GEORG-AUGUST-UNIVERSITÄT
GÖTTINGEN

Programme and Abstracts

IOBC - Working Group Meeting
Integrated Control in Oilseed Crops

4th - 6th October 2011
GÖTTINGEN, GERMANY

International Organisation for Biological
and Integrated Control of Noixious Animals and Plants

IOBC-WPRS
OILB-SROP

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Schedule of the Working Group Meeting

Programme Overview

Day		Event	Start	End	Room
October 4th		Registration	10:30	13:00	Hall
Tuesday		Welcome	14:00	14:30	MN06
		Introduction to IOBC/wprs	14:30	15:00	MN06
		Joint Session (1)	15:00	16:00	MN06
		Coffee break	16:00	16:30	Hall
		Joint Session (2)	16:35	18:35	MN06
October 5th		Morning Session **E**ntomology	09:00	10:20	MN07
Wednesday		Morning Session **P**athology	09:00	10:20	SR 0.233
		Coffee Break	10:20	11:10	Hall
		After Coffee Break Session **E**ntomology	11:15	12:35	MN07
		After Coffee Break Session **P**athology	11:15	12:35	SR 0.233
		Lunch **Coffee**	12:35	13:35	Mensa / Hall
		After Lunch Session **E**ntomology	13:40	15:00	MN07
		After Lunch Session **P**athology	13:40	15:00	SR 0.233
		Coffee Break	15:00	15:30	Hall
		Poster Session	15:30	17:30	Hall
		Guided City Tour	18:00	19:30	
		Conference Dinner	20:00	open	
October 6th		Morning Session **E**ntomology	09:00	10:20	MN07
Thursday		Morning Session **P**athology	09:00	10:20	SR 0.233
		Coffee Break	10:20	11:10	Hall
		After Coffee Break Session **E**ntomology	11:15	11:55	MN07
		After Coffee Break Session **P**athology	11:15	11:55	SR 0.233
		Joint Session (3)	12:15	12:45	MN06
		Closing	12:45	13:00	MN06

Programme Details

4th of October, Tuesday, All

10:30 13:00 REGISTRATION

Start	End	Welcome and Introduction	#
	14:30	Welcome	
		Andreas von Tiedemann, Birger Koopmann, Bernd Ulber & Sam Cook	
14:30	**15:00**	Introduction to IOBC/wprs	
		Lene Sigsgaard	
		Joint Session	
15:00	**15:30**	Actual situation and future aspects in oilseed rape in Europe	**J-01**
		Manuela Specht	
15:30	**16:00**	Integrated control of diseases, pests and weeds in oilseed rape - 30 years of multidisciplinary research in Göttingen	**J-02**
		Andreas von Tiedemann, Birger Koopmann, Petr Karlovsky, Bernd Ulber & Rudolf Heitefuß	
16:00	16:30	Coffee break	
16:35	**17:05**	Winter oilseed rape: a break crop that will ENDURE	**J-03**
		Neal Evans & Andrew W. Ferguson	
17:05	**17:35**	Trait variation in Brassica napus - The UK OREGIN diversity demonstration trials	**J-04**
		Clare J. Hopkins, Sue J. Welham, Graham R.Teakle, Kerry-Sue Peplow, David A.C. Pink, Pierre W.C. Carion, Graham J. King & Jackie H.A. Barker	
17:35	**18:05**	How to design and assess integrated crop management methods for winter oilseed rape in a network of farmers' fields ?	**J-05**
		Muriel Valantin-Morison	
18:05	**18:35**	Status of insecticide resistance in insect pests of oilseed rape crops in Germany	**J-06**
		Udo Heimbach & Andreas Müller	

5th of October, Wednesday, Entomology Subgroup

ENTOMOLOGY - Morning Session

Start	End	Entomology	#
9:00	**9:20**	Developing an integrated pest management strategy for pollen beetles in winter oilseed rape - a UK Defra SA LINK porject (LK09108)	**Eo-01**
		Sam M. Cook, Thomas F. Döring, Andrew W. Ferguson, Janet A. Martin, Matthew P. Skellern, Lesley E. Smart, Nigel P. Watts, Sue J. Welham, Christine M. Woodcock, JohnA. Pickett, Eileen Bardsley, Jo Bowman, Sean Burns, Matthew Clarke, Jackie Davies, Richard Jennaway, Andreas Johnen, Darren Murray, Mark Nightingale, Nigel Padbury, Colin Patrick, Julia-Sophie von Richthofen, Michael Tait, Peter Taylor, Peter Werner, Jemilah Bailey, George Rothschild & Jenna Watts	
9:20	**9:40**	The decision-support system proPlant expert: A computer-based tool for integrated pest management used in Europe	**Eo-02**
		Andreas Johnen & Julia-Sophie von Richthofen	
9:40	**10:00**	Comparing the performance of two decision-support systems for management of pollen beetles in oilseed rape in the UK	**Eo-03**
		Andrew W. Ferguson, Andreas Johnen, Eileen Bardsley, Julia-Sophie von Richthofen, Matthew P. Skellern, Nigel P. Watts & Sam M. Cook	
10:00	**10:20**	Effects of temperature and position on pollen beetle numbers per trap and per plant in oilseed rape	**Eo-04**
		Riina Kaasik, Nigel Watts & Sam Cook	
10:20	**11:10**	Coffee break	

ENTOMOLOGY - After Coffee Break Session

Start	End	Entomology	#
11:15	**11:35**	Using molecular methods to measure predation of oilseed rape pests	**Eo-05**
		Barbara Ekbom	
11:35	**11:55**	Carabids as predators of pollen beetles	**Eo-06**
		Erin O'Rourke, Sam Cook, Mark Emmerson, Laura Kirwan & Padraig Whelan	
11:55	**12:15**	The attractiveness of wild cruciferous plants on the key parasitoids of *Meligethes aeneus*	**Eo-07**
		Riina Kaasik, Gabriella Kovācs, Luule Metspalu & Eve Veromann	
12:15	**12:35**	Effect of *Beauveria bassiana* (Balsamo) Vuillemin spray applications to control pollen beetles	**Eo-08**
		Stefan Kuske	
12:35	**13:35**	Lunch	

ENTOMOLOGY - After Lunch Session

Start	End	Entomology	#
13:40	**14:00**	Insect pests and predators in oilseed rape relative to landscape and site factors	**Eo-09**
		Thomas Frank, Thomas Drapela, Dietmar Moser, Christiane Haschek, & Johann Zaller	
14:00	**14:20**	Measuring the accuracy of landscape indicators to predict high pest infestations and successful biocontrol in oilseed rape	**Eo-10**
		Adrien Rusch, Muriel Valantin-Morison, Jean-Pierre Sarthou & Jean Roger-Estrade	
14:20	**14:40**	How to reinforce pollen beetle biocontrol at landscape level using a spatially explicit model	**Eo-11**
		Fabrice Vinatier & Muriel Valantin-Morison	
14:40	**15:00**	Group discussions on landscape effects / Presentation of film clips on the life history of oilseed rape pests and their parassitoids	
		Sam Cook & Bernd Ulber	
15:00	**15:30**	Coffee break	

ENTOMOLOGY - Poster Session

15:30	17:30	Entomology Poster	
PC demonstration of proPlant expert: A decision-support system for pest and disease management in oilseed rape			Ep-01
Andreas Johnen, Thomas Volk & Julia-Sophie von Richthofen			
Effects of different management systems on pest infestation of oilseed rape in Croatia, Germany and Serbia			Ep-02
Wolfgang Büchs, Tanja Gotlin-Culjak, Ivan Sivcev, Sabine Prescher, Ivan Juran, Lazar Sivcev, Draga Graora & Dinka Grubisic			
Use of plant-inducing chemicals in 'push-pull' pest control strategies in oilseed rape			Ep-03
Mumuni Abudulai, Mattew P Skellern, Nigel P. Watts & Sam M. Cook			
Are current monitoring methods for pollen beetles meaningless?			Ep-04
Matthew P. Skellern, Nigel P. Watts & Sam M. Cook			
The effects of nitrogen input and flowering time on pollen beetle infestation in the OREGIN demonstration trials.			Ep-05
Sam M Cook, Sue J. Welham, Andrew W Ferguson, Matthew P. Skellern, Nigen P. Watts & Jackie H. A. Barker			
Ensemble-based analysis of regional climate change effects on the pod midge (*Dasineura brassicae* Winn.) in oilseed rape,			Ep-06
Michael Eickermann, Jürgen Junk, Klaus Görgen, Lucien Hoffmann & Marco Beyer			
Population age structure of the cabbage aphid infesting oilseed rape plants at Upper Egypt			Ep-07
Mohamed A. A. Abdel-Rahman, Azza M. A. Awad, Assmaa H. Mohamed & Yousif M. Omar			
Winter activity of the predaceous larvae of Cantharidae (Coleoptera) in oilseed rape crops			Ep-08
Pawel Mederski & Zdzisław Klukowski			
Some factors affecting the larval parasitism of pollen beetle in Germany			Ep-09
Marie-Luise Tölle, Ines Vollhardt, Dorothea Mennerich & Bernd Ulber			
Turnip rape as a trap crop and natural pesticide: Results of a three-year field trial on pest control in organic winter oilseed rape			Ep-10
Tobias Ludwig & Stefan Kühne			
Monitoring and forecasting cabbage stem flea beetle			Ep-11
Helle Mathiasen & Peter Esbjerg			
Host selection in *Tersilochus heterocerus* (Hymenoptera: Ichneumonidae), parasitoid of *Meligethes aeneus* (Coleoptera: Nitidulidae)			Ep-12
Josef Straka, Peter Anderson & Katarina Hedlund			

5th of October, Wednesday, Pathologists

PATHOLOGY - Morning Session

Start	End	Pathology	#
9:00	**9:20**	Potential effects of global warming on oilseed rape pathogens in Northern Germany	**Po-01**
		Magdalena Siebold & Andreas von Tiedemann	
9:20	**9:40**	*Sclerotinia sclerotiorum* – the important disease of oilseed rape on selected sites in the Czech Republic	**Po-02**
		Jana Poslušná & Eva Plachká	
9:40	**10:00**	Interactions between canopy structure of WOSR and *Sclerotinia sclerotiorum* disease development	**Po-03**
		Chloé Allart, Marine Gourrat, Odile Tauvel, Michael Geloen, Olivier Guerin & Xavier Pinochet	
10:00	**10:20**	Phenotyping of oilseed rape and other Brassica species for identification of Sclerotinia stem rot resistance sources.	**Po-04**
		Tobias Wulf, Birger Koopmann & Andreas von Tiedemann	
10:20	**11:10**	Coffee break	

PATHOLOGY - After coffee break session

Start	End	Pathology	#
11:15	**11:35**	Use of Geographic Information Systems for the DSS SkleroPro - simulation of Sclerotinia stem rot.	**Po-05**
		Beate Tschöpe, Benno Kleinhenz & Thorsten Zeuner	
11:35	**11:55**	Reducing the impact of sclerotinia disease on arable rotations, vegetable crops and land use.	**Po-06**
		Caroline Young, Denise Ginsburg, Laura Fawcett, Peter Gladders, Jon West, John Clarkson & Steve Waterhouse	
11:55	**12:15**	Biocontrol of sclerotinia stem rot - cornerstone in durable high-intensity oilseed rape production.	**Po-07**
		Nana Bitsadze & Andreas von Tiedemann	
12:15	**12:35**	Studies on Trichoderma in protection of OSR against fungal diseases.	**Po-08**
		Malgorzata Jedryczka, Adam Dawidziuk, Delfina Popiel, Judyta Strakowska, Piotr Kachlicki, Jerzy Chelkowski, Beata Wisniewska-Kadzajan & Dorota Kalembasa	
12:35	**13:35**	Lunch	

PATHOLOGY - After Lunch Session

Start	End	Pathology	#
13:40	**14:00**	Forecasting system for blackleg (*Leptosphaeria maculans* and *Leptosphaeria biglobosa*) of crucifers in the Czech Republic	**Po-09**
		Jana Poslušná, Eva Plachká, Pavel Ryšánek, Radovan Pokorný & Tomáš Spitzer	
14:00	**14:20**	Identification of Phoma risk years and regions with the decision-support system proPlant.	**Po-10**
		Thomas Volk & Julia-Sophie von Richthofen	
14:20	**14:40**	8-years experience of the SPEC forecasting system for oilseed rape protection in Poland	**Po-11**
		Malgorzata Jedryczka, Joanna Kaczmarek, Andrzej Brachaczek, Robert Matysiak & Ryszard Bandurowski	
14:40	**15:00**	Group discussion	

15:00	**15:30**	Coffee break	

PATHOLOGY - Poster Session

15:30	17:30	Pathology Poster	#
IOBC-wprs: working groups, ICOC objectives, membership			**Pp-01**
Birger Koopmann, Sam Cook & Lene Sigsgaard			
Fungal Diseases of Sunflower in Turkey.			**Pp-02**
Cafer Eken			
WIN: Developing Site-Specific Advisories for Agricultural Producers			**Pp-03**
Neal Evans, Rishi Burlakoti, Aman Thakral & Sandy Vervaet			
Characterization of current populations of *Leptosphaeria* spp. from infected oilseed rape plants in Europe (autumn 2010)			**Pp-04**
Deng Shu, Andrzej Brachaczek, Witold Irzykowski, Joanna Kaczmarek & Malgorzata Jedryczka			
Comparative studies on growth and fungcide sensitivites of *Leptosphaeria maculans* and *Leptosphaeria biglobosa isolates.*			**Pp-05**
Andreas Rhalves, Evelin Vorbeck & Birger Koopmann			
Molecular detection of *Leptosphaeria maculans* and *L. biglobosa* versus BBCH stages of oilseed rape plant development – the impact on protection with fungicides			**Pp-06**
Joanna Kaczmarek, Akinwunmi O. Latunde-Dada & Malgorzata Jedryczka			
Studies on the optimal time of fungicide application against phoma leaf spotting and stem canker in Poland			**Pp-07**
Andrzej Brachaczek, Joanna Kaczmarek & Malgorzata Jedryczka			
Effect of combined inoculation of *Phoma lingam* pathogenicity groups on disease expression of cotyledons of a Brassica napus RLm7 cultivar.			**Pp-08**
Patrick Koch, Evelin Vorbeck & Birger Koopmann			
Characteristics of isolates of *Sclerotinia sclerotiorum* and *Leptosphaeria maculans / L. biglobosa* originating from the Czech Republic.			**Pp-09**
Eva Plachka, Jana Poslusna & Ivana Machackova			
KILA – the new project on clubroot and stem canker of oilseed rape in Poland			**Pp-10**
Malgorzata Jedryczka, Marek Korbas, Andrzej Wojciechowski, Jan Olejniczak, Ewa Jajor, Janetta Niemann, Joanna Kaczmarek & Tomasz Ksiazczyk			
Studies on the optimal time of fungicide application against sclerotinia stem rot in Southern Poland			**Pp-11**
Andrzej Brachaczek, Malgorzata Jedryczka, Xiaoli Duan & Joanna Kaczmarek			
Influence of soil moisture and temperature on the infection of oilseed rape with *Plasmodiophora brassicae*			**Pp-12**
Simone Koch			

5th of October, Wednesday, All

ALL-Evening

City tour Göttingen (18:00 - ca. 19:30; Start: Old City Hall)
Conference Dinner (20:00; Restaurant La Laconda, Reinhäuser Landstraße 22)

6th of October, Thursday, Entomologists

ENTOMOLOGY - Morning Session

Start	End	Entomology	#
9:00	**9:20**	The occurrence of different species of pollen beetles in oilseed rape fields	**Eo-12**
		Christoph Buuk & Thomas Thieme	
9:20	**9:40**	The hibernation of pollen beetles: will beetles resistant to insecticides suffer higher mortality?	**Eo-13**
		Kai Gloyna & Thomas Thieme	
9:40	**10:00**	Growth rate of pollen beetle populations on different cultivars of oilseed rape	**Eo-14**
		Marie-Luise Tölle & Bernd Ulber	
10:00	**10:20**	The potential of silicate rock dust to control pollen beetles	**Eo-15**
		Claudia Daniel, Hansueli Dierauer & Maurice Clerc	

ENTOMOLOGY – After Coffee Break Session

Start	End	Entomology	#
11:15	**11:35**	Suitability of different cultivars of turnip rape as trap crops for integrated control of major pests on winter oilseed rape	**Eo-16**
		Alexander Döring, Rainer Wedemeyer, Helmut Saucke & Bernd Ulber	
11:35	**11:55**	Effect of turnip rape trap crops on the infestation of winter oilseed rape by pollen beetle	**Eo-17**
		Marie-Luise Tölle, Kai Gloyna, Thomas Thieme & Bernd Ulber	

6th of October, Thursday, Pathologists

PATHOLOGY - Morning Session

Start	End	Pathology	#
9:00	**9:20**	Monitoring after the introduction of a new specific resistance against *Leptosphaeria maculans* in oilseed rape in a pilot production area Xavier Pinochet , Annette Penaud, Gilles Sauzet, Julien Carpezat, Martine Leflon & Emmanuelle Pic	**Po-12**
9:20	**9:40**	Methods for investigation of quantitative resistance to *Leptosphaeria maculans* (phoma stem canker) in *Brassica napus(*oilseed rape) Yong-Ju Huang, Regine Delourme, Graham J King & Bruce DL Fitt	**Po-13**
9:40	**10:00**	Studies on the Improvement of Winter Oilseed Rape Resistance to Verticillium longisporum Jessica Knüfer, Petr Karlovsky, Birger Koopmann & Andreas von Tiedemann	**Po-14**
10:00	**10:20**	Response of oilseed rape (*Brassica napus*) to combined effects of drought stress and *Verticillium longisporum* infestation Daniel Lopisso, Jesscia Knüfer & Andreas von Tiedemann	**Po-15**

PATHOLOGY – After Coffee Break Session

Start	End	Pathology	#
11:15	**11:35**	Ten years experience with the clubroot resistant cultivar 'Mendel': Performance and Perspectives Elke Diederichsen & Martin Frauen	**Po-16**
11:35	**11:55**	Virulence anaylsis of *Plasmodiophora brassicae* derived from different locations of the main European oilseed rape growing regions Wolfgang Lüders, Stefan Abel, Wolfgang Friedt, Doris Kopahnke &, Frank Ordon	**Po-17**

6th of October, Thursday, All

FINAL Session

12:15	**12:45**	Joint Session 3 (Next meeting, Convenor)
12:45	**13:00**	Closing

ABSTRACTS

Joint Session

J-01

Actual situation and future aspects in oilseed rape in Europe

Manuela Specht
Union zur Förderung von Oel- und Proteinpflanzen e.V. (UFOP), Claire-Waldoff-Straße 7, 10117 Berlin, Germany

Abstract: The rapeseed crop is of high importance for European agriculture and has increased its potential in the EU during the last years. In 2011 the EU-27 cultivated nearly 11.2 million ha of oilseeds. Almost 6.8 million ha of this area were cultivated with rapeseed. Rapeseed production is forecast at 19.1 million t. This is in line with last five years average but much lower than the production in 2010 (- 6.3 %). At EU-27 level the yield forecast is lower than those in 2010 (2.9 t/ha; - 2.4 %). Following the good harvest of 2010, German farmers could only achieve very low yields in 2011, which were 23.7 % lower than the year before. Most important factor of this failure was caused by very bad weather conditions: heavy rainfall in August and September 2010 and a delay of sowing, a hard and cold winter, drought during springtime and strong rainfalls during harvest 2011 too.

The rapeseed oil for food use consists of high-quality lipid acid composition which is acknowledged by the food and nutrition industry and the consumer in general. Products derived from rapeseed oil are used frequently in a healthy diet, and they belong to the group of products with the highest growth rates in food retail sales.

Strong incentives come particularly from the non-food sector, since the EU has initiated guidelines for the support of biofuel, in order to establish a proper production for biodiesel. The Renewable Energy Directive (RED) of European Union set mandatory national targets for renewable energy shares, including 10 % renewables in transport (incl. biofuels) in 2020. But RED creates a sustainability regime for biofuels with a strong greenhouse gas saving of at least 35 % at the moment. Germany has been proven to be the leader in the field of biodiesel development.

Forecasts predict a consistent development of the global oilseed sector. They put emphasis on the increasing demand of plant oils in human nutrition, renewable resources for biofuels and bioenergy, as well as their use in animal feed products. As a local oilseed crop with a high yield potential under intensive agronomic cultivation, rapeseed will be an increasing factor of economic importance in European agriculture. The relevance of resulting products of the rapeseed crop in the food, non food and feed industries will constantly increase.

J-02

Integrated control of diseases pests and weeds in oilseed rape - 30 years of multidisciplinary research in Göttingen

Andreas von Tiedemann[1], Birger Koopmann[1], Petr Karlovsky[3], Bernd Ulber[2] & Rudolf Heitefuß[1]

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[2] *Division of Entomology, Department of Crop Sciences, Georg-August-University of Göttingen, Grisebachstr.6, D-37077 Göttingen, Germany*

[3] *Division of Molecular Phytopathology and Mycotoxin Research, Department of Crop Sciences, Georg-August-University of Göttingen, Grisebachstr.6, D-37077 Göttingen, Germany*

Abstract: Extensive research on oilseed rape (OSR) in Germany began in the early 1980s. Due to new, double low cultivars introduced the average area of rapeseed cultivation in Germany rapidly grew from 140,000 ha in 1980 to 254,000 ha in 1984 and has reached 1.43 Mio ha at present. As a consequence of increased intensity in production, diseases and pests of OSR became more important. This stimulated research on effective control methods and enhanced especially the demand for cultivars with improved resistance to major diseases. In Göttingen, this challenge was met with several research projects and numerous dissertations. The ultimate aim of these efforts was to deliver a scientific basis for development of various components of integrated control and their integration in suitable IPM systems.

The root collar and stalk disease, also known as 'blackleg', caused by *Phoma lingam* was among the first diseases of scientific interest. Initial studies were performed in collaboration with Wilhelm Krüger (BBA) on epidemics of the pathogen and resistance screening both in the field (e.g. Wittern et al. 1984) and in greenhouses. This work was followed over years and established close collaborative relationships with breeders through support of their selection efforts in resistance breeding. *P. lingam* became a major topic in Göttingen and the aspects addressed were life cycle biology (e.g. Holtschulte 1992), epidemiology (e.g. Thürwächter et al. 1995) and population structure of the pathogen (e.g. Kuswinanti et al. 1999; Volke 1999), performed both on the national and European scale (IMASCORE project). In addition, several studies were attributed to effects of reduced tillage on the disease (Voss 1998, Sievert 2000).

In the early 1990s a novel disease occurred in practice and gained research interest in Göttingen, Verticillium, initially termed *V. dahliae*, nowadays known to be a separate species, *V. longisporum*. Basic knowledge on symptoms, disease development, and pathogen biology and detection was gathered in two PhD projects (Holtschulte, 1992; Cernusko & Wolf, 1994; Heppner, 1995; Theuerkauf, 1995). This work was continued and intensified after 2001 with studies on the damage potential of the disease (Dunker, 2006), the potential of biocontrol (Stadler, 2010), potential sources and mechanisms of resistance in the *Brassica* gene pool (Eynck, 2008; Knüfer, 2011) and interactions of Verticillium with root-feeding insect pests (Keunecke, 2009).

