

BULLETIN No. 37

EUCARPIA

EUROPEAN ASSOCIATION FOR RESEARCH ON PLANT BREEDING
EUROPÄISCHE GESELLSCHAFT FÜR ZÜCHTUNGSFORSCHUNG
ASSOCIATION EUROPÉENNE POUR L'AMÉLIORATION DES PLANTES

February 2010

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<http://www.eucarpia.org>

EUCARPIA aims to promote scientific and technical co-operation in the field of plant breeding in order to foster its further development. To achieve this purpose, the Association arranges and sponsors meetings of its members to discuss general or specific problems. Each year, **EUCARPIA** organizes open conferences and colloquia throughout Europe. Founded at Wageningen (The Netherlands) in 1956 as a non profit organization, **EUCARPIA** has made considerable contributions to improving international contacts in plant breeding research. **EUCARPIA** has 11 sections and a number of working groups active in specific fields of interest.

EUCARPIA has individual members (scientists qualified in the field of plant breeding) and corporate members (research institutes, breeding stations, associations, societies etc.). A corporate membership is a collective membership for at most 10 persons.

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TABLE OF CONTENTS

PRESIDENTIAL ADDRESS	Hiba! A könyvjelző nem létezik.
Prof. Dr. Ir. E Jacobsen	7
EUCARPIA EXECUTIVE COMMITTEE	8
EUCARPIA SECTIONS AND THEIR CHAIRPERSONS.....	9
Country Representatives of EUCARPIA	10
SECTION REPORTS	11
Section Potatoes	11
Section Fodder Crops and Amenity Grasses	12
Section Biometrics in Plant Breeding.....	15
Section Genetic Resources.....	16
Section Maize and Sorghum	18
Section Vegetables.....	19
Section Fruit.....	20
Section Ornamentals	20
Section Organic and low-input agriculture	21
Report on the fourth year of the BIOEXPLOIT Integrated Project	23
The BIOEXPLOIT objectives	23
This diagram describes the workflow between the subprojects in the BIOEXPLOIT integrated project	25
The BIOEXPLOIT consortium:	26
APPACALE (ESP)	26
NEWS FROM THE EUCARPIA SECRETARIAT.....	39
MINUTES OF THE EXECUTIVE COMMITTEE MEETING.....	45
EUCARPIA MEETING CALENDAR FOR 2010 AND LATER.....	48
RECENT EUCARPIA PUBLICATIONS.....	49
Application for EUCARPIA membership.....	56

PRESIDENTIAL ADDRESS

In 2009 the worldwide plant breeding community paid their final respects to Norman E. Borlaug, the plant breeder who was one of the great humanitarians of the 20th century, and winner of the Nobel Peace Prize in 1970. As a consequence of his efforts, global food production expanded faster than the human population in the second half of the last century, thus averting mass starvation. He was responsible for initiating the Green Revolution in the 1950s, thereby saving millions of lives. Many people have now forgotten that 50–60 years ago, half of mankind was undernourished. This figure has now dropped to 13–15%, while the world population has increased two and a half times. By the year 2000 it became clear that the Green Revolution had fulfilled its role, making a substantial contribution to an increase in plant productivity, though in different ways in various regions at various times. This process was most spectacular in developing countries, but the results achieved and the change in attitude it engendered also left a deep impression on European plant breeding.

Like all plant breeders, Norman Borlaug was constantly looking ahead. After the successful completion of the Green Revolution he said in 2002, “today we are faced with another, equally enormous task. We must learn to produce nearly three times as much food for the more populous and more prosperous world of 2050, and from the farmland we are already using...”. In 2003 he raised other crucial questions, suggesting for example that “growing shortages of water will require that the 21st century will need to bring about a ‘Blue Revolution’, one in which water-use productivity is much more closely wedded to land-use productivity”.

I could continue to quote similar statements. A comparison of these statements with the predictions published by FAO for 2009 reveals how clearly Norman Borlaug saw the future. This was based on his realization that the developments in life sciences and other fields of science have opened up new perspectives and opportunities. In plant breeding, as in other disciplines, a scientific system has evolved which combines the fragmentation of the whole, reducing it to the molecular level, and the implementation of an integrated approach involving both the molecular and the whole organism level. This new approach opens up magnificent vistas in numerous fields, since it allows knowledge of plant functions at the molecular level to be utilised at the plant or population level. New branches of science, such as genomics and bioinformatics, play an important role in this process, and have led to important new

developments in medicine, the pharmaceuticals industry and increasingly in agricultural sciences.

Never before in the history of plant breeding has there been such a major change in attitudes and methodology as we are witnessing at present. Without it, there is no guarantee that we can meet the future challenges foreseen by Norman Borlaug. On behalf of EUCARPIA I would like to thank all our members for their contribution to the efficient and consistent implementation of these efforts.

Martonvásár, Hungary

February 2010

Zoltán Bedő

President of EUCARPIA



Norman E. Borlaug

Letter of view

Open competition in plant breeding needs functional co-existence between PBR and IPR

Until the start of plant biotechnology, plant breeding was made in an atmosphere of open innovation. Main trigger was that breeders exemption of existing varieties ensured open access also to protected varieties for breeding purposes. It is stimulating climbing on each others shoulder for improvement. This means that all traits present in protected varieties can be used for free in any new variety. In this way open competition for improvement is ensured and it results in a system in which a recently protected variety with a new trait can be replaced relatively quickly by another improved one of the breeder itself or of a competitor. In this way yield gain, needed for world food security, is ensured by a constant flow of new varieties but also open competition.

The history of plant breeders rights (PBR) in many countries of Europe is parallel to that of seed business. In the past, varieties were produced by universities and institutes and seeds sold by private companies. These companies started own breeding programs followed by strategic research and the role of institutes and universities changed gradually into pre-breeding and fundamental aspects of plant breeding, including plant biotechnology. In USA, PBR is much more weakly implemented than in Europe and many other countries.

Another big change came in the USA by the Bayh-Dole Act (P.L. 96-517; The Bayh-Dole Act, 1980). It gave public institutions ownership of discoveries by (industrial) IPR (Intellectual Property Rights) rather than making them freely available in the public domain. This was later triggering the simultaneous use of IPR in PBR protected varieties or in the USA by protecting varieties by “utility patents”. A utility patent is related 1. to products of genetic engineering because it can apply to the method used to engineer a plant, the genetic sequences that are inserted, and the plant that results; 2. but increasingly also to normal varieties and parental lines. There is no exemption as breeding parent for plant breeders or for farmers to use materials for own multiplication (“farmers privilege”), respectively. The same is true for the earlier mentioned varieties protected by a combination of PBR and IPR. The “IPR principle” is that in turn of sharing the invention after publication, the inventor is protected by prohibiting the use of it by others. The “PBR principle” is that the use of the new variety itself is protected in economic terms for a certain period of time but in turn the

protected variety is freely available to be used as breeding parent and “farmers privilege” can be practiced.

Plant breeders rights have been developed as a stand alone system because the industrial IPR system was inappropriate because of the view that plant material was not regarded as capable of meeting the requirements of novelty, inventive step and disclosure and it was thought to be of public interest not to permit a monopoly as practiced in the industrial IPR system. Therefore, PBR is protecting a variety like IPR for a certain period of time but free access to it as breeding parent in plant breeding is allowed. In Europe, the hunger periods between the First and Second World War resulted in 1938 in the foundation of the global association ASSINSEL of plant breeders for legal protection of plant varieties. The Breeder’s right system was set up under the UPOV-convention in 1961 which was revised in 1971, 1978 and 1991. It gives breeders rights to everyone who has bred a new variety.

In the revised UPOV-1991, 1. the new concept of Essentially Derived Varieties (EDV) was introduced in order to regulate breeders right of existing varieties after additional improvement by mutations or introgressions, and 2. “farmers privilege” was limited. In this EDV-concept improvements, for example, through genetic modification could be covered.

The application of PBR and IPR simultaneously or separately needs a lot of attention in order to secure the principle of open innovation and open competition in plant breeding, which is crucial for global food security. Yield gain in coming years highly needed and open access to germplasm, including IPR protected varieties, is the best key for it. Therefore functional co-existence agreements between PBR, which is strongly implemented in Europe, and IPR, which is strongly implemented in USA, have to ensure open innovation and blocking barriers have to be removed. This co-existence can only be improved by openly discussing weak and strong points of both systems and the willingness to change so that open innovation and competition still have an optimal chance in plant breeding. If nothing happens PBR and open competition will gradually erode in Europe.

Prof. Dr. Ir. E Jacobsen

Plant Breeding

Wageningen UR

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A. Blanco	Italy	B. Boller	Switzerland
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SECTION REPORTS

Section Potatoes

Dr John Bradshaw retired from the Scottish Crop Research Institute on the 31st of March 2009, and in the previous bulletin, announced that he was also standing down as section chairman. Although we in “Section Potatoes” know him best as a potato breeder, over a 32 year career at SCRI (previously the Scottish Plant Breeding Station), John also worked on the breeding and genetics of barley and brassicas (kale, swedes and turnips).

During his career as a potato breeder, John was committed to making the breeding process as efficient as possible, and the SCRI recurrent multitrait selection scheme, with its innovative use of progeny-based selection, mid-parent values and a three-year recurrent selection cycle is a testament to his success in this area. John is also one of the pioneers of the development of linkage and QTL mapping in tetraploids, and he once told me that his goal was to retire as a “molecular breeder”. I think he succeeded.

I would like to take this opportunity, on behalf of the section members, to wish him all the best in his retirement, and hope that he will still occasionally grace us with his presence at section meetings.

Unfortunately, the joint meeting with the EAPR Section Breeding and Varietal Assessment that was originally planned for the Czech Republic in 2009 could not be organised. Dr Herman Van Eck has kindly stepped into the breach and volunteered to hold the meeting in Wageningen. The tentative date for the meeting is the end of June 2010. Given the recent release of the draft sequence of the potato genome, we thought a theme examining its potential ramifications on potato breeding would be interesting. We will circulate more details about the meeting. Despite the relatively short notice, I hope the section membership will support the meeting through their attendance, and enable us to continue the tradition of stimulating and informative joint section meetings.

Dan Milbourne

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Section Fodder Crops and Amenity Grasses

Meetings

The 28th section meeting was held in La Rochelle (on the West coast), France, from 11 to 14 May 2009.

The chairman of the organising committee was Claude Tabel (RAGT seed company), Marc Lecrivain (working at Sicasov in Paris) was responsible for the budget, and Christian Huyghe of Inra Lusignan chaired the scientific committee.

The topics of the meeting were ‘Sustainable use of genetic diversity in forage and turf breeding’.

Five sessions were organised with invited papers and offered papers:

- genetic resources,
- genetic changes in grasslands and turf communities,
- genetic progress in regard to end-users’ expectations,
- molecular biology and biotechnologies for the management of genetic diversity in breeding
- structure of varieties.

The texts of the invited and offered papers had to be submitted before end of May. They were peer-reviewed, modified and edited. They will be published in 2010 as a book by Springer.

