *L. iglobosa*. In general, half of isolates belonged to one species and the other half to the other one. However, there were great differences between isolates from different seasons and years. The majority of isolates obtained in the autumn belonged to *L. maculans* with the average of 71,9% and a variation from 67,3 % in autumn 2003 to 82,6 % in autumn 2001. Spring samplings resulted in comparable numbers of isolates from either of the two species, with 55,7 % isolates of *L. maculans*. However, isolations from stems before harvest resulted in more *L. biglobosa* than *L. maculans* in a proportion reversed to this obtained in the autumn. Before harvest it was only 21,4 % of *L. maculans*, with variation from 16.9 % in summer 2001 to 25.9 % in summer 2003. Results obtained in this experiment support the hypothesis of possible reduction of *L. maculans* infections due to slow growth of the fungus in leaf tissues and petioles combined with leaf shearing due to frost damage. It is noteworthy, that in contrast to previous reports, *L. maculans* was detected in all regions of intensive cultivation of oilseed rape, including east of Poland

## Development of a decision support system for control of stem canker of oilseed rape in Poland

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**Abstract:** System for Forecasting Disease Epidemics (SPEC; System Prognozowania Epidemii Chorób) is a decision support system for improved control of stem canker of oilseed rape in Poland. The system is a joint initiative between the Institute of Plant Genetics PAS and DuPont Poland. Activities of the system are supported by several research organisations, such as the Institute of Plant Protection, Central Cultivar Testing Station, University of Rzeszow, Agricultural University of Poznan, Institute of Soil Science and Plant Cultivation and two commercial enterprises: Arenda in Charbielin and Agro-Fundusz Mazury in Drogosze.

Stem canker of crucifers is a serious disease of oilseed rape in Poland and worldwide. The disease is caused by the ascomycete fungi *Leptosphaeria maculans* and *Leptosphaeria biglobosa*. SPEC aims to optimise fungicide sprays against stem canker. To achieve this, the system uses a series of seven day volumetric spore traps (Burkard Manufacturing, UK and Lanzoni, Italy) to monitor the concentration of fungal ascospores in the air. The system has been operating since 1 September 2004 with five spore traps operating during the 2004/05 season and ten traps in the 2005/06 season. The traps are located across the main oilseed rape growing areas of Poland, namely Lower Silesia, West Pomerania, Pomerania and west Warmia, Great Poland, Upper Silesia, the north part of the Opole region, the south part of the Opole region, the Carpathian Foothills, Mazuria with east Warmia and the area encompassing the Mazovia Plain and Lublin region. Data on ascospore release are published on the websites of the SPEC system ([www.spec.edu.pl](http://www.spec.edu.pl)) and DuPont Poland ([www.dupont.pl](http://www.dupont.pl)). The results are updated weekly from September to November and from March to May. Information is also distributed free of charge via e-mail, SMS text messages or fax to registered users.

Since 2005/2006 season a net of points to examine maturity of fungal fruiting bodies on infected straw has been established. Monitoring of pseudothecia maturity is performed in 44 locations and covers all provinces of Poland.

To investigate the efficiency of fungicide treatments an experiment has been done with the timing of application being based on spore sampling results. In parallel, monitoring is accompanied by two field experiments located in regions with different weather conditions located ca. 330 kilometres apart. The target end users of SPEC are oilseed rape farmers, breeders, extension services and the commercial companies who distribute agrochemicals.

## SimMat, a new dynamic module of Blackleg Sporacle for the prediction of pseudothecia maturation of *L. maculans*/*L. biglobosa* species complex. Parameterisation and evaluation in Polish conditions.

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**Abstract:** Dynamic of pseudothecia maturation is a key process of phoma stem canker epidemics. The prediction of ascospore showers, which strongly depends on state of pseudothecia maturity, are useful not only to help decision making for fungicide application, but also to help formulating sowing time of oilseed rape accounting for the risk of phoma stem canker. This paper presents the structure, the parameterisation, and the evaluation of SimMat, a model that represents the dynamic of *Leptosphaeria maculans*/*L. biglobosa* complex species pseudothecia maturity, in Poland. The data used in this study were collected in Poznan for four years (1998, 1999, 2000, 2001). The model uses three input variables : average harvest date, mean daily temperature, and mean daily rainfall. SimMat uses the same concept of favourable day to pseudothecial maturation as in the static module embedded in Blackleg Sporacle, a model developed in Australian conditions. However, the criteria used to define a day favourable to pseudothecial maturation are different and biological variability in the requirement of a number of days favourable to maturation has been introduced. A day is considered to be favourable to pseudothecial maturation if the mean temperature is below a given threshold ( $\square_{max}$ ) and if the cumulated rainfall over the last nr days is greater than a threshold (rmin). SimMat assumes that the number of favourable days required for pseudothecial maturation follows a Gaussian distribution. SimMat has five parameters: the expected number of days favourable required for pseudothecial maturation, NFD; the standard deviation of the number of days favourable required for pseudothecial maturation,  $\square_{FD}$ ;  $\square_{max}$ ; nr; and rmin. Firstly, the model was tested using parameter values established in Australian conditions (in Blackleg Sporacle model), with addition of  $\square_{FD}$ , which was chosen to ensure that 95% of simulated pseudothecial maturation occurred after the number of favourable days defined in Blackleg Sporacle  $\pm$  10 days. Without a calibration, as expected, the quality of prediction was poor (Root Mean Squared Error of Prediction, RMSEP = 0.44). In order to parameterise SimMat for Polish conditions, each possible combination of parameters to be adjusted was tested using cross-validation (in all 31 combinations). The best quality of prediction was obtained by adjusting just two parameters : NFD and  $\square_{FD}$  (RMSEP = 0.17; bias =  $-4.3 \cdot 10^{-2}$  for cross-validation over the four years). Fitting these two parameters to the whole dataset led to a Root Mean Squared Error of 0.15, and a bias of  $-4.4 \cdot 10^{-4}$ . Although this parameter estimation appears to be satisfying, the robustness of the model still has to be enhanced by increasing the size of the dataset used for parameterisation. Using this approach, the possibility of prediction of ascospore showers is discussed.

## Prediction of the date of onset of phoma leaf spot epidemics on winter oilseed rape in the UK

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**Abstract:** Seasonal yield losses from phoma stem canker (*Leptosphaeria maculans*) are estimated to range from £18M to £40M in the UK (Fitt et al., 1997; <http://cropmonitor.co.uk/>), making phoma stem canker one of the two major diseases on winter oilseed rape. However, the severity and timing of phoma stem canker differs between seasons, between different regions of the UK and between individual crops within a region (West et al., 2002). To achieve effective control of phoma, a decision about if and when to apply fungicide treatments has to be taken at the leaf spot stage in epidemics, in October or November, some 9 months before damaging stem cankers develop.

An empirical model has been developed to predict regional incidence of stem canker before harvest using monthly temperature, rainfall and stem canker incidence before the previous harvest as inputs (<http://phoma.csl.gov.uk/>). There is good evidence that stem canker epidemics in June/July are most severe in seasons/at sites when the onset of phoma leaf spotting in autumn is early (West et al., 2002). This paper describes work to develop an empirical model to predict onset of phoma epidemics which could be used locally by growers to help aid decisions on the timing of fungicide applications. The model developed uses mean maximum daily temperature [temp\_max] and sum of rainfall [rain\_sum] between 15 July (approximate harvest date) and 26 September to forecast the date when phoma leaf spot/stem canker epidemic 10% plants affected with phoma leaf spot. This coincides with the current threshold for fungicide application in the UK.

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## Studies on the contribution of cultivar resistance to the management of stem canker (*Leptosphaeria maculans*) in Europe

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**Abstract:** Phoma stem canker (*Leptosphaeria maculans*) is considered the most damaging disease of winter oilseed rape in Europe. Control strategies are heavily dependent on the use of resistant cultivars as cultural control measures are only partially effective and there are problems achieving control with fungicides because epidemics are variable from year to year.

This paper reviews the first two years of a field evaluation of nine different winter oilseed rape cultivars at sites in UK, France, Sweden, Germany and Poland. The cultivars Eurol and Darmor with and without the major resistance gene Rlm6 were compared with other commercial cultivars with different disease resistance (cvs Apex, Escort, Falcon, Samurai and Shogun) as part of the EU-funded SECURE project. Detailed leaf and stem assessments have been done at each site and allowed evaluation of the effectiveness of both polygenic (in Darmor) and major gene resistance in the major production areas of Europe. The Rlm6 resistance gave very effective control of phoma leaf spotting and subsequently phoma stem canker. However, it is clear that new races of *L. maculans* can emerge quickly and overcome single major gene resistance in oilseed rape. Strategies to improve the durability of resistance are required. Technology transfer activities need to be targeted carefully so that breeders and farmers adopt an integrated strategy to achieve control of stem canker. There are concerns that the intensification of oilseed rape cropping in rotations combined with minimum tillage techniques will reduce the effectiveness of stem canker control through both cultivar resistance and fungicides.

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## **Controlling the deployment of a new specific resistance Rlm7 to *Leptosphaeria maculans* in a small production area in the Centre of France**

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**Abstract:** Recently new oilseed rape cultivars resistant to stem canker are commercially available. Their excellent behaviour towards the pathogen *Leptosphaeria maculans* is mainly due to a new efficient and specific resistance gene Rlm7. But such varieties could rapidly be exposed to a risk of resistance break down. To prevent such an event, an extension approach of deployment of resistance cultivars has been carried out in a small area (10 km<sup>2</sup>) in the Central region of France where stem canker pressure used to be high. This approach of durable management of genetics resistance has involved about twenty oilseed rape fields with a cropping ratio of Rlm7 resistant cultivars of about 5%. Observations are focused on technical practices, agronomic diagnosis, foliar and stem symptoms and population structure of *L. maculans*. A particular attention is paid to the emergence of leaf spot symptoms on the Rlm7 cultivars. These observations will be associated with extension recommendations for controlling stem canker to the farmers and local advisors. Evolution in time will be followed over four years. This paper presents results of the initial year.

Key words: winter oilseed rape, blackleg, stem canker, deployment of resistant cultivars,

## Effects of temperature on Rlm6-mediated resistance to *Leptosphaeria maculans* in *Brassica napus*

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**Abstract:** Near-isogenic *B. napus* lines with/without the resistance gene Rlm6 were used to investigate the effects of temperature on Rlm6-mediated resistance to *Leptosphaeria maculans*. Leaves were inoculated with ascospores of *L. maculans* carrying the corresponding avirulence gene AvrLm6. Inoculated plants were incubated at 15°C or 25°C. DarmorMX (with Rlm6) was resistant to *L. maculans* at 15°C but susceptible at 25°C, and Darmor (without Rlm6) was susceptible at both temperatures. On Darmor, large grey leaf lesions developed at both 15 and 25°C. On DarmorMX, small dark spots were produced at 15°C but large grey lesions were produced at 25°C. Although large grey lesions were also produced on DarmorMX at 25°C, the lesions on DarmorMX were smaller than those on Darmor. The incubation period of *L. maculans* (from inoculation to the appearance of first lesion) was longer on DarmorMX than on Darmor. The infection efficiency (number of lesions resulting from inoculation with 100 ascospores) was greater on Darmor than on DarmorMX at 15 and 25°C. Further characterization of the Rlm6-mediated resistance showed that the resistance was effective at 25°C if inoculated plants were pre-incubated at 15°C for 5 days before moving to 25°C, but not if inoculated plants were pre-incubated at 15°C for only 2 days before moving to 25°C. We conclude that temperature affects Rlm6-mediated resistance to *L. maculans* in *B. napus* leaves.