In-depth studies into host-pathogen interactions addressed the signal exchange and the fungal/plant gene expression (Ratzinger, 2008; Riediger, 2008; Weiberg, 2008).
Further interest was in Sclerotinia stem rot, particularly in the development of a computer-based forecasting system including economic damage thresholds (SkleroPro), which has been launched to the agricultural practice in 2006 (Dunker, 2006; Koch, 2006).
The OSR Pest Group has been involved in various research projects on the development of *Integrated Pest Management* strategies in Germany since 1988. Basic and applied research on population dynamics of pests, host plant-pest/pathogen-relationships (Dechert, 1999), plant resistance (Eickermann, 2008), economic damage thresholds (Wahmhof, 2000), effects of cultivation techniques (Nuss, 2004) and conservation bio-control of pests (Klingenberg, 1991) has been conducted in order to improve the oilseed rape production systems and reduce the need for insecticide application. Special emphasis was given to the effects of various tillage systems (Voss 1998; Nitzsche, 1998; Schierbaum-Schickler, 2005) and of pesticide application (Wolf-Schwerin, 1993; Neumann, 2010) on pests and their antagonists. The main focus was on cabbage stem flea beetle, stem weevils, pollen beetle, seed weevil and cabbage root fly as well as on the status and potential of their natural enemies, particularly hymenopterous parasitoids.
Based on several years of extensive field experiments to quantify the competition between weeds and OSR, an economic threshold model for weed control was developed in several PhD projects (Küst, 1990; Munzel, 1992; Werner, 1996). The state wide applicability was tested and confirmed in cooperative field trials with the German Plant Protection Service (Werner & Heitefuss, 1997).

J-03

Winter oilseed rape: a break crop that will ENDURE

Neal Evans[1] & Andrew W. Ferguson

Plant and Invertebrate Ecology Department, Rothamsted Research, Harpenden, AL5 2JQ, UK

[1]Now at: *Weather INnovations Inc., 7159 Queens Line, PO Box 23005, Chatham, N7L OB1, ON, Canada.*

Abstract: The aim of the EC-funded Network of Excellence ENDURE (Project 031499) was to develop a multi-disciplinary and cross-sector approach to the development and implementation of Integrated Pest Management strategies in Europe, creating a coordinated structure that takes advantage of advances in agricultural sciences and technologies. As part of this work we collaborated with colleagues from Denmark and France to analyse current rotational practices and cropping patterns in arable farms. We explored the extent to which different crops and/or crop sequences and emerging IPM technologies could be used to reduce inputs while maintaining profitability and sustainability. Results from the UK highlight the current importance of oilseed rape in the rotation in comparison to other break crops. In addition to being a profitable crop which fits in well with cereals in terms of agronomic practices and on-farm time planning, oilseed rape offers a 'window of opportunity' to address UK growers' most important pest problem, the control of resistant weeds (particularly black grass, *Alopecurus myosuroides*). This paper discusses potential crop rotations for reduced inputs in the UK and the central role of oilseed rape within them.

J-04

Trait Variation in *Brassica napus* - The UK OREGIN Diversity Demonstration Trials

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Abstract: In 2009, the UK OREGIN (Oilseed Rape Genetic Improvement Network) project, funded by Defra, established small-scale Diversity Demonstration Trials over two seasons (2009/10; 2010/11) at Rothamsted Research. The objective of these trials was to observe, sample and collect baseline information describing plant performance and properties of the Diversity Fixed Foundation Set for *B. napus* (BnaDFFS). Within the project, a limited number of component traits (i.e. mineral analyses, architecture and seed composition) affecting yield, harvest index and nitrogen utilisation efficiency (NUE), and their impact on seed composition were assessed. However, a key feature of the OREGIN Diversity Demonstration Trials is that they are available for use by the research community. For the 2009/2010 trial, more than 100 people visited and 78 traits, including pest and disease assessments, were scored collaboratively. Raw data for 2009/10 have been collated and analysed in GenStat® providing REML means, scatter plots, distribution of line means, heritability values and outputs for other software. Processing of post-harvest trait data for 2009/10 and further examination of trait variation and patterns of co-variation across all traits is underway. GxE interactions will be investigated with 2010/11 trial data and other relevant datasets. Trait data will be secured in CropStoreDB and made available via the OREGIN website, providing users with the capability to select subsets of BnaDFFS lines for use in more detailed experimental studies of their particular trait(s) of interest.

OREGIN Diversity Demonstration Trials: http://www.oregin.info/resources/trials.php
BnaDFFS: www.brassica.info/resource/plants/diversity_sets.php
CropStoreDB: http://www.cropstoredb.org/

J-05

How to design and assess integrated crop management methods for winter oilseed rape in a network of farmers' field?

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Abstract: Concerns about the adverse impacts of pesticides on the environment and their inevitable negative side-effects on non-target organisms have been growing since the 1960's. For winter oilseed rape- WOSR- (*Brassica napus* L.) in France, the Treatment Frequency Index (TFI) was increasing since 1994. However, many scientists have been arguing, for more than two decades, that this reliance on chemicals could be considerably reduced by making better use of cultural control. The aim of this paper is to (1) expose a conceptual scheme illustrating the biotic interaction between pests, diseases and plants and crop management and to explicit the possible use of those interactions for WOSR (2) to demonstrate that friendly crop management for WOSR could be designed, implemented in farmers' fields and assessed with several criteria.

Considering the interaction between disease, or weeds or pests with plants, it could be possible (1) to avoid pests or weeds or pathogens by shifting the crop and pests cycles, (2) to modify the habitat of pests and thereafter to disturb the behaviour of insects, the contamination of pathogens or the growth of weeds, (3) to reduce the impact of pests. Several examples from literature were chosen to illustrate those biotic interactions, the impact of crop management and main advantages and limitations of such cultural control. Based on a logical combination of those elementary ways to avoid, disturb or reduce the pests, several environmental friendly crop managements (Integrated Crop Management) have been designed thanks to a logical combination of those elementary ways to avoid, disturb or reduce the pests. We studied 32 plots on 15 fields from six regions with contrasting climatic conditions, distributed all over France from 2005 to 2007. The plots differed in terms of crop management. On each field, at least one integrated crop management and a conventional crop management were tested. Each plot was located on a homogeneous area of the field. Not all the plots were studied every year. Two types of new integrated crop management system (ICM) were tested, according to results obtained in organic WOSR by Valantin-Morison et al. (2007) and Valantin Morison and Meynard (2004): a strategy based on avoidance of pests and smothering effect on weeds and another one based on avoidance of diseases and destruction of weeds before sowing. The choice of the strategy was depending on soil depth and soil nitrogen supply. The calculation of TFI (Treatment Frequency Index) was done for herbicides, fungicides, insecticides and molluscicides with the method detailed in Brunet et al. (2008). The calculation of energy consumption was split into direct and indirect consumption (Bockstaller et al., 2008).

The mean TFI value obtained for integrated crop management was 3.47, which is 41% less than the mean value for conventional crop management. The reduction of energy use for integrated crop management system compared to the conventional crop management system was low and achieved 6% with a mean of 10168 MJ/ha (SD=2303MJ/ha). Despite a 0.22 t/ha yield reduction (with a max of 0.86 t/ha), the gross margin of ICM was higher than the conventional one, mainly thanks to the reduction of operating costs (for a yield of ICM ranging from 1.62 to 4.73 t/ha). Agronomic results on disease occurrence and weed competitiveness show that limitation of the number and damage of those pests was possible.

J-06

Status of insecticide resistance in insect pests of oilseed rape crops in Germany

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Abstract: Pyrethroid resistant pollen beetles (*Meligethes aeneus*) are widely distributed in different European countries. Since 2005 a monitoring on oilseed rape pest insects was carried out from the JKI in Germany in order to monitor both pollen beetle resistance and the susceptibility of other oilseed rape pest insects like stem weevils and flea beetles. These oilseed rape pest insects are in a similar way selected by the use of pyrethroids than pollen beetles. Laboratory experiments and monitoring activities were conducted using the IRAC Method 11 test design. In all tests l-cyhalothrin was used as active substance representing Typ II pyrethroids, in many tests additionally also other active substances were used. The results of the monitoring showed that the resistance of pollen beetles increased from year to year: In 2010 highly resistant populations dominated in Germany, no susceptible population could be found any more. For other OSR pest insects (especially *Psylliodes chrysocephala* and *Ceutorhynchus obstrictus*) locations with reduced sensitivity/resistance were detected.

Entomology - Oral Presentations

Eo-01

Developing an integrated pest management strategy for pollen beetles in winter oilseed rape – a UK Defra SA LINK project (LK09108) (HGCA RD-2007-3394)

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Abstract: Pollen beetles (*Meligethes aeneus*) are a serious pest of oilseed rape crops in Europe. Resistance to the major group of insecticides used to control them – the pyrethroids – is now widespread. Integrated pest management (IPM) strategies are urgently needed to reduce the number of insecticide treatments to lessen selection pressure for resistance and to protect the environment. The UK Sustainable-Arable LINK project LK09108 'Developing an integrated pest management strategy for pollen beetles in winter oilseed rape' has been funded by Defra and AHDB-Home Grown Cereals Authority (RD-2007-3394) to address this need. The project consortium has 2 academic partners (Rothamsted Research and Imperial College London) and 13 industrial partners comprising representatives of the agrochemical industry (Bayer CropScience Ltd and Syngenta Crop protection UK Ltd), Crop Advisers (Association of Independent Crop Consultants), oilseed rape plant breeding companies (Syngenta Seeds Ltd, Elsoms Seeds Ltd, KWS UK Ltd, Limagrain UK Ltd, Monsanto UK Ltd, Saaten-Union UK Ltd), the oilseeds levy board (AHDB-HGCA), and specialists in trap manufacture (Oecos Ltd), decision support (proPlant GmbH) and software for bioscience (VSN International Ltd – the makers of GenStat). Together we are developing an IPM strategy based on three tactics: (i) improved monitoring, (ii) risk assessment and (iii) novel crop management i.e., trap cropping.

Eo-02

The decision-support system proPlant expert: A computer-based tool for integrated pest management used in Europe

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Abstract: proPlant expert. is a computer-based consultation system on crop protection. Since many years the concept meets the requirements of farmers and consultants in both Germany and Europe. Meanwhile about one third of the users are from outside Germany. From March till June 2010 users carried out about 60,000 consultations with the proPlant expert. online services. Altogether about 310,000 web pages were called. This high degree of utilisation shows that the unbiased and independent services proPlant GmbH offers also abroad together with local partners are appreciated by the users.

proPlant expert. helps farmers and advisers to reduce the input of plant protection products to a minimum while giving them economic returns as good or even better than high-input routine sprays. The system offers assistance to users in making decisions on a range of major crops and problems: Fungicide and growth regulator application in cereals, insecticide, fungicide and growth regulator application in rapeseed as well as fungicide treatment in potatoes and sugar beet. For crop protection in winter oilseed rape proPlant expert. covers cabbage stem flea beetle (*Psylliodes chrysocephala*) in autumn and rape stem weevil (*Ceutorhynchus napi*), cabbage stem weevil (*Ceutorhynchus pallidactylus*), pollen beetle (*Meligethes aeneus*), cabbage seed weevil (*Ceutorhynchus assimilis*) and brassica pod midge (*Dasineura brassicae*) in spring. Regarding fungal diseases and growth regulators proPlant expert. includes consultation on Phoma leaf spot (*Phoma lingam*) and growth regulator use in autumn and on growth regulator use in spring.

Meteorological data including a three-day-forecast, provided by meteorological services, build up the base for proPlant expert. The system analyses these weather data regarding immigration conditions, egg-laying periods and larval development of rapeseed pests, the infection probabilities of Phoma leaf spot since crop emergence in autumn and if the weather is suitable for growth regulator application in early spring.

The analyses are presented in online warning services including among others daily updated maps about relevant phenological dates of rapeseed pests, e.g. begin of egg deposition of stem weevils or good weather conditions for immigration of pollen beetles into the fields. This places farmers and advisers in a position to assess the current situation in one or several regions. Together with crop data (e.g. variety, growth stage, infestation levels/yellow trap catches) the system is futhermore able to develop a field-specific recommendation on the application of a specific chemical, if necessary. By this fewer treatments are generally needed against spring pests than with a threshold-based control strategy.

Eo-03

Comparing the performance of two decision-support systems for management of pollen beetles in oilseed rape in the UK

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Abstract: Decision support systems (DSS) that identify the main period of risk by modelling the population dynamics of insect pests could target pest-monitoring efforts more precisely. Moreover, they are likely to increase growers' confidence in decision-making, reducing unnecessary treatments and the risk of insecticide resistance in the target pest. Such a DSS is urgently required in the UK for management of pollen beetle (*Meligethes aeneus*) to preserve activity of a limited armoury of insecticides as levels of resistance increase. A phenological model-based DSS, 'proPlant expert', is used widely in Europe for pollen beetle management but is not yet available in the UK. proPlant expert has now been tested and refined for pollen beetle management under UK conditions as part of a project to develop an IPM strategy for the beetle in the UK. We compared the performance of proPlant expert with that of a rule-based system, depending on crop growth stage and temperature, that is currently disseminated to UK farmers through the CropMonitor ™ website and other channels. We used weather data and the phenology of the beetles on sticky traps and oilseed rape crops across the UK to compare the accuracy with which the two systems identified immigration risk and the monitoring effort they recommended. Peak risk periods were identified by both systems but the monitoring effort recommended by proPlant expert was usually less than that recommended by Crop Monitor ™, in some years markedly so. Potential management decisions resulting from the proper use of both systems did not differ.

Eo-04

Effects of temperature and plant position on pollen beetle numbers per trap and per plant in crops of oilseed rape

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Abstract: This study investigates the relationship between Pollen Beetle (*Meligethes aeneus*) migration into an oilseed rape field and weather conditions. The knowledge generated will compliment other studies in the quest to refine monitoring systems for pollen beetle migration. A better monitoring system will provide farmers with a more targeted approach to applying pesticides. This may result in fewer applications which would have economic and environmental benefits. The study was carried out in a winter oilseed rape field on Rothamsted Farm (UK) on five days in mid April 2011, during the migration phase of pollen beetles into crops. Each of the four sides of the field had a main trap facing outwards towards one of the four compass points North, East, South and West and three further traps facing into the crop to monitor the other compass positions (sixteen traps in total). Traps were set up at 07:00 each sampling day and changed every hour between 08:00 and 19:00 to cover a twelve hour period. A transect walk was completed every hour in which ten plants were sampled for pollen beetles over a distance of 30m towards the centre of the crop. This was done on each of the four sides of the field. The relationship between the mean number of beetles per plant along the transects, the mean number of beetles per trap and the field side and meteorological conditions at the time of assessment will be discussed.

Eo-05

Using molecular methods to measure predation of oilseed rape pests

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Abstract: Pollen beetles, *Meligethes aeneus* (Fabricius) (Coleoptera: Nitidulidae), and flea beetles, Phyllotreta spp. (Coleoptera: Chrysomelidae) are major pests in oilseed rape, *Brassica napus* L. (Brassicaceae). Among the predator species in the generalist predator complex present in oilseed rape fields, wolf spiders (Araneae: Lycosidae) are found on the ground and cobweb spiders (Araneae: Theridiidae) build webs in the foliage. Here we study the incidence of predation of pollen beetles and flea beetles by these two spider groups using DNA-based molecular analysis. Wolf spiders of the genus *Pardosa* and the cobweb spider, *Theridion impressum* L. Koch, were each collected in six oilseed rape (OSR) fields (three winter and three spring). Pollen beetle and flea beetle densities as well as the occurrence of predators and alternative prey were monitored. In winter oilseed rape fields 13.8% of the collected *Pardosa* tested positive for pollen beetle DNA in the PCR analyses whereas 51.7% *T. impressum* were positive. The likelihood of detecting pollen beetle DNA in the gut contents of both spider groups was positively related to pollen beetle larval density. In spring oilseed rape fields 67.1% *T. impressum* tested positive for pollen beetle DNA, but less than 10% were positive (both for winter and spring OSR) for flea beetle DNA. The implications of these results for conservation biological control and future studies of food webs in oilseed rape are discussed.

Eo-06

Carabids as predators of pollen beetles

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Eo-07

The attractiveness of wild cruciferous plants on the key parasitoids of *Meligethes aeneus*

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Abstract: Parasitoids can play an essential role in natural control on oilseed rape pest populations. Parasitoids can find their hosts in response to chemical cues released from their hosts and the infested host plant. Also, plant structure can affect the host finding success of parasitoids. Small scale field experiment was conducted to investigate pollen beetle (*Meligethes aeneus* Fab.) parasitism rate by larval endoparasitoids on different wild cruciferous plants: *Brassica nigra* (black mustard), *Raphanus sativus var. olifera* (oilseed radish) and *Eruca sativa* (wild rocket) compared to spring oilseed rape (*Brassica napus*). In total four species of *M. aeneus* larval parasitoids were found: *Diospilus capito, Tersilochus heterocerus, Phradis morionellus* and one stayed unidentified. Species composition of parasitoids differed with plant species. All four species were found on *B. napus* (*P. morionellus* 47%, *D. capito* 39.8%, *T. heterocerus* 8.4%, unidentified 4.8%), three on *B. nigra* (*T. heterocerus* 68.6%, *P. morionellus* 16.3%, *D. capito* 15.1%) and *E. sativa* (*P. morionellus* 44.4%, *D. capito* 33.3%, unidentified 22.2%) and two species parasitized larvae on *R. sativus (D. capito* 71.4%, *P. morionellus* 28.6%).

The most common larval endoparasitoid species of *M. aeneus* in northern and central Europe are *P. interstitialis*, *P. morionellus* and *T. heterocerus*. *Brassica nigra* was the most suitable for *T. heterocerus*, the key parasitoid in most European countries. Similarly to Finland, in Estonia the most important parasitoids species in oilseed rape has been *D. capito,* which was the dominant species on *R. sativum* and *B. napus.*

In conclusion, we can assume, that using *B. nigra* in oilseed rape field edges may enhance species richness of parasitoids of *M. aeneus*; by preserving more species of economically important natural enemies of oilseed rape pests, it is possible to decrease chemical input and use more sustainable pest control.

Eo-08

Effect of *Beauveria bassiana* (Balsamo) Vuillemin spray applications to control pollen beetles

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Abstract: The effect of *Beauveria bassiana* spray applications to control adult pollen beetles (*Meligethes* spp.) was investigated. The two *B. bassiana* isolates ART 2587 and ATCC 74040 were selected for the present study. The isolate ART 2587 was obtained from a mycosed pollen beetle adult, *Meligethes aeneus* (Fabricius), found in Switzerland in 2004 and applied both as unformulated spores and formulated in a 2% oil-based experimental formulation at a dosage of $5x10^{12}$ spores/ha. The isolate ATCC 74040 was obtained from Intrachem Bio Italia S.p.A. as the active ingredient of the product Naturalis-L, and applied at a dosage of 3 l/ha (0.5%). The *B. bassiana* spray applications were conducted in a standardized spray cabin at 23°C, using turbo TwinJet nozzles at 4 bar pressure. Compared to untreated control or water only treatments, the *Beauveria* applications led to significantly increased pollen beetle mortality within few days after application. One week after spray application, the *B. bassiana* treatments achieved mortality levels similar to selected insecticide treatments. The results of this study show that spray applications may be a promising strategy for biological pollen beetle control in oilseed rape. However, initial experiences with field applications suggest that the tested spray formulations have to be further optimised to achieve significant pest control under field conditions.

Eo-09

Insect pests and predators in oilseed rape relative to landscape and site factors

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Abstract: In thirty oilseed rape (OSR) fields located in landscapes ranging from structurally poor to complex in an agriculturally dominated region in Eastern Austria, abundance and diversity of OSR pests and arthropod predators were investigated at eight spatial scales. Abundance of pollen beetles and stem weevils was significantly positively correlated with soil quality and negatively related to OSR area. Total number of spider species revealed the strongest positive response to proportions of woody areas at small scale, and agrobiont spider species were best explained by increasing proportion of fallows at larger scales. Spider density was positively related to length of road-side strips with maximum effects at large scales. The results demonstrate the scale dependent influence of semi-natural habitats on spiders in agroecosystems. In an exclosure experiment we demonstrated that the two most abundant carabid beetles differed in their impact on emergence from pupation of pollen beetles and stem weevils. Whereas *Anchomenus dorsalis* fed more effectively on stem weevils than *Poecilus cupreus*, both carabids marginally significantly reduced pollen beetles. Under natural field conditions, both the number and biomass of spiders and carabids were significantly negatively correlated with the density of pollen beetles and stem weevils, which further indicates that the arthropod predators studied may affect these particularly severe pests of OSR.

Eo-10

Measuring the accuracy of landscape indicators to predict high pest infestations and successful biological control on oilseed rape

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Abstract: Designing multifunctional landscapes requires accurate indicators to assess the impact of landscape structure on the provision of goods and services. Biological pest control relying on natural enemies is an important ecosystem service considered as a sustainable alternative to chemical control. The aim of this study is to measure and compare the accuracy of landscape indicators computed at various spatial scales to predict pollen beetle infestations and successful biological control in northwestern France. The sensitivity, specificity, and probability of correctly ranking fields were estimated for each indicator based on a survey of 42 fields using the receiver operating characteristic procedure. For pest infestation, the proportion of woodland and the proportion of semi-natural habitats were found to be informative indicators with good discriminatory abilities. For biological control, the proportion of woodland, the proportion of semi-natural habitats and the proportion of the previous year's oilseed rape fields with reduced soil tillage were found to be informative indicators with good discriminatory abilities. By using indicator values, optimal thresholds, and posterior probabilities, we were able to compute maps of areas at risk for pest infestation and those displaying successful biological control at the regional scale. This study provides tools that could help extension services, landscape planners, and policy makers in optimizing landscape structure according to the provision of a key ecosystem service. The results of this study also provide new grounds for understanding trophic interactions at the regional scale as well as the ambivalent effect of landscape complexity on pest and natural enemy populations.

Eo-11

How to reinforce pollen beetle biocontrol at landscape level using a spatially explicit model?

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Abstract: Increasing studies point out that pest management in agro-ecosystems requires a landscape perspective to be achieved, as landscape composition and structure affect both pest populations and their relative beneficial organisms (Rusch et al. 2010). Pollen beetle (*Meligethes aeneus* F.) is the major insect pest of oilseed rape (*Brassica napus* L.) in Europe, and is parasitized by the ichneumonid *Tersilochus heterocerus* (Thomson). It appears that semi-natural habitats, especially woodland and grassland, are favorable for both overwintering of beetle populations and nutrients acquisition of parasitoids (Rusch et al. 2011). Moreover, soil tillage and pesticide use influence natural parasitism at large scale. To study this conflicting influence of landscape, and to explore new crop management and landscape arrangement, a modeling approach at larger scale is essential. Therefore, we developed a lattice model to simulate the spatio-temporal dynamics of cohorts of pollen beetles and parasitoids in relation with landscape composition and structure. The model describes the most important processes (dispersal, mortality and fecundity) affecting population structure in space and time. Crop rotation, soil tillage, and pesticide use were explicitly considered in the model, considering their influence on beetle and parasitoid populations. Species-specific parameters were derived from the literature available on the species or its closed taxon. Landscape mosaic and especially semi-natural habitats and oilseed rape crops were defined on the basis of GIS maps collected in north-western France, figuring contrasting situations in terms of landscape complexity. The model was confronted to real population levels of beetle collected in the zone. Inference about some uncertain parameters was conducted using an Approximate Bayesian computation analysis. A sensitivity analysis of the model with fractional plans allowed evaluating the interaction between species traits, landscape and agricultural practices. It helps determining the best combination of practices, or the trade-offs between practices that reinforce biological regulation at landscape level.