A full-day was devoted to visits. In the morning, groups visited either a dairy goat farm or a beef cattle farm. During the afternoon, four visits were organised and devoted to 1) conventional breeding (on the site of Jouffray-Drillaud breeding station), 2) analysis of the agronomic potential of grassland swards with a broad species diversity, 3) analysis of environmental impacts (nitrates, pesticides, gas emission, soil and sward biodiversity) of temporary grasslands and 4) variety registration for grass and legume species. These last three visits took place on the sites of Inra Lusignan, the last one being organised with GEVES.

A total of 135 persons from 25 countries attended this meeting. Special support was made available for young scientists (PhD and post-doc), making it possible to have a good attendance of numerous young researchers. The meeting was carbon-compensated for the

greenhouse gas emissions of the organisation process, the conference and the travel of the participants.

Information from the business meeting held in La Rochelle on 13th May 2009

As proposed by the Board, the business meeting decided to enlarge the board of the section. Dejan Sokolovic from Serbia (Eastern Europe) was approved by the audience. Susanne Barth (who was absent because on a maternity leave) was proposed. Her name was approved by the audience, and she accepted after being contacted by the Chairman.

Future meetings

The next section meeting will be held 2011 in Ireland, with Susanne Barth and Dan Milbourne of Teagasc Crops Research Centre, Oak Park as key persons in the organization. The meeting will be organised in Carlow, Ireland and will take place in September-October. The general theme will be 'Breeding strategies for sustainable forage and turfgrass improvement'. Special attention will be paid to achieve low fees and to have most accommodation in the same hotel.

A formal invitation was received from the Institute Forage Crops Krusevac, represented by Dejan Sokolovic, to hold the 2013 Section meeting in Serbia. This invitation was unanimously accepted by the Section Board. The meeting will be organized with support from the Institute for Field and Vegetable crops and is planned to take place in a hilly-mountainous region of Serbia.

New Festulolium Working Group

A core group comprising Mike Humphreys, UK (Chair) Zbigniew Zwierzykowski (Poland), Marc Ghesquière (France) initiated the establishment of a new Festulolium Working Group. The idea was warmly welcomed by the Section during its business meeting at La Rochelle and the Working Group became formally established after approval by the Executive Committee of Eucarpia.

The WG believes that changes in EU Legislation about Festulolium allow now to exploit fully the outcomes of research and provide the ability to develop and commercialize any Lolium x Festuca species hybrid. The recent great advances in the genomics of Festulolium will allow to design and develop new options for grassland agriculture in Europe. The WG aims to inform all interested parties and explain to them the reasons why breeders/seed industry/farmers/ policy makers should support and use Festulolium. A particular reason for “Festulolium now more than ever” is seen in climate change. The group will stress the novelty of Festulolium and its multifunctionality with possibilities for improved resistance to abiotic stresses (drought, cold, flooding), for stabilizing soils, for improved nutrient and water-use-efficiency, for improved crop persistency, and for maintenance and generation of biodiverse grassland communities, and for improved soil structure and hydrology to reduce overland flow of water and nutrients and to protect scarce water and nutrient reserves, and protect water quality.

The 1st Festulolium Working Group Workshop will be held 22-23 April 2010 in Poznan, Poland, organized by the Institute of Plant Genetics of the Polish Academy of Sciences, with Zbigniew Zwierzykowski as chairman of the Organizing Committee. Four sessions, each divided in a lecture and discussion part of equal length, will be dedicated to describe what is special about Festulolium hybrids, to how to best develop Festulolium cultivars for the grass seed market, to descriptions of trait variability, and to advances in genomics studies. Early registration is open until 15 February 2010. More information is found on www.eucarpia.org.

Publications

The Proceedings of the 27th Section Meeting , edited by Th. Lübberstedt, B. Studer and S. Graugaard, were printed with kind support from the Royal Veterinary and Agricultural University, Copenhagen, and were distributed to all attendants. They are also available online on the Section homepage, http://www.eucarpia.org/01sections/foddercrops/section_meetings2/sm2.html, then click on 27th meeting. As stated above, the proceedings of the 28th meeting will be published as a book by Springer.

Many members of the Section have contributed to the “Handbook of Plant Breeding” volume 5 devoted to “Fodder Crops and Amenity Grasses”. The book is edited by Beat Boller, Ulrich Posselt and Fabio Veronesi, present, past, and past-past chairmen of the Section. It is appearing in January 2010 at Springer.

Multisite rust evaluation trial

This trial series, lead by Franz Schubiger of Agroscope Reckenholz-Tänikon (ART) under the auspices of the EUCARPIA Fodder Crops and Amenity Grasses Section, has now been carried out in three experimental years, 2001, 2004, and 2007, and is planned to go in its 4th experimental year in 2010. The results of the first three trial series have been summarized in an article submitted to Euphytica, which is expected to appear in 2010.

Beat Boller

Section Chairperson

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Section Biometrics in Plant Breeding

The fourteenth and very successful meeting of the Biometrics in Plant Breeding Section of Eucarpia was held in Dundee from 2-4 September 2009. About 100 participants were registered from all over the world. The scientific committee for this meeting consisted of Fred van Eeuwijk, Chris Schoen, Christine Hackett, Ignacio Romagosa, Kristian Kristensen and Pawel Krajewski. The members of the local organising committee were Bill Thomas, Anne Rendall, Christine Hackett, David Marshall and Phil Taylor. Sponsors were Eucarpia, Dundee and Angus Convention Bureau, Dundee City Council, British Society of Plant Breeders, Rijk Zwaan, Nunhems, Pioneer, Florimond Desprez, KWS and VSNi – software for bioscience.

The meeting started on Tuesday afternoon, September 1, with a pre-conference QTL mapping workshop at the Scottish Crop Research Institute. Here the Biometrics team from Wageningen (Martin Boer, Marcos Malosetti and Fred van Eeuwijk) demonstrated together with Sue Welham and Darren Murray from (VSNi-Genstat / Rothamsted) the QTL mapping facilities in Genstat release 12.

The official program started on Wednesday, September 2, with Session 1 on Association Mapping, chaired by Fred van Eeuwijk and an invited lecture by Ed Buckler. On the same

day, Session 2 on Selection Responses was chaired by Chris Schoen and invited lectures were given by Mark Cooper and Ian Mackay. In the evening there was a special buffet/ reception offered by the Lord Provost at Dundee City Chambers.

The second day of the meeting, Thursday, September 3, contained in the morning Session 3 on Statistical methods, chaired by Ignacio Romagosa with an invited lecture by Sue Welham. The end of morning was reserved for the business meeting. The afternoon was dedicated to a tour of the Edradour Distillery including whisky tasting. The evening program consisted of the conference dinner and a presentation to Mike Kearsey on board HM Frigate Unicorn.

The last day, Friday, September 4, had Session 4 in the morning on Systems biology chaired by Kristian Kristensen and an invited lecture by Dirk Husmeier. The afternoon presented Session 5 with the title ‘ Developments in design’ chaired by Pawel Krajewski and with an invited lecture by Brian Cullis. The closing talk was by Mike Kearsey with the telling title ‘What have the Biometricians ever done for us?’. The meeting closed at 15.00.

The meeting had an excellent scientific program (thanks to scientific committee and sponsors), was held at a fantastic location, and offered state of the art facilities and logistics (thanks to local committee and sponsors). The proceedings of the meeting will be published in a special issue of Euphytica. The next meeting will be in Hohenheim, Germany. Chairman of the local organizing committee will be Hans-Peter Piepho. We wish him good luck in the preparation, and we thank everyone involved in making the Dundee meeting a big success. We hope to see you all in Hohenheim.

Fred van Eeuwijk

Section Chairperson

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Section Genetic Resources

The section held its 19th conference in Ljubljana, Slovenia from 26 – 29 of May 2009 kindly hosted by the Agricultural Institute of Slovenia and organised by Dr. Vladimir Meglič and his colleagues. The meeting was well-attended with 122 participants from 29 countries. Apart from the European countries also Mexico was represented.

The conference program was divided into four sessions; Searching for traits, Rationalization of ex situ collections and sharing of responsibilities, Utilization of gene banks and gene bank accessions, and Material for special products. Oral and poster presentations were given and thoroughly discussed by the participants at the end of each session. The topics covered a wide range of issues from collecting of plant genetic resources to conservation and utilisation. It was evident that methods and techniques which are used today by many gene banks and research institutions have become very sophisticated and specialized in order to fulfil the requirements for thorough studies of individual traits, genetic diversity and composition of gene bank collections. However the need for development of good collaboration strategies in order to make the best use of all the resulting data and knowledge coming out of the research and to transfer it into practical use was emphasised by several participants. High quality documentation was one of the key works during the conference.

Definition of common goals for gene banks and plant breeders and improved coordination of tasks were also discussed. It was considered that defined roles of gene banks, research institutes and plant breeding companies could facilitate an increased investment in research areas such as trait mining, evaluation and exploration of the diversity. This in turn could lead to enhancement of germplasm and pre-breeding initiatives and ultimately new cultivars with traits and qualities necessary to meet the future challenges and needs of the world. Partnership was another key word during the discussions also exemplified by presentations given by FAO and ECPGR representatives.

The conference participants were taken on a very nice and interesting half day excursion during which some experimental fields of Agriculture Institute of Slovenia (AIS) and the hops and MAP gardens of Institute of Hop and Research Brewing of Slovenia (IHPS) were demonstrated. The excursion ended by tasting of excellent beer and local food at IHPS.

A book of abstracts of oral and poster presentations is available and a conference proceedings with full text of the presentations is under preparation.

The next meeting of the Genetic Resources section is planned to be held in 2011 hosted by the Centre for Genetic Resources in Wageningen, the Netherlands. Further information will be presented at the EUCARPIA information portal in due time.

Eva Thörn
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Section Maize and Sorghum

The XXI. Conference EUCARPIA Conference of the Maize and Sorghum section “Maize and Sorghum Breeding in the Genomics Era” was held in Bergamo (Italy) from 21 to 24 June, 2009. The members of the Organization Committee were: Yves Barrière (France), Janos Berenji (Serbia), Alain Charcosset (France), Alfons Gierl (Germany), Frank Hochholdinger (Germany), Kosana Konstantinov (Serbia), Csaba L. Marton (Hungary), Albrecht Melchinger (Germany), Montserrat Pages (Spain), Atanasios Tsaftaris (Greece), Fred van Eeuwijk (The Netherlands), Johan van Waes (Belgium), Mario Motto (Italy).

The Conference consisted of invited full lectures (17), short oral communications (28), and selected posters (80) covering the following topics:

1 - Frontiers in breeding for complex traits. Dissection of complex trait. Breeding by designlinking gene discovery to trait improvement. Molecular breeding. Marker assisted selection. Heterosis: genetic and molecular bases. Genotype-environment interaction.

2 - New molecular tools and technology for breeding. High throughput genotyping and phenotyping. Tilling and mutant screening. Single feature polymorphism. Epigenetics as new source of variability. RNAi technology and applications. New transgene technology products and markers. DH in recurrent selection and hybrids development.

3 - Breeding for quality, nutritional, and micronutrients. Genetic approaches to identify genes underlying quality traits. Metabolic pathways. Starch, proteins, oil, new components. Forage quality. Seed and embryo development.