## Detection and quantification of *Leptosphaeria maculans* in the petiole of *Brassica napus*

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**Abstract:** *Leptosphaeria maculans* is the main causal agent of phoma stem canker, the most important disease of oilseed rape (*B. napus*) in the UK and worldwide. Leaves are infected by air-borne ascospores in autumn, causing pale lesions full of pycnidia. The fungus grows from these lesions down the petiole to the stem base where it causes a canker and subsequent yield loss. To determine whether there is a component of resistance in the petiole which would impede or prevent fungal growth, different winter oilseed rape cultivars are being compared. Methods for detection and quantification of the fungus in the petiole are being developed and evaluated. These include isolation, end-time PCR diagnostics, maceration and plating and quantitative (real-time) PCR to assess the presence and abundance of *L. maculans* in different cultivars. Results will be related to the field characteristics of these cultivars. In addition, results obtained from the tracking of GFP (green fluorescent protein) transformed isolates down the petiole from foci of infection on leaves to the stem will be presented.

## The complete-genome sequencing project of *Leptosphaeria maculans*

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**Abstract:** Until now *Leptosphaeria maculans*, which is responsible for major losses on oilseed rape crops, has been poorly characterized at the genomic level. This fungus belongs to the dothideomycete class, which encompasses numerous important phytopathogenic fungi, such as the wheat pathogen *Stagonospora nodorum*, the apple scab agent *Venturia inaequalis*, and the oilseed rape pathogen *Alternaria brassicicola*. The species belonging to this group share some common life traits, such as their mode of infection and colonization, the frequent production of secondary toxic metabolites, or the frequent occurrence of a sexual stage in their life cycle. They also differ by their host range, and include pathogens of both monocots and dicots. The whole genome sequence of *S. nodorum* was very recently released, while genome initiatives for the whole sequencing of *L. maculans* at Genoscope, and *A. brassicicola* in the USA were recently successful. Therefore the complete sequences of three closely related phytopathogenic fungi will soon be available. In this communication, the *L. maculans* genome initiative will be presented, along with the perspectives in terms of new fields of research offered by these sequence data. In particular, comparative genomic studies between *L. maculans*, *S. nodorum* and *A. brassicicola* are expected to allow identification of pathogenicity genes either common or specific to each of these plant/fungus interactions. Also, the complete sequence of *L. maculans* will allow the development of a large set of new micro- and minisatellite markers. These will be used both to develop population genetic studies and therefore help answer unresolved epidemiological questions, and to speed up map-based cloning of avirulence genes, and therefore help develop molecular markers of specific races of the pathogen, which will be useful for a better management of specific resistance genes. The complete sequence data will also speed up the molecular analyses of pathogenicity genes identified either via random insertional mutagenesis, or via a systematic genome-wide search of candidate genes, including avirulence genes, and genes involved in toxin production.

## Development of a new disease and yield-loss related forecasting model for *Sclerotinia sclerotiorum* in winter oilseed rape in Germany

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**Abstract:** *Sclerotinia sclerotiorum* the causal pathogen of Sclerotinia stem rot is a common problem in winter oilseed rape production in Germany. Fungicide treatments against the disease are routinely carried out during flowering. Forecasting systems can help to reduce the costs of oilseed rape production by predicting the necessity and exact timing of a fungicide application. The major aim of forecasting systems is to reduce fungicide use and to avoid crop loss. A new forecasting model for Sclerotinia stem rot has been developed, involving weather data, field specific factors and damage thresholds. Data from different field trials of the state extension services from 1994-2004 in Germany were analysed to investigate the impact of different field factors as cultivar, soil type, sowing time, crop rotation, fertilization and tillage. In laboratory experiments, the effect of the microclimate in plant cover was determined. The new forecasting model SkleroPro was validated by a retrospective calculation using data of different field trials of the state extension services with meteorological data of the last ten years with regard to the economic efficiency of fungicide applications against *S. sclerotiorum*. The examination of the field specific factors showed that the disease incidence is dependent on various factors which are crop rotation, sowing time, cultivar and soil type. The temperature range for an infection with ascospores is between 7 - 22°C. Furthermore the results of the validation of SkleroPro in relation to the accuracy, economic efficiency and optimal time of fungicide application of the forecasting will be presented. SkleroPro is the first disease forecasting model for a Sclerotinia disease providing a crop-loss related, field-site and time-point specific decision support. SkleroPro will be made available to growers in the season 2006 via the internet portal 'ISIP' in 2006.

## Petal test – success and disappointments in sclerotinia stem rot forecasting in Poland and China

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**Abstract:** Sclerotinia stem rot or white mould, caused by *Sclerotinia sclerotiorum* (Lib.) de Bary, is one of the most damaging fungal diseases of oilseed rape worldwide. In China, the worlds largest producer of rapeseed, this disease causes considerable yield loss. In Poland, sclerotinia stem rot and stem canker of crucifers are the two most damaging diseases of winter oilseed rape (*Brassica napus* L. forma *biennis*), whereas spring oilseed rape (*B. napus* L. forma *annua*) is mostly infected by black spot and sclerotinia stem rot. Primary sources of plant infection are ascospores produced in apothecia. These fruiting bodies of the perfect stage germinate in the spring on sclerotia, the dormant mycelium formed in black lumps or nodules, inside stems infected with the pathogen. At first, ascospores infect petals, which then fall down onto leaf surfaces and cause disease within the infected plant tissue.

Petal test serve as the basis of all forecasting systems for sclerotinia stem rot on oilseed rape. The test uses selective media with pH indicators, that change colour of the medium when it is acidified with oxalic acid, secreted by *S. sclerotiorum* during its growth.

We studied discolouration of Steadman’s medium supplemented with different pH indicators which change pH in the range from 4.5 to 5.5. Based on experiments using mycelial discs obtained from pure cultures of *S. sclerotiorum*, we have chosen bromophenol blue and bromocresol green as two supplements showing clear and easily assessable results. These two reagents were subsequently used for tests with petals of different cultivars and field situations in China and Poland.

## **Studies on the Germination of Sclerotia and Formation of Apothecia of *Sclerotinia sclerotiorum***

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**Abstract:** A method has been developed and optimized to study germination of sclerotia and apothecia formation under continuous temperature conditions. This method allowed differentiation of the origin of 33 different sclerotia isolates and also the behaviour of germination of the origin of *S. sclerotiorum* isolates. Wheat kernels are highly suitable for production of sclerotia. Development of apothecia was optimal under conditions of 10 °C and 500 lux and sclerotia germinated after 2-3 months of incubation. Germination of sclerotia and formation of apothecia could be differentiated according to the origin of sclerotia.

In general sclerotia of isolates originally coming from warmer areas germinated more readily. Sclerotia germinated in different substrates, such as ‘Einheitserde’, sand and vermiculite. Germination of sclerotia which had been developed on especially nutrient rich or nutrient poor media was impaired. One apothecium produced more than 1 million ascospores and was viable more than 15 days at 10 °C and 500 lux.

## Verticillium wilt on Brassica oilseed crops

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**Abstract:** This presentation on Verticillium wilt in Brassica oilseed crops in Sweden aims to give a historic background to the disease problem as well as to present recent work on both the disease causing organism, its biology and plant breeding actions taken. The severe disease incidence present in Skåne and Östergötland, is most likely due to the very intensive cultivation, in some places monoculture, of Brassica oilseed crops between 1945 and 1955. Molecular studies of Verticillium isolates from diseased plants have revealed that *V. longisporum* is the disease causing organism. *V. longisporum* is closely related to *V. dahliae* and *V. albo-atrum* and can easily be mixed up with *V. dahliae* especially when considering morphological characters. The overall colonization pattern of *V. longisporum* in oilseed rape seems to be in concordance with earlier reports concerning *V. dahliae* in a range of host species. However, *V. longisporum* preferentially infect members of *Brassicaceae*. The dispersal, propagation, and long-term survival of this pathogen is mediated through the microsclerotia. Analyses of soil samples from Skåne and Östergötland have revealed high levels of microsclerotia and a presence of *V. longisporum*, *V. dahliae* and *V. tricorpus* in the soil. All *B. napus* germplasm is susceptible to Verticillium wilt. Thus, gene bank accessions of both *B. oleracea* and *B. rapa* origin have been evaluated to identify new resistant material. Enhanced levels of resistance were found within both species and these novel genotypes are now being incorporated in *B. napus* breeding programmes. This widening of the gene-pool of *B. napus* will also be of great value to future hybrid breeding programs.

## Verticillium wilt in Sweden – incidence, field scoring and importance

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**Abstract:** The aim of this paper on Verticillium wilt is to show the difficulties with the assessment of the disease. Often are plants infected not only by Verticillium wilt but also with *Phoma lingam*. To determine disease severity is field assessment uncertain, soil analysis can be a better method. Verticillium wilt, caused by *Verticillium longisporum*, is a very serious disease in some regions of Sweden. The problem is mainly due to intensive oilseed cultivation in the early 1950s, sometimes even as a second crop. The high inoculum density of microsclerotia has been maintained by weeds and crop rotation. A wide spread crop rotation, four years between every oilseed crops, has been practiced since the late 1950s. The yield of winter oilseed rape in Sweden have increased very slow since the 1970s and have varied between 22-36 dt/ha. There are many reasons for this big variation in yield, but Verticillium wilt is definitely one explanation. The impact on yield from Verticillium wilt varies very much between different years. When in-fected plants show visible microsclerotia and senescence, the yield can be reduced by 30-50 %. But in other years, when only bronze-coloured symptoms appear, the yield is little affected.

## Determination of risk-factors for the occurrence of *Verticillium longisporum*

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**Abstract:** In a two-year monitoring experiment the occurrence of *Verticillium*-wilt in oilseed rape could be confirmed for all surveyed regions in Germany. However, there are some regional differences in the infestation frequency. In North- and Northeast- Germany, where traditionally a high-intensive oilseed rape production is occurring, the disease is more frequently diagnosed. The obtained data from the determination of risk-factors showed a clear effect by the percentage of infested oilseed rape during crop rotation with *V. longisporum*. By performing the oilseed rape crop rotation in longer intervals (more than three years) and an additional growing of non-host plants in close cereal/oilseed rape crop rotations, the risk of an infestation by this pathogen could be lowered. In addition, a longer interval period of the oilseed rape had a positive effect on its yield. However, the importance of conservation tillage systems as a risk-factor could only be basically confirmed and further investigations are still required. The same is the case for differences of the varietal susceptibility which recently became apparent. The effect of organic nitrogenous fertilizer could not be assessed finally. These investigations showed also no effect of the factors soil type, pH-value and the application of fungicides on the occurrence of *Verticillium*-wilt disease.