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Eo-12

The occurrence of different species of pollen beetles in oilseed rape fields

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Abstract: Oilseed rape pollen beetles and their biology were studied from 2008 to 2010. This species is a serious pest of oilseed rape as it causes a significant reduction in yield. It is reported that the species composition of the pollen beetles infesting oilseed rape crops changes during a growing season. *Meligethes aeneus* is resistant to pyrethroids but it is unknown to what extent, if any, the other species of pollen beetle are resistant. For the effective application of insecticides it is important to know which species are present and when they occur in a crop during a season. Besides testing thousands of pollen beetles from different parts of Europe for resistance to different insecticides, the species were identified using relevant keys. These keys are usually produced for academic purposes and include a number of taxa that do not occur on oilseed rape. Therefore, a key was developed for those species that occur only on oilseed rape. This key is based on digital photographs using specimens kindly provided by the Humboldt University (museum of natural sciences, Berlin, Germany), German Entomological Museum (Eberswalde, Germany) and Dr. Jelinek (Prague, Czech Republic).

The analysis revealed that only a single species is dominating on oilseed rape, the true oilseed rape pollen beetle, *M. aeneus*. Reports of seasonal changes in the species composition of pollen beetles on oilseed rape could not be verified. This might be a consequence of the intense and widespread spraying of oilseed rape crops with insecticides, which is likely to kill all the species of pollen beetles that are not resistant to pyrethroids. Nevertheless the identification of the pollen beetles occurring in oilseed rape crops is important as analyses of samples from Switzerland show (Derron et al. 2007). There *M. viridescens*, a species susceptible to pyrethroids, is widely found infesting oilseed rape crops. It is the dominant pollen beetle in this crop in many areas of the country. If such susceptible species are also abundant in other parts of Europe then it may be possible to reduce the application of insecticides in these areas.

Eo-13

The hibernation of oil-seed rape pollen beetles (Do beetles resistant to insecticides suffer a higher over-wintering mortality?)

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Abstract: Winter mortality is assumed to be one of the most important factors influencing the population growth of insects. Despite the economic importance and frequent occurrence of mass-flights of the oil-seed rape pollen beetle (ORPB), *Brassicogethes aeneus* (F. 1775), in spring there is little and contradictory information on over-wintering survival in this species. Currently it is not possible to forecast the population density and risk of mass-flights in spring.
Over the last five years field and laboratory experiments were conducted to broaden the knowledge of the hibernation biology of ORPB in Germany. The questions investigated were:

1. Where and how many beetles hibernate and the possibility of using such information to predict the risk of mass-flights the following spring?
2. To what extent is population growth influenced by winter mortality?
3. Do beetles resistant to pyrethroids suffer greater over-winter mortality?

In order to characterize ORPB hibernation sites soil samples (0.25 m^2) were collected monthly from different biotopes from late summer/autumn to the following spring. The beetles in these samples were extracted in the laboratory using a modified MacFadyen apparatus. As it is impossible to determine winter mortality by counting dead beetles, over-wintering survival was assessed based on the number of extractable beetles. Previously reported features characterizing hibernation places were confirmed, i.e. no beetles were found in the litter layer of coniferous forests. Further this study revealed that the distribution of oilseed rape pollen beetles is highly heterogeneous, even at a small scale (i.e. of 1 m^2) and in suitable biotopes. This heterogeneity and the effort needed to take and extract the samples limits the potential of using this method to forecast the numbers of pollen beetles the following spring. Interestingly the numbers of extractable beetles remained statistically the same throughout hibernation. This suggests that winter mortality is low, at least at the locations and over the periods studied.
To verify these results artificially infested samples were dug into the soil at hibernation sites and similarly collected and extracted throughout the winter season. As for the naturally infested soil samples the winter mortality was low and did not change from autumn to spring. In addition laboratory experiments were conducted to determine the effect of three different temperature regimes on beetle mortality.
To test the hypothesis that pyrethroid resistant ORPB suffer a greater over-wintering mortality, glass vial residue bio assays were conducted using beetles extracted from soil samples at different times during winter. The inner surface of glass vials were coated with different application rates of lambda-cyhalothrin and ORPB-mortality was assessed after 5 and 24 hours. The mean percentage mortality remained constant throughout winter, suggesting that the pyrethroid resistance of ORPB is not linked with reduced winter fitness.
This study was financially supported by the German Federal Ministry of Food, Agriculture and Consumer Protection and the Union for Promoting Oil and Protein Plants (UFOP).

Eo-14

Growth rate of pollen beetle populations on different cultivars of oilseed rape

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Abstract: The main objective of this project was to determine the effect of oilseed rape cultivar and crop phenology on infestation and population growth of pollen beetle (*Meligethes aeneus* F.). Field experiments were conducted over three years to compare the abundance of adult beetles, their reproduction and population development on four cultivars (cvs) of winter oilseed rape: two cultivars classified as very early flowering and two as late flowering, each represented by open pollinated cvs (NK Passion vs. Favorite) and hybrid cvs (Elektra vs. Titan). Field trials were set up in a complete randomized block design with four replicated plots of each cultivar.

The number of overwintered pollen beetles was assessed on plants in April at three-day intervals from early bud stage until full flowering. Sampled buds were examined for feeding wounds and oviposition holes. The number of eggs and first instar larvae within buds was counted and the infested buds related to the total number of buds available. The abundance and phenology of second instar larvae dropping to the ground for pupation was assessed using water traps. The abundance of adult new-generation beetles emerging from soil was determined by ground-photoeclectors.

Depending on start and duration of bud and flowering period in relation to the time of beetle immigration, the infestation, reproduction and emergence rate of pollen beetles was affected differently by the tested cultivars. This was particularly obvious in 2008 when the phenology of early and late flowering cultivars obvious differed and the immigration and oviposition of pollen beetle was delayed by cold weather conditions. In the early flowering cvs the emergence rate of new-generation beetles was lower than in the late flowering cvs. The population growth rate was significantly higher on cv Favorite than on cv NK Passion. These results were confirmed by semi-field experiments including early and late release of pollen beetles in caged plots.

In 2009 and 2010, when there was only little difference between the phenologies of the four cultivars and pollen beetles colonized the plots in the early bud stage, both hybrid cvs tended to be preferred by overwintered beetles and showed higher larval densities than the open pollinating cultivars. In contrast, on hybrid cvs the emergence rate of new-generation beetles was lower than on OP cvs, indicating density-dependend effects on larval fitness and mortality of larvae and pupae in soil.

Our results suggest that the coincidence between adult immigration and the time of flowering is one of the main factors regulating the population growth of pollen beetle in the field. In early and short flowering cultivars, and particularly at delayed beetle immigration, the time available for oviposition and larval development can be insufficient, resulting in low reproduction rates. These results confirm earlier observations by Nilsson (1988, 1994).

This project was funded by the German Federal Ministry of Food, Agriculture and Consumer Protection.

Eo-15

The potential of silicate rock dust to control pollen beetles (*Meligethes spp.)*

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Abstract: In organic agriculture, treatments with rock dusts for soil amendment, disease prevention or insect control have a long tradition. Clinoptilolite (a naturally occurring zeolite) was tested against pollen beetle *Meligethes spp*. in organic and IPM oilseed rape fields in order to find a control strategy compatible with the guidelines for organic agriculture in Switzerland. Dust and spray applications were evaluated in several large-scale field trials from 2008 to 2011. Dust applications using 300-750 kg/ha pulverized clinoptilolite (particle size <0.1 mm; product Klinofeed, company Unipoint, Switzerland) were applied using anold drop-box fertilizer spreader or a Vicon pendulum spreader. For spray applications the same clinoptilolite (product Klinospray) with a particle size of 0.017 mm was applied at rates of 30 - 50 kg/ha with a wetting agent (product Heliosol, Omya AG Switzerland; 2 l/ha) using a standard field crop sprayer. Depending on the rate of developement of the rape plants, 2 or 3 applications were conducted during the blossom stage (BBCH 51 – 57).

Under the dry and sunny weather conditions in 2009 and 2010, these treatments significantly reduced the number of pollen beetles by 50 to 80% until seven days after treatment (BBCH 51-54). Under the rainy weather conditions in 2008, no reduction of pollen beetles was observed. However, pollen beetles in treated plots showed a lower activity compared to beetles from the untreated control plots. In all experimental years a visibly more intense flowering was observed in the treated plots. Pod setting on the main raceme was significantly increased in the treated plots. The yield was significantly increased by 23% in the experiments conducted under IPM conditions in 2010. However, no yield increase was observed in 2008 and 2009 under organic agricultural conditions.

Eo-16

Suitability of different cultivars of turnip rape as trap crops for integrated control of major pests on winter oilseed rape

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Abstract: Turnip rape (*Brassica rapa*) has been reported to be a suitable trap crop for the management of insect pests in oilseed rape (*Brassica napus*). Due to its high attractiveness to major pests it has potential to divert pest insects from the main crop, thereby preventing damage to oilseed rape.

In the years 2008 - 2010, two types of field experiments were conducted in order to identify the most suitable turnip rape cultivar for trap cropping and to assess the effect of trap crop perimeter strips on the spatial within-field distribution of pests. In randomised field plot experiments, one oilseed rape cultivar (‘Robust’), one oilseed turnip rape cultivar (‘Largo’) and two cover crop turnip rape cultivars (‘Perko’, ‘Malwira’) were screened for their attractiveness to the most important insect pests. In the other field experiments, perimeter strips with alternating plots of turnip rape (‘Largo’) and oilseed rape (‘Robust’) (6m width * 60m length) were sown along two opposite edges of an oilseed rape field. The effect of turnip rape and oilseed rape perimeter plots on the level of pest infestation within the adjacent oilseed rape main crop (10, 20 and 30m from perimeter plots) was investigated in spring and summer.

Cabbage stem flea beetle (*Psylliodes chrysocephala*) and pollen beetle (*Meligethes aeneus*) significantly preferred all tested turnip rape cultivars to oilseed rape, measured as number of flea beetle larvae per plant, number of pollen beetle adults in flowers and damaged pods, respectively. Only the pollen beetle discriminated between different cultivars of turnip rape and significantly preferred ‘Malwira’ to ‘Largo’ and ‘Perko’. In contrast, the cabbage seed weevil (*Ceutorhynchus assimilis*) preferred oilseed rape to turnip rape: pods of oilseed rape showed a significantly higher level of infestation by weevil larvae than turnip rape pods.

Similar to the results of the cultivar screening, perimeter plots of turnip rape were preferred by most insect pests compared to oilseed rape. However, the higher aggregation of cabbage stem flea beetle and pollen beetle in the turnip rape border plots did not result in lower pest infestation in the adjacent oilseed rape main crop. Further, grain yield of the main crop did not differ significantly between plots bordered by turnip rape and oilseed rape.

The use of the turnip rape cultivar ‘Malwira’ may improve the efficacy of the perimeter strips against pollen beetle.

Eo-17

Effect of turnip rape trap crops on the infestation of winter oilseed rape by pollen beetle

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Abstract: Pollen beetle, *Meligethes aeneus* F. has developed widespread resistance to pyrethroid insecticides in recent years. To reduce the current extensive use of insecticides, alternative control strategies are needed which have potential to keep pollen beetle infestation on crops of oilseed rape below threshold levels. We investigated the potential of winter turnip rape, *Brassica rapa* (cv. 'Perko') for protection of the main crop of winter oilseed rape, *Brassica napus*, from infestation by pollen beetle. The effect of the turnip rape trap crop on the abundance, spatio-temporal distribution and damage of pollen beetles on the oilseed rape main crop was examined over three years in multiple field experiments at two locations close to Rostock and Göttingen in Northern Germany. In each field, replicated plots of oilseed rape (50 m wide x 60-100 m long) were bordered at one edge either by a turnip rape strip (6 m wide x 60-100 m long) or by oilseed rape; trap crop plots alternated with control plots. In addition, the effect of targeted insecticide applications on these border strips on pollen beetle abundance and distribution on the main crop was investigated.

The turnip rape trap crop borders attracted significantly higher numbers of pollen beetles than the oilseed rape borders, as long as the main crop of winter oilseed rape was in the bud stage. However, in all experiments the preference of adult beetles for turnip rape did not result in lower numbers of pollen beetles in the adjacent main crop. This might be due to the phenology of the turnip rape inflorescences which developed only 3-4 days earlier than the inflorescences of oilseed rape. Numbers if pollen beetles were reduced in border plots that were directly sprayed with insecticides. However, insecticide treatments targeted to the border strips had no significant effect on the abundance and spatial distribution of pollen beetles in the adjacent oilseed rape main crop, as compared to oilseed rape plots bordered by untreated strips. Feeding damage of pollen beetles on oilseed rape was not significantly different between all treatments.

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Pathology - Oral Presentations

Po-01

Potential effects of global warming on oilseed rape pathogens in Northern Germany

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Abstract: The rise of mean air and hence soil temperature due to global warming will have effects on both crop and fungal pathogen development. Within the research framework KLIFF (Climate Change Research in Lower Saxony, Germany), potential effects of higher air and soil temperatures on the life cycle of the economically important oilseed rape pathogens *Leptosphaeria maculans, Sclerotinia sclerotiorum* and *Verticillium longisporum* are investigated both theoretically and experimentally.

Within the theoretical approach, published knowledge about temperature influences on certain life cycle stages of the pathogens, such as survival, sporulation, infection and further disease development, was compared with current climate change scenarios for the periods 2001-2030 and 2071-2100 at three different oilseed rape growing regions in Northern Germany. There is evidence that warming might favour all three fungal diseases, but shifts in future prevalence of these pathogens may occur, favouring *Sclerotinia sclerotiorum* and *Verticillium longisporum* in particular.

In order to study effects of rising soil temperatures on the soil- and debris-borne life cycle stages of the three pathogens under field conditions, a soil warming experiment was established. Investigations include (1) ascospore release of *Leptosphaeria maculans* in autumn as well as subsequent stem canker development, (2) apothecia production of *Sclerotinia sclerotiorum* in spring and (3) the infection of winter oilseed rape by *Verticillium longisporum*. First year experiences and results of this soil warming experiment will be presented, including warming effects on plant growth, microclimate and fungal pathogen development.

Po-02

Sclerotinia sclerotiorum – the important disease of oilseed rape on selected sites in the Czech Republic

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Abstract: Sclerotinia stem rot is a serious global problem on oilseed rape. The disease is caused by the polyphagous pathogen *Sclerotinia sclerotiorum* which also attacks sunflower, mustard, peas, beans and various other vegetable crops (tomatoes, cucumbers, lettuce etc.). Since 2007, serious oilseed rape diseases (Sclerotinia stem rot, blackleg etc.) have been monitored at two locations in the Czech Republic. Research institutions in Šumperk and Opava are engaged in testing for the occurrence of Sclerotinia ascospores on oilseed rape petal leaves. Tests are done according to the methodology used at the University of Saskatchewan (Petal Test Manual for Sclerotinia in Canola; 1991). The testing of petals for the presence of ascospores is done during the flowering period and the data are used to predict the possible level of infection in selected regions of the Czech Republic. We advise growers when they should treat oilseed rape crops with the aim of decreasing plant damage and yield loss. Since 2004 we have also tested the resistance of selected varieties of winter oilseed rape to Sclerotinia stem rot. This work has produced a large dataset that includes information on resistance, overwintering and frost-proof ability, yield and thousand grain weight (TGW) from a number of experiments across the Czech Republic.

Po-03

Interactions between canopy structure of WOSR and *Sclerotinia sclerotiorum* disease development

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Abstract: Sclerotinia stem rot caused by the fungal pathogen *Sclerotinia sclerotiorum* (Lib.) de Bary is one of the most damaging diseases of oilseed rape (*Brassica napus*) with harmful attacks 2 in 3 every 10 years. Today, this fungal disease is the major cause of fungicide applications on the crop. In order to find alternative approaches to pesticides as expected by the French Ecophyto 2018 plan, we are looking for agronomic practices able to limit attacks of Sclerotinia on oilseed rape.

The following hypothesis was tested: an "open" canopy in oilseed rape could limit the development of disease by reducing the contact between infested petals (pathogen) and leaves (host), and by creating a canopy microclimate unfavorable for disease development. Contrasted canopies have been generated using 3 factors: plant density, variety and nitrogen date of application during two agronomic seasons in several locations each year.

During the oilseed rape development, some observations were made to control plants' growth, to estimate differences between canopies (ramifications, LAI), to estimate disease development risk (infested petals' rate, petals fallen in the canopy, measure of climate within the canopy). Disease incidence and severity under natural contamination have been checked when it occurred.

Variance analyses bring to light morphologies of contrasted canopy according to the tested modalities, more or less favorable of petals' adhesion to leaves. Lower densities develop canopies with more ramifications: revealing the plasticity of the plant able to compensate low densities. These differences of canopy architecture are to be connected with the fungus development.

Po-04

Improvement of stem mold resistance of oilseed rape

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Abstract: The German set of winter oilseed rape varieties harbours no pronounced resistance against the stem rot pathogen, *Sclerotinia sclerotiorum*. Therefore, screening methods were developed to characterize a set of varieties provided by different breeding companies. These methods included field screening experiments, a greenhouse screening and a laboratory assay, which are presented followed by a comparison of results. Additionally, the greenhouse screening and the laboratory assay were used to characterize the resistance in wild *Brassica* species. This yielded some potential sources of resistance which are described and which could be deployed in the future breeding of oilseed rape with improved resistance to Sclerotinia stem rot.

Po-05

Use of Geographic Information Systems for the DSS SkleroPro - simulation of Sclerotinia stem rot

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In 2010 a new way of presenting results of Decision Support Systems (DSS) for plant pests and diseases has been implemented in the Information System for Integrated Plant Production (ISIP) www.isip.de. By means of Geographic Information Systems (GIS) meteorological data of temperature, relative humidity and global radiation were interpolated. Additionally precipitation data from radar measurements in a high spatial resolution were used as input parameter. This data lead to risk maps which help to identify hot spots and simplifies the interpretation of the model's results. Furthermore the user does not have to choose a specific meteorological station, but gets a plot-specific calculation for his plant production site. The system is supplemented by a spatial three-day weather forecast offered by the German Meteorological Service.
For the DSS SkleroPro which calculates the risk of Sclerotinia stem rot (SSR) on oil seed rape (OSR) the GIS-based risk maps are shown in figure 1. If the risk map turns from "green" to "yellow" the user should start plot specific calculation because first infections of SSR are possible. The spatial meteorological input is also used to calculate the microclimate in the OSR canopy. Further input data for plot-specific calculation are crop rotation, date of mid-bud stage (GS 55), costs of spray, expected yield and price of rapeseed.
Since 2006 plot-specific validation trials of SkleroPro have been carried out by the Plant Protection Services. In 2011 the trials are calculated based on interpolated met data and radar precipitation for the first time.

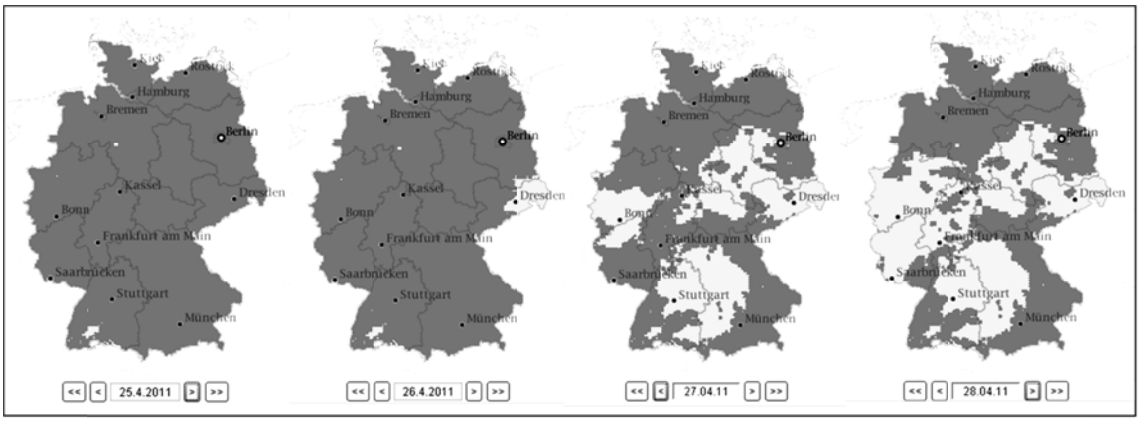

Fig. 1: Risk maps of Germany for Sclerotinia stem rot, April 2011. Dark (green) areas mean "no infection", light-colored (yellow) areas mean "first infection possible" (Individual plot-specific calculation necessary).

Po-06

Reducing the impact of sclerotinia disease: inoculum detection and forecasting fungicide timing in oilseed rape

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Abstract Sclerotinia disease caused by the fungus *Sclerotinia sclerotiorum* causes significant losses in oilseed rape and other arable and vegetable crops in the UK, with infected crops providing a potential source of infection to subsequent and/or nearby susceptible crop species. Strategies for control are mainly focused on infection from the airborne spores produced when sclerotia germinate, but there is interest in targeting sclerotia in soil as well. This report focuses on improving the timing of foliar fungicide applications, but is part of a larger project on integrated control, also investigating control of the soil-borne phase, the potential for improved control from co-operation between farms, and modelling the effects of rotations. Boscalid with metconazole was applied as single sprays at yellow bud, early-, mid-, and late-flower, and also as two and three spray programmes at combinations of these times, to an oilseed rape trial at ADAS Rosemaund, Hereford, UK 2010. Two forecasting models were adapted for use and tested in-field. A spore infection model based on SkleroPro infection conditions gave approximately 90% control using 48 hr forecast alerts to guide spray timing (two sprays). A germination model predicted a late spray which was less effective. Petal sampling on four occasions during flowering indicated moderate-high inoculum according to agar plate tests. PCR tests on 24 hr Burkard spore trap samples showed that some ascospore inoculum was present earlier than detected on petals or by observations of sclerotial germination, and concentrations increased and peaked during flowering. Forecasting based on weather data may need to be combined with inoculum measurements to be more effective.