4 - Exploitation of genetic resources. Germplasm characterization and exploitation. Association between gene polymorphism and trait variation. Bridging genomics and genetic diversity.

5 - *Breeding for resistance to biotic and abiotic stresses*. Genetic resistance to fungi, bacteria, viruses, and insects. Mycotoxin management via genetic resistance. Use of crop physiology/biochemistry to enhance breeding for drought tolerance, water use efficiency, suboptimal temperatures, salt and metals, nitrogen-use efficiency.

6 - *Breeding for industrial uses*. Genetic approaches for biofuel productions and biomass properties. Cellulosic ethanol. Cell wall biogenesis.

7 - *Regulatory issues*. New technologies and registration of varieties. Transgenic plant detection and regulation. Mycotoxin limits.

182 participants from 26 countries took part in this Conference that was informative and successful for all participants. The quality of the presentations was mostly very good and rich in substance.

Mario Motto, Director of the CRA-Maize Research Unit of Bergamo was elected as new chairman of the Maize and Sorghum Section and the Eucarpia members chose Osijek, Croatia, as the location of the next Conference that will be organized by Dr. D. Simic in 2011.

Mario Motto

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Section Vegetables

The section Vegetables had a quiet year in 2009, because none of the working groups convened this year. However, we are already looking forward to an exciting meeting in Valencia in September, of the working group on Genetics and Breeding of Capsicum and Eggplant. This meeting, the fourteenth of this working group, is being organized by Jaime Prohens and his colleagues of COMAV, and is timed such that it directly follows the 28th International Horticulture Congress late in August in Lisbon.

Delegates can easily cross the Iberian peninsula to join the meeting in Valencia.

Unfortunately the organization of the meeting of the Carrots working group has once more met with severe difficulties and we are still looking for options to get this group together again, hopefully in 2011.

Also in 2011 the next meeting of the Leafy vegetables working group will take place in France, time and place to be announced.

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Section Fruit

This year has seen the publication of the Proceedings of the XII Symposium on Fruit Breeding and Genetics held in Zaragoza (Spain) in September 16-20, 2007. These Proceedings constitute volume 814 of Acta Horticulturae which was published by the ISHS in two volumes with a total of 872 pages. The editing task was mostly undertaken by Associate Editors M.T. Espiau and J.M. Alonso as well as by a great numbers of reviewers in order to attain the highest scientific level in all papers. Unfortunately, not all contributions could be published due to some problems derived from the lack of response to the efforts of the reviewers. The Editorial Board included members from France (D. Esmenjaud and F. Laurens), Italy (S. Sansavini), the United Kingdom (K. Evans) and the United States (G. Fazio), as well as a retired distinguished breeder from Germany, our friend M. Fischer. In addition, a large group of Spanish researchers made valuable contributions to this reviewing process, including G. Llácer, F. Dicenta, M.L. Badenes, M.J. Rubio-Cabetas, J. Gómez Aparisi, I. Hormaza, P. Arús, M.A. Moreno, A. Pina, and O. Kodad.

The next Symposium will be held in Warsaw (Poland) and is now under preparation.

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Section Ornamentals

The XXIIIrd International Eucarpia symposium, section ornamentals “Colourful Breeding and Genetics”, was organized by Wageningen University and Research Center in cooperation with Plantum NL and 4 ornamental plant breeders of the Netherlands. The symposium aimed to be

a platform for exchange of knowledge between scientists and plant breeders working on ornamentals from all over the world. The main theme of this symposium was “Colourful breeding and genetics”. The meeting had sessions with oral presentations on biodiversity, flower colour, interspecific hybridization, resistance breeding, plant breeders’ rights, breeding and genetics, marketing and molecular breeding. In addition to the molecular breeding session there was a molecular marker workshop to inform breeders and scientists on the prospects of molecular assisted breeding. In addition to the oral presentations, 20 out of 120 posters were presented as a short oral-presentation in 5 minutes in two sessions. The location for the symposium was the beautiful renewed concert hall ‘Stadsgehoorzaal’ in Leiden, close to the ornamental breeding industry. Besides 3 days with presentations, one day was devoted to excursions. Five different excursions were organized visiting the flower auctions of Aalsmeer and Naaldwijk in the early morning followed by visits to ornamental breeding companies and research Institutions (Fides, Hilverda Kooij, Hilverda De Boer, Beekenkamp Ornamentals, Florist, Syngenta; NAKTuinbouw, Keygene and Wageningen University).

In total more than 280 participants from 40 countries attended the meeting. The proceedings of the symposium were published in Acta Horticulturae volume 836 and were ready for the participants during the meeting. A second volume of Acta Horticulturae will be prepared within six months after the meeting and will contain the papers of a number of selected posters and the evaluation presented by Alain Cadic at the end of the symposium. The book of abstracts can be downloaded from the congress website www.ornamentalbreeding.nl. The next meeting will be held in Poland (organizer Teresa Orlikowska).

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Section Organic and low-input agriculture

The Eucarpia section meeting this year was organised in cooperation with the EU projects Bioexploit and EU SOL from 25 – 27 February 2009 in Wageningen, the Netherlands and was focused on ‘the role of Marker Assisted Selection in breeding varieties for organic agriculture’. The aim of this workshop was to facilitate a broad discussion with invited speakers on the state of the art and progress in relation to whether, when and how breeding

programs for organic agriculture can benefit from Marker Assisted Selection. Standards for organic agriculture do not exclude the use of molecular markers as such, however for the organic sector the appropriateness of molecular markers is not self-evident and is often debated. In an open and very fruitful discussion with some 50 breeders and researchers working both in organic and conventional breeding programs, the strengths, weaknesses, opportunities, and threats of the use of molecular markers for breeding for organic varieties were debated. Clear strengths were identified, but also common concerns among breeders aiming at breeding for organic and/or conventional agriculture. A major conclusion of the authors is that more interaction and mutual understanding between organic and molecular oriented breeders is necessary and can benefit both research communities. Some of the participants have joined together and submitted a paper on the SWOT analysis produced during the workshop. Hopefully this will be published in a scientific journal in 2010.

The next Eucarpia Section meeting will be in Paris, 1-3 December 2010. The topic will be: 'Breeding for organic and low-input farming systems with a special emphasis on strategies that allow for more resilience in response to global change'.

While organic and low-input agricultural systems are more exposed than conventional ones to heterogeneous environments, low nutrient availability and biotic as well as abiotic pressures, global change might increase uncertainty in environmental conditions by producing drastic variation in climate, epidemic pressures, nutrient availability, etc. These changes could be considered an opportunity for the organic sector to develop original and innovative strategies for high level resilience. This conference wishes to take inspiration from the ecological sciences to reconsider the use of biodiversity without ignoring the new tools coming from genomics.

This conference will be jointly organized by INRA (UMR Le Moulon, SAD-Paysage Rennes, Montpellier) and ITAB. There will be a call for papers for oral and poster presentations to be published on the Eucarpia website.

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Report on the fourth year of the BIOEXPLOIT Integrated Project

Project full title: Exploitation of natural plant biodiversity for the pesticide-free production of food

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The BIOEXPLOIT objectives

The aim of the Integrated Project BIOEXPLOIT is to force a break-through in exploiting natural host plant resistance by developing efficient and rational breeding strategies using genomics and post-genomics tools. Two strategies are followed to design new resistant varieties: i) marker-assisted breeding and ii) genetic engineering. In the shade of the discussions on GMOs, marker-assisted breeding has gone through a silent revolution and has become a realistic option for developing new varieties with multiple resistance specificities. The development of high through-put technologies for selecting plants at the seedling stage shortens the time between the first cross involving wild species and introduction on the market considerably, for some crops even with 50%. Genetic variation in wild relatives of crop species is still largely unexplored.

The BIOEXPLOIT integrated project addresses four strategic objectives:

- 1) To understand the molecular components involved in durable disease resistance
- 2) To explore and exploit the natural biodiversity in disease resistance
- 3) To accelerate the introduction of marker-assisted breeding and genetic engineering in the EU plant breeding industry
- 4) To coordinate and integrate resistance breeding research, to provide training in new technologies, to disseminate the results, and to transfer knowledge and technologies to industry

BIOEXPLOIT focuses on wheat and potato - the two most important staple crops for consumers in the EU - for which pesticides, mainly fungicides, are indispensable at the moment. Despite their importance as food crops for Europe, investments in genomics and

post-genomics research on wheat and potato have been severely lagging behind when compared with rice or even tomato. In addition, wheat and potato have not been model species for the scientific community to unravel disease resistance, and, as a consequence, basic knowledge and tools to design new resistances are often poorly developed. The coming years a critical mass on genomics research in wheat and potato will be essential to strengthen the competitiveness of European small and medium size enterprises.

BIOEXPLOIT has translated the strategic objectives into eight research objectives, which represent the subprojects in the integrated project:

- **Subproject 1** identifies targets for durable resistance by analysing the function of effector molecules from the oomycete *Phytophthora infestans* in potato and from the fungal mildew and rust pathogens in wheat;
- In **Subproject 2** mapping, isolation and characterisation of genes responsible for qualitative and quantitative disease resistance in potato and wheat is taking place;
- **Subproject 3** aims at unravelling the molecular mechanisms underlying innate resistance to plant pathogens;
- In **Subproject 4** the natural biodiversity on genetic loci associated with disease resistance in wheat and potato accessions (and identified in subproject 2) is being explored in European genebanks;
- All subprojects mentioned above feed into **Subproject 5** in which disease resistance in potato and wheat is being increased through marker-assisted breeding (MAB);
- In **Subproject 6** knowledge from upstream subprojects is integrated to increase disease resistance in potato and wheat through genetic engineering;
- In **Subproject 7** a programme is being developed to provide training and workshops for researchers, breeders, research managers, industrial executives and other potential users of the innovative disease resistance breeding technologies;
- The activities in **Subproject 8** are focussed on the dissemination and exploitation of project results, and to transfer technology to industry.