## Comparative histological studies on the interaction of *Brassica napus* with *Verticillium longisporum* and *Verticillium dahliae*

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**Abstract:** The increasing area under oilseed rape (OSR) cultivation and the relatively high crop rotation rate have significantly promoted *Verticillium longisporum* (VL), the causal agent of Verticillium wilt, and thus has rendered this disease a major challenge for current breeding efforts. The soil borne vascular pathogen VL is distinct from *Verticillium dahliae* (VD) in being host-specific to the *Brassicaceae*. It does not induce wilt symptoms but stunted growth and premature bloom and maturity. This is in contrast to interactions between VD and a broad spectrum of host plants, where definite wilting symptoms can be observed, except for cruciferous species. The colonization of the plant by VL is characterized by an extended latency until the beginning of maturity after which the pathogen bursts out of the xylem vessels within a few days to produce ample masses of microsclerotia underneath the stem epidermis and in the stem pith.

We transformed an aggressive strain of VL as well as of VD with the green fluorescent protein (SGFP) and conducted interaction studies on roots of *Brassica napus*, which is a host plant for VL but not for VD. Microscopic analysis of the gfp-transformants revealed homogeneity of the fluorescent signal, which was clearly visible in the hyphae as well as in the conidia. The transformants were unimpaired in aggressiveness compared to the wild type. Using confocal laser scanning microscopy, we visualized the colonization and infection processes on rapeseed roots as well as the fungal spread in the roots. Furthermore we compared the relative new technique of gene tagging with a classical staining method relating to its suitability for plant-pathogen-interaction studies.

The first steps of contact between VL as well as VD and the roots took place at the root hair zone where we could observe a mingling and an attachment of hyphae to the root hairs, followed by colonization of the root surface and penetration of the rhizodermis. In comparison to VL, VD developed only few hyphae in the root hair zone and did not show any root penetration. In general, attachment and infection of the root apart from the hair zone were infrequent. The preferential colonization sites of VL on the root surface were the grooves along the junctions of the rhizodermal cells, which is not the case for VD. VL did not prefer any specific infection sites, e.g. sites of emergence of secondary roots or wounded tissue. It also did not form any specific infection structures like appressoria, but penetrated directly. These comparative studies of pathogenic and non-pathogenic interactions are conducted in order to identify resistance factors in OSR against Verticillium.

# **Pathology Posters**

p – 01

## **Impact of rape stem weevil, *Ceutorhynchus napi*, on infections of oilseed rape stems by *Phoma lingam***

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**Abstract:** The rape stem weevil, *Ceutorhynchus napi* Gyll., is one of the most damaging pests of winter oilseed rape throughout Central Europe. Adults deposit eggs into the top of elongating stems in February and March. Secretions originating from the oviposition result in distortion and disruption of growth which may be followed by splitting of stem tissue. Larvae hatching from the eggs feed within the pith for three to five weeks, however, this is considered to be of little harm to the plant. The infested tissue may be invaded by secondary fungal pathogens, particularly *Phoma lingam*. To study the importance of this indirect damage by *C. napi*, adult weevils and plant samples were collected repeatedly from three crops of oilseed rape at Goettingen in the course of the oviposition period in spring 2004. The presence of propagules of *P. lingam* was assessed from both, the outer integument and the gut channel of the weevils by using PCR. Further, the incidence of *P. lingam* within the stem pith was determined microscopically at three occasions from the beginning of egg-laying until flowering. There was clear evidence that *C. napi* is capable to initiate stem infections by *P. lingam* just from the beginning of egg-laying. Focussed experiments have been performed under standardized conditions in the laboratory to determine whether feeding wounds provide ports of entry for the pathogen or whether the fungal inoculum is being transmitted by females.

p – 02

## Importance of application mode for the efficacy of CONTANS (*Coniothyrium minitans*) in biocontrol of *Sclerotinia sclerotiorum*

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**Abstract:** CONTANS WG®, a biofungicide containing the living conidia of *Coniothyrium minitans* (CM), is registered in Germany for biocontrol of *Sclerotinia sclerotiorum* since 1998. Its main application is in oilseed rape for control of stem rot. Here, we report laboratory and field experiments conducted in order to evaluate the biocontrol efficacy of CM under practice conditions. CM was capable of degrading living sclerotia of *S. sclerotiorum* at soil conditions ranging from 10 to 90% water holding capacity (WHC) and from 1 to 29°C. Significant reduction in antagonistic activity only occurred at dry conditions below 20% WHC and at soil temperatures below 5°C. At conditions from 13 to 25°C and 20 to 90% WHK sclerotia were degraded within 8 weeks at rates of 90% or more. However, preservation of CM conidia increased at lower soil temperatures. In mini-plots in the field, the antagonist initially applied at a rate of  $3.3 \times 10^5$  cfu g<sup>-1</sup> soil, was still detectable after 72 months at rates sufficient to effectively reduce the survival of sclerotia to levels between 6.6 and 0.2%. The minimum rate of CM in soil for a more than 90% degradation of sclerotia within six months was  $1.9 \times 10^3$  cfu g<sup>-1</sup> soil. In order to optimise the biocontrol efficacy of CM, the timing of application within a rapeseed-cereal crop rotation was varied by either applying CONTANS WG® on the oilseed rape stubble (SR), on the stubble of the previous barley crop (SB) or on the soil prior to sowing of oilseed rape (PS). Appearance of apothecia was recorded in the three following seasons. Three years after application no apothecia were found in SR, while in SB and PS apothecia still occurred at elevated rates. Further laboratory studies revealed complete inhibition of CM conidia germination in unsterile natural soil, clearly implying a lack of potential of the antagonist to reach sclerotia at any distance apart. Therefore the direct targeting of this antagonist appears essential for realizing its biocontrol potential.

## Analysis of systemic signals in the xylem of *Brassica napus* infected with *Verticillium longisporum*

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**Abstract:** *Verticillium longisporum* (VL) is a soilborne, pathogen with host specificity on the Brassicas. Typical symptoms on oilseed rape are premature ripening and stunting under greenhouse conditions. Compared to other *Verticillium* diseases no wilting occurs on crucifers. There are signalling molecules assumed to cause disease symptoms by altering the developmental physiology of the host plant. A likely candidate is nitric oxide (NO). NO is reported to induce various physiological alterations, such as de-etiolation, inhibition of hypocotyl growth and ethylene production. Therefore, we examined the induction of stunting by application of the NO donor sodium nitroprusside (SNP). SNP, applied over a period of 28 days (three times per week) at different concentrations (10, 50, 100 µM), induced stunting on 'rapid cycling rape' in the climate chamber. Plant growth was reduced in each SNP treated variant and plants were smaller than the ones infected with VL, with the greatest growth reduction at 10 µM SNP. However, after 30 days of growth a difference in shoot length was no longer be detectable. At present, it is unclear whether the nitric oxide level in the plant is (i) up- or down-regulated during infection with the vascular pathogen, (ii) whether the pathogen produces NO scavenging proteins, or (iii) whether VL directly alters the NO metabolism of the plant so that NO is no longer produced. First results indicate that the NO level in VL infected plants is lower than in uninfected. As NO is known to delay senescence, a lower NO level may result in premature flowering, an effect observed on field-grown oilseed rape upon infection with VL. Hence the physiological effects of VL infection and NO application were analysed with relation to NO levels in plant tissue.

Therefore, we developed an indirect NO analytical method by using an NO specific scavenger, carboxy-PTIO, which reacts with NO in a stoichiometric manner. NO can be detected by measuring the specific reaction product (cPTI) with HPLC mass spectrometry. We extracted xylem sap from infected plants with a pressure bomb and used the samples for the quantitative analysis of NO. Alternatively, measurements were conducted with electron-resonance-spectroscopy (ESR). Here, NO is scavenged and stabilised by 'spin trap' molecules and measured due to its properties as a free electron radical, by recording the changes in a magnetic field, which creates specific signal peaks. Since NO can derive from different sources e.g. nitrate/nitrite reductase or a presumed NO synthase, the level of nitrite in infected and uninfected plants in relation to NO levels was recorded. In a further analytical approach NO is indirectly determined by using a nitrite specific fluorescence dye diaminoaphthalene (DAN), whose derivate NAT can be detected by fluorescence- HPLC.

## ***Verticillium longisporum* in winter oilseed rape - Impact on plant development and yield**

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**Abstract:** In the last ten years an increasing incidence of *Verticillium longisporum* has been observed in the German winter oilseed rape production. The impact of this pathogen on yield and plant morphological parameters, the disease development as well as the reaction of different cultivars is still not known. In two-year field trials the yield effect of *V. longisporum* in relation to disease severity was investigated in plots artificially inoculated with different amounts of infested rapeseed straw. Disease development was investigated on plant samples during the whole growing season using the ELISA test. In agreement with the visual disease assessment in the field, an obvious fungal spread in the plants could not be detected before beginning of maturity. In greenhouse experiments, plants of a susceptible and a moderate susceptible cultivar were inoculated using two different methods (root dip inoculation with conidia, soil infestation with microsclerotia). In contrast to symptom development in the field an intense stunting effect could be observed in infested plants already two weeks after inoculation. Disease severity was higher in the susceptible cultivar and fungal spread was faster and stronger than in the moderately susceptible cultivar. In plants inoculated with microsclerotia fungal spread was delayed compared to the root dip inoculation.

## Significance of *Leptosphaeria maculans* and *Sclerotinia sclerotiorum* incidence of Winter Rapeseed in the Czech Republic

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**Abstract:** Phoma root rot (causal agent *L. maculans*) and white mold (causal agent *S. sclerotiorum*) are serious pathogens of oilseed rape in the Czech Republic. In test years was confirmed the strong dependence of disease occurrence on the position of rape in crop rotation system, weather conditions, characteristics of locality and used growing technology (fungicidal treatment).

In 2000 and sporadically also in 2001 the occurrence of visual symptoms of white mold attack was observed before fungicidal treatment in early spring yet and at the beginning of fast prolongation growth especially at plants having the overgrown symptoms at autumn

In growing season 2001/2002 heavy infestation of oilseed rape by phoma root rot was observed. In field trials the mean disease infestation was 57 % on treated plots in comparison with 67 % on untreated variant. This result corresponds with low effect of fungicidal autumnal and early spring treatments on low increase of seed yield (+3,6 %). Infestation of oilseed rape by white mold in 2002 was about 30 %. Targeted fungicidal treatment against this disease in full flowering stage increased seed yield for 7,65 %.

In growing season 2002/2003 the strong damages of roots were caused by occurred as a result of temperature variation in early spring. The surface of cracked roots had deep furrow. It caused the difficult evaluation of phoma root rot infestation. It was not possible in visual evaluation to differentiate if the scratches on root were caused by the weather conditions or by fungal disease. Roots of plants from plots with lower crop density and plots untreated in autumn were more damaged. Occurrence of phoma root rot on rapeseed root crown in autumn 2002 was not observed. Infestation of phoma root rot before harvest at untreated variant was in Opava 85 %, in Šumperk 73 %. Average infestation on plots treated in autumn was in Opava 78 %, in Šumperk 50%. Infestation by white mold was not observed in Opava, in Šumperk was till 7 % only at untreated crops.