Po-07

Biocontrol of sclerotinia stem rot – cornerstone in durable high-intensity rape production

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Abstract: Rapeseed production in the EU-15 has doubled in the past 20 years reaching at present more than 15 million tons while the area of cultivation has increased by about 65%. The underlying intensification of rapeseed production mainly consisted in a narrowing of crop rotations which has enhanced disease problems and increased the number of fungicide applications. Nonetheless, chemical control of diseases like sclerotinia stem rot has not been able to counteract the overall increase of disease pressure, since this pathogen forms long-lasting inoculum, sclerotia, which may survive in the soil for at least 12 years and is not controlled by fungicides. Moreover, *Sclerotinia sclerotiorum*, besides stem rot, has induced additional disease types like root rot and young plant damage, recently. Since no effective control through resistant cultivars is available, current control does not appear durable under high-intensity conditions of rapeseed cultivation. A potential improvement is post-harvest treatment of rapeseed plant debris with the conidia of the antagonistic mycoparasite *Coniothyrium minitans*. *C. minitans* attacks the sclerotia and penetrates the sclerotial rind and medulla, whereafter pycnidia are formed in the host tissue. Thereby, *C. minitans* propagates and may establish and survive for several years in the field soil. *C. minitans* has been shown to be superior to any other sclerotial colonizers having a mycoparasitic potential. A more recent finding is, that *Microsphaeropsis ochracea*, known as a potent degrader of melanised fungal structures of *Venturia inaequalis*, *Gibberella zeae* and *Rhizoctonia solani*, has a high potential to degrade sclerotia of *S. sclerotiorum*. In a lab assay, *M. ochracea* at an inoculum density of 10^5 conidia/ml, induced 100% mortality of sclerotia within 3 weeks. Fluorescence microscopic studies under the confocal laser scanning microscope with reporter gene transformed (DsRed, GFP) transgenic strains of *M. ochracea* and *C. minitans* demonstrated the ability of *M. ochracea* to invade and colonize vital sclerotia, finally resulting in internal formation of pycnidia and complete sclerotial degradation. In a direct comparison with *C. minitans*, mycoparasitic activity of *M. ochracea* was lower and colonization pattern more restricted to the periphery of sclerotia. Treatment of sclerotia with a mixture of *C. minitans* and *M. ochracea* did not increase the overall mycoparasitic potential. The effect of *C. minitans* was particularly superior at lower inoculum densities ($<10^4$ conidia/ml).

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Po-08

Studies on *Trichoderma* in protection of winter oilseed rape against fungal diseases

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Abstract: According to the newest directives of the European Community the management of pests and diseases shall combine integrative practices, that are both effective and environmentally friendly. The amount of pests should be reduced using the most economical ways with the least possible hazard to people and the environment. In recent years there has been increasing interest in antagonistic and hyperparasitic fungi, which have potential in combating plant pathogens and thus reducing the amount of pesticides needed in crop protection. One of the most powerful biocontrol agents for use against plant pathogens, are the representatives of the genus *Trichoderma*. The aim of this work was to check the potential of the genus *Trichoderma* to control fungi pathogenic to oilseed rape (*Brassica napus*). The fungal materials used in the study comprised the isolates belonging to five species, including *T. atroviride, T. hamatum, T. harzianum, T. koningii (Tk)* and *T. longibrachiatum (Tl).* Isolates of these fungi were obtained from oilseed rape and yellow lupin plants as well as from the soil from rapeseed fields. The studies were performed under laboratory and field conditions. The laboratory experiments were done on agar media using dual culture bioassays with most important fungal pathogens growing side by side with the cultures of *Trichoderma*. The studies were done using 19 isolates, belonging to the following species: *Alternaria alternata, A. brassicae, A. brassicicola, Botrytis cinerea, Leptosphaeria biglobosa (Lb), Leptosphaeria maculans (Lm), Sclerotinia sclerotiorum* and *Verticillium longisporum (Vl)*. The cellulolytic activity of the isolates was also studied using Filter Paper Assay. The level of absorbance was measured at λ=530 nm. The cellulolytic activity was measured in Filter Paper Units (FPU), where 1 FPU = 1 µmol/ml×min. In field experiments the plants of two cultivars of WOSR were treated with four doses of spore suspension in two periods during the autumn and in three consecutive seasons from 2008/2009 to 2010/2011. The collected stubble was also sprayed with spore suspensions of five *Trichoderma* species. It was found that in dual cultures the tested isolates of *Trichoderma* sp. efficiently controlled the pathogens of oilseed rape. They decreased the growth of the pathogens on agar cultures, especially of *Vl* and *Lb*. The species of *Trichoderma* differed in their hyperparasitic properties, mainly towards *Lm*, where an antibiosis effect was observed in dual cultures with *Tl* and *T. harzianum*. The highest cellulolytic activity was found for the isolates of *T. harzianum*. In the proces of the hydrolysis of cellulose the most efficient isolate was *Tk*. This isolate was also the slowest in growth and the least abundant in sporulation. The highest retardation of growth and development was observed for *Lb*. In contrast, *Lm* slowed down the growth of *Trichoderma* spp., especially of *Tl*. The *Lm* phytotoxin sirodesmin PL has been added to liquid cultures of several *Trichoderma* isolates to study its role in this inhibition. No significant decrease or decomposition of sirodesmin PL has been observed in these cultures so far. Field studies have demonstrated a very weak effect of *Trichoderma* spp. on phoma leaf spotting of WOSR. The trend was positive, but low or no statistical correlations were found. The spore suspension of *Trichoderma* sprayed on stubble of WOSR decreased the amount of crude fiber by 7.4% (after two weeks) to 16.7% (after two months).

Po-09

Forecasting system for blackleg (*Leptosphaeria maculans* and *Leptosphaeria biglobosa*) of crucifers in the Czech Republic

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Abstract: Blackleg is a serious global disease of crucifers. It is caused by two pathogens *Leptosphaeria maculans* and *L. biglobosa*. In the Czech Republic, canola and oilseed rape are attacked each season and yield loses can be 20 %. To help growers protect their crops from blackleg attack, prediction system are used to help target fungicide applications in some other countries in Europe (Poland, UK). In 2008, the Czech Ministry of Agriculture commissioned a project (QH81127) to develop a forecasting system to help oilseed rape growers and agricultural chemical company representatives to recognise when crops were at risk from high levels of infection with the aim of reducing yield loses. Five Czech research institutions worked on the project in collaboration with DuPont who provide meteorological data (precipitation, temperature) for input to the system which allows us to predict the risk of infection from blackleg.). At five different sites (Šumperk, Opava, Prague, Brno and Kroměříž) we monitor for the presence of airborne ascospores of *Leptosphaeria* spp. in both spring and autumn. This data along with associated meteorological data allows us to forecast high risk periods in order to advise growers of the need for preventive or curative treatments on oilseed rape crops. In 2009/10, a dedicated website was also made available to provide information about the risk of infection.

Po-10

Identification of Phoma risk years and regions with the decision-support system proPlant

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Abstract: The proPlant expert. crop protection consultation system helps farmers and advisers with their decisions regarding control of Phoma leaf spot and the use of growth regulators in autumn.

The first question the system answers is, if the current weather promotes Phoma leaf spot infections. Taking into account the previous days and a three-day-forecast, the system finds out whether recent weather conditions were conducive or become conducive to phoma infections in the next days. In parallel the system also analyses the increase of phoma risk since crop emergence.

The second question proPlant expert. answers is, if a fungicide application against Phoma leaf is required this autumn, when are the optimal dates and what needs to be considered regarding growth regulator use. The field-specific recommendation considers both, the need of phoma leaf spot treatment and the need of growth regulator use (timing, choice of fungicide).

The use of fungicides against Phoma leaf spot in autumn makes sense only if several leaves have already developed, if Phoma leaf spot infestation is visible and if the weather during the previous days promoted new infections. In this case a curative treatment leads to a high degree of efficiency (infection-based fungicide strategy). The system advises against a fungicide application if no infestation is visible yet or if infestation cannot develop because of the weather during the previous days. Depending on the year and the region the optimal date for treatment in Germany can be already around 20th of September or not before mid of October.

proPlant expert. analyses the weather data and the user gives the information to the system if infestation is visible in the field or not. From these and further data (e.g. susceptibility of the variety, growth stage) proPlant expert. derives a concrete decision for treatment with a selection of suited fungicides and application rates. The requirements regarding growth regulating and frost resistance are also taken into account.

By this also the third question “how do fungicides differ in the efficacy against Phoma leaf spot” is answered by proPlant expert., because it contains a database with curative and protective efficacy (given in degree days) of registered Phoma leaf spot fungicides.

Po-11

Eight years' experience of the SPEC forecasting system for oilseed rape protection in Poland

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Abstract: Numerous pathogens of plants are broadcasted by air, which allows then to be dispersed over very large areas. Unlike soil pathogens that are persistent in certain areas or fields, and are transferred to new sites mainly on agricultural machinery or sometimes via seeds or tubers, airborne pathogens can easily move over tens- or even hundreds of kilometers. This allows them to find new ecological niches suitable for growth and development. Pathogen dispersal is the key point of each infection process and may greatly vary between species, regions and host-plants and is affected by the weather and regional microclimates. Aerobiology offers tools and methodologies allowing monitoring of airborne inocula. This process allows us not only to gather theoretical knowledge on pathogens' development but also provides valuable information for agricultural practice and can identify the crucial periods for plant protection with fungicides.

In Poland a network of 10 volumetric spore samplers located in different geographical locations has been constantly operating since autumn 2004. The monitoring is known as the System for Forecasting Disease Epidemics (*in Polish:* System Prognozowania Epidemii Chorob, SPEC). From the very start, the monitoring of airborne ascospores has been focused on *Leptosphaeria maculans* and *L. biglobosa*, two pathogens of oilseed rape, responsible for economic losses due to blackleg or stem canker. The communications about the concentration of the inoculum in air samples are immediately passed to farmers, using the website and SMS text messages sent to registered users. The data distribution in real-time is possible due to these technologies of message delivery. In Poland the communications of the SPEC decision support system are being sent using mobile nets to 3000 registered users, four times per season. The educational website (www.spec.edu.pl) offering scientific descriptions is visited by *ca*. 4000 website users per year and the commercial website (www.dupont.pl) offering a complex information service as well as advice is visited by nearly 10,000 users each year. The numbers show high interest in the use of aerobiological data in helping to undertake decisions in plant protection against the most serious diseases of agricultural crops. The methods can be easily implemented to other pathogens and geographical regions, for example as already demonstrated in north Poland, for the inoculum of *Pyrenopeziza brassicae*, the cause of light leaf spot. Studies on the dispersal of inoculum of other fungal pathogens in oilseed rape, cereals and other crops are currently under investigation.

Po-12

Monitoring after the introduction of a new specific resistance against *Leptosphaeria maculans* in oilseed rape in a pilot production area.

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Abstract: Recently new genotypes of oilseed rape were introduced commercially. Their excellent resistance to blackleg (*Leptosphaeria maculans*) is mainly due to a new major resistance gene Rlm7. Such varieties are potentially exposed to a resistance break down risk. We promote a specific monitoring in a production area where the risk seems to be particularly high. This area of around 100 km^2 is located in the central region of France between the towns of Issoudun and St Florent sur Cher. In this area 20 to 30 farmer's fields are observed each year. Rlm7 varieties were slightly introduced in 2004, but were widely developed in the following years. Observations over the seasons include agronomic diagnosis, ascospore releases each autumn, and leaf spots sampling, both on Rlm7 and non Rlm7 cultivars. From sampled leaves, fungus isolates were characterized for virulence profiles. This paper presents the main results for seven successive cropping years and associated progress in detection methods.

Po-13

Methods for investigation of quantitative resistance to *Leptosphaeria maculans* (phoma stem canker) in *Brassica napus* (oilseed rape)

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Abstract: Phoma stem canker, caused by *Leptosphaeria maculans*, is the major disease problem on oilseed rape (*B. napus*) in Europe, currently causing UK annual losses worth more than £100M, despite use of fungicides. Furthermore, it is predicted that global warming will continue to increase the range and severity of UK phoma stem canker epidemics. Host resistance has been the most economical and effective method for control of this disease. Two types of resistance to *L. maculans* have been identified in *B. napus*; major resistance (*R*) gene mediated qualitative resistance and minor gene mediated quantitative resistance. Quantitative resistance to *L. maculans* is race non-specific and is thought to be durable. However, it is difficult to investigate this type of resistance due to a long period of symptomless growth of *L. maculans* from the leaf lesion along the leaf petiole and into stem tissues to cause stem canker. Two doubled haploid (DH) oilseed rape lines were used; A30 is very susceptible and C119 has good quantitative resistance. Two types of inoculum (conidia and ascospores), two inoculation methods (leaf inoculation and petiole inoculation) and different assessment methods (assess disease visible symptoms; trace symptomless pathogen growth using reporter gene, such as GFP; quantify pathogen DNA) were used to study the development of stem canker in controlled conditions. In controlled conditions, for stem canker development ascospores were more effective than conidia, and petiole inoculation was more effective than leaf lamina inoculation. Significant differences were observed between A30 and C119 in terms of visible disease score, the rate of growth of GFP labelled *L. maculans* and amount of *L. maculans* DNA.

Po-14

Studies on the Improvement of Winter Oilseed Rape Resistance to *Verticillium longisporum*

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Abstract: The soilborne fungal pathogen *Verticillium longisporum* (VL) causes premature ripening on oilseed rape and can lead to yield damage under favorable conditions. Melanized resting structures of the pathogen, microsclerotia, can persist for several years and can therefore cause a long-term contamination of the soil. Since there are no effective fungicides available, breeding for resistance is one of the most efficient measures to control the disease. Conventional screening of field-grown winter oilseed rape (WOSR) for evaluation of resistance to VL is performed by visual detection of microsclerotia in OSR stubbles. Although this method allows for a rough estimate of the infestation level, a late detection of the pathogen together with interference by the plants' ripening stage limits the applicability of the method. Here, we report on the development of a quantitative real-time PCR method to detect and quantify VL in field-grown OSR. Two primer pairs targeting distinct gene loci in *V. longisporum* were evaluated for their specificity and sensitivity in detection of VL DNA. The primers targeting the ITS (Internal transcribed spacer) region showed high sensitivity and were specific for *Verticillium* species, but not for VL isolates. Primers targeting the beta-tubulin-region were considerable less sensitive, while showing high specificity for most of the tested VL isolates. Application of ITS-based qPCR permitted detection of the pathogen before symptom expression in stems of four field grown WOSR cultivars with varying susceptibility in the season 2008/09. The fungal DNA concentrations in the four cultivars correlated with the stubble and greenhouse screening when grouped into resistance classes. This method provides a tool for classification of resistant genotypes for integration in breeding of VL resistant elite cultivars. Furthermore, we studied ultrastructural changes in the hypocotyl of *B. napus* after infection with VL by transmission electron microscopy. Upon infection, ultrastructural changes of the vascular tissue, such as formation of occlusions and secondary cell wall covering occurred in both susceptible and resistant plants. This suggests that resistance is rather based on quantitative differences in the vascular tissue.

Po-15

Response of oilseed rape (*Brassica napus* L.*)* to combined effects of drought stress and *Verticillium longisporum* infestation

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Abstract: The host specific fungus *Verticillium longisporum* (VL) is becoming a serious threat to oilseed rape (OSR) production particularly in Northern Europe. It causes premature senescence and ripening which finally results in severe yield losses. Very limited options are available to control this disease and studies suggest that plant resistance remains the preferred strategy. However, the negative consequence of the recently discovered resistance mechanism (higher accumulation of vascular occlusions in hypocotyl tissue) on movement of water and essential nutrients in the plant system which may ultimately affect the quality and quantity of yield particularly during drought seasons is not known. Besides this, the occurrence of drought due to the changing global climate is also emerging as the most important production constraint even in temperate regions of the world. The aims of the present study were to identify physiological and morphological characteristics that are affected by water-deficit and VL stress factors, to find out the relationship between level of disease tolerance and changes in morpho-physiological features and to prove weather VL resistance is stable under conditions where there is drought stress (DS). The study was conducted under greenhouse condition and consisted of three factors: disease, DS and genotype. Disease index, agronomic and yield parameters were assessed using standard methods. WALZ portable photosynthesis system was used to monitor stomatal conductance, photosynthesis and transpiration rates. Leaf proline content and fungal biomass in hypocotyl tissue were determined by spectrophotometer and qPCR respectively. Our result showed that VL caused severe disease severity and reduction of biological yield (up to 36%) in the susceptible cultivar. Moreover, we observed that DS has significant effect on most agronomic & yield parameters and fungal growth. DS also slightly induced proline accumulation in both cultivars. However, addition of drought factor in inoculated plants did not significantly affected disease, physiological and yield parameters indicating that previously mentioned resistance mechanisms of OSR genotype did not interfere with translocation of water and nutrients. In addition to this, the results from the present study provided evidence that VL resistance of OSR genotypes against VL is stable even under conditions where there is DS. Nevertheless, we still recommend further investigation of additional yield, physiological and molecular characteristics that may be affected by these stress factors. Furthermore, further studies focusing on identification of genetical and histological changes responsible for VL resistance and/or tolerance needs to be explored. The knowledge obtained from such studies will provide valuable information for further studies aiming at development of OSR cultivars that withstand the effects of the vascular pathogen *Verticillium longisporum.*

Po-16

Ten years experience with the clubroot resistant cultivar 'Mendel': Performance and Perspectives

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Abstract: The clubroot resistant oilseed rape cultivar ‚Mendel' has been released in 2001 to the European seed market. Since its introduction 'Mendel' has an average market share of 1 to 2% in European winter oilseed rape seed sales. It is preferably used in cropping areas that have a significant clubroot risk, such as the eastern parts of Schleswig-Holstein, where its market share is estimated to exceed 15%.

'Mendel' is a hybrid cultivar which has been bred using a resynthesised *Brassica napus* form as resistance donor. The resynthesised form originated from a cross between a clubroot resistant curly kale (B. oleracea) and a clubroot resistant stubble turnip (B. rapa), and had been shown to possess a broad spectrum resistance. While the stubble turnip parent is expected to carry 3 dominant resistance genes, 'Mendel' has been shown to have at least one dominant resistance gene.

The clubroot resistance of 'Mendel' is acting in a race-specific manner and compatible races have been present already before its introduction, however, the frequency of compatible isolates has been low. Monitoring for compatible races by the breeders has focused on farmer reports about clubroot in 'Mendel' crops and the confirmation of the compatibility of the local race in greenhouse assays. In many cases the local race could be classified as still incompatible. Compatible races occurred more frequent in certain areas such as the north-east of Mecklenburg-Vorpommern or parts of Westphalia. So far there is no indication for a close relation between the frequency of 'Mendel' within the rotation and the frequency of compatible isolates.

'Mendel' has a yield potential which is comparable to other hybrid cultivars from the same breeding period. Breeding efforts should lead to the release of new clubroot resistant cultivars which are comparable in yield to recent cultivars and have a broader resistance spectrum in the near future.

Po-17

Virulence anaylsis of *Plasmodiophora brassicae* derived from different locations of the main European oilseed rape growing regions

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Abstract: Clubroot caused by the obligate biotrophic protist *Plasmodiophora brassicae* is a serious soil-borne disease of cruciferous crops. It causes galls to form on roots leading to premature death of the plant. The organism remains in the soil as resting spores which can survive for up to 20 years. Therefore, there are no economically reasonable control measures once a field has been infected. The hot spots of clubroot infestation in Europe are mainly located in Scotland, England, France and Northern Germany. Currently, due to the raise of oilseed rape cropping within the last decades the number of contaminated fields detected all over Europe is increasing. There are numerous populations and races, respectively, of *P. brassicae* with differences in pathogenicity causing different symptoms on the host plant. For this reason resistance breeding is difficult.

To get more detailed information on the occurrence and the virulence of *P. brassicae* and its implications for agricultural production, samples of infected plant material were taken from locations all over the main oilseed rape growing regions in Europe. Currently the collection contains samples from the United Kingdom, France, Denmark, Poland, the Czech Republic and mainly from numerous locations in Germany. These samples are actually analyzed under greenhouse conditions by using artificial inoculation and performing optical ratings of disease symptoms. The European Clubroot Differential Set (ECD) consisting of 15 genotypes which are subdivided into 5 lines each from 3 different species i.e. *Brassica rapa, B. napus* and *B. oleracea* and the INRA differential set (Hôte differentiel de l'INRA) composed of three *B. napus* genotypes, i.e. ´Nevin´, ´Brutor´ and ´Wilhelmsburger´, are used for these tests respectively.

First results of these analyses give hint, that different pathotypes are present in Europe. The benefit of this geographic monitoring will be on the one hand general information about the dimension of clubroot disease in Europe and on the other hand the appearance of specific pathotypes. This is a prerequisite for an efficient breeding for resistance as up to now only one race specific resistance is incorporated in adapted cultivars.

Entomology - Poster Presentations

Ep-01

PC demonstration of proPlant expert: A decision-support system for pest and disease management in oilseed rape

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Abstract: The computer-based proPlant expert. crop protection consultation systems offer assistance in making decisions on many problems in winter rapeseed. In autumn the system covers control of cabbage stem flea beetle and Phoma leaf spot (*Phoma lingam*) and growth regulator use. In spring it is possible to optimise insecticide applications with the aid of proPlant expert. With only few treatments a maximum efficacy can be reached against rape stem weevil and cabbage stem weevil, pollen beetle, cabbage seed weevil and pod midge.

The proPlant expert.porfolio contains a range of products and services meeting the different requirementsof farmers, advisors, experimentation stations,schools, colleges and universities: Commercial farmers, advisers and experimental stations use the desktop version proPlant **expert.classic**. The software offers a maximum function range: The “regional consultation”includes comprehensive graphics for planning the running crop protection season but also for final overview (e.g. of field trials) by analysis of weather data regarding infection probabilities of Phoma leaf spot, conditions for migration and egg deposition of pests and conditions for the application of growth regulators.expert.classic also offers a “plot-specific consultation” to evaluate the treatment need (depending on weather analysis and field data, e.g. variety, growth stage, last treatment, infestation) including an unbiased recommendation of suitable chemicals and application rates. In addition expert.classic contains information systems on varieties (rating of lodging risk and susceptibility to Phoma leaf spot) and chemicals (e.g. evaluation of the direct and continuing effect of insecticides). **expert.com** is the personal proPlant consulting system on the internet. Two versions are available: The farmers’ version focuses on plot-specific treatment decisions, provides a selection of chemicals that are suitable for application and computes optimum dates and rates for an application to ensure optimum efficacy. The advisers’ version provides plot-specific treatment decisions and a regional consultation with personalised warning service images and export for use of images in facsimiles or e-mails.

The proPlant products **expert.basic** and **expert.map** are online warning services without field relation including proPlant prognoses derived from the analyses of weather data. Beyond Germany where multifarious plant protection services are provided together with different partners, proPlant partners also offer warning services in other European countries since several years.

The PC demonstration will also include the newest program versions and developments.

Ep-02

Effects of different management systems on pest infestation of OSR in Croatia, Germany and Serbia

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Abstract: While Germany is on of the largest producer of OSR in Europe (1.6 million ha), OSR production is of increasing importance in Western Balkan Countries (WBC´s) where 20% of the area cultivated with arable crops is suitable for OSR production. Problems of OSR growing are N-overfertilization, intensive tillage and the use of pyrethroids and phosphoric acids due to pest resistance. Environmentally friendly production techniques are demanded. This EU-project (SEE-ERA-NET.PLUS) targets on the within-field biodiversity. Besides classical aspects (species richness/composition) this project comprises functional aspects like biocontrol of pests by predators (Carabidae, Staphylinidae, Araneae), and turnover of plant residues by decomposers (earthworms). In Croatia and Serbia research on OSR is recently focused on general crop production and pest control. Nothing is known about within-field biodiversity of functional groups like epigaeic predators and decomposers. Organic OSR production is introduced the first time to Croatia and Serbia through this project.