This diagram describes the workflow between the subprojects in the BIOEXPLOIT integrated project

The BIOEXPLOIT consortium:

The BIOEXPLOIT project integrates the effort of 43 organizations from 15 different countries. From these organizations, 68 research laboratories are active in BIOEXPLOIT making up a unique assembly of scientific and technological specializations (e.g. plant pathologists, population geneticists, molecular biologists, molecular and classical plant breeders from academia, research institutes, SMEs and industry). The organizations involved in the project are:

Wageningen University (NL)
Institute National de Recherche Agronomique (F)
Scottish Crop Protection Institute (UK)
John Innes Centre (UK)
Sainsbury Laboratory (UK)
University of Dundee (UK)
Rothamsted Research (UK)
Institute of Plant Genetics and Crop Plant Research (D)
CGN (NL)
Max-Planck Institute for Plant-Breeding Research (D)
Royal Veterinary and Agricultural University (DK)
Danish Institute of Agricultural Sciences – Aarhus University (DK)
University of Helsinki (SF)
Plant Research International (NL)
Plant Breeding and Acclimatization Institute (PL)
Institute of Field and Garden Crops (IL)
University of Haifa (IL)
University of Bologna (I)
NEIKER (ESP)
Romanian Academy Institute for Biochemistry (RU)
University of Amsterdam (NL)
Instituto Nacional de Investigaciones Forestales Agrícolas y Pecuarias (MX)
Swiss Federal Institute of Technology Zurich (CH)
University of Zurich (CH)
Agricultural Research Institute Hungarian Academy of Sciences (HU)
RISØ National Laboratory - University of Aarhus (DK)
European Association for Plant Breeding (EU)
European Association for Potato Research (EU)
Keygene N.V. (NL)
National Institute of Agricultural Botany (UK)
Società Produttori Sementi Bologna (I)
Stichting Stimulering van Aardappelonderzoek (NL)
Federation Nationale des Producteurs de Plants de Pomme de Terre (F)
BioPlante (F)
AgroVegetale SA (ESP)
ZAMARTE Breeding Company (PL)
SZELEJEWÓ Breeding Company (PL)
APPACALE (ESP)
Saaten-Union Resistenzlabor GmbH (D)
SOLANA Research GmbH (D)
Austrian Institute of Technology GmbH (AUS)
KWS Lochow GmbH (D)

What's news and noteworthy from BIOEXPLOIT's fourth year:

WP1.1: Identification and analysis of fungal effector molecules (/ avirulence genes)

The objective of work package 1.1 is to identify and characterise effector/*Avr* genes from *P. infestans*, *M. graminicola*, and *B. graminis*.

In the fourth year of BIOEXPLOIT, research on *P. infestans* avirulence genes focused on the RXLR-dEER effectors IPI-O and AVR1. IPI-O is the *Avr* counterpart of the *R* gene *Rpi-blb1*. Mexican isolates virulent on *Rpi-blb1* containing potato lines were analyzed and compared to isolates that are avirulent on *Rpi-blb1* lines. This revealed that the virulent isolates lack one specific of IPI-O variants, the class I variants, but do possess class II and III variants. Apparently, the presence and expression of a class II *ipiO* variant does not guarantee that the isolate is blocked by *Rpi-blb1*. These results suggest that in the virulent isolates the class II IPI-O variant is suppressed by other effectors. This information can be used to predict the virulence of field isolates on *Rpi-blb1* potato.

The focus in the work on *B. graminis* was on the co-evolution of AVR_{k1} paralogs with retrotransposons. In silico analysis revealed that the AVR_{k1} family is the largest family of effector paralogs discovered so far in a fungal genome. Analysis of flanking regions revealed that the frequency with which members of the AVR_{k1} and TE1a retrotransposon lineages occur together in the genome is highly significant. The coevolution between these two entities indicates that they move and evolve together. This association likely benefits the pathogen by providing a mechanism for amplifying and diversifying effectors, which would increase the pathogen's mean fitness in the presence of diverse plant resistance genes.

For determining the rate of variation in avirulence genes a bioinformatics pipeline was developed that consists of several analytical steps (i.e. Clustal blast, MUSCLE, Pal2Pal, and PAML). Automated connections between the individual analytical steps in the pipeline have been established and the successive steps now feed into each other without manual input of an operator. A previously encountered key bottleneck was solved and the successful test runs were performed with the *P. infestans* genome/proteome as input.

WP1.2: Studying the cost of losing avirulence effector activity, as a predictor of durable resistance

The objectives of work package 1.2 in BIOEXPLOIT are:

- to develop new plant and pathogen resources.
- to estimate the cost of virulence in fungal pathogens of potato and wheat.
- to determine the stability of costs of virulence in different environmental conditions.
- to test the involvement of induced resistance in the cost of virulence.

In order to measure fitness costs associated with the loss of virulence, it is necessary to create appropriate strains of both host and pathogen that allow the isolation of specific fitness costs. In the wheat-*P. striiformis* pathosystem, appropriate pathogen and host strains were developed and preliminary tests have already been conducted. The outcome was relatively clear for one Avr-R-gene combination, there was no fitness penalty associated with loss of avirulence. This suggests that this R protein is not likely to be durable in agroecosystems. In the wheat-*M. graminicola* pathosystem, appropriate host materials were developed, and crosses were made to create appropriate pathogen materials, but the pathogen phenotypes of the progeny were not as expected, suggesting that Avr genes in these crosses were not inherited as Mendelian factors or that other genes related to aggressiveness overwhelmed the phenotypic effects of the Avr genes. Additional work is underway to try to develop appropriate *M. graminicola* strains, but it appears likely that another approach will be needed to measure fitness costs associated with virulence in *M. graminicola*. Preliminary work focused on cell wall degrading enzymes shows promise.

For the third and fourth objectives, preliminary experiments were conducted and appropriate methodologies for measuring virulence and induced resistance were developed for both of the wheat pathogens. A preliminary experiment indicated that induced resistance may play a significant role in the *P. striiformis* pathosystem.

WP 1.3: Studying the evolution of avirulence genes in response to selection in agriculture, to predict resistance deployment strategies that maximise the durability of resistance

The objectives of work package 1.3 in BIOEXPLOIT are:

- to examine the relative importance of selection and genetic drift in generating diversity in virulence in potato late blight.
- to investigate the interaction of selection with dispersal and sex in generating virulence diversity in septoria of wheat.
- to test the roles of mutation and parasexual recombination in generating new virulences in yellow rust of wheat.
- to investigate the interaction of selection with long-distance dispersal, using wheat yellow rust as a model.
- to identify isolates of wheat brown rust with avirulence/virulence cognate to new sources of resistance.

It was demonstrated that the most aggressive isolates of *P. infestans* have a lower transmission across seasons than least aggressive ones, indicating a trade-off between pathogen transmission and aggressiveness. Furthermore, a publication by Montarry et al (2008) - Journal of Evolutionary Biology 21:1397-1407 shows that French populations of *P. infestans* are not structured geographically, but are adapted to the most abundant host genotype. Allelic variation of effector candidates was studied and structural genome differentiation at the dispensable chromosomes was determined in several international *M. graminicola* panels. Genomic libraries were prepared from two strains of *Puccinia striiformis* f.sp. *tritici* and they have become available for Solexa sequencing. For future transcriptome studies, cDNA libraries have been prepared from both pairs of wildtype-mutant isolates and ready for Solexa sequencing. Two AFLP primer combinations and 15 microsatellites were used to screen all the isolates. The North African population genetic structure demonstrates a clonal evolution and a narrow genetic base. The diversity is higher in the Middle East and in Pakistan. The molecular profiles of the Mediterranean population differ strongly from the North-West European population. Publication of a paper: Bahri et al., 2009, Molecular Ecology 18: 4165-4179. A paper on this subject has been written by L.U. Wingen, M.W. Shaw and J.K.M. Brown and will shortly be submitted to a peer-reviewed journal.

WP 2.1: Genetic and Physical Mapping of major R genes and QTLs associated with resistance to major fungal pathogens

The objectives of work package 2.1 are:

- To establish for representative mapping populations in which resistance traits are segregating.
- To construct and distribute immortal populations to enhance the analysis of complex phenotypes. To genetically map major *R* genes and QTL associated with novel and/or effective forms of disease resistance that are segregating in these populations.
- To initiate the physical mapping of *R* gene or QTL loci (prior to progression into WP2.2).

Many representative segregating populations from wheat (Bread and Durum), barley and potatoes have been generated in the first 48 months of BIOEXPLOIT and in some cases in the cereals advanced through several generations towards fixation. Continuing work in this objective involves the final cycles of crossing or multiplication for maintenance and distribution of inbred lines. Much of the successes in this objective have been reported previously.

The overall objective of the work was to produce and maintain safely clonal populations segregating for resistance to *P. infestans*). Two mapping populations were previously developed crossing *Solanum tuberosum* dihaploids as females with *S. sparsipilum* and *S. spegazzinii* clones. These two populations were phenotyped for quantitative late blight resistance and the test indicated that both of them were interesting because they were carrying strong QTL involved in expression of the targeted character. Novel populations were also developed relying on resistance sources that were detected in *S. tuberosum*, *S. berthaultii* and *S. phureja*. Connected populations were obtained crossing *S. tuberosum* with "*S. tuberosum* x *S. berthaultii*" interspecific hybrids. Additional populations were created crossing *S. tuberosum* susceptible dihaploids with a *S. tuberosum* resistant dihaploid and a *S. phureja* resistant clone. All the material was phenotyped for *P. infestans* resistance in outdoor conditions and using a stem test under controlled conditions. The potato populations developed are multiplied vegetatively *via* tubers. All populations were also introduced *in vitro* in order to be maintained more safely, to accelerate multiplication and facilitate distribution to partners. Populations were distributed to partners either as tubers, *in vitro* plantlets or leaf samples for DNA extraction

WP2.2: Isolation and characterisation of R genes and QTLs for resistance

The objectives of workpackage 2.2 are:

- To clone major *R* genes and genes controlling polygenic resistance.
- To characterise these genes by investigating, validating and understanding their role in resistance.

Considerable progress has been made towards these objectives. To date four functional potato resistance genes against *P. infestans* (*Rpi* genes) have been isolated, Candidate genes for a field resistance QTL on chromosome IV and for a novel source of resistance from *Solanum caripense* on LG IX are at the functional testing stage. Use of candidate gene approaches is lessening the requirement for construction of a new BAC library for each targeted resistance gene, reducing the amount of resource needed.

The cereal aspects of this WP have also advanced significantly. For *Rphq11* the identification of two strong candidate genes is a major advance. Good progress has been made towards identifying Yr17 and Yr15 using physical maps across these loci. Markers and BAC clones very close to Yr15 have been developed using a fine mapping strategy.

Transformation of barley cultivars other than Golden Promise remains a technical obstacle for the demonstration of function for candidate barley resistance genes. A novel approach is being used to try to produce new lines with improved transformability and susceptibility to certain fungal pathogens. A cross between SusPtrit and Golden Promise, from which a DH population has been developed in order to identify plants with high susceptibility to *P. hordei* and *P. triticina* from SusPtrit, and the ability to be transformed from Golden Promise.

Genetic modification of many potato varieties is relatively facile and so demonstration of function for candidate potato genes is more straightforward than in the cereals. In the work on *S. caripense*, an unexpectedly large number of candidate gene alleles were obtained. Ten clones amplified from a pool of late blight resistant progenies that showed distinct sequences were subjected to transient expression assays in tobacco *N. benthamiana* leaves via the infiltration technique reported previously. This approach allowed putative identification of 13 constructs conferring at least partial resistance.

WP 2.3 Genomic organisation and evolution of major *R* genes and QTLs associated with disease resistance

The objective of workpackage 2.3 are:

- to resolve the genomic organisation, structural diversity and
- evolution of major *R* genes and QTLs associated with disease resistance.

Research on potato was focusing on the analysis and genomic organization of NBS-LRR RGA sequences in more than 288 anchored BAC clones. Up to 740 complete or truncated RGAs were determined and clusters were mapped on the different potato chromosomes and their sequences were subsequently compared to known *R* genes. On the same species a QTL meta-analysis has been performed. A total of 21 QTL maps and 8 reference maps from literature were integrated in the QTL meta-analysis on the whole potato genome the initial number of late blight QTLs by clustering 144 QTLs into 26 meta-QTLs. Positions of late blight resistance meta-QTLs were compared to positions of *R*-genes and of *R*-gene-like or defence-related loci.