Sporadic phoma infection was observed at test localities Opava and Šumperk at autumn 2003, the infection was observed at leaves only. In 2004 (BBCH 85 - the seeds started brown) was observed the significant infection appearing as dark brown or black spots at rapessed stem base. The infection of roots was minimal. The infection was evaluated on stem base. The infection of untreated variant was about 50% at Opava and to 15% at Šumperk. The mean infection was at variants treated by combined autumnal - spring treatment in Opava about 42% and at Šumperk 4 - 8 %. The infection of *Sclerotinia* was at untreated variants at Opava 21%, at Šumperk 39%, the mean infection of treated variants was in Opava 5 %, in Šumperk 18,5 %. First symptoms of infection were observed till in second half of June.

In autumn 2004 different intensity of phoma root rot occurrence was recorded, symptoms were observed only on leaves. It concerned about zero, sporadic and medium occurrence. The dependence on position of oilseed rape in crop rotation and on locality was monitored. Similar situation was also in spring 2005. Evaluation of phoma root rot incidence on stem bases and roots of plants has not been realised so far. Infestation by white mold in this year is very high. The early start of plant infestation was recorded, occurrence of necroses, mycelia and sklerotia was observed (24th May 2005 - Slapy u Tabora). Types of infestation are different: infestation of roots and stem base is similar as in year 2000 and 2001. Also high occurrence of stem lesions to the middle or in the second third of the plant was observed. Mostly main stem is infected. Infestation of lateral branches and siliques is sporadic. Evaluation of infestation by both pathogens in 2005 has not been still completed and the exact data are not yet available.

## Consequences of oilseed rape infection with phytoplasma like organisms

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**Abstract:** On winter oilseed rape plantations in Poland and other country sporadically some „shaggy” looking plants can be observed. These deformations are usually caused by phytoplasmas, that settle the sieve tubes (phloem) of affected plants. Morphological changes of inflorescences and single flowers was described for the first time by Schmidt (1955). In the next years other authors - Lehmann (1969), Horvath (1969), Gundersen et al. (1994) - described the cause of strong deformations of plants as well as ethiology and symptomatology of the pathogen which was responsible for growth aberration and irregular organogenesis. Initially, it was thought that yellow type viruses were responsible for such a situation (Valenta, Musil 1963). But further investigations excluded this hypothesis and pointed at mycoplasma-like organisms as the actual perpetrators (Sears, Kirkpatrick 1994, Gundersen et al., 1994). To distinguish them from bacterial animal pathogens, so called mycoplasmas, bacteria that settle on plants was termed “phytoplasmas”. The vector of phytoplasmas are insects of *Jasside* family. In the insect the pathogen occurs as inclusions. At present the identification of possible phytoplasmas and their pathotypes is possible with the use of molecular techniques.

Isolation of total DNA was done by Doyle and Doyle method (1990). For PCR analysis two pairs of universal primers for identification of *Phytoplasma* were used: rU3/fU5 that amplifies about 880 bp (Lorenz et al., 1995) and rA16/fA16 (Ahrens, Seemuller 1992, Schneider et al. 1993) that amplifies 558 bp. As a standard of phytoplasma from group AAY (Kamińska, Korbin, 1999) DNA of infected plant *Catharanthus roseus* L. was used (Kamińska et al., 1996).

Additionally from some of less infected plants seeds were received, which were sown again. After vernalisation period only “shaggy” plants were isolated in blossom phase and put to haploidisation (Cegielska-Taras, Szała 1997). Observations of haploids development were made from seedling stage (*in vitro*) to grown-up stage (*in vivo*). The same treatment was applied to diploid plants received from seeds that were descendent from self-pollinated “shaggy” plants.



## **Polymorphisms within *Leptosphaeria maculans* and *Leptosphaeria biglobosa* revealed with rep-PCR fingerprints**

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Abstract: The method of rep-PCR was originally designed for species or strain differentiation of prokaryotes, but later it was successfully used to generate DNA fingerprints for numerous fungi, including '*Leptosphaeria maculans* species complex'. The method allows to amplify sequences between randomly dispersed repetitive sequences in a genome and it proved its usefulness to discriminate different components of the species complex and evaluate a level of polymorphism within members of this complex. In a current study, 200 isolates, including 111 isolates of *L. biglobosa* and 89 isolates of *L. maculans* were studied using primers derived from the 'repetitive extragenic palindromic, (REP) sequence, the 'enterobacterial repetitive intergenic consensus' (ERIC) sequence and the conserved repeated DNA element 'BOX'. In *L. biglobosa* two polymorphic bands were found for REP and three polymorphic bands were found for both ERIC and BOX. Surprisingly, more variation was found for *L. maculans*, with five polymorphic bands for REP, twenty nine for ERIC and three for BOX. This polymorphism was not connected with any known character of two species in study. Isolates differing from by a substitution in ITS1-5.8S-ITS2 region did not form any specific group with a unique rep-PCR fingerprint. Different fingerprints were not specific to geographical location.

p – 08

***In vitro* comparison of fitness of *AvrLm1* vs. *avrLm1*  
isolates of *Leptosphaeria maculans***

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One of the main diseases of rapeseed (*Brassica napus*) in Europe and across the world is stem canker of crucifers, caused by *Leptosphaeria maculans* (*Phoma lingam*). Stem canker contributes to great losses of winter oilseed rape yield. The newly introduced resistance of cultivars can be overcome by the pathogen within a few years.

Experiments in controlled temperature environment were performed to compare growth rate of near isogenic isolates of *L. maculans*, differing with avirulence gene towards resistance gene *Rlm 1*. The studies were done using six avirulent isolates (*AvrLm1*) and six virulent isolates (*avrLm1*). The isolates were cultivated on six media: Malt Extract Agar (MEA), Luria Broth Agar (LBA), Water Agar (WA), Potato Dextrose Agar (PDA), Campbell's V8 Juice Agar (V8) and Synthetic low Nutrient Agar (SNA). Twenty mL of a medium was poured on a 9mm diameter petri dish. Experiments were performed in controlled environment at 20 °C and 12 hour photoperiod. Three replicates per each variant (isolate x medium) were used. Growth rate was measured every two days from 3 days to 3 weeks after depositing the fungus on the medium.

Statistically significant differences between growth rate of virulent and avirulent isolates were observed at early phase of the experiment – three days after subculturing fungi on media V8, PDA and LBA and 5 days after subculturing on V8, with avirulent isolates growing faster than virulent ones. The fastest growth rate was observed on V8 medium and the slowest growth was on MEA medium. One week after depositing an agar disc on a medium, differences between avirulent and virulent isolates were no longer significant, but avirulent isolates tended to grow faster on most of the media.

The experiment confirms the hypothesis of loss of fitness connected with the gain of new virulence of an isolate. Similar results were previously reported for *AvrLm4* vs. *avrLm4* isolates of *L. maculans*, although the differences between two groups of isolates were mostly observed *in vivo*.

## Molecular detection of *L. maculans* and *L. biglobosa* spores from Burkard tapes

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**Abstract:** Oilseed rape in Poland is exposed to two fungal pathogens, *Leptosphaeria maculans* and *L. biglobosa*, which cause stem canker of cruciferes and are responsible for considerable yield losses. Infected stems that stay unploughed, remain on soil surface and they are the source of pseudothecia - fruiting bodies of the perfect stage that contain ascospores. Released ascospores are the main source of infection for young plants of winter oilseed rape in the following season. Information about time of an ascospore release is a basis of decision support systems used to control the disease.

One of standard tools used to detect time of first and mass ascospore release is a seven day volumetric spore trap by Burkard Manufacturing Ltd. (Rickmansworth, UK). Analysis of presence and concentration of airborne fungal spores may be performed either by means of conventional microscopy methods or PCR-based molecular techniques. In contrast to time consuming microscopy, PCR assays are faster and more accurate. This experiment was designed to optimise methods used for molecular detection of *L. maculans* and *L. biglobosa* spores from Burkard tapes. We have performed multiplex PCR using previously described primers LmacA, LmacB and LmacRev as well as own primers LmF, LmR, LbF and LbR. Both Lmac, Lm and Lb primers were species specific. The primers worked very well in a presence of one of the two species. However, it was not possible to detect any spore DNA in case of imbalanced ratio between *L. maculans* and *L. biglobosa*. Freezing of a spore tape, which is done to store tapes for a long time, has increased the resolution of the method by 10 times. For *L. maculans*, the sensitiveness of the method was ca. 8 spores on a frozen tape or fresh pycnidiospore suspension or 100 pycnidiospores, when the fresh tape was used for processing. The resolution for *L. biglobosa* was lower: 100 pycnidiospores from fresh and frozen tape. The detection of 4 and 10 pycnidiospores of *L. biglobosa* has been achieved, but the method was not reproducible.

## Effect of temperature on development of lesions caused by *Alternaria* spp. on leaves of oilseed rape

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**Abstract:** Leaves, stems, pods and seeds of oilseed rape (*Brassica napus* L.) can be infected by species belonging to the genus *Alternaria*. Pathogenic species are responsible for black spot disease which can cause considerable problems, especially in case of pod infection before harvest. Strong infection of pods may result with poor quality of seeds used for processing, poor storage and low quality of sowing material. In Poland black spot is regarded as an important problem in cultivation of both spring and winter oilseed rape.

In our experiment we have used 12 isolates belonging to six following species: *A. brassicae* (3 isolates), *A. brassicicola* (3), *A. alternata* (3), *A. radicina* (1), *A. porri* (1) and *A. dauci* (1). The aim of this experiment was to compare development of disease symptoms on leaves of oilseed rape at different temperature regimes. Experiments were performed in controlled environment at 16 °C, 18 °C and 22 °C. Fungal isolates were cultured on SNA medium, what allowed to form numerous spores. Symptom development was studied on third and fourth leaf of a cultivar Bosman. Leaves were cut and placed in plastic containers, with petioles wrapped up in filter paper soaked with distilled water. Special supports allowed to avoid contact of leaf surfaces with wet paper. Leaves were inoculated with 6 mm diameter agar discs placed in the middle of each half of a leaf. Each isolate was placed on intact leaves and on leaves wounded with a needle. Each variant (isolate x temperature x leaf treatment) had twelve replicates. Experiments were carried for two weeks. Symptoms resulting from inoculation were scored every three days. Discolouration of a leaf was measured in two perpendicular directions: along the side vein and across the leaf. Measurement of a symptom on leaf was done separately for black, yellow and light green zone.

The largest symptoms on leaves were caused by *A. brassicicola* with the mean size of the whole leaf symptom reaching 29,5 mm for wounded leaves and 22,4 mm for intact leaves (observation 11 days after treatment). Symptoms caused by *A. brassicae* were about half the size of symptoms caused by *A. brassicicola*. Symptoms produced by other species were negligible or non-existent when the leaf surface was not wounded prior to depositing of an inoculum. Symptom development greatly depended on temperature, with the smallest spot sizes at 16 °C and the largest symptoms at 22 °C. Wounding speeded up the infection process and resulted in large symptoms on leaves.

## Effect of differentiated fertilization with sulphur on health status of winter oilseed rape

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**Abstract:** The aim of the experiments carried out in 2001-2003 was to examine the effect of fertilization with sulphur on health of cultivar Lisek. Infection of plants was determined twice: during flowering (4 lower leaves on 25 plants) and beginning of ripening (50 whole plants randomly chosen from each plot). Sulphur was applied at different doses and growth stages: into soil in the form of (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> and foliar as 5% solution of MgSO<sub>4</sub>.