In a 2-year field experiment in each country the impact of three differently managed OSR fields (conventional, advanced integrated, organic) on pests and on the biodiversity and fitness of predators and decomposers are investigated. The systems differ in tillage, fertilizer and pesticide input, weed control, row space and application of *Brassica campestris*-trap-crop-strips and are integrated in a crop rotation with winter wheat. The fields are covered by a grid of sampling points using different methods to assess predators (pitfall traps, endogaeic pitfall traps, emergence traps), decomposers (soil samples) and pests (bud/pod/stem samples). The experimental work will constitute a demonstration of possible ecological approaches in OSR production and thus, will give impulses towards research activities which focus more on aspects of functional biodiversity especially in WBC´s. The project started in October 2010. First results on pest infestation are will be presented here.

In autumn serious pest attacks were only recorded by *Athalia rosae* in Serbia in October 2010. In Serbia organic OSR recovered after severe *A. rosae*-infestation. *Ceutorhynchus napi* and *C. pallidactylus*, which immigrate into OSR-fields in Germany in spring, occurred in Croatian and Serbian OSR-fields already in November. In all countries trap crop strips (in integrated and organic) with Perko (Brassica campestris x B. pekinensis) contributed to pull pests from the oilseed rape field stand, but its effect is limited if the pressure of pest insects exceeds a certain level and if there is no option to conduct an insecticide application. Thus, its function is optimal in combination with integrated crop management. Nevertheless, in Serbia organic OSR showed a great potential to recover regardless of an extreme level of pest attack, especially of Ceutorhynchus-stem weevils.

In total, the first results indicate that despite climatic differences in the 3 countries, the soil quality and conditions as well as the surroundings of OSR fields are key factors to determine the level of pest attack.

Ep-03

Use of Plant defence-inducing chemicals in 'push-pull' pest control strategies in oilseed rape

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Abstract: The push-pull strategy deploys stimuli from plant compounds or semiochemicals to deter or 'push' colonising insects away from a harvestable crop and simultaneously attracts them ('pull') to a sacrificial or trap crop. We investigated the use of semiochemicals, namely plant inducers, and trap cropping in a push-pull pest control strategy for pollen beetles in oilseed rape. Previous work has shown that application of methyl jasmonate (MeJa) to Brassicas induces the production of indolyl glucosinolates (defence compounds which help protect Brassicas from generalist herbivores) and that application of salicylic acid (SA) induces production of alkyenyl glucosinolates (these defence compounds break down upon plant damage to produce volatile isothiocyanates which are highly attractive to Brassica specialist pests). The hypothesis that application of MeJa to an oilseed rape crop would make it less attractive to pests, in particular generalist pests (e.g. the aphid *Myzus persicae*), and that application of SA to turnip rape trap crops would make them more attractive, particularly to the specialist pests (e.g. pollen beetles and *Brevicoryne brassicae* and *Lipaphis erysimi* aphids), was tested in laboratory and field experiments. No significant effect of the plant-inducing chemicals was found on the host-selection behaviour of the test insects in laboratory experiments. However, oilseed rape treated with a range of concentrations of MeJa was generally less attractive, and turnip rape treated with SA was generally more attractive, than control plants as expected. In field trials, plots of oilseed rape treated with MeJa and bordered with a turnip rape trap crop treated with SA was infested with fewer beetles than control plots, but due to large variation, differences were not significant. Experiments to further explore these trends are necessary.

Ep-04

Are current monitoring methods for pollen beetles meaningless?

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Abstract: The use of thresholds to determine when insecticide sprays are necessary is strongly encouraged, especially in the light pest populations developing insecticide resistance. Spray thresholds for pollen beetles (*Meligethes aeneus*) are given as an average number of beetles per plant. In the UK, for example, the threshold is 15 beetles per main raceme when the crop is at the damage-susceptible green-yellow bud stage, or 5/plant for a backward crop. A grower or professional crop advisor wishing to use spray thresholds can derive the average number of beetles per plant as an estimate of the population in a crop by either monitoring several plants along the edge of the crop nearest the field gate or by monitoring several plants along a transect into the middle of the field, as is recommended by the levy board (HGCA). Both methods can lead to inaccurate population estimates given that pollen beetles are unevenly distributed in the field and that they tend to infest the crop from the edge. The population estimate derived by monitoring is therefore highly dependent on where in the crop the monitoring takes place. We demonstrated this during a public open day on Rothamsted Farm and suggest that current monitoring methods for determining population estimates for thresholds are meaningless.

Ep-05

The effects of nitrogen input and flowering on pollen beetle infestation in the OREGIN demonstration trials

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Abstract: The Oilseed Rape Genetic Improvement Network project (OREGIN) has assembled key genetic resources to enable researchers and breeders to explore the relevant gene-pool for enhanced traits to incorporate into breeding programmes. This includes establishing diversity fixed foundation sets for B. napus (*Bna*DFFS). The set of founder lines within the *Bna*DFFS was compiled to represent a structured sampling of the genetic diversity across the global *B. napus* genepool, and to encompass winter and spring OSR, swedes, and fodder, forage and salad kales. OREGIN established small-scale demonstration trials to gather baseline information on plant performance and properties of the fixed lines. Assessments were made of component traits affecting yield, harvest index and nitrogen utilisation efficiency (NUE), and their impact on seed composition in two years. In the first year of the project we assessed flowering duration and pollen beetle (*Meligethes aeneus*) infestation on the test lines. There was a wide variation in the start of flowering between the lines. In general, pollen beetles were most abundant on the early-flowering lines. There was little effect of the two nitrogen treatments (low and high) on pollen beetle infestation.

Ep-06

Ensemble-based analysis of regional climate change effects on the pod midge (*Dasineura brassicae* Winn.) in oilseed rape

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Abstract: The impact of projected regional climate change on the migration of brassica pod midge (*Dasineura brassicae* Winn.) to crops of winter oilseed rape (*Brassica napus* L.) in the Grand Duchy of Luxembourg was evaluated for past and future time spans. A threshold-based statistical model for the first occurrence and the main migration of *D. brassicae* to rape crops was taken from the literature and combined with selected regional climate change projections of the EU ENSEMBLES project. An ensemble of six regional climate change projections was used to quantify the bandwidths of possible change signals and also to assess the uncertainty associated with these projections. In comparison to the reference period (1961 until 1990), a significant earlier onset of the first migration period between 4.3 (near future, 2021 until 2050) and 5.3 days (far future, 2069 until 2098) per decade was detected. Even the possible time span of the first migration was prolonged from 20 days (near future) up to 60 days (far future). The main migration period of the pod midge to the field started significantly earlier (5.0 days per decade) under future climate conditions. Additionally, the time span of possible migration was prolonged from 9 days (near future) up to 13 days (far future) under projected future climate conditions in comparison to the reference period.

Ep-07

Population age structure of the cabbage aphid infesting canola plants at Upper Egypt

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Abstract: The present studies were carried out throughout the period from 2008-2009 to 2009-2010 The main objectives were studying population age structure of the cabbage aphid infesting canola in Assiut, Upper Egypt. Data show that the migration of aphid from the overwintering site into canola field occurred after about 23 days (nearly during the third week of December). The population then increased to become 10% of the maximum number after 49 days (nearly during the third week of January). Maximum population density of the cabbage aphid occurred after about 97 days. Therefore, the peak of abundance could expect around the end of February and the beginning of March. After the population reached its highest level it generally declined and reached 10% of the maximum after 112 days. The population then vanished from the canola field in 122 days (toward the end of March). Also the present results indicate that the number of cabbage aphid was significantly higher in the first season 2009 (938.79 aphids / plant), than that of second 2010 season (244.77 aphids / plant). The differences in levels of infesting between the seasons might be attributed to the differences in weather factors (temperature, relative humidity) and / or the effect of the common natural enemies in each season. The general means of temperature ranged from 16.51 to 22.70°C and from 13.00 to 20.19°C and for relative humidity ranged from 48.43 to 56.43% and 41.29 to 48.14%, during the first and second seasons, respectively.

Ep-08

Winter activity of predaceous larvae of Cantharidae (Coleoptera) in oilseed rape crop

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Abstract: Soldier beetle larvae are predator, able to gain the food also in low temperatures. Aim of the study was to describe the impact of climatic factors on the activity of soldier beetle larvae in winter oilseed rape crop, besides of the vegetation period. Insects were caught by pitfall trap in years 2007-2009, each year from the end October to the end of March in two crop fields differing with the microclimate each to other. The larvae of soldier beetles (Coleoptera: Cantharidae) show the activity since the early autumn until the end of winter, as long as the daily average temperature is not lower than minus 3.0 °C. Larval activity under snow cover was confirmed until daily average minimum temperature reached minus 8.0 °C. However, the larvae achieve their greatest activity at the end of October, when the average temperatures oscillate near 3.8-6.0 °C.

Ep-09

Some factors affecting the larval parasitism of pollen beetle in Germany

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Abstract: Populations of pollen beetle (Meligethes aeneus F.) can be regulated through natural control by hymenopterous parasitoids. Particularly the univoltine larval endoparasitoids Tersilochus heterocerus, Phradis interstitialis and P. morionellus (Hym.; Ichneumonidae) have been reported as key natural enemies of pollen beetle from crops of oilseed rape in various European countries. In this study, we investigated the species composition of larval parasitoids and the level of parasitism at various sites in Germany. Further, the influence of site-specific factors, such as geographical latitude, regional proportion of area grown with oilseed rape, field size, plant density, as well as effects of insecticide usage, i.e. insecticide application in bud or flower stage, number of applications averaged over the past five years and level of pyrethroid resistance in pollen beetle, on the total level of larval parasitism and the larval parasitism by individual parasitoid species was studied.

In 2008 and 2009, second instar larvae of the pollen beetle were sampled from 36 and 42 fields, respectively, of winter oilseed rape across Germany. Larvae were dissected under a binocular microscope to detect parasitism. Subsamples of parasitized larvae were reared for identification of adult parasitoids. Factors affecting the parasitism and correlations between these factors were analysed by using multivariate statistical analyses (‘tree model’).

Total parasitism of pollen beetle larvae ranged between 1.6 – 55.9 % and 1.0 - 81.3 % in 2008 and 2009, respectively. In 2008, mean parasitism by P. interstitialis and T. heterocerus was on a similar level while mean parasitism by T. heterocerus was more frequent in 2009. The level of parasitism was significantly affected by geographic region in Germany, area grown with oilseed rape, field size and particularly by insecticide application during bud or flower stage. These results suggest that larval parasitism of pollen beetle might be affected by the timing of insecticide application and additional site-specific factors.

This project was financially supported by the Federal Ministry of Food, Agriculture and Consumer Protection.

Ep-10

Turnip rape as a trap crop and natural pesticide – Results of three-year field trials on pest control in organic winter rapeseed

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Abstract: A mixed cropping system of rapeseed and 10 % turnip rape as trap crop was compared with oilseed rape in pure stand to demonstrate the reduction of infestation by insect pests. Furthermore the application of bio-pesticides like pyrethrum/rape oil (Spruzit® Neu), spinosad (SpinTor), diatomeen earth (SiO_2) /sunflower-oil and rock powder/water was tested. Oilseed rape showed a higher infestation by stem weevils (*Ceutorhynchus* spp.) in the mixed cropping system compared to rapeseed in pure stand. The reduction of the pollen beetle (*Meligethes aeneus*) on the rapeseed buds resulted from higher attractiveness of turnip rape as a consequence of advanced growth. The faster development of turnip rape seems to be the important key of successful pollen beetle regulation. The application of pyrethrum and spinosad against *Ceutorhynchus* spp. had no effect, spinosad was the only agent that caused a reduction of the pollen beetle.

Ep-11

Pest monitoring and forecasting of the cabbage stem flea beetle, (*Psylliodes chrysocephala)*

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Abstract: The cabbage stem flea beetle has become a local and serious pest of winter oil seed rape in the southern part of Denmark since 1992 and since 2001 the pest is widespread in all of Denmark. Attacks have peaked in cycles of seven years and this behaviour is believed to be caused mainly by cold winters and natural enemies. The beetles invade winter oil seed rape fields at crop emergence and feed on leaves but the most severe damage is caused by the larvae tunnelling petioles and stems of plants. In Denmark, control against larval damage relies on pyrethroid insecticides and decisions on treatment are based on a threshold based monitoring of adult beetles in the field. Uncertainties are attached to a threshold based strategy of control when monitoring is of a non-damaging stage of the pest and potentially insecticides are applied without a valid need. The public aim of reducing pesticide use as well as the potential risk of pyrethroid resistance developing in the pest puts a pressure on the need of changing this control strategy of "spraying and praying" towards an integrated pest management approach. The overall objective of this study is to improve the existing management strategy towards timed action when needed by compiling reliable monitoring with details on biological key points of the pest. The existing monitoring technique will be investigated in field experiments and analysed in relation to other existing or potential methods of pest and damage monitoring. Laboratory tests will be carried out to study reproduction and fecundity and to determine developmental thresholds and requirements as well as mortality factors of the egg and larval stages. The project aims to test the following hypothesis: a) egg-laying varies with temperature and temperature dependent activities and requires continuous mating, b) thermal requirement of the different stages varies to a larger extent than indicated so far, c) mortality of larvae and possibly also eggs is influenced by low temperature and very dry or wet conditions, d) first instars are most exposed to mortality factors on its way from soil into plants and e) monitoring can be improved and translated into forecasting by analysing values in relation to climate and mortality of egg and larval stages.

Ep-12

Host selection of *Tersilochus heterocerus* (Hymenoptera: Ichneumonidae), parasitoid of the pollen beetle *Meligethes aeneus* (Coleoptera: Nitidulidae)

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Abstract: Larvae of the pollen beetle *Meligethes aeneus* Fabricius 1775, the major European pest of oilseed rape, are attacked by several species of hymenopterous parasitoids. One of the most abundant parasitoids in winter oilseed rape is *Tersilochus heterocerus* Thomson 1889. This species is known to be attracted by long-distance volatiles from oilseed rape in the bud and flower stage (Jönsson 2005). However, once a parasitoid lands on the inflorescence, it still needs to locate its host larva.

The aim of this study was to examine how parasitoid females react to odours from living pollen beetle larvae, and if there is any preference for a particular larval stage.

Olfactory bioassays were conducted to determine preferences of female parasitoids collected in the winter oilseed rape field at Alnarp near Malmö in Southern Sweden: In a Y-shaped glass tube, the female wasps were allowed to choose between two airstreams carrying either purified air, or air from living immature stages of the pollen beetle. The pollen beetle larvae were tested in three size categories: Smallest stage (1 - 1,5 mm), b) intermediate stage (2 - 2,5 mm), and final larval stage (3,5 - 4 mm).

The tested *T. heterocerus* females showed a significant preference for the airstream carrying odours from the intermediate larval stage when tested against purified air. The females also significantly preferred the smallest larval stage when tested against the final larval stage, and the intermediate stage when tested against the final stage. This suggests that after landing, *T. heterocerus* females are able to react to volatile cues from the host, and prefer host larvae which have not yet reached the final larval stage.

Reference

Jönsson, M. 2005: Responses to oilseed rape and cotton volatiles in insect herbivores and parasitoids. Doctoral thesis no.2005:14, Swedish University of Agricultural Sciences, Alnarp.

Pathology - Poster Presentations

Pp-01

IOBC/WPRS, Working Group on Integrated Control in Oilseed Crops and membership of IOBC/WPRS

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The Working Group on Integrated Control in Oilseed Crops (ICOC) is one of 19 Working Groups of the West Palearctic Regional Section (WPRS) of the International Organization for Biological and Integrated Control of Noixious Animals and Plants (IOBC). For more details on other working groups refer to **http://www.iobc-wprs.org/**.

IOBC/WPRS encourages collaboration in promoting feasible and environmentally safe methods of pest and pathogen control. IOBC/WPRS fosters research and practical application, organizes meetings, symposia, offers training and information, especially on biological methods of control, but also on all methods, including chemicals, within an integrated pest management context. Major activities include development and standardization of methods used to test for effects of pesticides on beneficial species, pest and disease damage assessment, modeling in relation to pest and disease management, and the practical implementation of biological and integrated controls for pests and diseases of particular crops.

Working Groups (WG) may publish a proceeding biannually or triennially. Copies of proceedings from WG can be obtained through the publisher of the Bulletin (list and titles of the issues and ordering form can be found on the IOBC/WPRS Website).

Aims of the WG ICOC: The working group was established in 1982 by Bent Bromand (Danish Research Centre for Plant Protection) and Christer Nilson (Swedish University of Agriculture) to encourage and coordinate research on integrated disease and pest management systems in oilseed production. Through its regular meetings, it is also intended to serve as a platform to gather and exchange fundamental knowledge and expertise on diseases and pests. Major areas of focus for the group have been:

+ Occurrence and distribution of diseases and pests (monitoring work)
+ Integrated pest and disease management
+ Establishment of damage thresholds
+ Development of decision support systems
+ Disease resistance
+ Use of trap crops for pest control
+ Biology of pest and beneficial insects
+ Biological control (predators, parasitoids and antagonists)
+ Seed pathology in oilseed crops
+ Gene technology in oilseed crops – significance, economics and environment

ICOC convenors / liason officer: The Working Group is headed by two convenors: Birger Koopmann is the working group and subgroup convenor Pathology, and Sam Cook is subgroup-convenor Entomology. Sam Cook was elected in 2004 during a working group meeting in Rothamsted following Prof. Ingrid Williams. Birger Koopmann took over from Prof. Volker Paul after election in Copenhagen in 2003. Lene Sigsgaard is the liason officer of the group and vice president of IOBC-WPRS. She followed Barbara Ekbom as liason officer in 2009.

ICOC Working Group web page: A web page is available for information on WG-ICOC activities. Meetings are announced, PDFs of abstract booklets are provided and other useful information is available. URL is: **http://wwwuser.gwdg.de/~iobc/.**

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Individual membership: 75 €. Includes 10 € for individual membership of IOBC-Global and the possibility to consult and download all recent IOBC/WPRS Bulletins online in the Members' Area of the web site. Also includes a 50-75 € reduction in the registration fee when participating in meetings organized by IOBC/WPRS.

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Pp-02

Fungal Diseases of Sunflower in Turkey

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Sunflower (*Helianthus annuus*) is one of the main crops for oilseeds in Turkey. The sunflower has a number of pathological problems, especially fungi. In this review, the fungal species determined in Turkey until now are summarized. According to the relevant literature, 19 fungal species belonging to 16 genera are reported in Turkey. *Sclerotinia sclerotiorum*, *Plasmopara helianthi* and *Macrophomina phaseolina* are some of the most important pathogens of sunflower.

Pp-03

WIN: Developing Site-Specific Advisories for Agricultural Producers

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Abstract: Weather INnovations Incorporated, (WIN) is a research spin off from the University of Guelph in Ontario, Canada which began commercial operation in 2007. WIN specialises in providing turnkey weather based monitoring and modelling solutions for agribusinesses, producer organisations, government agencies, researchers and others. The primary goal of WIN is to help facilitate the delivery of science based decision support systems to agricultural producers who need straightforward advisories and tools which are easily accessible on the web. As a private company, WIN is completely independent and offers a flexible, service minded solution for a number of producer groups and multinational clients. As part of this service, WIN maintains and manages >750 weather stations, mainly in North America, but has recently been deploying monitoring equipment in agricultural landscapes in Europe. WIN offers an ever increasing number of online Decision Support System products for a range of crops, based on real-time weather data. These include BEETcast (cercospora leaf spot on sugar beet), TOMcast (anthracnose, septoria and blights on tomato), SPUDcast (late and early blight of potato), DONcast (predicting DON [deoxynivalenol toxin] levels at heading in wheat) WHEATcast (septoria and powdery mildew on wheat) and SPRAYcast (forecast of spraying conditions to minimize spray drift). WIN creates and manages websites for its clients so information can be well targeted to the client's needs (for example www.vineandtreefruitinnovations.com). Further, WIN operates custom monitoring programs for crop insurance and irrigation infrastructure management. WIN (www.weatherinnovations.com) is currently working to provide similar online solutions to other pests including pests that affect canola in Canada and oilseed rape in Europe.

Pp-04

Characterization of current populations of *Leptosphaeria* spp. from infected oilseed rape plants in Europe (autumn 2010)

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Abstract: Knowledge about the current populations of plant pathogens is important for combating the diseases they cause and decreasing yield of crop plants. The aim of this work was to characterize the population of *Leptosphaeria* spp. obtained from oilseed rape plants in Europe in the autumn of 2010.

The samples were collected from 20 experimental sites, including 9 fields in Poland, 5 in Hungary, 2 in Germany and France and 1 site in Denmark and the Czech Republic. The materials were collected from the cultivar PR46W10 (HiBred-Pioneer). The plots were not treated with fungicides. From each field, 55 leaves of oilseed rape with visible symptoms of phoma leaf spotting were randomly collected. Leaf fragments colonized by the species of *Leptosphaeria* complex were surface disinfected with 70% ethanol and 1.5% sodium hypochlorite, rinsed in sterile distilled water and subcultured on PDA medium supplemented with 0.02% streptomycin sulphate. Single spore or hyphal tip isolates obtained from the studies were attributed to *L. maculans* or *L. biglobosa*, based on visual differences in culture morphology, confirmed with RAPD using primer OPJ-10. There were considerable differences in the proportion of both *Leptosphaeria* species obtained from the different sites, ranging from 14.3% of *L. maculans* (85.7% of *L. biglobosa*) in Hegyfalu, Vas region in Hungary to 97.1% of *L. maculans* (2.9% *L. biglobosa*) in Gut Barthof, Bayern region in Germany. The results of this study are contrary to current knowledge on *Leptosphaeria* species on oilseed rape in Europe. There were differences between the fields, but – in general - in central Europe (Poland, the Czech Republic and Hungary) the prevailing species was *L. maculans* (81%). In Germany and Denmark the isolates of *L. maculans* constituted a quarter of all *Leptosphaeria* cultures obtained from oilseed rape plants and in France the mean amount of *L. biglobosa* isolates was also high (25% to 33% depending on collection site). The variation between the composition of the populations of *Leptosphaeria* may significantly vary within a country, however, this investigation shows that the amount of *L. biglobosa* in west Europe may be higher than expected. One of the possible reasons may by connected with the higher persistence of *L. biglobosa* in oilseed rape plants and difficulties to erradicate this species with lower doses of fungicides. Once developed on stems, *L. biglobosa* forms numerous pycnidia and then pseudothecia and produces big numbers of ascospores (primary inoculum).

In addition, the isolates of *L. maculans* obtained from Poland were ascribed to the opposite mating types and (a)virulence alleles. The population still favours *Mat 1.2* (66%) as compared to *Mat1.1*. The *avrLm1* allele was still dominating (90%) comparing to *AvrLm1*. In spite of no cultivars with *Rlm6* resistance gene, we have found 5 isolates with *avrLm6* allele. Strangely, these isolates were not localized in west Poland, where they could be transmitted with west winds, but at two locations in the central part of the country. The detection of *AvrLm6* was done using PCR. The cotyledon test checking the virulence of the isolate to *Rlm6* resistance gene present in Darmor MX and Eurol MX cultivars is currently under way.

