CRPMC2022

16th International Cereal Rusts and Powdery Mildew
CONFERENCE 2022

Organised by NIAB

On behalf of EMCRF
The European and Mediterranean Cereal Rusts Foundation

Early Career Scientist Awards

EMCRF
Patrick Schweizer Award
Winner
Zoe Bernasconi

BSPP
Winners
Julian Rodriguez Algaba
Diana Gomez de la Cruz
Tyler Frailie

BGRI
Borlaug Global Rust Initiative
Winners
Martin Chemonges
Niranjana Murukan

Poster session sponsor
SONY

CRPMC2022

16th International Cereal Rusts and Powdery Mildew
CONFERENCE 2022

31 August – 2 September 2022

Clare College, Riley Auditorium
Queen's Road, Cambridge, UK

EMCRF
The European and Mediterranean Cereal Rusts Foundation

NIAB

Programme

WEDNESDAY 31 AUGUST – ARRIVAL
Check in from 3 pm at Porters Office, Memorial Court

15:00 **Registration desk opens, Foyer**

18:30 **Welcome function, Garden Room**

19:00 **Morris dancers**

20:00 **EMCRF Board Meeting**

THURSDAY 1 SEPTEMBER

8:30-9:00 **Registration opens**

9:00-9:20 **Auditorium: Opening remarks**

Session 1: Pathogen genomics, biology and epidemiology

Chair: Robert Park

9:20-9:50 **Adaptive genome evolution of the cereal powdery mildew fungi**
Keynote speaker: Stefan Kusch

9:50-10:50 **Success and failure of invasive races of plant pathogens: the case of *Puccinia striiformis* f.s p. *tritici* in France**
Tiphaine Vidal

The Euro-Mediterranean population of *Puccinia triticina* on durum wheat is structured in two genetic groups with distinct pathotypes
Roula Shamsi

Pathogenomics of wheat stripe rust reveals a population shift in western Canada
Samuel Holden

10:50 **Refreshments break, Garden Room (30 minutes)**

11:20-12:20 **Tracking the spread of a new population of the airborne fungal pathogen *Puccinia graminis* f. sp. *tritici* in Sweden between years**
Anna Berlin

Impact of host on shaping the pathogen population structure – the case study of *Puccinia striiformis* in its Himalayan centre of Diversity
Sajid Ali

Comparative population genetic structure suggested high divergence between the diverse and recombinant *P. striiformis* populations of China and Pakistan
Muhammad Awais

Prof. Simon Krattinger
KAUST, Saudi Arabia

Prof. Simon Krattinger obtained his PhD in 2009 from the University of Zurich, Switzerland. After spending three years as a Marie Curie postdoctoral fellow at CSIRO Plant Industries in Canberra, Australia, he became an independent group leader at the University of Zurich supported by an Ambizione early career grant from the Swiss National Science Foundation. In 2017, he joined the Center for Desert Agriculture at KAUST as an Assistant Professor. Despite the planting of elite cultivars and improved disease management practices, rust epidemics have become more severe over the past two decades, which is mostly attributed to the emergence and rapid spread of new and highly virulent pathogen races. Although hundreds of disease resistance genes have been genetically characterised in the wheat gene pool, only a handful of them have been cloned. The large and repeat-rich genome of wheat has represented a major hurdle for the rapid and efficient cloning of disease resistance genes. A major focus of the research is on the development and use of novel genomic approaches that allow for a more rapid and cost-effective cloning of rust resistance genes in wheat. The particular interest is in elucidating the molecular bases of durable rust resistance.

Dr Annemarie Fejer Justesen
Aarhus University (part of GRRC), Denmark

In her early career at Aarhus University, Annemarie established the genotyping laboratory for characterisation and diagnostics of plant pathogenic fungi, and she has been involved in the GRRC activities since the beginning. Her work with rust began more than 25 years ago, studying the population structure and population dynamics of the Danish and European yellow rust populations, which revealed the clonal population structure. Subsequent studies of the distribution and spread of *P. striiformis* strains at a global scale showed that world-wide epidemics were caused by two aggressive and high temperature adapted strains. In recent years the genetic studies of yellow rust involving the alternate host Barberry has been a focus area. As part of the BGRI, Annemarie started the genotyping activities of stem rust at GRRC. This work has been extended in the recent project RUSTWATCH funded by EU's Horizon 2020 research and innovation programme. The main aim has been to identify drivers for the emergence of new rust strains in Europe. This has involved alignment activities with rust research laboratories in Europe and beyond in order to display the European genotyping and phenotyping results in a global context as visualised in the wheat rust toolbox.

Keynote Speakers

Dr Stefan Kusch

RWTH, Aachen, Germany

Stefan Kusch studied biology at Göttingen University (Germany) and earned his Ph.D. at RWTH Aachen University (Germany) in 2017. He then joined the INRAE in Toulouse (France), where he helped uncover the evolution of broad host range in a fungal plant pathogen. In 2019, he rejoined RWTH Aachen University to study powdery mildew fungi. His current research is funded by starting grants from the Excellent Research Space at RWTH, and the German Research Foundation. Stefan's work with powdery mildew fungi began in 2012, when he investigated effectors assuming an RNase-like fold in his Master's thesis. Since then, he has focused on the molecular genetics and evolution of plant-powdery mildew interactions. In addition to dissecting the genetics behind isolates of the cereal pathogen Blumeria graminis f.sp. hordei overcoming mlo-based broad-spectrum powdery mildew resistance, he investigates how transposable elements affect the genomes of these fungi, their regulation, and their contribution to the innovation of novel coding and noncoding RNA molecules. In a broader sense, he is leading efforts towards comparative genome analysis of powdery mildew fungi and the evolution of the obligate biotrophic lifestyle in this lineage.