Depending on pathogen, the proper scales for infection determination were used. Results were transferred into disease index (DI) and analyzed statistically with variation analysis and Tuckey's test being applied. After harvest the occurrence of pathogenic fungi on seeds was also determined.

During flowering leaves showed the symptoms of black spot, downy and powdery mildew, but their intensity was relatively low and there were no significant differences between combinations. During the beginning of ripening black spot on leaves was noted most often in 2001 on control plots not fertilized with sulphur, but this result was not confirmed in the next years.

There were numerous symptoms of infection with *Phoma lingam* on stems in 2002, however disease occurrence did not depend on fertilization with sulphur.

There were many stems observed in 2002 with the symptoms of infection with *Rhizoctonia* spp., and in the next year with *Erysiphe cruciferarum*. Intensity of infection with both pathogens was not related to combinations of sulphur fertilization.

Harvested seeds were numerously settled by *A. alternata* followed by *Cladosporium herbarum*. Hyperparasite *Gonatobotrys simplex* was often observed on colonies of *Alternaria* spp. Pathogenic species were represented by *Alternaria brassicae*, *Phoma ligam* and *Fusarium* spp.

## Health status of winter oilseed rape depending on differentiated fertilization with nitrogen and sulphur

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**Abstract:** In 2001-2003 under field conditions there was determined the effect of spring doses of nitrogen and sulphur on health of 2 varieties of winter oilseed rape: open-pollinated and composite hybrid. In autumn the 26 kg of nitrogen in the form of NH<sub>4</sub>NO<sub>3</sub> was applied on all plots and in springtime 80 kg (before the beginning of vegetation), 160 kg (120kg before the beginning of vegetation + 40kg in the beginning of flower bud development) and 240 kg•ha<sup>-1</sup> (140+100kg). Sulphur in the form of (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> was applied in spring at doses 30, 60 and 90 kg ha<sup>-1</sup> + control combination with no sulphur (S<sub>0</sub>).

Depending on year of investigation, in higher intensity blackleg (*Leptosphaeria maculans*) and black spot (*Alternaria* spp.) was noted and in low - downy mildew (*Peronospora parasitica*). Infection of plants was more dependent on variety and year than fertilization, however in some years some effect of nitrogen and sulphur was observed.

In two years of investigations more symptoms of black spot (*Alternaria* spp.) was noted on leaves of plants fertilized with the highest doses of nitrogen. Infection of pods was not dependent on the dose of this element. In some cases higher amount of nitrogen often resulted in more symptoms of blackleg on leaves and stems.

Disease intensity was more dependent on sulphur fertilization. More symptoms of black spot on leaves and pods was observed in the control combination (with no sulphur). This element had a low influence on symptom intensity of blackleg. In some combinations advantageous effect of this element was noted but the results were very differentiated and it is difficult to draw explicit conclusions. On leaves and pods of open-pollinated variety the number of *Alternaria* spp. symptoms was significantly higher in comparison with hybrid one, but the opposite situation was observed in the case of blackleg.

In one year (2002) high intensity of *Rhizoctonia* sp. was noted in lower parts of stems and it didn't depend on applied fertilization.

## The incidence of *Alternaria* spp. on seeds of chosen population and hybrid oil seed rape cultivars

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**Abstract:** Often in Poland on oil seed rape fields on leaves, stems and siliques symptoms of black spot are observed. The casual agents of black spot are fungi of genus *Alternaria* mainly *Alternaria brassicae*, *Alternaria brassicicola* and *Alternaria alternata*. Often from diseased siliques diseased seeds are obtained. Spores and mycelium of *Alternaria* spp. are present on seed surface or mycelium overgrowth seed cover.

In our investigation main subject was to estimate the occurrence of *Alternaria* fungi on 16 cultivars of oil seed rape (8 population and 8 hybrid cultivars). Surface disinfected and nondisinfected seeds were incubated on potato dextrose agar (PDA) and on malt extract agar (MA). After 8-9 days of incubation (temperature 18 °C and 12 hours photoperiod) the incidence of fungi were observed and identification was performed.

The disinfected seeds incubated on both medium were weak infected (mean 2,3 % of seeds). Of obtained isolates 1.4% were fungi from genus *Alternaria*. The most often was observed *A. alternata* and *A. brassicicola* and in less percent *A. brassicae* (mainly on PDA medium).

From nondisinfected seeds 16 % on MA and 10% on PDA isolates of fungi were obtained. The incidence of fungi from genus *Alternaria* on MA medium reached 50% of seeds (6,7% - *A. alternata*, 1,2% - *A. brassicicola*), and on PDA over 90% (7% - *A. brassicicola*, 2% - *A. alternata*). On this seeds *A. brassicae* was absent.

The occurrence of *Alternaria* spp. on investigated oil seed rape cultivars were similar in case of seed disinfection and slightly different in case of nondisinfected seeds.

## Effectiveness of combined application of insecticides and fungicides for control of winter oilseed rape pests and diseases in the period of flowering and pods formation according to the time and frequency of applications

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**Abstract:** In 2003 – 2005, at the Sośnicowice Branch of the Institute of Plant Protection, Poznań, investigation were made of tank-mix application of various insecticides and fungicides in modern production technologies of rape. This paper reports results from synchronous application of insecticides to control pods pests - cabbage seed weevil (*Ceutorhynchus assimilis* Payk), brassica pod midge (*Dasyneura brassicae* Winn.) and fungicides to control some fungal pathogens at the flowering stage – grey mold (*Botrytis cinerea* Pers.), pod spot (*Alternaria brassicae* Berk.), according to the time and frequency of application of these agrochemicals.

In 2003, the trials were conducted with two insecticides - Karate Zeon 050 CS (lambda-cyhalothrin) and Trebon 10 SC (etofenprox), which were applied individually and as mixtures with three fungicides: Alert 375 SC, Horizon 250 EW and Amistar 250 SC. There was done only one application of investigated mixtures at the time according to BBCH growth stage 65.

In 2004 and 2005, there were conducted three trials with three new insecticides, which were Proteus 110 OD (tiachloprid + deltamethrin), Calipso 480 SC (tiachloprid) and Patriot 100 EC (deltamethrin). Just like in 2003, all these insecticides were applied individually and as mixtures with the fungicides: Alert 375 SC (flusilasole 125 + carbendazim 250), Amistar 250 SC (azoksystrobin) and Horizon 250 EW (tebuconazole). The trials were differed among themselves with times and frequency of applications.

The effect of mixed application of insecticides and fungicides in pest incidence, fungal diseases of pods and seed yield were examined.



## Comparison of results of a petal test and natural infection of oilseed rape with sclerotinia stem rot in Poland

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**Abstract:** In spring 2005, petals of oilseed rape (*Brassica napus* L.) were sampled from flowering plants of farmers' fields and cultured on BB and BCG media, supplemented with bromophenol blue or bromocresol green pH indicators. Samples were collected 24 times from 19 different fields located in different places throughout Poland. Some fields were treated and some were untreated with fungicides. Each time, a field sample consisted of 30 petri dishes containing 20 mL of a given medium with 7 petals uniformly placed on each dish. Petals from the same inflorescence were placed on the same petri dish, with one petal from a randomly chosen flower on BB medium and a petal from the same flower on BCG medium. Petals were placed on a petri dish in the same order on all plates, which allowed us to study the infection of the same flowers and inflorescences on two media in parallel. Sampling was performed over 20 days in May, with one field sampled 3 times, every nine days. Sampling was also done from four separate replicates of control fields of two experiments using different cultivars in one location. There were also studies to compare the infection of petals of inflorescences located in upper and lower parts of the oilseed rape canopy, as well as studies comparing the infection of different parts of flowers and also studies of infection of leaves and siliques. For comparison, petals were placed on media directly in the field and a few hours later, in laboratory conditions.

In general, upper flowers were more infected than flowers which were collected from lower parts of the canopy. Petals were the most infected parts of flowers. The use of fungicides decreased petal infection by half. Considerable differences were found between the two media on intermediate days of observation (day 3 to day 5), but the final results (obtained on day 4 to day 6) were comparable, with results slightly higher for BCG than for BB medium. The highest infection level of petals was observed at the beginning of the flowering period. There were no considerable differences concerning the final result, irrespective of a place used to put petals on a media. Two different cultivars at one location were infected with the same percentage. At final assessment the percent infection of petals varied from 19.9% to 90.5%.

## Patterns of *Leptosphaeria maculans*/ *L. biglobosa* ascospore release in the season 2004/2005 in Poland

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**Abstract:** The ascomycete fungi *Leptosphaeria maculans* (Desm.) Ces. et de Not and *L. biglobosa* Nov. cause stem canker of crucifers, one of the most damaging diseases of oilseed rape in Poland and worldwide. The main sources of infection are ascospores of these species released by pseudothecia formed on infected stubble of previous oilseed rape crops. System for Forecasting Disease Epidemics (SPEC) has been developed to improve the management of stem canker by optimisation of the fungicide spray timing. The core element of this system is monitoring of *L. maculans* and *L. biglobosa* pseudothecial maturation and ascospore release. At present spore traps operate in different oilseed rape growing regions of Poland – West Pomerania, Pomerania, Great Poland, Lower Silesia, Upper Silesia and Carpathian Foothills. Spores are detected using a 7-day volumetric spore trap (Burkard Manufacturing Ltd., Great Britain) or volumetric pollen and particle sampler (Lanzoni S.r.l., Italy) surrounded by a circle of oilseed rape debris infected with *Leptosphaeria* spp.

In West Pomerania, Pomerania and Lower Silesia monitoring was done from 1 September to 30 November 2004 and from 21 March to 7 June 2005. In Great Poland and Upper Silesia spore trapping has continued since 1 September 2004. In the Carpathian Foothills, monitoring began on 20 April 2005 and has continued to the present time. In autumn 2004, the difference in date when spores were first detected between various regions was 12 days. Spores were first observed at the site in Lower Silesia on 11 September 2004 and the latest detection was in Great Poland on 23 September 2004. The lowest numbers of spores were detected in Upper Silesia and the highest numbers (up to 320 spores/m<sup>3</sup> of air) in Lower Silesia. Lower Silesia had the longest duration of ascospore release (73 days from the detection of first spores in September to the detection of last spores in November 2004). In winter 2004/2005, no spores were captured either in Poznan (Great Poland) or in Sosnicowice (Upper Silesia). In spring 2005 ascospores were only trapped sporadically and at very low quantities in Rarwino (West Pomerania), Tarnow (Lower Silesia) and Rzeszow (Carpathian Foothills).