Pp-05

Comparative studies on growth and fungicide sensitivities of *Leptosphaeria maculans* and *Leptosphaeria biglobosa* isolates

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Abstract: Oilseed rape is affected by a Phoma species complex causing blackleg or stem canker. The two teleomorphs of *Phoma lingam, Leptosphaeria maculans* and *L biglobosa* are associated with this disease. These species are believed to be of different economic importance. Stem base girdling and severe stem cankers are assigned to *L. maculans.* However, *L. biglobosa* can also be isolated from stem bases, but it is more frequently found at higher stem areas. These observations suggest different biological properties of the two species. In this context we compared temperature demands of three isolates of each species between 5 - 32°C, recording radial mycelial growth on malt extract agar. Our results suggest a broader temperature range and a more pronounced growth of *L. biglobosa* at lower temperatures. Numerous studies demonstrated higher radial mycelial growth rates of *L. biglobosa* compared to *L. maculans* on different media. This observation may not be based on differences of biomass production. Huang et al. (2001) studied ascospore germination of these two species and observed different mycelial growth patterns. Whereas, *L. maculans* displayed pronounced branching, *L. biglobosa* shows only faint branching of hyphae, which may pretend higher biomass production by more straight hyphae. To assess the capacities of biomass production of both species, we recorded dry matter production of three isolates each after different growth periods in liquid culture. Results show that both species were not significantly different.

Finally, the isolates of both species were checked for their sensitivity against 16 fungicides *in vitro*. For this purpose fungicides were implemented into Czapek Dox media at 1, 1:5 and 1:5 field application rates. Radial mycelial growth was recorded at regular intervals after incubation at 20°C in the dark. Active compounds of the sterol biosynthesis inhibitors (FRAC groups G1 and G2) Metconazol, Difenoconazol, Tebuconazol, Prothioconazol, Fenpropimorph, Spiroxamine, Fenpropidin) were highly effective against all studied isolates. This was also true for carbendazin (B1), bixafen (C2) and iprodion (E3). Insensitivities were observed for cyflufenamid (6), metrafenone (U8) and proquinazid (E6). Efficacy of fungicides of the group of strobilurins (C3) varied significantly. Whereas pyraclostrobin still shows efficacy, azoxystrobin was only effective against 30% of the isolates tested. Boscalid (C2) also showed reduced efficacy at field application rates in contrast to iprodion (E3), which was effective.

Literature: Huang Y.J., C. Toscano-Underwood, B.D.L. Fitt, A.D. Todd, B. Koopmann, M.H Balesdent (2001): Effects of temperature on germination and hyphal growth from ascospores of A-group and B-group *Leptosphaeria maculans* (Phoma stem canker of oilseed rape). Annals of Applied Biology 139 (2), 193-207.

Pp-06

Molecular detection of *Leptosphaeria maculans* and *L. biglobosa* versus BBCH stages of oilseed rape plant development – the impact on protection with fungicides

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Abstract: Winter oilseed rape (*Brassica napus* ssp. *oleifera*) became one of the most profitable crops grown in Europe. Its plants stay in the field for for 11 months, and during this long period they can be attacted by numerous diseases, including blackleg or stem canker. The disease is caused by two highly related pathogenic fungal species: *Leptosphaeria maculans* [Desm.] Ces. et de Not. and *L. biglobosa* sp. nov. (Shoemaker & Brun). The fingus is transmitted by airborne ascospores, that land on leaves and cause plant infection. In Europe, the primary infection takes place in the autumn. The beginning of spore release and the time of the maximum concentration of spores in air samples greatly depend on weather conditions. The collection of ascospores from air samples was done in Wielkopolska region (Poznan, Great Poland) over five consecutive seasons (2004-2008) from 1st September to 31st November. The weather data were collected from the optimal sowing time (20 August) till the end of spore sampling session. The detection of spores belonging to each species of the *Leptosphaeria* complex was done based on quantitative PCR method using species-specific dual-labelled fluorescent probes designed based on *β-tubulin* genes. In three consecutive autumn seasons (2004-2006) the summary number of spores of *L. maculans* was higher than this of *L. biglobosa*, in autumn 2007 it was twice bigger for *L. biglobosa*, and in autumn 2008 is was egual for both species. The begining of spore detection of the two species was earlier for *L. biglobosa* two times (2004, 2005), in the other two seasons (2007, 2008) it was identical for both species and in autumn 2006 it was earlier for *L. biglobosa*. These differences in time ranged from 8 to 11 days. The detection of the maximum number of spores of these two species was earlier for *L. maculans* in three seasons (2004, 2006, 2008) and slightly earlier (11 days) for *L. biglobosa* in autumn 2005. These differences in time ranged from 3 to 18 days. In 2005 there were two identical peaks of the maximum concentration of *L. biglobosa* in this season. In autumn 2007 the mass ascospore release was identical for both species. The number of days with spores of *L. maculans*, present in air samples ranged from 9 to 48, and for *L. biglobosa* it ranged from 9 to 39, what means that the differences between seasons were tremendous (9.9% to 49.5%). Ascospore showers of *L. maculans* and *L. biglobosa* differed greatly from each other and coincided with different stages of development of oilseed rape plants, measured in BBCH scale. The growth stage of oilseed rape plants and the efficiency of the fungicide to both species has strong impact on the protection of oilseed rape, because both species show different reactions to the same dose of the fungicides and their active compounds, with *L. biglobosa* more persistent and difficult to eradicate.

Pp-07

Studies on the optimal time of fungicide application against phoma leaf spotting and stem canker in Poland

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Abstract: Among the diseases that affect oilseed rape, one of the most damaging is phoma leaf spot and stem canker. It is caused by two species of fungi - *Leptosphaeria maculans* and *L. biglobosa*, respectively. The main source of plant infection are ascospores originating from pseudothecia - fruiting bodies of the perfect stage, produced on oilseed rape stubble from the previous vegetative season. These wind dispersed spores constitute the inoculum for the spread of the disease from season to season and to new fields in the same season. Monitoring of spore dispersal is of great importance for disease risk assessment. In Poland this monitoring has been done within the framework of System for Forecasting Disease Epidemics (www.spec.edu.pl) using volumetric spore samplers.

The aim of this research was to determine the effect of the autumn and early spring spraying time on the incidence and severity of stem canker in relation to presence of spores in the air. The experiments were done in three seasons: 2008/2009- 2010/2011. The fields with winter oilseed rape cultivar PR46W10 (Pioneer Hi-Bred) were placed in 5 sites located in different regions of Poland. Fungicide treatments were done at weekly intervals from late September to mid-November, using Capitan 250 EW, containing 250 g of flusilasole per 1 L of the fungicide.

The results clearly show that time of fungicide application had a strong, statistically significant influence on the effectiveness of chemical protection of oilseed rape. The percentage of healthy plants was significantly different between assessment dates, years and locations. The lowest percentage of healthy plants was always observed in variants with no fungicide treatments. Application of fungicide was the most efficient when it was performed a few days following the ascospore release. It caused not only reduced disease incidence but also the highest increase of the yield.

In conclusion, information about timing and intensity of ascospore release given by SPEC may greatly help in controlling stem canker epidemics and allow better predictions of the disease risk. and consequently judicious use of fungicides.

Pp-08

Effect of combined inoculation of *Phoma lingam* pathogenicity groups on disease expression of cotyledons of a *Brassica napus* Rlm7 cultivar

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Abstract: Pathogen resistance is the most important measure for integrated control of fungal diseases. Both qualitative (monogenic) and quantitative (polygenic) resistance genes contribute to blackleg resistance of oilseed rape (OSR). Several monogenic resistance genes are known and widely used in commercial cultivars. Recently, a few cultivars were introduced into the market possessing the new monogenic resistance gene Rlm7, which has been shown to be highly effective. However, monogenic resistance is vulnerable to being overcome by the development of virulent fungal populations. This process may rely on the selection of virulent isolates already present in the population at low frequencies, but also on avirulence genes which may alter and turn into virulence alleles or are deleted via mutation. We isolated *Leptosphaeria maculans* avr7-strains virulent on Rlm7 genotypes from experimental plots in Göttingen. In this study we used an isolate to investigate the performance of Rlm7 if triggered with isolate combinations of different pathogenicity groups. It has been shown in OSR and other hosts, that pre- and/or co-inoculations with less virulent isolates may induce resistance to highly virulent isolates. We studied the presence of this effect in the Rlm7 cv. Caiman using well characterized isolates of both *L. maculans* and *L. biglobosa.*

Pre-inoculations were performed with an Avr7 *L. maculans* or an *L. biglobosa* isolate both avirulent on cv. Caiman. They were followed by inoculations with a virulent *L. maculans* isolate (avr7) 0, 1, 2 and 4 days after pre-inoculation. A mock pre-inoculation control was also realized. Different spatial inoculation systems were used to check for local and systemic effects of induced resistance. Local effects were studied by inoculating both isolates at the same place or each on a separate half of a cotyledon. Systemic effects were studied by inoculating avirulent and virulent isolates on different cotyledons of a single plant. Both lesion area and qualitative assessments considering sporulation of the pathogen were conducted. For this purpose we used the IMASCORE rating scale (Volke 1999).

Results clearly demonstrate efficacy of Rlm7 against both studied *L. maculans* Avr7 and *L. biglobosa* isolates. Lesion sizes were about 50 times smaller compared to *L. maculans* avr7-controls. Also no sporulation was observed within these lesions after 18 days post inoculation. Results of combined inoculations showed clear effects only if isolates were inoculated in close proximity. This was true for both pre-inoculation systems using either avirulent *L. maculans* or *L. biglobosa*. This effect was even more pronounced and statistically significant compared to the controls, if there was a time gap of 4 days between pre-inoculation and inoculation. This variant also showed no sporulation of the pathogens. Lower effects were recorded when inoculations were spatially separated. Slight effects were only visible using Avr7 *L. maculans* for pre-inoculations. However, they were not statistically different from controls. No effects, not even a trend, were observed using *L. biglobosa* for spatially separated pre-inoculations.

These results demonstrate that Rlm7 may be triggered by avirulent *L. maculans* and *L. biglobosa* locally. Probably, a systemic effect of a pre-inoculation with avirulent *L. maculans* and *L. biglobosa* becomes significant in systems using extended time gaps between pre-inoculation and inoculation.

Pp-09

Characteristics of isolates of *Sclerotinia sclerotiorum* and *Leptosphaeria maculans / L. biglobosa* originating from the Czech Republic

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Abstract: In 2011, samples of the fungi *Leptosphaeria* spp. and *Sclerotinia sclerotiorum* were isolated and grown in pure cultures on potato dextrose agar (PDA). The isolates were taken from different plant tissues of winter oilseed rape (*Brassica napus*). The *Leptosphaeria* spp. isolates were taken from leaves whilst sclerotia of *S. sclerotiorum* were found in the stems at harvest. Samples come from different sites. The type of *Leptosphaeria* spp. was detected using PCR and isolates were confirmed as either *L. maculans* or *L. biglobosa*. In culture, differences were observed for different Sclerotinia isolates with respect to mycelial growth rate and the size of sclerotia that were formed. Isolates of the three pathogens will be used in field tests to monitor levels of resistance in different cultivars of oilseed rape and to evaluate the efficacy of fungicides.

Pp-10

KILA – the new project on clubroot and stem canker of oilseed rape in Poland

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Abstract: The new project on clubroot and stem canker of winter oilseed rape commenced in Poland in autumn 2010. The project will last for three years and is funded by the Polish Ministry of Science and Higher Education. The main goal of the project is the search for resistance sources to clubroot and stem canker in selected mutants of *Brassica napus* and interspecific hybrids among the genus Brassica. Stem canker, caused by *Leptosphaeria maculans*, and clubroot, caused by *Plasmodiophora brassicae*, are diseases that greatly reduce the yield of oilseed rape in Poland; the former disease is well established since the 1980's, whereas the latter is a new disease, fast expanding in all regions of intensive cultivation of oilseed rape. The research aims to determine the composition of the population of *P. brassicae*, which is not known in Poland at all, and to monitor further *L. maculans*; comparing its current population with the previous findings and recognize newly emerging pathotypes or races. So far, over 50 samples of *P. brassicae* have been collected from numerous geographic regions of Poland, these demonstrate that clubroot is not only present, but ubiquitous. The most prevailing races of the pathogen will be used to study the resistance of hybrids of *B. napus x B. rapa* and *B. napus x B. juncea* as well as 32 mutants of *B. napus* with increased tocopherols and decreased amounts of indole glucosinolates. We plan to check the usefulness of selected molecular markers and study what genomes and chromosomes contain the detected resistance to diseases, using GISH and FISH techniques.

Pp-11

Studies on the optimal timing of fungicide application against sclerotinia stem rot in southern Poland

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Abstract: Sclerotinia stem rot caused by *Sclerotinia sclerotiorum* is a major pathogen of oilseed rape (OSR) causing great decrease in seed yield. Sclerotia of the fungus reside in the soil and germinate to form apothecia, which then release airborne ascospores. Spores usually infect plants via petals, and are later deposited on leaves or stems. Petals of OSR are good sources of nutrition for the fungus. In Poland the control of the disease relies on application of the fungicide, but choosing appropriate timing of sprays and working out the necessity of treatment based on real levels of primary inoculum is still unsolved. To address this problem a petal test using media with pH indicators that change colour when they are acidified with oxalic acid - the main metabolite of *S. sclerotiorum* - has been implemented. The main aim of this study was to determine the effect of fungicide application in different times during flowering stage of OSR and to compare the results of petal contamination with the subsequent infection of OSR plants. The experiments were done in two seasons: 2009/2010 and 2010/2011. The field was situated in Glubczyce, located in southern Poland. The winter OSR hybrid PR46W31 (Pioneer Hi-Bred) was tested. Fungicide treatments were done at weekly intervals from late April to mid July, with Acanto SC 250 containing 250 g picoxystrobin per 1 L of the fungicide. The stem canker symptoms before harvest were evaluated according to a scale from 0 to 9, where 0 was no visible symptoms and 9 was a plant totally damaged by the disease. Each experiment variant was also evaluated according to the following characters: seed yield at 90% of dry matter content, mass of thousand seeds (MTS), the percentage of oil in seeds, the content of proteins, the content of acid and neutral detergent fibers, the content of five damaging glucosinolates: glucobrassinapin, progoitrin, napoleiferin, glucobrassicin and 4-OH glucobrassicin. Each season the petals were chosen randomly from an untreated variant, six times during the flowering stage. Scoring of fungal colonies was done based on media discoloration followed by sclerotia formation. Time of fungicide application had a statistically significant impact on the effectiveness of chemical protection of OSR against sclerotinia stem rot. The highest disease incidence was observed in the unsprayed variant, with 25% of infected plants in 2010 and 50% in 2011. Application of fungicide reduced disease incidence. The percentage of infected plants depended on the time of fungicide application. It ranged from 4% (spray on 26 April) to 12.7% (28 May) in 2010 and from 10% (4 May) to 27.3% (15 July) in 2011. The comparison of the availability of primary inoculum in the air (up to 100% of petals infected with *S. sclerotiorum*) and the subsequent plant infection have demonstrated that the infection of OSR plants was much smaller that the infection of petals, indicating that most of the infected petals did not initiate the disease. The proportion of petals that started the disease greatly depended on weather conditions, mainly rainfall and humidity. This correlation was highly significant, suggesting that the petal test supplemented with a relatively simple analysis of rainfall may serve as a good tool for predicting the incidence and severity of Sclerotinia stem rot of OSR. Low percentages of infected plants due to early fungicide sprays suggest that farmers growing OSR in high risk areas should protect the plants of OSR at early flowering stage.

Pp-12

Influence of soil moisture and temperature on the infection of oilseed rape with *Plasmodiophora brassicae*

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Abstract: The effect of soil moisture and temperature on the effectiveness of spore infection of oilseed rape with the soilborne pathogen *Plasmodiophora brassicae* was studied in two trials under greenhouse conditions. In both trials the rape seed plants were cultivated in a soil-sand-turf mix under a consistent pH-value of 5.4. Ten days after sowing the rape seed was inoculated with a 2 ml spore suspension (1×10^7 spores/ml) placed on each root neck. In the temperature trial four different variants (10, 15, 20 and 25°C) were adjusted at consistent soil moisture of 100% of the water holding capacity. In the soil moisture trial three different variants were adjusted (100, 80 und 60 % of the water holding capacity) at consistent temperature of 20°C. The soil moisture was controlled daily. In both greenhouse trials the severity of typical symptoms of *P. brassicae* infection on the roots of 25 plants was visually examined once a week. Disease symptoms could be observed in all temperature variants five weeks after inoculation. The severity of *P. brassicae infection* decreased from high to low temperature. The results of the second trial indicate a stronger effect of soil moisture on the severity of *P. brassicae* infection than temperature.

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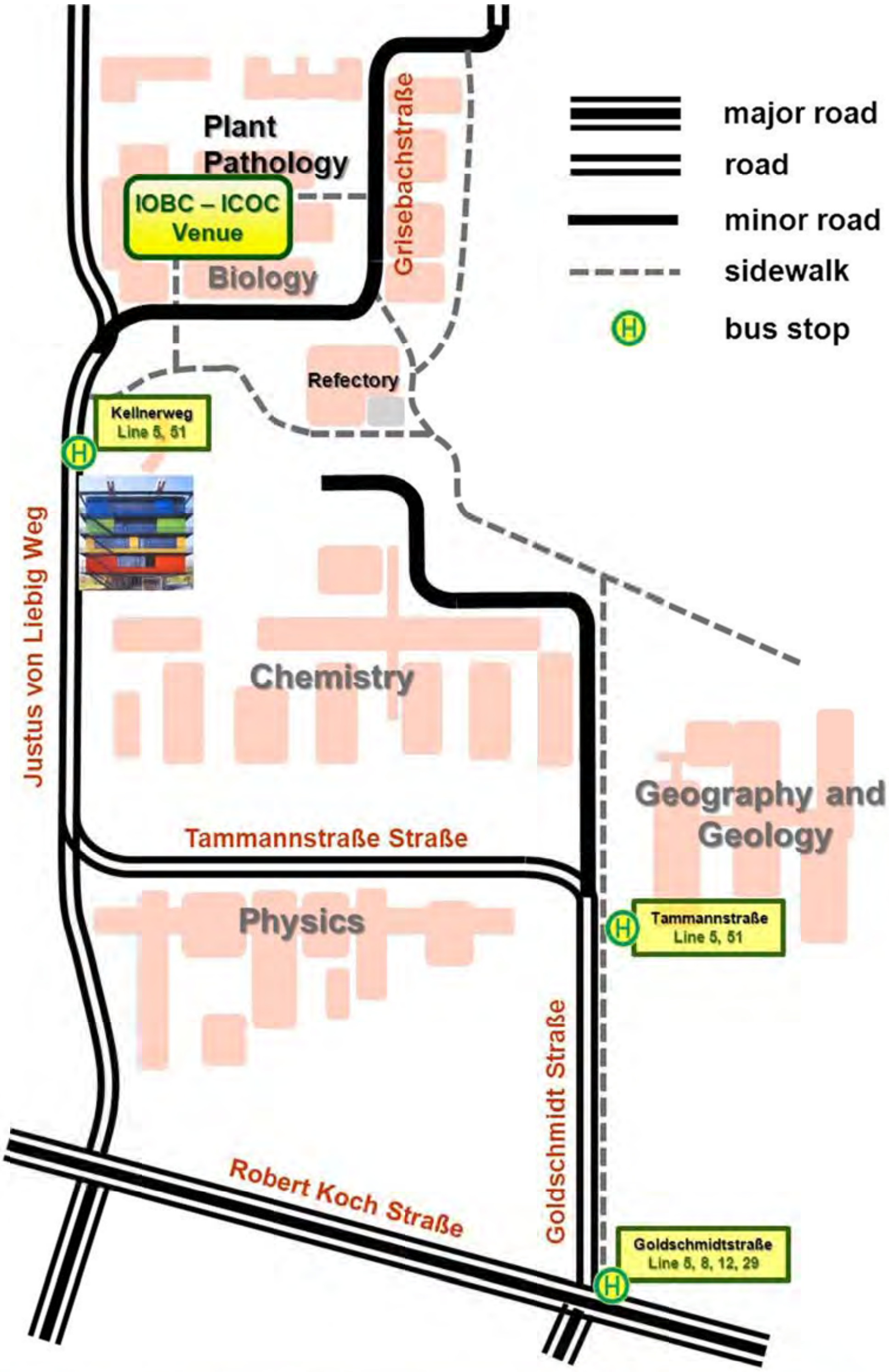
Venue Information

Aerial view of the North Campus

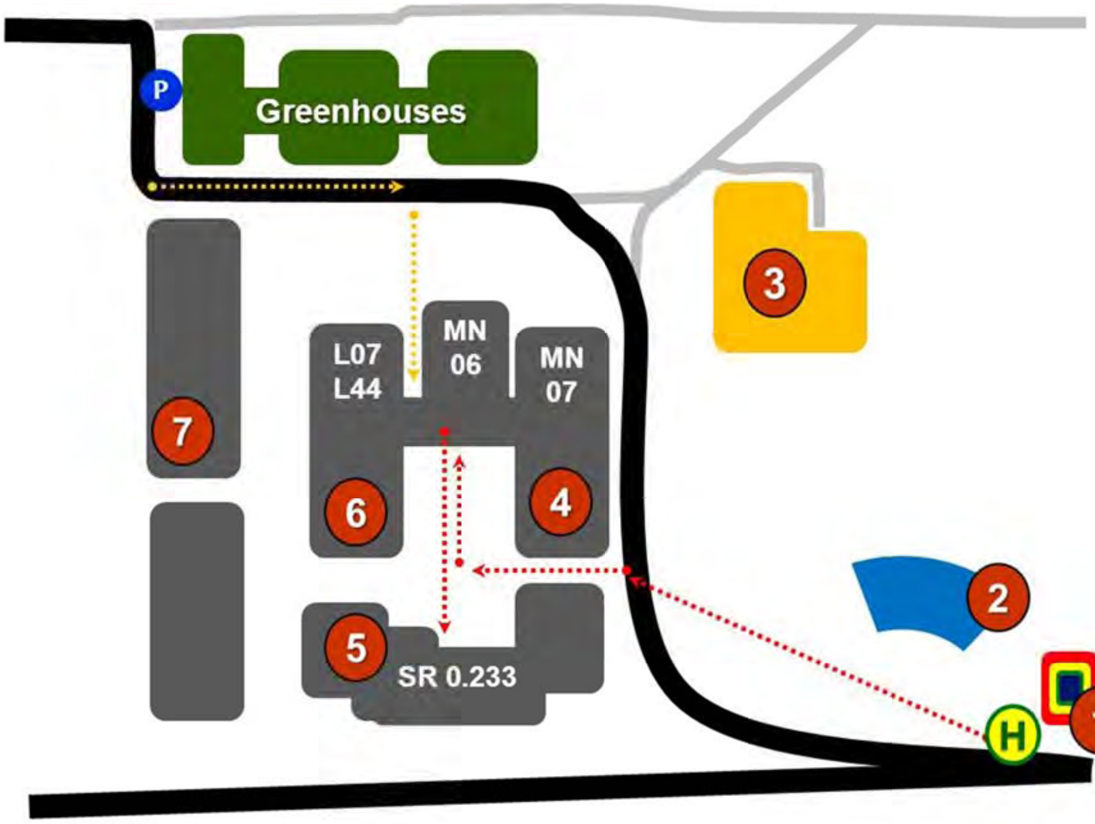
GEORG-AUGUST-UNIVERSITÄT
GÖTTINGEN

1. Physics
2. Chemistry
3. Mathematics
4. Informatics (2008)
5. Geosciences
6. Laser Laboratory
7. Experimental Laboratory for Young People (XLAB)
8. Cafeteria / Mensa
9. International Guest House
10. Student's Hostel "Kellner Weg"
11. Microbiology and Genetics
12. European Neuroscience Institute (ENI)
13. Agricultural Sciences
14. Molecular Biosciences
15. German Primate Center (DPZ)
16. Institute of Veterinary Medicine
17. Forest Sciences
18. Data Processing Service Center (GWDG)
19. MPI for Biophysical Chemistry
20. MPI for Dynamics and Self-Organisation
21. Botanical Garden
22. Animal Nutrition Physiology