In wheat, an experiment was carried out to check whether in the *Aegilops ventricosa* introgression carrying the Yr17, Lr37 systematically occurs on the A genome. We continued anchoring and sequencing of wheat BAC clones with NBS-LRR PCR-derived markers, with a focus on those that are polymorphic between hexaploid wheat cultivars Chinese Spring and Renan, for which BAC libraries are available. Several of the BAC clones are being sequenced and analyzed and several of the NBS-LRR markers were profiled.

WP2.4 Computer aided modelling of R proteins

The objectives of work package 2.4 are:

- To resolve the evolution of recognition specificities in *R* proteins by using computer aided modelling of protein structure.
- This aims to assist the experimental effort of identifying the amino acid residues involved in protein recognition and to generate evolutionary models of recognition specificity of this highly homologous gene class.

In year 4, good progress has been made and the activities contribute directly to the objective of this Workpackage. This has resulted in the computer aided 3D model of additional members of the SPRYSEC effector protein family (RBP-1) from *Globodera pallida* based on previous work on a similar SPRY effector protein from the sibling species *G.*

rostochiensis. For the wheat R protein Lr10 and Mla10, homology modeling was performed for the NBS and LRR domains using the models generated for Rx1 and Gpa2 as a template. For these two closely related R proteins, a docking model of the LRR and NBS was produced, resulting in the prediction of an interaction surface between the NB and ARC domain with the N-terminal half of the LRR domain. Based on this model we could determine potential target sites for mutagenesis studies in WP6.1 to investigate their role in the functioning of Rx1 and Gpa2. Finally, an *ab initio* model was generated for the CC domain of Rx1 and Gpa2.

WP3.1: Identification and characterization of the molecular components in pathogen recognition complexes

The objectives of workpackage 3.1 are:

- To identify molecular components in pathogen recognition complexes.
- To assess functions of molecular components in pathogen recognition complexes.

We aim to resolve the identity of the molecular targets of pathogen effectors in a host. For effectors associated with avirulence, the host interactors are expected to interact or to be part of R protein containing protein complexes. In the current models the pathogen effectors with avirulence activity, their molecular targets, and R proteins collectively make up the pathogen recognition complexes. In the fourth year of BIOEXPLOIT we have approached these pathogen recognition complexes by using pathogen effectors as baits to screen host cDNA libraries for interacting host proteins. We have also approached resolving pathogen recognition complexes from the R protein ‘angle’ by searching for proteins interacting with R proteins, or parts thereof. Ideally these two approaches should complement each and converge on a single complex. However, the number of interactors we find both for effectors and for (parts of) R proteins suggest that effectors have multiple targets and that R protein containing complexes consist of multiple (multimeric) components. We have not yet resolved all the components of a single functional pathogen recognition complex whose activation leads to R protein-dependent immunity, but by using the identified components as baits we have the tools in hand to find them.

The second objective aims at the functional analysis of host interactors of either pathogen effectors or R proteins. Several research groups employed overexpression of effectors in plants and found a suppression effect on basal defenses of the plants. Strikingly, the apparent immune suppression by these effectors affects the virulence of often entirely un-related pathogens. In these studies effectors were included either with or without cognate avirulence

activity that had been selected based on their involvement either with PAMP-triggered immunity or effector-triggered immunity.

WP3.2 Dissection of the architecture of disease resistance signalling pathways

The objectives of work package 3.2 are:

- To use targeted gene and protein expression profiling, phage display library screening, yeast two hybrid screening and bioinformatics to identify candidate genes involved in disease resistance signalling.
- To validate the function of candidate disease resistance signalling genes by a combination of (single-cell) silencing and gene overexpression.
- To combine gene expression profiling and haplotype analysis in barley and wheat to identify genes involved in quantitative disease resistance/signalling.

Various plant systems have been exploited to eventually identify candidate genes involved in defense signaling. The Cf/Avr system, in which defense responses can be triggered at will by performing a temperature-shift of the plants, has provided very reliable and solid results concerning differential gene expression studies. Also resistant (Cf-4) and susceptible (Cf-0) tomato showed highly reproducible responses when analysed by microarrays. In addition to several (known) genes that are up-regulated in resistant plants, also several genes were found to be down-regulated in susceptible plants. Most of the latter genes encode cell wall proteins and silencing studies have been initiated to test the role of these proteins in basal defense and in Cf/Avr-induced defense responses. Concerning the studies on defense responses in potato and *Nicotiana benthamiana*, a tool set was made to study defense gene expression by real-time PCRs. In addition, a transgenic potato line was generated that expresses a tagged version of a nematode SPRYSEC protein, which is an effector of this pathogen, to study its effect on defense related gene expression.

WP3.3 Biochemical and biophysical characterisation of inter-and intramolecular interactions in recognition complexes and disease resistance signalling pathways

The objectives of work package 3.3 are:

- To study the physical inter- and intramolecular interactions in recognition complexes and disease signalling pathways *in planta*.

- To analyse the role of the nucleotide binding domain (NBS) of resistance proteins in inter and intramolecular interactions, and in activation of disease signalling.

Part of the work in this workpackage investigated the effect of specific mutations in the NB domain on its binding to the CC and the LRR domain. The so-called P-loop mutant and two other NBS mutants were found to bind the N-terminal domain CC-NB-LRR resistance proteins. In contrast, the wild type NB-LRR and one LRR autoactivating mutant did not bind the N-terminal domain. Like for Rx we found that the EDVID motif in the N-terminal domain of Mi-1 is required for intramolecular interactions as well as for functional transcomplementation. Deletion constructs of Rx revealed that a small part in the middle of the CC domain is sufficient for active nuclear import. FRAP analysis revealed low diffusion rates for Rx (or the CC) in the nucleus indicating that it interacts with nuclear components. Rx and its matching avirulence protein, the coat protein of PVX, were found to localise both in cytoplasm and nucleus. Fusing either nuclear import- or export-signals revealed that the CP is recognized in the cytoplasm by Rx. Furthermore, in contrast to I-2 several other R proteins did not interact with Formin, KLC, or Trax in a yeast-two-hybrid assay. Challenging plants in which either Formin or Trax is silenced suggest that these proteins nonetheless have a significant role in the hypersensitive response mediated by these resistance proteins.

WP 4.1: Genotypic analyses to define customised core collections

The objectives of workpackage 4.1 are:

- To develop and apply more efficient and new molecular methods for defining core collections of plant accessions in genebanks.
- To genotype the allelic variance in resistance traits in customised core collections of wheat and potato that are likely to capture a major portion of the alleles in the gene pool by using targeted chromosome haplotyping, *R* gene profiling, and comparative genomics.

This year partner we finished a series of field trials in south of Spain. Data on resistance against fungal pathogens of wheat (25 durum and 25 bread wheat cultivars) will be integrated in our database and were used to select cultivars with very good resistance performance for further breeding programs. The work on the development of molecular tools for evaluating potato and wheat germplasm continued again this year with focus on resistance loci on chromosome 10 (potato) and 7B, and 6B (wheat). Finally, pilot experiments on the usability of SNP-markers obtained from modern cultivars (such as Bintje, Kennebec, Shepody

etc.) to characterise landraces and wild species from Latin America were started. The projects on allele mining in potato, hexaploid wheat, and barley were completed this year. The study for presence/diversity of *Pm3* in wild emmer wheat collections from Israel identified to date six new *Pm3* haplotypes. In addition to the so-called classical resistance genes, studies on eQTLs in barley were performed. A genome-wide gene expression study was carried out by association with SNP-markers. eQTLs for 989 genes were identified as being coincident with previously identified phenotypic QTL.

WP 4.2: Phenotypic analyses and functional characterisation of allelic variance in customised core collections

The objectives of work package 4.2 are:

- To phenotype the allelic variance in resistance traits in customised core collections of wheat and potato that are likely to capture a major portion of the alleles in the gene pool using representative collections of fungi.
- To functionally characterise the allelic variance in customised core collections by using libraries of fungal effector molecules.

We continued our efforts to phenotype customized collections of potato including wild species, durum and hexaploid wheat, and of barley. Resistance of this material against *P. infestans* (potato), brown rust (wheat) and *Septoria tritici* (wheat) was tested. In addition, assays for testing of suitability of greenhouse and in vitro resistance tests to predict the outcome of field infection with *P. infestans* were continued.

WP 4.3: Integrated Databases for wheat and potato

The objectives of work package 4.3 are:

- To provide an infrastructure for knowledge management
- To construct an integrated database of genotypic, phenotypic, and passport data of accessions in the customised core collections carrying alleles associated with disease resistance.

The data set on wheat phenotypic data originating from GRIN, received via WP4.1, was included in the database as backbone information. Some partners have sent extended data sets on phenotypic and genotypic characterisations, which are being processed for on-line accessibility. A few data sets have been made downloadable on the password protected

website. Most of the data uptake work will have to be performed in the final year of the project, because initially received data sets were only preliminary.

WP5.1: To develop and validate high throughput marker technologies and molecular markers associated with disease resistance loci for commercial marker-assisted breeding

The objectives of work package 5.1 are:

- To develop and validate molecular markers for use in marker-assisted breeding programs.
- To develop and validate high throughput (HTP) molecular marker technologies for use in marker-assisted breeding programs.

The objective of WP5.1 is the acquisition, testing and deployment of high throughput molecular markers linked to disease resistance loci under study in BIOEXPLOIT for application in marker-assisted breeding in WP5.2. A prerequisite for this is the selection of molecular markers for conversion to high throughput application. Important properties, which these candidate markers must eventually possess when adapted to a high-throughput format include the following:

1. Close linkage to the resistance genes being studied
2. Polymorphism in the populations being studied by the BIOEXPLOIT project
3. Correct marker type for scoring cheaply and reliably in a high-throughput format
4. Robust high-throughput marker performance between different laboratories

In year 4 the work has continued on the two main Objectives of the work package. A final set of candidate markers has been assembled for conversion of high throughput format, previous markers identified in the work package have been converted and some have been fed into WP5.2. Work has also continued on the development of the tetraploid scoring technologies.

WP5.2: To build pyramids of major R genes and QTLs by marker-assisted introgression into elite materials

The objectives in work package 5.2 are:

- To build genome wide and haplotype-specific pyramids of major *R* genes by marker-assisted introgression breeding into elite materials.
- Validation of the effectiveness of different resistance sources and/or marker-assisted backcross into diverse elite germplasm.

With the aim to accelerate the introduction of marker-assisted breeding in the EU plant breeding industry, the project specifically focuses on pyramiding major *R* genes and QTL by marker assisted breeding approaches into elite materials. First, the project focussed on resistance sources already identified in other projects, while sources identified and genes mapped in upstream subprojects will be integrated at a later stage. In year 4 of BIOEXPLOIT, participants continued working and collaborating on crosses for the introgression and pyramiding of resistance genes.