# **Entomology Sessions**

E – 01

## Insect problems in European oilseed rape cultivation, and how to deal with them: the OSR farmers' perspective

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**Abstract:** A survey was carried out among oilseed rape growers in six countries (Estonia, Finland, Germany, Poland, Sweden, and the UK) concerning the growing season of 2002-2003, as part of the EU's MASTER research project. In total, 1005 replies were obtained with 115-216 responses from each of the countries surveyed. Here the core results concerning the occurrence and importance of insect pests, the decision making criteria concerning the need for active control measures, and the impact of farming methods (conventional-integrated-organic) on these perspectives are presented. Europe-wide, only the pollen beetle was a problem requiring control in each country. The seed weevil, pod midge, and the stem flea beetle were the second most commonly mentioned as problems (important in 4 out of 6 countries), followed by the stem weevils (2-3 out of 6 countries). Six-seven different insect species were all very important in DE and PL, while in the UK 2-3 species and in SE, FI and EE only 1-2 species were problematic. This was reflected in the number of insecticide spray treatments: typically 2-4 per season in Poland, 1-4 in Germany, 0-3 in the UK, and 0-3 in SE, FI, and EE. Oddly enough, the mean number of insecticide sprays was the same for conventional and IPM farmers (1.65 sprays/season), and in FI and PL farmers using IPM sprayed more often than conventional farmers. Also, the proportion of IPM farmers was highest in countries where the spraying rate also was highest (DE, PL, UK). Overall, also a higher proportion of IPM farmers used insecticide seed dressing than of conventional farmers (77.3% vs 69.7%). In all countries, the majority of farmers always sprayed all their OSR fields (81.0%), while overall, 14.7% sprayed some but not all fields, and a mere 4.3% reported having sprayed field edges only. Out of nine different decision making criteria for determining whether active pest control was necessary, farmers were using most often simply seeing the pest on the crop (70.0% mentioned using), followed by using economic thresholds (47.3%), recommendation by crop protection consultant (24.0%), plant growth stage (16.3%), advisory service message (16.3%), advisory service general recommendation (8.7%), advise by neighbours (8.2%), commercial decision support system (2.7%), or spraying by date (1.8%). Growers in PL used on the average 4.6 different criteria simultaneously to arrive at pest control decision, while in other countries clearly fewer criteria were sufficient: 2.7 in DE, 1.9 in SE and UK, and 1.6 in EE and FI.

E – 02

**Efficacy of *Trichogramma chilonis* (Ishii) and some new chemistry insecticides against *Helicoverpa armigera* (Hübner) in Sunflower**

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**Abstract:** An experiment was conducted at the experimental farm of University of Arid Agriculture, Rawalpindi (Pakistan) with the specific objectives i.e.: 1) to assess the effectiveness of *T. chilonis* eggs against *H. armigera*, 2) to examine the insecticidal effect of some new chemistry insecticides against *H. armigera*. Four new chemistry insecticides viz. Lannate 40 SP, Proclaim 019 EC, Steward 150 SC and Tracer 240 SC @ 330 gm./ac., 200, 175 and 80 ml./ac. respectively were used and the eggs of the *T. chilonis* were released @ 60,000, 80,000 and 1,00,000 per acre. All the treatments exhibited significant results for the control of pest but among the insecticides Steward proved to be the most effective in reducing the larval-population. Other insecticides also controlled the insect pest population significantly but were found to be inferior to the above treatment. *T. chilonis* suppressed larval-population of the pest which was more pronounced with the increase of release of eggs in the field. Maximum decrease in larval-population was observed when the eggs of the parasitoid were released @ 1,00,000 per acre. It was concluded that the parasitoids might become an integral part of management package only by augmenting it with new insecticides. But at the same time, to avoid resistance in the insect pests conventional insecticides must be replaced with the newly emerging insecticides, which are safer and ensure sustainability of environment.

**Keywords:** Efficacy, *Helicoverpa armigera*, *Trichogramma chilonis*, Insecticides, Sunflower

E – 03

## First steps to analyse pyrethroid resistance of different oil seed rape pests in Germany

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**Abstract:** Due to EU regulations of plant protection products and increasing demands for human and environmental safety issues the number of active substances which can be used to control pest insects was reduced in the last year. In Germany only pyrethroids are available for the control of most pest insects in oil seed rape. Therefore resistance development of pest insects to pyrethroids is becoming more relevant because the resistance status of pest insects need to be known for IPM.

In the past years *Meligethes aeneus* has developed resistance to pesticides in different European regions. Actually resistant *M. aeneus* populations seem to spread in Europe. No information on possible development of resistance to the other pest insects of rape is available, though they often are exposed to more than one pyrethroid application per season similar to *M. aeneus*.

We conducted laboratory tests using active substances of pyrethroids on different pest insects of rape collected in different areas of Germany. Tests have been carried out on *Phyllotreta* spp., *Ceutorhynchus assimilis*, *C. quadridens*, *C. napi* until now.

Results obtained and methods used will be presented and discussed.

E – 04

**Resistance of pollen beetle (*Meligethes aeneus* F.) to pyrethroids, chloronicotinyls and organophosphorous insecticides in Poland**

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**Abstract:** Poland is a major producer of rape (*Brassica napus*). This plant is cultivated on about 600 000 ha (2005) in this country but the average crop is very low – 1 000 000 t. Pollen beetle (PB) is the most serious rape pest in Poland and is considered to be the pest with high likelihood of developing insecticide resistance. Pyrethroids, organophosphorous and chloronicotinyls insecticides have been widely used to control PB in Poland. For many years pyrethroids (deltamethrin, cypermethrin, alpha-cypermethrin, zeta-cypermethrin, lambda-cyhalothrin, esfenvalerate, ethofenprox, ) held the primary place in the PB control in Poland. Over a period of 27 years these classes of insecticides have been most commonly used for controlling PB in Poland. During last years decrease of efficacy of chemical protection against PB was signalled from many regions of Poland.

Bioassays of determined pyrethroids, chloronicotinyls and organophosphorous insecticides for resistance monitoring in PB were performed in the Institute of Plant Protection in Poznań before the year 2004. Concerning this subject Scientific Project 2P06R 09228 is supported by Polish Ministry of Scientific Research and Information Technology since the year 2005. Results of the researches demonstrated some level of resistance to alpha-cypermethrin, deltamethrine, lambda cyhalothrin and also acetamiprid. In laboratory studies (2004) the pyrethroid insecticide and acetamiprid were less effective in controlling PB beetle. Survival at recommended concentration in case of alpha-cypermethrine, deltamethrin, lambda-cyhalothrin and also in case of acetamiprid indicated occurrence of resistance in tested populations.

The results indicated that populations tolerant for pyrethroids and acetamiprid were no cross-resistant to chloropyrifos.

The widespread use of pyrethroids in Poland can lead to control failure. Understanding the conditions which favour the development, the causes, and the mechanism of resistance are the crucial challenge for the future of pyrethroids and acetamiprid use to PB control in Poland.

The constant monitoring of PB susceptibility level to insecticides used in Poland and studies on mechanisms of PB resistance to them will allow to enterprise a best strategy for managing PB resistance. At present the general principles of strategy involve the rational application of all recommended insecticides and their rotation including different modes of their toxic.

**E – 05**

**Responses of pollen beetles (*Meligethes aeneus*)  
to conspecific odours**

**Cook, S.M., Watts, N.P. & Williams, I.H.**

*Plant & Invertebrate Ecology Division, Rothamsted Research, Harpenden, Hertfordshire, AL5 2JQ, UK.*

**Abstract:** As part of ongoing studies to investigate insect-derived semiochemicals for use in pest control strategies for oilseed rape (*Brassica napus*), the responses of male and female pollen beetles (*Meligethes aeneus*), to conspecific odours was assessed in laboratory and semi-field experiments. In laboratory bioassays using a linear track olfactometer, male pollen beetles did not respond to the odours from groups of other males or from females. Females did not respond to the odours of groups of males, but were increasingly repelled by the odours from groups of females in increasing numbers. This suggests that females display epideictic (spacing) behaviour in response to high densities of other females. This response was found to be at least partially due to the odour of the females themselves, rather than due to the volatiles from the female-damaged plants. The results from semi-field and field-scale experiments however, failed to support preliminary laboratory evidence for the existence of a female-produced epideictic pheromone in the pollen beetle.



E – 06

## **Responses of pollen beetles (*Meligethes aeneus*) to petal colour**

**Cook, S.M., Skellern, M.P., Smith, M., & Williams, I.H.**

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**Abstract:** It is well known that the pollen beetle (*Meligethes aeneus*), a major pest of oilseed rape (*Brassica napus*) inflorescences, is attracted the yellow colour of the flowers. Little is known however, about how variation in flower colour might affect host plant location and subsequent infestation by this pest. We investigated the responses of new-generation pollen beetles to a range of differently-coloured traps and to flowers of a white-petalled oilseed rape cultivar that had been dyed different colours. In the field, beetles were significantly more attracted to sticky traps coloured yellow than other colours. Black and blue coloured-traps caught fewest beetles. In laboratory and semi-field experiments using racemes and potted plants with dyed flowers, flowers dyed yellow were more attractive than untreated white flowers, which were in turn more attractive than flowers dyed red or blue. The potential for manipulation of petal colour in control strategies for this pest is discussed.

E – 07

**Predation rates and assessment of *Staphylinidae* larvae from oilseed rape flower stands and their role in regulation of *Meligethes* larvae**

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**Abstract:** Large numbers of *Staphylinidae* larvae are frequently observed together with pollen beetle larvae in flower stands of oilseed rape plants. The quantitative relation of rove beetle larvae and pollen beetle larvae has been recorded with funnel traps under the rape canopy. From 2002 to 2005 funnel traps have been installed in an Standard (STN) and an integrated (ICM) system. The numbers of dropping larvae per m<sup>2</sup> have been counted and the temporal coincidence between the two groups analysed. In 2003 the temporal coincidence between pollen beetle larvae and *Staphylinidae* larvae was clearer in the ICM-system than in the STN-system and the number of rove beetle larvae was higher in the ICM-system. The hatching of the new *Meligethes*-generation showed the effect of the predators on the pest population. The percentage of the hatched pollen beetles of the new generation was lower in the ICM-system than in the STN-system.

## **Oilseed rape pests and their parasitoids in Estonia**

**Eve Veromann and Anne Luik**

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**Abstract:** The pests and their hymenopterous parasitoids present in a spring and a winter oilseed rape crop in Estonia were studied. *Meligethes aeneus* was most abundant pest in both crops. Other crucifer-specialist pests included: *Ceutorhynchus assimilis*, *C. pallidactylus*, *C. rapae*, *C. floralis*, *C. pleurostigma* and *Phyllotreta* spp., but their abundance was very low. Four parasitoids of *M. aeneus* larvae (*Diospilus capito*, *Phradis morionellus*, *P. interstitialis* and *Tersilochus heterocerus*) and three of *C. assimilis* larvae (*Mesopolobus morys*, *Stenomalina gracilis* and *Trichomalus perfectus*) were also found.

**Key words:** spring and winter oilseed rape, pests, pollen beetles, hymenopterous parasitoids.

## Phenology of parasitoids (Hym., *Ichneumonidae*, *Tersilochinae*) of oilseed rape pests in northern Germany in 1995-1997

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**Abstract:** The phenology of the most abundant univoltine larval parasitoids of oilseed rape pests, *Tersilochus microgaster* (host: *Psylliodes chrysocephala*), *Tersilochus fulvipes* (host: *Ceutorhynchus napi*), *Tersilochus obscurator* (host: *Ceutorhynchus pallidactylus*), *Phradis interstitialis* and *Tersilochus heterocerus* (host: *Meligethes aeneus*), was studied at Goettingen, northern Germany, in 1995-1997. The emergence of adult parasitoids from fields which had been grown with rape in the previous year was assessed by using ground photoelectors, yellow water traps and Malaise traps. In new crops of oilseed rape, the immigration and activity of adult parasitoids were monitored with yellow water traps, positioned at the top of crop canopy and at ground level, and with Malaise traps.