Map of the North Campus (Bus stops and location of the venue)

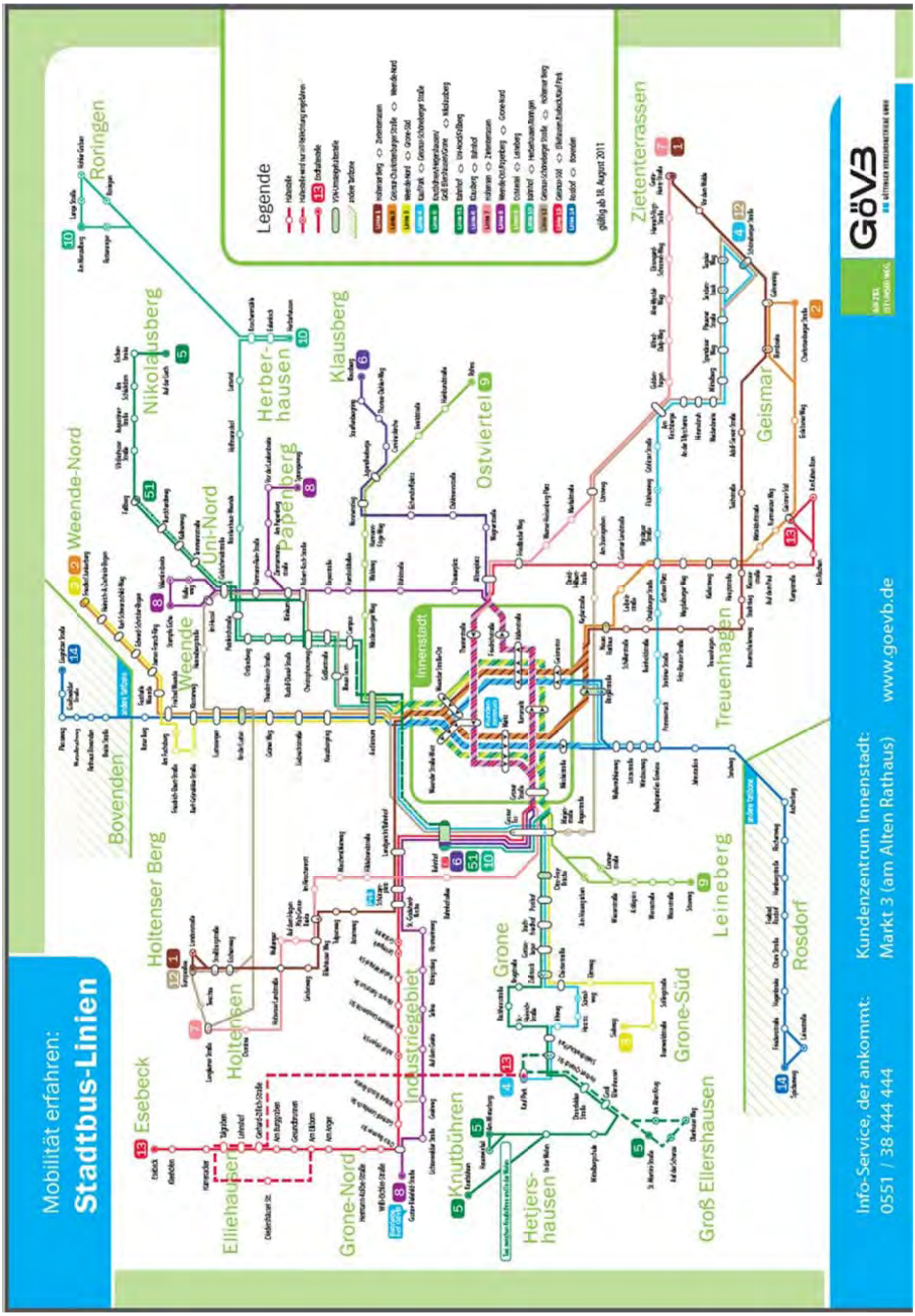


Map of the IOBC-ICOC venue



1) XLAB (Ⓗ Bus stop Kellnerweg line 5 & 51)
2) Guest house
3) Refectory (Mensa, Lunch)
4) Institute of Microbiology and Genetics
   (MN06 ground floor , MN07 1st floor)
5) Göttingen Center for Molecular Biosciences
   (GZMB SR 0,233, ground floor)
6) Plant Pathology and Crop Protection Division
   (L07, L44, Internet Access Point, 1st floor)
7) European Institute of Neurosciences (ENI)

Map of bus lines in Göttingen



Bus time tables

Fast transfer using Line 51

Linie 51 Campus-Linie: Bahnhof - Campus - Uni-Nord - Faßberg

Rapid transfer- approaching the venue – direction Faßberg

Montag - Freitag												
Bahnhof D	6.40	7.10	7.40	8.10	8.40	9.10	9.40	10.10	10.40	11.10	11.40	12.10
Auditorium	6.43	7.13	7.43	8.13	8.43	9.13	9.43	10.13	10.43	11.13	11.43	12.13
Campus	6.45	7.15	7.45	8.15	8.45	9.15	9.45	10.15	10.45	11.15	11.45	12.15
Christophorusweg	6.47	7.17	7.47	8.17	8.47	9.17	9.47	10.17	10.47	11.17	11.47	12.17
Robert-Koch-Straße	6.48	7.18	7.48	8.18	8.48	9.18	9.48	10.18	10.48	11.18	11.48	12.18
Tammannstraße	6.51	7.21	7.51	8.21	8.51	9.21	9.51	10.21	10.51	11.21	11.51	12.21
Kellnerweg	6.52	7.22	7.52	8.22	8.52	9.22	9.52	10.22	10.52	11.22	11.52	12.22
Burckhardtweg	6.53	7.23	7.53	8.23	8.53	9.23	9.53	10.23	10.53	11.23	11.53	12.23
Faßberg	6.55	7.25	7.55	8.25	8.55	9.25	9.55	10.25	10.55	11.25	11.55	12.25

Montag - Freitag												
Bahnhof D	12.40	13.10	13.40	14.10	14.40	15.10	15.40	16.10	16.40	17.10	17.40	18.10
Auditorium	12.43	13.13	13.43	14.13	14.43	15.13	15.43	16.13	16.43	17.13	17.43	18.13
Campus	12.45	13.15	13.45	14.15	14.45	15.15	15.45	16.15	16.45	17.15	17.45	18.15
Christophorusweg	12.47	13.17	13.47	14.17	14.47	15.17	15.47	16.17	16.47	17.17	17.47	18.17
Robert-Koch-Straße	12.48	13.18	13.48	14.18	14.48	15.18	15.48	16.18	16.48	17.18	17.48	18.18
Tammannstraße	12.51	13.21	13.51	14.21	14.51	15.21	15.51	16.21	16.51	17.21	17.51	18.21
Kellnerweg	12.52	13.22	13.52	14.22	14.52	15.22	15.52	16.22	16.52	17.22	17.52	18.22
Burckhardtweg	12.53	13.23	13.53	14.23	14.53	15.23	15.53	16.23	16.53	17.23	17.53	18.23
Faßberg	12.55	13.25	13.55	14.25	14.55	15.25	15.56	16.25	16.55	17.25	17.55	18.25

venue

fährt nur vom 04.10.2011 - 23.12.2011 und vom 02.01.2012 - 31.08.2012

Linie 51 Campus-Linie: Faßberg - Uni-Nord - Campus - Bahnhof

Rapid transfer- leaving the venue – direction Bahnhof

Montag - Freitag												
Faßberg	6.50	7.20	7.50	8.20	8.50	9.20	9.50	10.20	10.50	11.20	11.50	12.20
Burckhardtweg	6.52	7.22	7.52	8.22	8.52	9.22	9.52	10.22	10.52	11.22	11.52	12.22
Kellnerweg	6.53	7.23	7.53	8.23	8.53	9.23	9.53	10.23	10.53	11.23	11.53	12.23
Tammannstraße	6.54	7.24	7.54	8.24	8.54	9.24	9.54	10.24	10.54	11.24	11.54	12.24
Robert-Koch-Straße	6.57	7.27	7.57	8.27	8.57	9.27	9.57	10.27	10.57	11.27	11.57	12.27
Christophorusweg	6.58	7.28	7.58	8.28	8.58	9.28	9.58	10.28	10.58	11.28	11.58	12.28
Campus	7.00	7.30	8.00	8.30	9.00	9.30	10.00	10.30	11.00	11.30	12.00	12.30
Auditorium	7.02	7.32	8.02	8.32	9.02	9.32	10.02	10.32	11.02	11.32	12.02	12.32
Bahnhof D	7.05	7.35	8.05	8.35	9.05	9.35	10.05	10.35	11.05	11.35	12.05	12.35

Montag - Freitag												
Faßberg	12.50	13.20	13.50	14.20	14.50	15.20	15.50	16.20	16.50	17.20	17.50	18.20
Burckhardtweg	12.52	13.22	13.52	14.22	14.52	15.22	15.52	16.22	16.52	17.22	17.52	18.22
Kellnerweg	12.53	13.23	13.53	14.23	14.53	15.23	15.53	16.23	16.53	17.23	17.53	18.23
Tammannstraße	12.54	13.24	13.54	14.24	14.54	15.24	15.54	16.24	16.54	17.24	17.54	18.24
Robert-Koch-Straße	12.57	13.27	13.57	14.27	14.57	15.27	15.57	16.27	16.57	17.27	17.57	18.27
Christophorusweg	12.58	13.28	13.58	14.28	14.58	15.28	15.58	16.28	16.58	17.28	17.58	18.28
Campus	13.00	13.30	14.00	14.30	15.00	15.30	16.00	16.30	17.00	17.30	18.00	18.30
Auditorium	13.02	13.32	14.02	14.32	15.02	15.32	16.02	16.32	17.02	17.32	18.02	18.32
Bahnhof D	13.05	13.35	14.05	14.35	15.05	15.35	16.05	16.35	17.05	17.35	18.05	18.35

venue

fährt nur vom 04.10.2011 - 23.12.2011 und vom 02.01.2012 - 31.08.2012

Bus transfer using Line 5 - Approaching the Venue

venue

Approaching the venue – direction Nikolausberg

Linie 5 **Knutbühren (AST) - Hetjershausen - Groß Ellershausen - Grone/Altdorf - Zentrum - -Universität Nord - Nikolausberg**

	Montag - Freitag																													
				L		L		L	S	S				L			L			L			L			L			S	L
Knutbühren				5.49		6.20		6.49						7.49			8.49			9.49			10.49			11.49				12.49
Am Winterberg				–	5.56	–		–		6.55	6.56	7.07		–	7.56		–	8.56		–	9.56		–	10.56		–	11.56			–
Hasenwinkel				–	5.57	–		–		6.56	6.57	7.08		–	7.57		–	8.57		–	9.57		–	10.57		–	11.57			–
In der Wehm				5.54	5.59	6.25		6.54		6.58	6.59	7.10		7.54	7.59		8.54	8.59		9.54	9.59		10.54	10.59		11.54	11.59			12.54
Mittelbergschule					6.00	–				6.59	7.00	7.11		7.55	8.00			9.00			10.00			11.00			12.00			
St.-Martini-Straße					–	–	6.27			–	–	–	7.27		–	8.27		–	9.27		–	10.27		–	11.27		–	12.27		
Groß Ellershausen					6.01	6.28	6.28			7.00	7.01	7.12	7.28		8.01	8.28		9.01	9.28		10.01	10.28		11.01	11.28		12.01	12.28		
Dransfelder Straße					6.02		6.29			7.01	7.02	7.13	7.29		8.02	8.29		9.02	9.29		10.02	10.29		11.02	11.29		12.02	12.29		
Kauf Park-Ost					–		6.31			–	–	–	7.31		–	8.31		–	9.31		–	10.31		–	11.31		–	12.31		
Herbert-Quandt-Straße					6.03		–			7.02	7.03	7.14	–		8.03	–		9.03	–		10.03	–		11.03	–		12.03	–		
Siekhöhe					6.04		6.34			7.03	7.04	7.15	7.34		8.04	8.34		9.04	9.34		10.04	10.34		11.04	11.34		12.04	12.34		
St.-Heinrich-Straße		5.20	5.53		6.06		6.36		7.04	7.05	7.06	7.17	7.36		8.06	8.36		9.06	9.36		10.06	10.36		11.06	11.36		12.06	12.36		
Backhausstraße		5.21	5.54		6.08		6.38		7.06	7.07	7.08	7.19	7.38		8.08	8.38		9.08	9.38		10.08	10.38		11.08	11.38		12.08	12.38		
Krugstraße		5.22	5.55		6.09		6.39		7.07	7.08	7.09	7.20	7.39		8.09	8.39		9.09	9.39		10.09	10.39		11.09	11.39		12.09	12.39		
Zollstock		5.23	5.56		6.11		6.41		7.09	7.10	7.11	7.22	7.41		8.11	8.41		9.11	9.41		10.11	10.41		11.11	11.41		12.11	12.41		
Gotteslager		5.24	5.57		6.12		6.42		7.10	7.11	7.12	7.23	7.42		8.12	8.42		9.12	9.42		10.12	10.42		11.12	11.42		12.12	12.42		
Stadtfriedhof		5.25	5.58		6.13		6.43		7.11	7.12	7.13	7.24	7.43		8.13	8.43		9.13	9.43		10.13	10.43		11.13	11.43		12.13	12.43		
Posthof		5.26	5.59		6.14		6.44		7.12	7.13	7.14	7.25	7.44		8.14	8.44		9.14	9.44		10.14	10.44		11.14	11.44		12.14	12.44		
Otto-Frey-Brücke		5.27	6.00		6.16		6.46		7.14	7.15	7.16	7.27	7.46		8.16	8.46		9.16	9.46		10.16	10.46		11.16	11.46		12.16	12.46		
Groner Tor		5.29	6.02		6.18		6.48		7.16	7.17	7.18	7.29	7.48		8.18	8.48		9.18	9.48		10.18	10.48		11.18	11.48		12.18	12.48		
Groner Straße		5.30	6.03		6.19		6.49		7.17	7.18	7.19	7.30	7.49		8.19	8.49		9.19	9.49		10.19	10.49		11.19	11.49		12.19	12.49		
Kornmarkt		5.32	6.05		6.21		6.51		7.19	7.20	7.21	7.32	7.51		8.21	8.51		9.21	9.51		10.21	10.51		11.21	11.51		12.21	12.51		
Jüdenstraße		5.34 W	6.07 W		6.23		6.53		7.21	7.22	7.23	7.34	7.53		8.23	8.53		9.23	9.53		10.23	10.53		11.23	11.53		12.23	12.53		
Weender Straße-Ost					**6.26**		**6.56**		**7.24**	**7.25**	**7.26**	**7.37**	**7.56**		**8.26**	**8.56**		**9.26**	**9.56**		**10.26**	**10.56**		**11.26**	**11.56**		**12.26**	**12.56**	**13.20**	
Auditorium					6.28		6.58				7.28	7.39	7.58		8.28	8.58		9.28	9.58		10.28	10.58		11.28	11.58		12.28	12.58	13.22	
Campus					6.30		7.00				7.30	7.41	8.00		8.30	9.00		9.30	10.00		10.30	11.00		11.30	12.00		12.30	13.00	13.24	
Goßlerstraße					6.31		7.01				7.31	7.42	8.01		8.31	9.01		9.31	10.01		10.31	11.01		11.31	12.01		12.31	13.01	13.25	
Christophorusweg					6.32		7.02				7.32	7.43	8.02		8.32	9.02		9.32	10.02		10.32	11.02		11.32	12.02		12.32	13.02	13.26	
Rudolf-Diesel-Straße					6.33		7.03				7.33	7.44	8.03		8.33	9.03		9.33	10.03		10.33	11.03		11.33	12.03		12.33	13.03	13.27	
Theodor-Heuss-Straße					6.34		7.04				7.34	7.45	8.04		8.34	9.04		9.34	10.04		10.34	11.04		11.34	12.04		12.34	13.04	13.28	
Ostlandweg					6.35		7.05				7.35	7.46	8.05		8.35	9.05		9.35	10.05		10.35	11.05		11.35	12.05		12.35	13.05	13.29	
Petrikirchstraße					6.36		7.06				7.36	7.47	8.06		8.36	9.06		9.36	10.06		10.36	11.06		11.36	12.06		12.36	13.06	13.30	
Goldschmidtstraße	5.46				6.38		7.08				7.38	7.49	8.08		8.38	9.08		9.38	10.08		10.38	11.08		11.38	12.08		12.38	13.08	13.32	
Tammannstraße	5.47				6.39		7.09				7.39	7.50	8.09		8.39	9.09		9.39	10.09		10.39	11.09		11.39	12.09		12.39	13.09	13.33	
Kellnerweg	5.48				6.40		7.10				7.40	7.51	8.10		8.40	9.10		9.40	10.10		10.40	11.10		11.40	12.10		12.40	13.10	13.34	
Burckhardtweg	5.49				6.41		7.11				7.41	7.52	8.11		8.41	9.11		9.41	10.11		10.41	11.11		11.41	12.11		12.41	13.11	13.35	
Faßberg	5.50				6.42		7.12				7.42	7.53	8.12		8.42	9.12		9.42	10.12		10.42	11.12		11.42	12.12		12.42	13.12	13.36	
Ulrideshuser Straße	5.51				6.43		7.13				7.43		8.13		8.43	9.13		9.43	10.13		10.43	11.13		11.43	12.13		12.43	13.13	13.37	
Augustiner Straße	5.52				6.44		7.14				7.44		8.14		8.44	9.14		9.44	10.14		10.44	11.14		11.44	12.14		12.44	13.14	13.38	
Am Schlehdorn	5.53				6.45		7.15				7.45		8.15		8.45	9.15		9.45	10.15		10.45	11.15		11.45	12.15		12.45	13.15	13.39	
Eschenbreite	5.54				6.46		7.16				7.46		8.16		8.46	9.16		9.46	10.16		10.46	11.16		11.46	12.16		12.46	13.16	13.40	
Auf der Lieth	5.57				6.50		7.20				7.50		8.20		8.50	9.20		9.50	10.20		10.50	11.20		11.50	12.20		12.50	13.20	13.44	

W weiter bis Weende-Nord
Am 24.12. fahren die Busse bis ca. 18.30 Uhr und am 31.12. bis ca. 21.00 Uhr wie Samstag

L Linien-Taxi (keine Bestellung)

S nur an Schultagen

Approaching the venue – direction Nikolausberg

Linie 5 Knutbühren (AST) - Hetjershausen - Groß Ellershausen - Grone/Altdorf - Zentrum - -Universität Nord - Nikolausberg