WP6.1: Modification of R gene recognition specificities and DR genes by targeted mutagenesis

The objectives of work packages 6.1 are:

- To modify *R* gene recognition specificity by targeted mutagenesis and domain swapping in order to generate broader spectrum effectiveness.
- This aims to generate novel *R* genes with specificities for secretory proteins from *P. infestans* that are essential for the fitness of this pathogen.

A new set of mini-swap constructs was tested to investigate the role of specific regions in the ARC domain and LRR domain, which are predicted to be involved in the interaction between these domains based on the docking model obtained in WP2.4. Disruption of the specific residues in the interaction surface between the N-terminal half of the LRR and the NB or the ARCII domain by targeted mutagenesis and small sequence exchanges between Rx and Gpa2 resulted in a loss-of-function in agroinfiltration assays. This suggests that the compatibility between the ARCII and N-terminal half of the LRR domain is determined by electrostatic and hydrophobic interactions and that the N-terminal half of the LRR is involved in disease signaling, whereas the C-terminal half contributes the *R* gene specificity. It is anticipated that these physical properties are also involved in the conformation of other *R* proteins and this will be explored in more detail in the next period.

WP6.2: Building cassettes of natural and modified R genes in standardized elite varieties

The objectives of work package 6.2 are:

- To build and to assess *R* gene cassettes of natural and modified *R* genes in standardized elite background.

Several new and improved cloning vectors were produced for wheat. Stable transgenic lines were produced in potato (potato blight resistance), by using new resistance genes and by the application of domain swap constructs of already known resistance genes. We also assembled a series of constructs with several cloned pm3 alleles and transformed these in Bobwhite lines. Transgenic progenies showed new characteristics of resistance to specific mildew strains. Several protein tags and reporter genes are used in the expression cassettes. By this the transgeneity is easily to screen and by using antibodies it might be possible to visualize and understand the plant microbe interaction better. Significantly improved triticale isolated microspore technology could be established and a protocol for an adapted soft winter wheat variety could be established. By this new protocol new transformation technologies are now being established. Efficiency of doubled haploid technologies (interspecific hybridization and anther culture) was significantly improved. New durum breeding lines with an improved combined resistance to mildew, septoria and rust are ready to be tested under Spanish field conditions.

NEWS FROM THE EUCARPIA SECRETARIAT

The Secretariat is pleased to inform the members that it is again possible to pay your membership fees **online** with the EUCARPIA secure credit card system. Please enter the web page of EUCARPIA (<http://www.eucarpia.org>) and click on "Membership renewal 2010". There you will find the instructions for payment.

Credit card payment can also be made by returning the form you will find at the bottom of your membership invoice by mail, fax or scanned by e-mail to the EUCARPIA Secretariat

Should you prefer to make a **transfer**, you can do so to the following bank account:

UBS SA, CH-1260 Nyon 1, Switzerland

IBAN: CH90 0022 8228 EU10 0387 6

BIC: UBSWCHZH80A

Please indicate your name and invoice number in the transfer.

Please do not send cheques.

There is no change in the EUCARPIA internet address (www.eucarpia.org), and updating of the website has been the task of the new secretariat since October 2008. Please send us section news and meeting information, so that we can keep the website up-to-date.

The Secretariat sends out a regular bulletin entitled "EUCARPIA NEWS" every two months. The members who do not receive it should contact the Secretariat with their correct e-mail address.

New EUCARPIA members

The executive committee is pleased to welcome the following new members (January-December 2009) in our association:

List of new individuals:

ALBANIA	IBRALIU A.	TIRANA
	KULLAJ E.	TIRANA
AUSTRALIA	ALAM M.M.	QUEENSLAND
	AURICHT G.C.	ADELAIDE
	PRODHAN M.A.	SYDNEY
AUSTRIA	SCHIESSL K.	MANK
BELGIUM	VLEUGELS T.	MELLE
BOSNIA AND HERZEGOVINA	GASI F.	SARAJEVO
	KONDIC D.	BANJALUKA
	RADUN M.	BANJALUKA
BRAZIL	BRAGA R.	SAO PAULO
CZECH REPUBLIC	KOPECKY D.	OLOMOUC
	KOPECKY P.	OLOMOUC
DENMARK	BEGUIER V.	SAINT SAUVANT
FRANCE	BOELT B.	SLAGELSE
	BOUTY E.	ANGERS
	JAUBERTIE J-P.	GUYANCOURT
	JULIER B.	LUSIGNAN
	MALVOISIN P.	BOIS-LE-ROI
	MOREL G.	FREJUS
	MOREL H.	FREJUS
GERMANY	GANAL M.	GATERSLEBEN
	MAURER H.P.	STUTTGART
GREECE	MARIOLIS N.	THESSALONIKI
HUNGARY	CSEUZ L.	SZEGED
	FALUSI. J.	TÁPLÁNSZENTKERESZT
	GÉMES JUHÁSZ A.	BUDAPEST
	HALÁSZ J.	BUDAPEST
	HEGEDŰS A.	BUDAPEST
	KOVÁCS G.	MARTONVASAR
	MESTERHÁZY Á.	SZEGED
	MÓRO CZ S.	SZEGED
	MOZSÁR J.	ÓCSA
	PÁL M.	SZEGED

IRELAND	RAKSZEGI M.	MARTONVASAR
ITALY	TREMMELNÉ TAR M.	SZEGED
KOSOVO	GROGAN D.	KILDARE
	PAOLINI M.	ARGELATO
	FETAHU S.	PRISHTINA
	ZEKA D.	PRISHTINA
LATVIA	BALODE A.	RIGA
MACEDONIA	AGIC R.	SKOPJE
	KRATOVALIEVA S.	SKOPJE
	SIMEONOVSKA E.	SKOPJE
MONTENEGRO	LAZOVIC B.	BAR
NETHERLANDS	ACHARJEE A.	WAGENINGEN
	BASTIAANSEN-KAMSTRA H.	AALSMEER
	VAN DER KNAAP K.	GRAVENZANDE
	VAN OOIJEN J.W.	WAGENINGEN
	VERHAEGH J.	BEESEL
POLAND	MADRY W.	WARSAW
	STUDNICKI M.	WARSAW
PORTUGAL	VAZ PATTO M.C.	OEIRAS
ROMANIA	ROTARENCO V.	FUNDULEA
SERBIA	DELIC D.	BELGRADE
	LUGIC Z.	KRUSEVAC
	PRODANOVIC S.	BELGRADE
	RADOVIC J.	KRUSEVAC
	SOKOLOVIC D.	KRUSEVAC
	VASIC M.	NOVI SAD
	ZECEVIC B.	SMEDEREVSKA PALANKA
SINGAPORE	ROUMEN E.	SINGAPORE
SOUTH AFRICA	NIEUWOUDT G.	PAARL
SPAIN	ESPIAU RAMIREZ M.T.	ZARAGOZA
	LOMAS CANO T.D.	ALMERIA
	MALLOR C.	ZARAGOZA
	MUMINOVIC J.	EL EJIDO
	RODRIGUEZ MAZA M.J.	ZARAGOZA
SWEDEN	CHRISTERSON T.	SVALÖF
	KALIFF M.	SVALÖF
	SEEDNET	ALNARP
	WEDELSBACK BLADH K.	ALARP
TURKEY	AYDOGAN S.	ANKARA
	ERGÜN N.	ANKARA
	GÜLER S.	ANKARA
	KURT C.	ADANA
	NAZLI R.I.	BALCALI
	SANAL T.	ANKARA
	SAYIM I.	ANKARA
UNITED KINGDOM	BROWNE K.	SUDBURY
	BRYAN G.	DUNDEE
	MARSHALL D.F.	DUNDEE
	MOUCHEBOEUF L.	DAWLISH
	RAMSAY G.	DUNDEE
UKRAINE	BATASHOVA M.	POLTAVA
	CHEKALIN N.	POLTAVA
	TISCHENKO V.	POLTAVA
USA	EVERSOLE K.	BETHESDA
	SANDOYA-MIRANDA G.V.	UNIV. PARK-PA

List of new corporate members

HUNGARY	AGRICULTURAL RESEARCH INSTITUTE	MARTONVÁSÁR
HUNGARY	CEREAL RESEARCH NON-PROFIT LTD	SZEGED
SINGAPORE	BAYER CROPSCIENCE RICE BREEDING	SINGAPORE
SWEDEN	TEAM	SVALÖF
SWEDEN	SVALÖF WEIBULL AB	ALNARP
SWEDEN	SEEDNET	

Membership fees

Invoices for the 2010 membership will be issued in March. The membership fee for individual members is € 40 for members of Western Europe and developed countries from elsewhere outside Europe, € 30 for EU members of Eastern Europe and € 20 for members of other Eastern European countries (this special rate may also apply to some developing countries outside geographical Europe). Members younger than 30 year or older than 65 years have 50% discount. The fee of corporate members is € 300. Corporate membership fee covers the fees of maximum 10 individual members.

In face of increasing bank costs, payment of membership fees by credit card (Visa/JCB, Eurocard/Mastercard) is strongly encouraged, as this is the cheapest both for members and for EUCARPIA. Please do not send cheques. For bank transfers, please use the following details

UBS SA, CH-1260 Nyon 1, Switzerland

IBAN: CH90 0022 8228 EU10 0387 6

BIC: UBSWCHZH80A

Please indicate your name and invoice number in the transfer.

Membership privileges

Individual membership

Among others, advantages of being a member of EUCARPIA include:

- Reduction (≥ 40 €) in the registration fee for events (General congress, symposia, meetings, etc.) organized by EUCARPIA.
- Reduced rates for the annual subscriptions to plant breeding journals: *Plant Breeding* and discounts in the publications edited by EUCARPIA.
- Participation in the EUCARPIA sections of your interest (or in all if you wish).

- Reception of the EUCARPIA Bulletin, with information on EUCARPIA activities, publications, dates and information of symposia, meetings and events related to plant breeding, etc.
- Reception of the EUCARPIA news by e-mail
- Membership certificate issued by the EUCARPIA Secretariat
- Other advantages, like the facilitation of international cooperation, exchange of methods and plant material, etc.

Corporate membership

Apart from the privileges entitled to individuals, Corporate members (Institutes, Departments, Companies, Associations, Societies, etc.) have the following additional privileges:

- Possibility of enlisting up to 10 individual members associated to the corporate membership for free.
- A link to the web page of the Institution can be posted in the web page of EUCARPIA (<http://www.eucarpia.org>). This web page is visited mainly by breeders and receives many hits per day.
- Possibility to place breeding-related advertisements on the EUCARPIA website.

EUCARPIA Bulletin

The EUCARPIA Bulletin No. 38 will probably be printed in February 2011. If you would like to publish information about congresses, meetings, publications, section news or any other information relevant to other members, please send in your contribution to the Secretariat by **December 1, 2010**.