The number of adults of *T. microgaster*, *T. fulvipes*, *T. obscurator* and *P. interstitialis* caught by Malaise traps was substantially higher than the number trapped by yellow water traps. Further, yellow water traps placed at ground level yielded higher numbers of *T. obscurator* and *T. microgaster* than water traps placed at the top of crop canopy. A higher number of *T. heterocerus* was found in traps at crop canopy level. Adults of *T. fulvipes* and *P. interstitialis* were captured at ground and canopy level in similar numbers.

The time of arrival of female parasitoids in new oilseed rape crops varied between species. At some occasions, it was found simultaneously with their emergence from nearby overwintering fields. Females of *T. microgaster* were recorded from the early bud stage in March until mid-flowering. *T. fulvipes*, *T. obscurator* and *P. interstitialis* colonized the rape crops from mid-April onwards and adults of *T. heterocerus* occurred towards the end of April or beginning of May. Very few individuals were trapped during pod formation up to the beginning of crop ripening. Accordingly, the main period of parasitoid activity coincided with the occurrence of susceptible larval instars of respective host species in the rape crop. Peak activity of all Tersilochine parasitoids, except *T. microgaster*, mainly focussed on flowering. Consequently, insecticide treatments during this period cause a high risk of damage to these parasitoid species. The reduction of parasitoid abundance may affect their impact on natural control of pest populations.

**Upwind anemotaxis of the parasitoid, *Tersilochus obscurator*, during its migration flights to oilseed rape**

**Williams, I.H., Barari, H. and Frearson, D.**

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**Abstract:** The direction of migration flights of parasitoids to crops of oilseed rape can affect their subsequent spatial distributions on the crop and hence their effectiveness in conservation biocontrol strategies. The effect of wind direction on the migration flights of natural populations of *Tersilochus obscurator*, a parasitoid of the stem-mining pest of oilseed rape, *Ceutorhynchus pallidactylus*, to the crop was investigated. Double-sided Malaise traps encircled a crop (20 m diameter) of winter rape, at each of eight compass points and at 5m from the crop periphery. Insects were collected during eight alternate weeks from mid-March to late June 2003. Meteorological data were recorded close to the plot. *Tersilochus obscurator* were caught in the traps from mid April until mid June with a peak in late May. Most (88%) were caught in the external halves of the traps indicating a net movement towards the crop. On five days analysed, there was a negative correlation between insect catch in the external halves of the traps and air flow through the traps, highly significant on three days. This study provides the first field evidence that *T. obscurator*, utilize upwind anemotaxis to locate their host habitat. Knowledge of parasitoid responses to host plant volatiles and to wind direction has potential for manipulation of the parasitoids in integrated pest management strategies for the crop.

E – 11

***Phradis morionellus* on *Meligethes aeneus*: long-term patterns of parasitism and impact on pollen beetle populations in Finland**

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**Abstract:** Annual percent parasitism of *Meligethes aeneus* (Nitidulidae) larvae by *Phradis morionellus* (Ichneumonidae) were collected in Finland for 11 years (1985-1995) from 35-70 different locations (13 regions) covering the total area of rapeseed growing in Finland. Additionally, more detailed data from 13 locations were collected on parasitism levels, and on the density of host larvae per plant at each location, for six years (1990-1995). Information on the level of pest attack at the national level (severity and frequency of attack) was obtained from the annual pest survey data, carried out by the Agricultural Research Centre of Finland until 1992. Total proportion of pollen beetles removed from the emerging new generation adult population (%-parasitism at each region weighted by the area of rapeseed grown in that area) varied between the highest in 1987 at 49.5% to the lowest in the following year (1988) at 7.5%; usually the proportion was around 30%. Pollen beetle attack decreased from severe in the early 1980s to moderate in 1986-87, with raising level of parasitism by *P. morionellus*. After the 1988 crash in *Phradis* populations pollen beetle attack jumped again to severe until the early 1990s, after which some balance seems to have been reached. Insecticide sprays to control the all-time high populations of the cereal aphid *Rhopalosiphum padi* in 1988 are a likely explanation for the parasitoid crash in 1988. A dynamic simulation model was constructed to describe the rapeseed plant, pollen beetle, and parasitoid interaction. This suggested that pollen beetle populations indeed can be held at a very low level by *Phradis*, if the interaction is not disrupted with pesticide applications, or if the parasitoid is enhanced by some other simple means. The parasitoid dynamics appear to follow a surprising pattern, being in synchrony over several large regions, but varying widely between these larger regions. Edaphic and climatic factors may explain such regional patterns, while also several micro-level factors were identified as influencing the level of parasitism at an individual field -level. These include distance to forest edge, soil type, size of rapeseed field, and possibly the abundance of umbelliferous plants at the field edge.

## **Study of harmful *Anthomyiidae* in oilseed rape fields with different drilling dates**

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**Abstract:** Since a couple of years the cabbage root fly (*Delia* spp.) causes increasing damages in winter oilseed rape crops in Germany, particularly by feeding of larvae on the roots of young oilseed rape plants in autumn. The intensity of infestation of the oilseed rape by root flies is a function of the development of the crop plant. In fields with different drilling dates the *Anthomyiidae* spectrum was assessed by soil samples and emergence traps. Overall 7 *Anthomyiidae* species with the potential to feed on oilseed rape were recorded, four of them more abundant. It could be shown that drilling date heavily influences the species assemblage of pest *Anthomyiidae* and their dominance. While in early drilled winter oilseed rape *Delia radicum* was dominant in later drilled winter oilseed rape fields *Delia platura* predominated. Also other species like *Delia florilega* and *Botanophila fugax* showed higher abundances in later drilled oilseed rape fields. Thus, the change of *Anthomyiidae* assemblages and their dominance position according to drilling date can influence the success of control measures.

E – 13

## **Sex determination of insect pests of oilseed rape for behavioural bioassays**

**Cook, S.M., Watts, N.P. & Williams, I.H.**

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**Abstract:** Male and female insects often have different requirements for host plants, food resources and space. Therefore, insect responses to such stimuli in behavioural bioassays vary according to the sex of the individuals tested. In order to compare differences in behavioural responses between female and male subjects, it is often necessary to determine the sex of an individual before its use in bioassays. Reliable techniques of determining the sex of live subjects which do not harm them are available for some species. We describe methods used to determine the sex of live, field-collected individuals of three major pest- species of oilseed rape: pollen beetles (*Meligethes aeneus*), seed weevils (*Ceutorhynchus assimilis*) and flea beetles (*Psylliodes chrysocephala*).



# **Entomology Posters**

e – 01

## Damage of registered Polish winter oilseed rape cultivars caused by pests

**Marek Mrówczyński**<sup>1</sup>, Henryk Wachowiak<sup>1</sup>, Czesław Muśnicki<sup>2</sup>, Michał Jodłowski<sup>2</sup>, Stefan Heimann<sup>3</sup>

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**Abstract:** The aim of investigations was to qualify degree of damage registered changes of winter oilseed rape by pests in Poland. It was analysed plants' damage caused by pests. Investigations were led on 42 registered in Poland winter rape's changes, in this: 5 restorer hybrids, 4 composed hybrids and 33 population changes. Experiences were led in Experimental Stations Opinion of Changes: Krościna Mała and Rarwino, in Station of the Plants' Farming Małyszyn. On the ground of conducted investigations the large differences were affirmed in degree of damage of studied winter rape's changes by *Ceutorhynchus pleurostigma* Marsh., *Phorbia brassicae* Bche., *Ceutorhynchus napi* Gyll., *Ceutorhynchus quadridens* Panz., *Meligethes aeneus* F., *Dasyneura brassicae* Winn. and *Ceutorhynchus assimilis* Payk.

## The endanger of oilseed rape with pests in Poland

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**Abstract:** Winter and spring rapes belong to these agricultural tillages, which throughout period of vegetation are damaged by different pests. The lack of the pest control brings to lowering of crop seeds about near 20%, and in extreme cases to partial or even total destruction plantation. The pests reduce the quality and quantity the crop as well as make difficult gathering of seeds.

Except present occurrence pests, which economic losses cause in the closest period, economic meaning can take different species *Phytomyza rufipes* Meig., Agrotinae, Thysanoptera, *Plutella cruciferarum* Zell. and also Gastropoda and birds.

Endeavour to lowering of costs of the plants protection across rational pest control has the multidirectional character it and depends mainly on: improvement the signalling of intervention, qualification of thresholds of economic profitability the pest control, limitation of number of executed interventions, usage shore interventions, using insecticide – manorial mixtures and correct choice of selective insecticide.

In this work winter and spring rapes pests occurrence in 1999-2003 was introduced. Among other pests, for 5 of them (*Meligethes aeneus* L., *Ceutorhynchus napi* Gyll., *Ceutorhynchus quadridens* Marsh., *Ceutorhynchus assimilis* Payk., *Dasyneura brassicae* Winn) the average harmfulness in the country is shown as a graphs and the regions with higher occurrence as a maps. In years 1999-2003 occurrence of other rapes pests was introduced too.

It was executed also opinion of chemical protection of winter rape relating : number of interventions registered to exchanged pests fighting preparations, costs of spraying and purchase insecticides as well as proportional part of different groups of chemical means recommended in Poland. To the end of years eighties predominated phosphoroorganical preparations however from year 1980 had grown up number and part pyrethroids in rapes chemical protection before pests . In the latter part years ninetieth happened the fall of number of registered new biologically active substances to pest control in rape, however grows up number of reproductive insecticide, that is generics.

**The damages of seeds and seedlings of winter oilseed rape cultivars caused by *Deroceras reticulatum* (Müller) (Gastropoda: Pulmonata: Agriolimacidae) and *Arion lusitanicus* Mabile (Gastropoda: Pulmonata: Arionidae)**

**Tomasz Kałuski** and Jan Kozłowski

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**Abstract:** Young oilseed rape plants are attacked by numerous pests in Poland. The severe damages in crops of winter oilseed rape are caused by slugs. The most dangerous slug species, which damage oilseed rape plants, are *Deroceras reticulatum* and *Arion lusitanicus*. Some literature data show that the plant cultivar may be very important factor in determining damages degree caused by pests. The aim of studies was to determine palatability of 18 winter oilseed rape cultivars to feeding of *Deroceras reticulatum* and *Arion lusitanicus* slugs. In controlled conditions tests with seeds and seedlings were carried out. Once a day, for the next few days, damage degree of seeds or plants caused by slugs were observed. The obtained results showed low differentiation of susceptibility of tested oilseed rape cultivars for *Deroceras reticulatum* and *Arion lusitanicus*, but in group of cultivars strongly damaged by slugs were Lisek and Contact.