	Montag - Freitag																												SA
			L			L			L			L			L			L			AST		AST		AST		AST		
Knutbühren			13.49			14.49			15.49			16.49			17.49			18.49			20.02		21.02		22.02		23.02		
Am Winterberg	12.56		–	13.56		–	14.56		–	15.56		–	16.56		–	17.56		–	18.56		–	20.04	–	21.06	–	22.06	–	23.06	
Hasenwinkel	12.57		–	13.57		–	14.57		–	15.57		–	16.57		–	17.57		–	18.57		–	20.05	–	21.07	–	22.07	–	23.07	
In der Wehm	12.59		13.54	13.59		14.54	14.59		15.54	15.59		16.54	16.59		17.54	17.59		18.54	18.59		20.07	20.07	21.07	21.09	22.07	22.09	23.07	23.09	
Mittelbergschule	13.00			14.00			15.00			16.00			17.00			18.00			19.00			20.08		21.10		22.10		23.10	
St.-Martini-Straße	–	13.27		–	14.27		–	15.27		–	16.27		–	17.27		–	18.27		–	19.27		–		–		–		–	
Groß Ellershausen	13.01	13.28		14.01	14.28		15.01	15.28		16.01	16.28		17.01	17.28		18.01	18.28		19.01	19.28		20.09		21.11		22.11		23.11	
Dransfelder Straße	13.02	13.29		14.02	14.29		15.02	15.29		16.02	16.29		17.02	17.29		18.02	18.29		19.02	19.29		20.10		21.12		22.12		23.12	
Kauf Park-Ost	–	13.31		–	14.31		–	15.31		–	16.31		–	17.31		–	18.31		–	19.31		20.12		–		–		–	
Herbert-Quandt-Straße	13.03	–		14.03	–		15.03	–		16.03	–		17.03	–		18.03	–		19.03	–		–		21.13		22.13		23.13	
Siekhöhe	13.04	13.34		14.04	14.34		15.04	15.34		16.04	16.34		17.04	17.34		18.04	18.34		19.04	19.34		20.14		21.14		22.14		23.14	
St.-Heinrich-Straße	13.06	13.36		14.06	14.36		15.06	15.36		16.06	16.36		17.06	17.36		18.06	18.36		19.06	19.36		20.16		21.16		22.16		23.16	
Backhausstraße	13.08	13.38		14.08	14.38		15.08	15.38		16.08	16.38		17.08	17.38		18.08	18.38		19.08	19.38		20.17		21.17		22.17		23.17	
Krugstraße	13.09	13.39		14.09	14.39		15.09	15.39		16.09	16.39		17.09	17.39		18.09	18.39		19.09	19.39		20.18		21.18		22.18		23.18	
Zollstock	13.11	13.41		14.11	14.41		15.11	15.41		16.11	16.41		17.11	17.41		18.11	18.41		19.11	19.41		20.19		21.19		22.19		23.19	
Gotteslager	13.12	13.42		14.12	14.42		15.12	15.42		16.12	16.42		17.12	17.42		18.12	18.42		19.12	19.42		20.20		21.20		22.20		23.20	
Stadtfriedhof	13.13	13.43		14.13	14.43		15.13	15.43		16.13	16.43		17.13	17.43		18.13	18.43		19.13	19.43		20.21		21.21		22.21		23.21	
Posthof	13.14	13.44		14.14	14.44		15.14	15.44		16.14	16.44		17.14	17.44		18.14	18.44		19.14	19.44		20.22		21.22		22.22		23.22	
Otto-Frey-Brücke	13.16	13.46		14.16	14.46		15.16	15.46		16.16	16.46		17.16	17.46		18.16	18.46		19.16	19.46		20.23		21.23		22.23		23.23	
Groner Tor	13.18	13.48		14.18	14.48		15.18	15.48		16.18	16.48		17.18	17.48		18.18	18.48		19.18	19.48		20.25		21.25		22.25		23.25	
Groner Straße	13.19	13.49		14.19	14.49		15.19	15.49		16.19	16.49		17.19	17.49		18.19	18.49		19.19	19.49		20.26		21.26		22.26		23.26	
Kornmarkt	13.21	13.51		14.21	14.51		15.21	15.51		16.21	16.51		17.21	17.51		18.21	18.51		19.21	19.51		20.28		21.28		22.28		23.28	
Jüdenstraße	13.23	13.53		14.23	14.53		15.23	15.53		16.23	16.53		17.23	17.53		18.23	18.53		19.23	19.53		20.30		21.30		22.30		23.30	
Weender Straße-Ost	**13.26**	**13.56**		**14.26**	**14.56**		**15.26**	**15.56**		**16.26**	**16.56**		**17.26**	**17.56**		**18.26**	**18.56**		**19.26**	**19.56**		**20.33**		**21.33**		**22.33**		**23.33**	
Auditorium	13.28	13.58		14.28	14.58		15.28	15.58		16.28	16.58		17.28	17.58		18.28	18.58		19.28	19.58		20.34		21.34		22.34		23.34	
Campus	13.30	14.00		14.30	15.00		15.30	16.00		16.30	17.00		17.30	18.00		18.30	19.00		19.30	20.00		20.36		21.36		22.36		23.36	
Goßlerstraße	13.31	14.01		14.31	15.01		15.31	16.01		16.31	17.01		17.31	18.01		18.31	19.01		19.31	20.01		20.37		21.37		22.37		23.37	
Christophorusweg	13.32	14.02		14.32	15.02		15.32	16.02		16.32	17.02		17.32	18.02		18.32	19.02		19.32	20.02		20.38		21.38		22.38		23.38	
Rudolf-Diesel-Straße	13.33	14.03		14.33	15.03		15.33	16.03		16.33	17.03		17.33	18.03		18.33	19.03		19.33	20.03		20.39		21.39		22.39		23.39	
Theodor-Heuss-Straße	13.34	14.04		14.34	15.04		15.34	16.04		16.34	17.04		17.34	18.04		18.34	19.04		19.34	20.04		20.40		21.40		22.40		23.40	
Ostlandweg	13.35	14.05		14.35	15.05		15.35	16.05		16.35	17.05		17.35	18.05		18.35	19.05		19.35	20.05		20.41		21.41		22.41		23.41	
Petrikirchstraße	13.36	14.06		14.36	15.06		15.36	16.06		16.36	17.06		17.36	18.06		18.36	19.06		19.36	20.06		20.42		21.42		22.42		23.42	
Goldschmidtstraße	13.38	14.08		14.38	15.08		15.38	16.08		16.38	17.08		17.38	18.08		18.38	19.08		19.38	20.08		20.43		21.43		22.43		23.43	5.46
Tammannstraße	13.39	14.09		14.39	15.09		15.39	16.09		16.39	17.09		17.39	18.09		18.39	19.09		19.39	20.09		20.44		21.44		22.44		23.44	5.47
Kellnerweg	13.40	14.10		14.40	15.10		15.40	16.10		16.40	17.10		17.40	18.10		18.40	19.10		19.40	20.10		20.45		21.45		22.45		23.45	5.48
Burckhardtweg	13.41	14.11		14.41	15.11		15.41	16.11		16.41	17.11		17.41	18.11		18.41	19.11		19.41	20.11		20.46		21.46		22.46		23.46	5.49
Faßberg	13.42	14.12		14.42	15.12		15.42	16.12		16.42	17.12		17.42	18.12		18.42	19.12		19.42	20.12		20.47		21.47		22.47		23.47	5.50
Ulrideshuser Straße	13.43	14.13		14.43	15.13		15.43	16.13		16.43	17.13		17.43	18.13		18.43	19.13		19.43	20.13		20.48		21.48		22.48		23.48	5.51
Augustiner Straße	13.44	14.14		14.44	15.14		15.44	16.14		16.44	17.14		17.44	18.14		18.44	19.14		19.44	20.14		20.49		21.49		22.49		23.49	5.52
Am Schlehdorn	13.45	14.15		14.45	15.15		15.45	16.15		16.45	17.15		17.45	18.15		18.45	19.15		19.45	20.15		20.50		21.50		22.50		23.50	5.53
Eschenbreite	13.46	14.16		14.46	15.16		15.46	16.16		16.46	17.16		17.46	18.16		18.46	19.16		19.46	20.16		20.51		21.51		22.51		23.51	5.54
Auf der Lieth	13.50	14.20		14.50	15.20		15.50	16.20		16.50	17.20		17.50	18.20		18.50	19.20		19.50	20.20		20.54		21.54		22.54		23.54	5.57

venue

L Linien-Taxi (keine Bestellung)

AST Anrufsammeltaxi - bitte 30 Min. vor Fahrtantritt unter Tel.: 0551-34034 oder 0551-38444843 anmelden

Am 24.12. fahren die Busse bis ca. 18.30 Uhr und am 31.12. bis ca. 21.00 Uhr wie Samstag

Bus transfer using Line 5 - Leaving the Venue

venue

Leaving the venue – direction Zentrum

Linie 5 Nikolausberg - Universität Nord - Zentrum - Grone/Altdorf - Groß Ellershausen - Hetjershausen - Knutbühren (AST)

Montag - Freitag

				L		S		L	S				L			L			L			L			L		S	S		L
Auf der Lieth	5.12		6.00		6.30	6.57	7.00		7.13		7.30	8.00		8.30	9.00		9.30	10.00		10.30	11.00		11.30	12.00		12.30			13.00	
Eschenbreite	5.13		6.01		6.31	6.58	7.01		7.14		7.31	8.01		8.31	9.01		9.31	10.01		10.31	11.01		11.31	12.01		12.31			13.01	
Am Schlehdorn	5.14		6.02		6.32	6.59	7.02		7.15		7.32	8.02		8.32	9.02		9.32	10.02		10.32	11.02		11.32	12.02		12.32			13.02	
Augustiner Straße	5.15		6.03		6.33	7.00	7.03		7.16		7.33	8.03		8.33	9.03		9.33	10.03		10.33	11.03		11.33	12.03		12.33			13.03	
Ulrideshuser Straße	5.16		6.04		6.34	7.01	7.04		7.17		7.34	8.04		8.34	9.04		9.34	10.04		10.34	11.04		11.34	12.04		12.34			13.04	
Faßberg	5.17		6.05		6.35	7.02	7.05		7.18		7.35	8.05		8.35	9.05		9.35	10.05		10.35	11.05		11.35	12.05		12.35			13.05	
Burckhardtweg	5.19		6.07		6.37	7.03	7.07		7.20		7.37	8.07		8.37	9.07		9.37	10.07		10.37	11.07		11.37	12.07		12.37			13.07	
Kellnerweg	5.20		6.08		6.38	7.04	7.08		7.21		7.38	8.08		8.38	9.08		9.38	10.08		10.38	11.08		11.38	12.08		12.38			13.08	
Tammannstraße	5.21		6.09		6.39	7.05	7.09		7.23		7.39	8.09		8.39	9.09		9.39	10.09		10.39	11.09		11.39	12.09		12.39			13.09	
Goldschmidtstraße	5.22 Ⓜ		6.10		6.40	7.06	7.10		7.24		7.40	8.10		8.40	9.10		9.40	10.10		10.40	11.10		11.40	12.10		12.40			13.10	
Petrikirchstraße			6.11		6.41	7.07	7.11		7.25		7.41	8.11		8.41	9.11		9.41	10.11		10.41	11.11		11.41	12.11		12.41			13.11	
Ostlandweg			6.12		6.42	7.08	7.12		7.26		7.42	8.12		8.42	9.12		9.42	10.12		10.42	11.12		11.42	12.12		12.42			13.12	
Theodor-Heuss-Straße			6.13		6.43	7.09	7.13		7.27		7.43	8.13		8.43	9.13		9.43	10.13		10.43	11.13		11.43	12.13		12.43		13.12	13.13	
Rudolf-Diesel-Straße			6.14		6.44	7.10	7.14		7.28		7.44	8.14		8.44	9.14		9.44	10.14		10.44	11.14		11.44	12.14		12.44		13.13	13.14	
Christophorusweg			6.17		6.47	7.11	7.17		7.29		7.47	8.17		8.47	9.17		9.47	10.17		10.47	11.17		11.47	12.17		12.47		13.15	13.17	
Goßlerstraße			6.18		6.48	7.12	7.18		7.30		7.48	8.18		8.48	9.18		9.48	10.18		10.48	11.18		11.48	12.18		12.48		13.16	13.18	
Campus			6.20		6.50	7.13	7.20		7.32 Ⓣ		7.50	8.20		8.50	9.20		9.50	10.20		10.50	11.20		11.50	12.20		12.50		13.18	13.20	
Auditorium			6.22		6.52	7.15	7.22				7.52	8.22		8.52	9.22		9.52	10.22		10.52	11.22		11.52	12.22		12.52		13.20	13.22	
Weender Straße-West			**6.26**		**6.56**	**7.18**	**7.26**				**7.56**	**8.26**		**8.56**	**9.26**		**9.56**	**10.26**		**10.56**	**11.26**		**11.56**	**12.26**		**12.56**	**13.11**	**13.24**	**13.26**	
Markt			6.28		6.58	7.20	7.28				7.58	8.28		8.58	9.28		9.58	10.28		10.58	11.28		11.58	12.28		12.58	13.13	13.26	13.28	
Groner Straße			6.29		6.59		7.29				7.59	8.29		8.59	9.29		9.59	10.29		10.59	11.29		11.59	12.29		12.59	13.14	13.27	13.29	
Groner Tor			6.30		7.00		7.30				8.00	8.30		9.00	9.30		10.00	10.30		11.00	11.30		12.00	12.30		13.00	13.15	13.28	13.30	
Otto-Frey-Brücke			6.32		7.02		7.32				8.02	8.32		9.02	9.32		10.02	10.32		11.02	11.32		12.02	12.32		13.02	13.17	13.30	13.32	
Posthof			6.33		7.03		7.33				8.03	8.33		9.03	9.33		10.03	10.33		11.03	11.33		12.03	12.33		13.03	13.18	13.31	13.33	
Stadtfriedhof			6.34		7.04		7.34				8.04	8.34		9.04	9.34		10.04	10.34		11.04	11.34		12.04	12.34		13.04	13.19	13.32	13.34	
Gotteslager			6.35		7.05		7.35				8.05	8.35		9.05	9.35		10.05	10.35		11.05	11.35		12.05	12.35		13.05	13.20	13.33	13.35	
Krugstraße			6.36		7.06		7.36				8.06	8.36		9.06	9.36		10.06	10.36		11.06	11.36		12.06	12.36		13.06	13.21	13.34	13.36	
Backhausstraße			6.37		7.07		7.37				8.07	8.37		9.07	9.37		10.07	10.37		11.07	11.37		12.07	12.37		13.07	13.23	13.35	13.37	
St.-Heinrich-Straße			6.39		7.09		7.39				8.09	8.39		9.09	9.39		10.09	10.39		11.09	11.39		12.09	12.39		13.09	13.25	13.37	13.39	
Kauf Park-West			–		7.12		–				8.12	–		9.12	–		10.12	–		11.12	–		12.12	–		13.12		–	–	
Siekhöhe/Kauf Park			6.42		–		7.42				–	8.42		–	9.42		–	10.42		–	11.42		–	12.42		–		13.40	13.42	
Dransfelder Straße			6.43		7.14		7.43				8.14	8.43		9.14	9.43		10.14	10.43		11.14	11.43		12.14	12.43		13.14		13.41	13.43	
Groß Ellershausen			6.44		7.15		7.44				8.15	8.44		9.15	9.44		10.15	10.44		11.15	11.44		12.15	12.44		13.15		13.42	13.44	
Am Alten Krug		6.21	–		7.17		–			8.16	8.17	–		9.17	–		10.17	–		11.17	–		12.17	–		13.17		–	–	
Olenhuser Weg		6.22	–		7.18		–			8.17	8.18	–		9.18	–		10.18	–		11.18	–		12.18	–		13.18		–	–	
Auf der Schanze		6.23	–		7.19		–			8.18	8.19	–		9.19	–		10.19	–		11.19	–		12.19	–		13.19		–	–	
St.-Martini-Straße		6.27	–		7.23		–			8.22	8.23	–		9.23	–		10.23	–		11.23	–		12.23	–		13.23		–	–	
Mittelbergschule			6.46				7.46					8.46			9.46			10.46			11.46			12.46				13.44	13.46	
In der Wehm			6.48	6.54			7.48	7.57				8.48	8.54		9.48	9.54		10.48	10.54		11.48	11.54		12.48	12.54			13.46	13.48	13.54
Am Winterberg			6.51	–			7.51	–				8.51	–		9.51	–		10.51	–		11.51	–		12.51	–			13.49	13.51	–
Knutbühren				6.59				8.02					8.59			9.59			10.59			11.59			12.59					13.59

Ⓜ über Lutteranger weiter bis Markt
S nur an Schultagen

L Linien-Taxi (keine Bestellung)
Am 24.12. fahren die Busse bis ca. 18.30 Uhr und am 31.12. bis ca. 21.00 Uhr wie Samstag

Ⓣ weiter bis Haltestelle Jugendherberge

Leaving the venue – direction Zentrum

Linie 5 Nikolausberg - Universität Nord - Zentrum - Grone/Altdorf - Groß Ellershausen - Hetjershausen - Knutbühren (AST)

	Montag - Freitag																												SA
	S			L			L			L			L			L			L			AST		AST		AST		AST	
Auf der Lieth		13.30	14.00		14.30	15.00		15.30	15.59		16.29	16.59		17.29	17.59		18.29	18.59		19.29	20.10		21.10		22.10		23.10		5.12
Eschenbreite		13.31	14.01		14.31	15.01		15.31	16.00		16.30	17.00		17.30	18.00		18.30	19.00		19.30	20.11		21.11		22.11		23.11		5.13
Am Schlehdorn		13.32	14.02		14.32	15.02		15.32	16.01		16.31	17.01		17.31	18.01		18.31	19.01		19.31	20.12		21.12		22.12		23.12		5.14
Augustiner Straße		13.33	14.03		14.33	15.03		15.33	16.02		16.32	17.02		17.32	18.02		18.32	19.02		19.32	20.13		21.13		22.13		23.13		5.15
Ulrideshuser Straße		13.34	14.04		14.34	15.04		15.34	16.03		16.33	17.03		17.33	18.03		18.33	19.03		19.33	20.14		21.14		22.14		23.14		5.16
Faßberg		13.35	14.05		14.35	15.05		15.35	16.04		16.34	17.04		17.34	18.04		18.34	19.04		19.34	20.15		21.15		22.15		23.15		5.17
Burckhardtweg		13.37	14.07		14.37	15.07		15.37	16.06		16.36	17.06		17.36	18.06		18.36	19.06		19.36	20.16		21.16		22.16		23.16		5.19
Kellnerweg		13.38	14.08		14.38	15.08		15.38	16.07		16.37	17.07		17.37	18.07		18.37	19.07		19.37	20.17		21.17		22.17		23.17		5.20
Tammannstraße		13.39	14.09		14.39	15.09		15.39	16.08		16.38	17.08		17.38	18.08		18.38	19.08		19.38	20.18		21.18		22.18		23.18		5.21
Goldschmidtstraße		13.40	14.10		14.40	15.10		15.40	16.09		16.39	17.09		17.39	18.09		18.39	19.09		19.39	20.19		21.19		22.19		23.19		5.22 Ⓜ
Petrikirchstraße		13.41	14.11		14.41	15.11		15.41	16.10		16.40	17.10		17.40	18.10		18.40	19.10		19.40	20.20		21.20		22.20		23.20		
Ostlandweg		13.42	14.12		14.42	15.12		15.42	16.11		16.41	17.11		17.41	18.11		18.41	19.11		19.41	20.21		21.21		22.21		23.21		
Theodor-Heuss-Straße		13.43	14.13		14.43	15.13		15.43	16.12		16.42	17.12		17.42	18.12		18.42	19.12		19.42	20.22		21.22		22.22		23.22		
Rudolf-Diesel-Straße		13.44	14.14		14.44	15.14		15.44	16.13		16.43	17.13		17.43	18.13		18.43	19.13		19.43	20.23		21.23		22.23		23.23		
Christophorusweg		13.47	14.17		14.47	15.17		15.47	16.17		16.47	17.17		17.47	18.17		18.47	19.17		19.47	20.24		21.24		22.24		23.24		
Goßlerstraße		13.48	14.18		14.48	15.18		15.48	16.18		16.48	17.18		17.48	18.18		18.48	19.18		19.48	20.25		21.25		22.25		23.25		
Campus		13.50	14.20		14.50	15.20		15.50	16.20		16.50	17.20		17.50	18.20		18.50	19.20		19.50	20.27		21.27		22.27		23.27		
Auditorium		13.52	14.22		14.52	15.22		15.52	16.22		16.52	17.22		17.52	18.22		18.52	19.22		19.52	20.29		21.29		22.29		23.29		
Weender Straße-West	**13.41**	**13.56**	**14.26**		**14.56**	**15.26**		**15.56**	**16.26**		**16.56**	**17.26**		**17.56**	**18.26**		**18.56**	**19.26**		**19.56**	**20.33**		**21.33**		**22.33**		**23.33**		
Markt	13.43	13.58	14.28		14.58	15.28		15.58	16.28		16.58	17.28		17.58	18.28		18.58	19.28		19.58	20.35		21.35		22.35		23.35		
Groner Straße	13.44	13.59	14.29		14.59	15.29		15.59	16.29		16.59	17.29		17.59	18.29		18.59	19.29		19.59	20.36		21.36		22.36		23.36		
Groner Tor	13.45	14.00	14.30		15.00	15.30		16.00	16.30		17.00	17.30		18.00	18.30		19.00	19.30		20.00	20.37		21.37		22.37		23.37		
Otto-Frey-Brücke	13.47	14.02	14.32		15.02	15.32		16.02	16.32		17.02	17.32		18.02	18.32		19.02	19.32		20.02	20.39		21.39		22.39		23.39		
Posthof	13.48	14.03	14.33		15.03	15.33		16.03	16.33		17.03	17.33		18.03	18.33		19.03	19.33		20.03	20.40		21.40		22.40		23.40		
Stadtfriedhof	13.49	14.04	14.34		15.04	15.34		16.04	16.34		17.04	17.34		18.04	18.34		19.04	19.34		20.04	20.41		21.41		22.41		23.41		
Gotteslager	13.50	14.05	14.35		15.05	15.35		16.05	16.35		17.05	17.35		18.05	18.35		19.05	19.35		20.05	20.42		21.42		22.42		23.42		
Krugstraße	13.51	14.06	14.36		15.06	15.36		16.06	16.36		17.06	17.36		18.06	18.36		19.06	19.36		20.06	20.43		21.43		22.43		23.43		
Backhausstraße	13.53	14.07	14.37		15.07	15.37		16.07	16.37		17.07	17.37		18.07	18.37		19.07	19.37		20.07	20.44		21.44		22.44		23.44		
St.-Heinrich-Straße	13.55	14.09	14.39		15.09	15.39		16.09	16.39		17.09	17.39		18.09	18.39		19.09	19.39		20.09	20.45		21.45		22.45		23.45		
Kauf Park-West		14.12	–		15.12	–		16.12	–		17.12	–		18.12	–		19.12	–		20.12	–		–		–		–		
Siekhöhe/Kauf Park		–	14.42		–	15.42		–	16.42		–	17.42		–	18.42		–	19.42		–	20.47		21.47		22.47		23.47		
Dransfelder Straße		14.14	14.43		15.14	15.43		16.14	16.43		17.14	17.43		18.14	18.43		19.14	19.43		20.14	20.48		21.48		22.48		23.48		
Groß Ellershausen		14.15	14.44		15.15	15.44		16.15	16.44		17.15	17.44		18.15	18.44		19.15	19.44		20.15	20.49		21.49		22.49		23.49		
Am Alten Krug		14.17	–		15.17	–		16.17	–		17.17	–		18.17	–		19.17	–		20.17	–		–		–		–		
Olenhuser Weg		14.18	–		15.18	–		16.18	–		17.18	–		18.18	–		19.18	–		20.18	–		–		–		–		
Auf der Schanze		14.19	–		15.19	–		16.19	–		17.19	–		18.19	–		19.19	–		20.19	–		–		–		–		
St.-Martini-Straße		14.23	–		15.23	–		16.23	–		17.23	–		18.23	–		19.23	–		20.23	–		–		–		–		
Mittelbergschule			14.46			15.46			16.46			17.46			18.46			19.46			20.50		21.50		22.50		23.50		
In der Wehm			14.48	14.54		15.48	15.54		16.48	16.54		17.48	17.54		18.48	18.54		19.48	19.50		20.52	20.55	21.52	21.55	22.52	22.55	23.52	23.55	
Am Winterberg			14.51	–		15.51	–		16.51	–		17.51	–		18.51	–		19.51	–		20.55	–	21.55	–	22.55	–	23.55	–	
Knutbühren				14.59			15.59			16.59			17.59			18.59			19.55			21.00		22.00		23.00		0.00	

venue

Ⓜ über Lutteranger weiter bis Markt

S nur an Schultagen

L Linien-Taxi (keine Bestellung)

Am 24.12. fahren die Busse bis ca. 18.30 Uhr und am 31.12. bis ca. 21.00 Uhr wie Samstag

AST Anrufsammeltaxi - bitte 30 Min. vor Fahrtantritt unter Tel.: 0551-34034 oder 0551-38444843 anmelden

Internet Access Point

IOBC-WPRS
OILB-SROP

Internet Access Point

TRAPEZE smart mobile.

Trapeze Networks

Access Instructions

To connect as a wireless network guest user:

1. Use your wireless network connection software to connect to Goemobile
2. Launch a web browser like Windows Internet Explorer 8 or Firefox 3
3. Enter the user name and password exactly as shown below:

Name: IOBC@guest
Password: oilseed
Valid Since: Not Availabe
Expiration Date: 10/07/2011-13:01
User Type: GoeMobile-Gäste

Experiencing any problem?

Please contact Tom Oesterreich, Room 11
(ground floor, upstairs from basement level !!!
keep right to the **Internet Access Point**)

Map of the City Center

Meeting point of the guided city tour

Meeting point will be the Old Town Hall (3) in the city center. The tour will start at 18:00. The tour will last about one and a half hour.

Location of the Conference Dinner

The Conference Dinner will be hosted in the restaurant La Locanda, which is located in the Reinhäuser Landstraße 22, close to the Town Hall. The dinner will start at 20:00.