Scientific journals at reduced rates for individual members of EUCARPIA

There is an existing agreement between EUCARPIA and Wiley offering individual members of EUCARPIA a personal subscription to the scientific journal *Plant Breeding* at a very special reduced rate. New subscriptions to the above two journal can be made in the following web page:

Wiley, *Plant Breeding*

<http://www.wiley.com/bw/journal.asp?ref=0179-9541>

<http://www.eucarpia.org>

The web-site of EUCARPIA (<http://www.eucarpia.org>) is updated on a regular basis. Information on all the forthcoming EUCARPIA events, on EUCARPIA publications, as well as on its Sections is included in the web page. Also, there is a section with links to the web pages of EUCARPIA Corporate members. For contributions, updates, suggestions or comments please contact the Secretariat (E-mail: eucarpia@mgki.hu). The web-site is the most cost-efficient tool to deliver up-to-date information about EUCARPIA both to members as well as to non-members of the association.

László Láng
EUCARPIA Secretary General

MINUTES OF THE EXECUTIVE COMMITTEE MEETING

Martonvásár, Hungary, 16 September 2009

Participants: Z. Bedő, B. Boller, E. Jacobsen, L. Láng, J. Prohens, P. Ruckenbauer

1. Welcome and opening by the president, Zoltán Bedő.
2. Report on secretariat activities by secretary general, László Láng
 - Transfer of secretariat to headquarters of ARI in Martonvásár went smoothly with the exception of bank arrangements. An agreement was signed between the Agricultural Research Institute and EUCARPIA according to which ARI opened an account at the Commercial and Credit Bank on behalf of EUCARPIA but in its own name. Membership fees, sponsorship fees and other income are paid into this account. ARI makes payment from the account with the preliminary authority of the secretary general of EUCARPIA. Thus EUCARPIA has no direct contact financially with anyone other than ARI.
 - A bank card terminal has been operating successfully at the institute since the beginning of the year and now at last there is also a possibility for on-line payment.
 - Web page changes were made quickly. The EUCARPIA Bulletin was ready to be mailed to members, together with membership cards by February.
 - The number of EUCARPIA members is increasing steadily. 97 members were deleted last October due to lack of payment of membership fees for more than three years. Since then, there have been 130 new applicants, which brings the total number of members to 1409. There are five new corporate members with ten members each. The EC strongly supports the registration of corporate members.
 - Since many e-mails were returned at the beginning of the year, a letter was sent together with the membership invoices, asking members to correct their data with special emphasis on e-mail addresses. There were many responses, for which the secretariat is very grateful.
 - Continuous correspondence is maintained with the organizers of section meetings. Announcements are sent out. Application forms are sent to the sections for recruiting new members. Professor Ruckenbauer underlined the practicality of the past custom of the Executive Committee to send a representative to each Section Meeting to help recruit members. They should give a five-minute presentation on the work of EUCARPIA. Results show that recruitment is much more effective in this way.
 - A new initiative, 'EUCARPIA News' an electronic information letter has been sent since last December and will continue to be sent to EUCARPIA members regularly. It reports on the most important events, personal changes. Information is provided about books which are available at a discount, meetings not organized by EUCARPIA but closely related to plant breeding, job announcements, etc.

- Cooperation with Springer. Springer has renewed the EUCARPIA page on its Internet homepage (www.springer.com/eucarpia). A 25 % discount is now available for EUCARPIA members on plant breeding related books.

3. Financial report by the vice president and treasurer Beat Boller

- A total of 10 000 euros were awarded as subsidies for EUCARPIA meetings. TheBioExploit/EUCARPIA Workshop received 1000 euros, whereas the Fodder Crops and Amenity Grasses Section, the Genetic Resources Section and the Biometrics in Plant Breeding Section received 3000 euros each. The EC decided that in future, requests for subsidies should be made after the first announcement of meetings. No preliminary budget will be required. A request has arrived from the Capsicum and Eggplant Working Group for a subsidy of 1500 euros.
- Bank transfer fees are high in Hungary, so it was decided by the EC that in future transfers should be made to the Swiss account of EUCARPIA. The printing costs of the Bulletin, envelopes, etc. were relatively cheap, however postage costs are high.
- The EC decided that the Valencia account should be closed. Following payment of the subsidy requested by the Capsicum and Eggplant Working Group the remaining sum should be transferred to the Budapest account.
- It has been concluded that the balance has been steadily increasing since 2004 due to an increasing number of members without a concomitant increase in expenses. A further increase in amount of the subsidy granted for section meetings could be envisaged in the future.

4. Report on 2009 events by the president Zoltán Bedő

- A summary of the main events in 2009 was presented by the president. There were five section meetings (Fodder Crops and Amenity Grasses, Genetic Resources, Maize and Sorghum, Ornamentals and Biometrics in Plant Breeding) as well as a BioExploit/EUCARPIA Workshop. The members of the EC who participated at the various meetings provided further information.
- One new Working Group, the Festulolium Working Group headed by Mike Humphrey (SCRI) within the Fodder Crops and Amenity Grasses Section was formed in 2009. The EC gave their approval.
- The scientific secretary, Professor Jacobsen mentioned that at the meeting of the Ornamentals Section, the question about coexistence problems between patent rights and breeders' rights had been raised. The EC decided that EUCARPIA should develop a view in connection with this asking the scientific secretary to prepare a letter of view.

5. EUCARPIA - EU FP cooperations

- Cooperations with EU FP projects, namely BIOEXPLOIT FP6, HEALTHGRAIN FP6 and DROPS FP7 were outlined by the president. BIOEXPLOIT and HEALTHGRAIN will be having workshops before the opening of the Cereal Section Meeting in Cambridge, April 6th 2010.

6. Report on 2010 EUCARPIA meeting plan by the president, Zoltán Bedő

- The preparations of the following EUCARPIA meetings are in progress for 2010:
 - EUCARPIA Cereal Section Meeting, National Institute of Agricultural Botany, Cambridge, UK 6-8 April,
 - Festulolium Working Group workshop in Poznan, Poland, 22-23 April,
 - Rye Working Group Meeting, International Symposium on Rye Breeding & Genetics, Zhodino, Belarus 29 June - 02 July 2010,
 - Capsicum and Eggplant Breeding, Working Group Meeting, Valencia, Spain, 30 August - 1 September 2010,
 - ‘Breeding for resilience: a strategy for organic and low-input farming systems?’ Joint Meeting of Organic and Low Input Agriculture Section and INRA, Paris, France, 1-3 December 2010
 - The new Working Group, Forest Tree, headed by Luc Paques plans a seminar in France, INRA at the end of 2010. Exact date of the meeting will be determined later.
 - Further steps will be taken to organize other EUCARPIA meetings for 2010 and start the preparations for 2011.
 - The EC decided which of its members should participate at the various meetings to promote the recruitment of new members.
 - It was decided that the next meeting of the Executive Committee would be organized late 2010 – early 2011.
 - EC would remind section leaders not to organize meetings in 2012, when the EUCARPIA General Congress will be held.

EUCARPIA MEETING CALENDAR FOR 2010 AND LATER

More information and updates on these meetings can be obtained in the web page of EUCARPIA (<http://www.eucarpia.org>)

- Potatoes** The next Section Meeting will take place in Wageningen, The Netherlands, 27-30 June, 2010.
Info: Dan Milbourne (Section Chairman Potatoes)
e-mail: dan.milbourne@teagasc.ie
- Cereals** The next Section Meeting will take place in Cambridge, United Kingdom, 6-8 April, 2010
Info: Wayne Powell (Section Chairman Cereals)
e-mail: wap@aber.ac.uk
- The next Rye Working Group Meeting will take place in Zhodino, Belarus 29 June -02 July, 2010.
Info: S. Hardzei
e-mail: spcaf@mail.ru
- Fodder Crops and Amenity Grasses** The next Section Meeting will take place in Carlow, Ireland in 2011, at a date to be determined.
Info: Beat Boller (Section Chairman Fodder Crops and Amenity Grasses)
- The 1st Festulolium Working Group Workshop will take place in Poznan, Poland, 22-23 April, 2010.
Info: Zbigniew Zwierzykowski
e-mail: zzwi@igr.poznan.pl
- Biometrics in Plant Breeding** The next Section Meeting will take place in Hohenheim, Germany, at a date to be determined.
- Genetic Resources** The next Section Meeting will take place in Wageningen, The Netherlands in 2011, at a date to be determined.
Info: E. Thörn (Section Chairman Genetic Resources)
e-mail: eva.thorn@cbm.slu.se
- Maize and Sorghum** The next Section Meeting will take place in Osijek, Croatia in 2011, at a date to be determined.
- Vegetables** The next Capsicum and Eggplant working group meeting will take place in Valencia, Spain, 30 August-1 September, 2010
Info: Jaime Prohens-Tomás
e-mail: jprohens@btc.upv.es

The next meeting of the Leafy vegetables working group will take place in France in 2011, time and place to be announced.

- Ornamentals** The next Section Meeting will take place in Poland, at a date to be determined.
- Organic and Low-Input Agriculture** The next Section Meeting “**Breeding for Resilience**” organized jointly with INRA will take place in Paris, France 1-3 December, 2010
Info: Isabelle Goldringer: isa@moulon.inra.fr
Frédéric Rey: Frederic.Rey@itab.asso.fr
- EUCARPIA General Congress** The XIXth EUCARPIA General Congress will take Place in 2012 in Budapest, Hungary

RECENT EUCARPIA PUBLICATIONS

- General** **Modern Variety Breeding for Present and Future Needs.**
Proceedings of the 18th EUCARPIA General Congress, Valencia, Spain, 9-12 September 2008
ISBN 978-84-8363-302-1
Editors: Jaime Prohens and María Luisa Badenes
Publisher: COMAV - Instituto de Conservación y Mejora de la Agrodiversidad Valenciana, Universidad Politécnica de Valencia, Valencia, Spain
Obtainable from: Jaime Prohens
UNIVERSIDAD POLITÉCNICA DE VALENCIA
Camino de Vera 14
E-46022 VALENCIA, SPAIN
Fax: +34 963 879429
e-mail: jprohens@btc.upv.es
- Fifty Years of EUCARPIA (1956-2006).**
ISBN 978-84-7986-626-8
Compilers: **J. Prohens and M.L. Badenes**
Published: 2007 by Ediciones Promolibro
Obtainable from: EUCARPIA Secretariat
M.L. Badenes
Instituto Valenciano de Investigaciones Agrarias
P.O. Box 322, 3300 AH Dordrecht, The Netherlands
E-46113 Moncada
Spain
- Potatoes** **The Science of Selection: Potato Breeding Methodology for the 21st Century.**
Abstracts of the 2006 Joint Conference of the EAPR Section Breeding and Varietal Assessment and the EUCARPIA Section Potatoes, Carlow, Ireland, 20-22 November, 2006
Compilers: **Dan Milbourne and Dennis Griffin**
Teagasc, Crops Research Centre
Oakpark, Carlow, Ireland
E-mail: dan.milbourne@teagasc.ie
- Cereals** **Cereal Science and Technology for Feeding Ten Billion People: Genomics Era and Beyond**
Abstracts, EUCARPIA Cereals Section Meeting, Lleida, Spain, 13-17 November 2006.
Editor: **José Luis Molina-Cano**
Centre IRTA-UdL

Av. Rovira Roure 177, 25198 Lleida, Spain
E-mail: joseluis.molina@irta.es
Publisher: Edicions de la Universitat de Lleida