## **The influence of glucosinolate content variability in the seed and green matter of winter rapeseed on the attack by selected pests**

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**Abstract:** The glucosinolate content in the seeds of present rapeseed collection (30 varieties) varied from 5,40 to 24,06  $\mu\text{mol}/1$  g of dry matter. The glucosinolate content at cotyledons of selected three varieties (from 9,73 to 12,14  $\mu\text{mol}/1$  g seed dry matter) varied from 9,30 to 12,14  $\mu\text{mol}/1$  g of herbage dry matter. The changes of glucosinolate content were observed after the mechanical injury of leaves. Glucosinolate content varied at third day after the injury from 4,33 to 8,6  $\mu\text{mol}/1$  g of herbage dry matter at intact leaves and from 23,22 to 24,19  $\mu\text{mol}/1$  g of herbage dry matter at damaged leaves. The significant increase of indolylglucosinolates was detected after leaf injury.

The connection of seed glucosinolate content, emergence ability and growth stage to slug damage was observed at ten selected varieties of actual rapeseed collection. The mean number of emerged plants varied from 22 to 31,5. Growth classification varied from degree 1 (low growth) to degree 3 (high growth). Injury of the slugs moved from 2,14 to 3,55 degrees at observed materials. Obtained one-year data showed, that glucosinolate content, emergence energy and growth stage influence the slug injury. The scale with 6 degrees was used for the evaluation of slug injury: 1 - intact plant, 6 - whole plant or plant top is missing.

The obtained results show, that exists variability of glucosinolate content at present collection of rapeseed varieties and this variability influences the slug injury.

The research of the influence of glucosinolate content in seeds to slug injury was finished in 2004. Obtained results are used for the research of influence of glucosinolate content in rapeseed green matter to the incidence by rapeseed sawfly (*Athalia rosae*) and stem weewils (*Ceutorrhynchus napi* and *C. pallidactylus*);

Analytical determination of glucosinolate content

The determination of glucosinolate content was realised using HPLC method developed at Research Institute of Oilseed Crops at Opava (Kolovrat 1998), this method is based on the international norm (ISO 1992). The method for the determination of glucosinolate content differs not in principle from the described method for the determination of glucosinolate content in seed, the differences are only in the preparation and purification of extract (Hrnčířík 1999). The sample 1 g of green matter is extracted three times by 2 ml of cooking 70% methanol solution. After purification by precipitating agent follow the enzymatic desulfatation using ion exchange. Desulphoglucosinolate content is determined by HPLC method - reversed phase column using gradient elution and detection in UV region.

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## Subsequent effect of pyrethroids Karate and Mavrik to carabid beetles (Coleoptera, Carabidae) activity in winter rapeseed crop

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**Abstract:** The carabid beetles are important in agrocenosis as predaceous insects of some group of pests as well as for different stages of herbivores feeding on winter rapeseed crop (*Meligethes aeneus* F., *Ceuthorhynchus assimilis* Payk., *Dasyneura brassicae* Winn.). The experiment was carried out in 2002 and 2004 at Experimental Station Pawłowice (Agricultural University at Wrocław). The aim of the study was to determine the effect of non-selective pyrethroids reducing number of phytophagous larvae (as food) on total amount and species diversity of carabid beetles. Each year, the insecticides lambda-cyhalothrin (Karate 25 EC) and tau-fluvalinate (Mavrik 2S) were applied at two different times to control major pests larvae of rapeseed. To determine seasonal dynamics of larvae dropping to the soil for pupation and to determine activity of Carabidae, falling and pitfall traps were set up properly. Two years investigations indirectly prove effect of using pyrethroids on seasonal appearance of beetles in winter rapeseed crop. Additionally, increased mortality of larvae caused through application of insecticides or decreasing total amount of phytophagous larvae was found. This phenomenon is changing daily activities of some group of carabid beetles as well as their feeding preference. This also suggested that subsequent effect of using non-selective insecticides influence the intraspecific relation of predaceous Carabidae.

## Adult activity and larval abundance of stem weevils and their parasitoids at different crop densities of oilseed rape

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**Abstract:** Sowing rates of winter oilseed rape in Germany have been reduced substantially in recent years, in order to optimize the crop canopy structure and yields of the crop. The aimed plant density ranges between 30 – 50 plants/m<sup>2</sup>, as compared with 80 – 100 plants/m<sup>2</sup> in former years. These changes may have wider consequences for pest infestation and natural control of pests. The effect of reduced plant density of oilseed rape on adult activity and larval abundance of rape stem weevil, *Ceutorhynchus napi* Gyll., and cabbage stem weevil, *Ceutorhynchus pallidactylus* (Mrsh.), (Col., Curculionidae) as well as their larval parasitoids, *Tersilochus fulvipes* (Grav.) and *Tersilochus obscurator* Aub. (Hym., Ichneumonidae), respectively, has been studied in a field experiment at Goettingen. Plots of two contrasting densities of oilseed rape cv. ‘Artus’ (70 plants/m<sup>2</sup> ;10 plants/m<sup>2</sup>) were established in a randomised block design with 6 replicated plots. To estimate the activity densities of adult stem weevils and parasitoids within the plots, two water trays were placed at ground level in the centre from late April to mid-May. The larval abundance of *C. napi* and *C. pallidactylus* was assessed from plant samples collected at random in each plot in May. The abundance of parasitoid larvae was examined by dissecting the host larvae under a microscope.

In plots of low plant density, the number of adult weevils trapped in water trays was higher than in plots of high plant density (significant only with *C. napi*). Further, low plant density resulted in higher numbers of adult *T. fulvipes*, whereas numbers of *T. obscurator* trapped in water trays were not affected significantly. The number of larvae of *C. napi* and *C. pallidactylus* per plant was increased in plots of low plant density compared with plots of high density (significant only with *C. pallidactylus*). In contrast, in plots of high plant density the abundance of *C. napi* larvae per m<sup>2</sup> was significantly higher than in plots of low density. The abundance of *C. pallidactylus* larvae per m<sup>2</sup> in all plots was on a similar level, indicating that oviposition and larval performance of this species was not affected even at very low plant density. Corresponding to the activity density of adult parasitoids, the percentage parasitism of *C. napi* at low plant density was increased significantly, whereas parasitism of *C. pallidactylus* differed not significantly. The number of parasitised *C. napi* and *C. pallidactylus* larvae per m<sup>2</sup> was not affected significantly by plant density.

## Larval parasitism of *Ceutorhynchus napi* Gyll. and *Ceutorhynchus pallidactylus* (Mrsh.) in plots of different crop density of oilseed rape

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**Abstract:** The rape stem weevil, *Ceutorhynchus napi* Gyll., and the cabbage stem weevil, *Ceutorhynchus pallidactylus* (Mrsh.), (Col., Curculionidae) are two of the most important stem boring pests of oilseed rape in Germany. Natural enemies of *C. napi* and *C. pallidactylus* are the parasitic wasps *Tersilochus fulvipes* (Grav.) and *Tersilochus obscurator* Aub. (Hym., Ichneumonidae), respectively. The aim of this investigation was to examine the effect of crop density on the level of larval parasitism. Plant density may have an impact on plant architecture as well as on microclimate, thereby influencing the abundance and within-plant distribution of host larvae and hence the efficiency of parasitoids. In 2003/04 a field experiment was conducted including four sowing densities, 74, 49, 37 and 25 seeds/m<sup>2</sup>. Various densities were achieved by choosing two row spacings (22.5 cm and 45 cm) and two intra row spacings (6 cm and 9 cm). The experiment was laid out in a randomized block design with four replications. Plant parameters recorded were length of main raceme, diameter of main raceme at base level, at 50 cm and 2/3 of raceme length, number of leaves per plant and number of lateral racemes. Samples of 20 plants per plot were analyzed in May to assess the abundance and within-plant distribution of the target pests *C. napi* and *C. pallidactylus* in the upper, lower and middle part of the stems as well as in the lateral racemes and in the leaves. The level of parasitism was detected by dissecting the larvae. In plots of 25 seeds/m<sup>2</sup> the plant length, the diameter of the main raceme, the number of leaves and the number of lateral racemes was significantly increased compared to plots of 74 seeds/m<sup>2</sup>. The larval parasitism of *C. napi* was influenced by the sowing density as well. In the bottom part of the main raceme the level of parasitism was higher in plots of 74 seeds/m<sup>2</sup> than in the other treatments. Referring to the total number of larvae per plant there was a tendency of decreasing levels of parasitism with lower sowing densities. The latter was true for the level of parasitism in *C. pallidactylus* as well.



## **Impact of rape stem weevil, *Ceutorhynchus napi*, on infections of oilseed rape stems by *Phoma lingam***

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**Abstract:** The rape stem weevil, *Ceutorhynchus napi* Gyll., is one of the most damaging pests of winter oilseed rape throughout Central Europe. Adults deposit eggs into the top of elongating stems in February and March. Secretions originating from the oviposition result in distortion and disruption of growth which may be followed by splitting of stem tissue. Larvae hatching from the eggs feed within the pith for three to five weeks, however, this is considered to be of little harm to the plant. The infested tissue may be invaded by secondary fungal pathogens, particularly *Phoma lingam*.

To study the importance of this indirect damage by *C. napi*, adult weevils and plant samples were collected repeatedly from three crops of oilseed rape at Goettingen in the course of the oviposition period in spring 2004. The presence of propagules of *P. lingam* was assessed from both, the outer integument and the gut channel of the weevils by using PCR. Further, the incidence of *P. lingam* within the stem pith was determined microscopically at three occasions from the beginning of egg-laying until flowering. There was clear evidence that *C. napi* is capable to initiate stem infections by *P. lingam* just from the beginning of egg-laying. Focussed experiments have been performed under standardized conditions in the laboratory to determine whether feeding wounds provide ports of entry for the pathogen or whether the fungal inoculum is being transmitted by females.

## Effectiveness of combined application of insecticides and fungicides for control of winter oilseed rape pests and diseases in the period of flowering and pods formation according to the time and frequency of applications

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**Abstract:** In 2003 – 2005, at the Sośnicowice Branch of the Institute of Plant Protection, Poznań, investigation were made of tank-mix application of various insecticides and fungicides in modern production technologies of rape. This paper reports results from synchronous application of insecticides to control pods pests - cabbage seed weevil (*Ceutorhynchus assimilis* Payk), brassica pod midge (*Dasyneura brassicae* Winn.) and fungicides to control some fungal pathogens at the flowering stage – grey mold (*Botrytis cinerea* Pers.), pod spot (*Alternaria brassicae* Berk.), according to the time and frequency of application of these agrochemicals.

In 2003, the trials were conducted with two insecticides - Karate Zeon 050 CS (lambda-cyhalothrin) and Trebon 10 SC (etofenprox), which were applied individually and as mixtures with three fungicides: Alert 375 SC, Horizon 250 EW and Amistar 250 SC. There was done only one application of investigated mixtures at the time according to BBCH growth stage 65.

In 2004 and 2005, there were conducted three trials with three new insecticides, which were Proteus 110 OD (tiachloprid + deltamethrin), Calipso 480 SC (tiachloprid) and Patriot 100 EC (deltamethrin). Just like in 2003, all these insecticides were applied individually and as mixtures with the fungicides: Alert 375 SC (flusilasole 125 + carbendazim 250), Amistar 250 SC (azoksystrobin) and Horizon 250 EW (tebuconazole). The trials were differed among themselves with times and frequency of applications.

The effect of mixed application of insecticides and fungicides in pest incidence, fungal diseases of pods and seed yield were examined.

# List of participants

## “Integrated Control in Oilseed Crops”

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