International Symposium on Rye Breeding & Genetics

Abstracts, Rye Working Group Meeting, Groß Lüsewitz, Germany, 28-30 June 2006
Editor: **Peter Wehling**
Publisher: Federal Centre for Breeding Research on Cultivated Plants
Institute of Agricultural Crops, Rudolf-Schick-Platz 3a
D-18190 Groß Lüsewitz, Germany
Fax: +49 3820945222
E-mail: bafz-lk@bafz.de

From Biodiversity to Genomics: Breeding Strategies for Small Grain Cereals in the Third Millennium

Proceedings, EUCARPIA Cereal Section Meeting, Salsomaggiore, Italy, 21-25 November 2002
Publisher: Experimental Institute for Cereal Research, Fiorenzuola d'Arda (PC), Italy
Editors: C. Marè, P. Faccioli and A.M. Stanca
Published: December 2003

Proceedings of the 5th International Triticale Symposium

Radzików, Poland, 30 June - 5 July 2002

Volume 1 (ISBN 83-89172-01-1), Volume 2 (ISBN 83-89172-02-X), Supplement (ISBN 83-89172-03-8)

Editor: **E. Arseniuk**

Published: June 2002

Total price: € 50.--

Obtainable from: Plant Breeding and Acclimatization Institute, Radzików
05-870 Blonie, Poland

Fax: +48 22 7254714

E-mail: e.arseniuk@ihar.edu.pl

Proceedings of the EUCARPIA Rye Meeting

Radzików, Poland, 4-7 July 2001

ISBN 83-89172-00-3

Editor: **Plant Breeding and Acclimatization Institute**

Published: March 2002

Obtainable from: Plant Breeding and Acclimatization Institute, Radzików
05-870 Blonie, Poland

Fax: +48 22 7254714

E-mail: postbox@ihar.edu.pl

**Fodder
Crops and
Amenity
Grasses**

XXVIIth EUCARPIA Symposium on Improvement of Fodder Crops and Amenity Grasses

Book of Abstracts of the Section Fodder Crops and Amenity Grasses Meeting
Copenhagen, Denmark, 19-23 August, 2007

Editor: **T. Lübberstedt**

Published: Denmark, 2007

Obtainable from: Thomas Lübberstedt

University of Aarhus, Research Centre Flakkebjerg, Institute of Genetics and Biotechnology,
Forsøgsvej 1, DK-4200 Slagelse, Denmark

E-mail: Thomas.Luebberstedt@agrsci.dk

Book of Abstracts available: <http://www.eucarpia.org>

Breeding and Seed Production for Conventional and Organic Agriculture

XXVI EUCARPIA Fodder Crops and Amenity Grasses and XVI *Medicago* spp. Group Joint Meeting, Perugia, Italy, 3-7 September 2006

Compilers: **Fabio Veronesi and Daniele Rosellini**

Dipartimento di Biologia Vegetale e Biotecnologie Agroambientali e Zootecniche
Faculty of Agriculture

Università degli Studi di Perugia
Perugia, Italy
E-mail: roselli@unpg.it

International Symposium on Grass Breeding

Meeting of the EUCARPIA Section Fodder Crops and Amenity Grasses, 22-25 September 2002, Bundesforschungsanstalt für Landwirtschaft (FAL) Braunschweig, Germany.

Editors: **U.K. Posselt and J.M. Greef**

Published in: *Vorträge für Pflanzenzüchtung*, Issue 59 (ISSN 0723-7812), 2003.

**Biometrics
in Plant
Breeding**

XIII EUCARPIA Biometrics in Plant Breeding Meeting Section

Abstracts, EUCARPIA XIII Biometrics in Plant Breeding Section Meeting, Zagreb, Croatia, 30 August - 1 September 2006

Published: *Agriculturae Conspectus Scientificus*

Volume 71 (2006) Supplement 1; Croatia, 2006

Editors: **Jerko Gunjaca, Fred van Eeuwijk and Zlatko Satovic**

Obtainable from: Dr. Jerko Gunjaca

Faculty of Agriculture

University of Zagreb

Svetosimunska 25

10000 Zagreb (Croatia)

E-mail: jgunjaca@agr.hr

Proceedings of the XII EUCARPIA Biometrics in Plant Breeding Conference, held in A Coruña, Spain, 3-5 September 2003 Selected Papers

Published as a Special Issue of *Euphytica*: *Euphytica* 137 No. 1 2004

Obtainable from: Springer Netherlands

Abstracts available at: <http://www.springerlink.com/content/1573-5060/>

**Genetic
Resources**

Plant Genetic Resources and their Exploitation in the Plant Breeding for Food and Agriculture. Book of Abstracts

Book of Abstracts of the 18th EUCARPIA Genetic Resources Section Meeting, Piešťany, Slovak Republic, 23-26 May 2007

ISBN 978-80-88872-63-4

Editors: **P. Hauptvogel, D. Benediková and R. Hauptvogel**

Published: 2007

Obtainable from: Pavol Hauptvogel

SARC – Research Institute of Plant Production Piešťany

Piešťany, Slovak Republic

E-mail: hauptvogel@vurv.sk

Plant Genetic Resources of Geographical and Other Islands. (Conservation, Evaluation and Use for Breeding)

Proceedings of the XVII Genetic Resources Section Meeting, Castelsardo, Italy, 30 March-2 April, 2005; ISBN 88-9011771-0-1

Published: Italy, 2007

Obtainable from: Dr. Simonetta Bullitta

Centro Miglioramento Pascoli CNR

Via Enrico de Nicola I-07100 Sassari (Italy)

E-mail: bullitta@cspm.ss.cnr.it

**Maize and
Sorghum**

XXIst International Conference EUCARPIA “Maize and Sorghum Breeding in the Genomics Era”. Book of Abstracts

Book of abstracts of the XXIst International Conference of the EUCARPIA Maize and Sorghum Section, Bergamo, Italy, 21-24 June, 2009. Published: Italy, 2009.

Editor: Mario Motto

Obtainable from: Dr. Mario Motto

CRA Maize Research Unit

Via Stezzano 24, 24126 Bergamo, Italy

E-mail: mario.motto@encra.it

XXth International Conference of the EUCARPIA Maize and Sorghum Section. Book of Abstracts.

Book of Abstracts of the XXth International Conference of the EUCARPIA Maize and Sorghum Section, Budapest, Hungary, 20 - 24 June, 2006. Published: Hungary, 2006

Editor: **Csaba L. Marton**

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Vegetables

Cucurbitaceae 2008.

Proceedings of the IXth EUCARPIA Meeting on Genetics and Breeding of Cucurbitaceae.

Avignon, France, 21-24 May, 2008

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Avignon, France

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XVI EUCARPIA Meeting Working Group Tomato. Book of Abstracts

Book of Abstracts of the XVI EUCARPIA Meeting Working Group Tomato.

Wageningen, The Netherlands, 12-15 May 2008

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Progress in Research on Capsicum & Eggplant

Proceedings of the XIIIth EUCARPIA Meeting on Genetics and Breeding of Capsicum and Eggplant.

Warsaw, Poland, 5-7 September, 2007

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EUCARPIA Cucurbitaceae 2004.

Progress in Cucurbit Genetics and Breeding Research. Proceedings of Cucurbitaceae 2004, the 8th EUCARPIA Meeting on Cucurbit Genetics and Breeding.

Olomouc, Czech Republic, 12-17 July, 2004

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EUCARPIA Capsicum and Eggplant 2004

Proceedings of the XIIth Meeting on Genetics and Breeding of Capsicum and Eggplant

Noordwijkerhout, The Netherlands, 17-19 May, 2004

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EUCARPIA Leafy Vegetables 2003.
Proceedings of the EUCARPIA Meeting on Leafy Vegetables Genetics and Breeding,
Noordwijkerhout, The Netherlands, 19-21 March 2003
Editors: Th.J.L. van Hintum, A. Lebeda, D.A. Pink and J.W. Schut
Published: Centre for Genetic Resources, The Netherlands (CGN), Wageningen, The Netherlands
Online-access of full papers: <http://www.leafyvegetables.nl/papers.htm>

Proceedings of the XIth Meeting on Genetics and Breeding of Capsicum and Eggplant,
Antalya, Turkey, 9-13 April, 2001
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Editors: **K. Abak, S. Büyükalaca and Y. Dasgan**
Published: Adana, 2001
Proceedings are no more available.

Capsicum and Eggplant Newsletter No. 20, 2001
Capsicum and Eggplant Newsletter No. 21, 2002
Capsicum and Eggplant Newsletter No. 22, 2003
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Web site: <http://www.capsicum.unito.it/>

Cruciferae Newsletter No. 23, April 2001
Cruciferae Newsletter No. 24, July 2002
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INRA - Station d'Amélioration des Plantes
BP 29, F-35650 Le Rheu, France

Fruit

EUCARPIA Symposium "XII Fruit Section". Book of Abstracts.
Book of Abstracts of the EUCARPIA Symposium XII Fruit Section
Spain, 16-20 September 2007.
Editors: Mayte Espiau, Rafael Socias.
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Centro de Investigación y Tecnología Agroalimentaria de Aragón
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E- 50008 Zaragoza, Spain
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EUCARPIA Fruit Breeding Section Newsletter No. 5, 2001
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Bergweg 23, D-01326 Dresden, Germany
Tel./Fax: +49 351 2615010/ 2615011
E-mail: fischer@ipk-gatersleben.de

Orna- mentals

Breeding for Beauty. Part II
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Sanremo, Italy, 11 - 15 September, 2006
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Classical versus Molecular Breeding of Ornamentals.

**Proceedings of the 21st International Symposium on Classical versus Molecular Breeding
of Ornamentals, EUCARPIA Section Ornamentals, ISHS Section Ornamental Plants,
München, Germany, 25-29 August 2003**

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Strategies for New Ornamentals .

**Proceedings of the Twentieth International Symposium Section Ornamentals,
Melle, Belgium, 3-6 July, 2001**

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**Oil and
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Crops**

**EUCARPIA Oil and Protein Crops Section Meeting- "Present status and future needs in
breeding oil and protein crops". Book of Abstracts**

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**Organic
and Low-
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Agriculture**

EUCARPIA Symposium “Plant breeding for organic and sustainable, low-input agriculture: dealing with genotype-environment interactions”. Book of Abstracts.

Book of Abstracts of the EUCARPIA Symposium “Plant breeding for organic and sustainable, low-input agriculture: dealing with genotype-environment interactions”, Wageningen, The Netherlands, 7-9 November 2007.

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BIOEXPLOIT/EUCARPIA Workshop on the role of Marker Assisted Selection in breeding varieties for organic agriculture. Proceedings.

Proceedings of the BIOEXPLOIT/EUCARPIA Workshop on the role of Marker Assisted Selection in breeding varieties for organic agriculture, Wageningen, The Netherlands, 25-27 February, 2009.

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Proceedings available: [bioexploit_2009.pdf](#)

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4. Titles _____
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6. Institution _____

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7. I, the undersigned Mrs. / Mr.

apply as an individual member of EUCARPIA.

apply on behalf of _____
as a corporate member of EUCARPIA.

8. I / We would like to participate in the following section(s):

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