Dr Jérôme Enjalbert

Senior Researcher, INRA, France

Jerome's current research aims are understanding how the management of intra-specific diversity in crops can contribute to a better performance of crops, and more specifically the effect of plant to plant interactions in wheat cultivar mixtures, through experimental approaches as well as development of models coupling ecophysiology and genetics (Wheatamix – WALTer). His work encompasses the creation of appropriate models in quantitative genetics to study the mixing ability of genotypes and contribute to the development of original breeding schemes for plant teams, both within and between different crop species; mobilising participatory approaches to co-design mixtures delivering appropriate services from farmers to end-users; and studying the impact of the management of disease resistances on the evolution of virulence of pathogen populations, focusing on wheat cultivars deployment in Europe and the selective pressure produced on rust fungal populations (RustWatch).

12:20-13:20 **Lunch in Garden Room and posters/Group photo**

13:20-13:30 **Announcements**

Session 2: Early Career Scientist Awards

Chair: Lesley Boyd

13:30-15:30 **Cereal rust fungi undergo sexual reproduction in barberry species present in Europe**
Julian Rodriguez Algaba (BSPP awardee)

The barley powdery mildew resistance gene Mla3 recognises the blast effector PWL2, and its function is dosage-dependant
Diana Gomez de la Cruz (BSPP awardee)

A low-cost, high throughput method for determining rust effector protease targets for use in decoy engineering
Tyler Frailie (BSPP awardee)

Mapping and validation of a stem rust seedling resistance gene in South African winter wheat varieties
Martin Chemonges (BGRI awardee)

Mapping of Aegilops speltoides derived leaf rust resistance gene (LrS2427) and its utilisation in wheat disease resistance breeding
Niranjana Murukan (BGRI awardee)

Unravelling the molecular basis of wheat powdery mildew's virulence patterns through ultraviolet mutagenesis
Zoe Bernasconi (Patrick Schweizer awardee)

15:30 **Refreshments break, Garden Room (30 minutes)**

Session 3: Integrated disease control and breeding for resistance

Chair: Charlotte Nellist

16:00-16:30 **From plant breeding to integrated management of varietal resistances**
Keynote speaker: Jérôme Enjalbert

16:30-17:50 **Yellowhammer: A genome-wide association study of field yellow rust resistance in European winter wheat (*Triticum aestivum*)**
Camila Zanella

Genetic mapping of barley stripe rust resistance loci from diverse wild and landrace accessions
James Russel

Three-year field nurseries on the susceptibility of European wheat varieties to novel rust races
Philipp Schulz

Summoning the ancestors: unearthing resistance to stripe rust in *Aegilops tauschii*
Vincent Fetterley

19:00 **Conference Dinner, Garden Room**

FRIDAY 2 SEPTEMBER
Check out by 10 am, Porters Office (luggage storage available)

8:30-9:00 **Registration opens**

9:00-9:10 **Auditorium: Announcements**

Session 3 (continued): Integrated disease control and breeding for resistance
Chair: Charlotte Nellist

9:10-9:50 **Control of wheat stem rust (*Puccinia graminis* f. sp. *tritici*) – studies on fungicide efficacy depending on temperature, application date and dose rate in climate chamber and field trials**
Anne-Kristin Schmitt

Genome-wide association mapping across multiple field environments identifies a stable QTL for yellow rust resistance on chromosome 6A
Min Lin

Session 4: Molecular and cell biology of plant-pathogen interactions
Chair: Thierry Marcel

9:50-10:20 **Genomics-assisted cloning of durable rust resistance genes in wheat**
Keynote speaker: Simon Krattinger

10:20-11:20 **Long-read genome sequencing of bread wheat facilitates disease resistance gene cloning**
Naveenkumar Athiyanna

NRLseek: a high-throughput trait discovery pipeline for functional NLRs
Helen Brabham

New molecular mechanisms of race-specific resistance: from NLRs to novel chimeric immune receptors
Javier Sanchez-Martin

11:20 **Refreshments break, Garden Room (30 minutes)**

11:50-12:50 **Cloning of a novel stripe rust resistance gene with a partial dominance mode of function derived from wheat wild relative**
Valentyna Klymiuk

Cultivar dependent amplitude of soil bacteria-induced leaf rust resistance in wheat
Fabio Mascher

Wheat transcription factors involved in plant immunity are targeted by the powdery mildew effector *AvrPm2*
Beatrice Manser

12:50-13:50 **Lunch in Garden Room and posters**

Session 5: Global landscapes of cereal rust and powdery mildew fungi
Chair: Mogens Støvring Hovmøller

13:50-14:00 **Announcements**

14:00-14:30 **Drivers of evolution within yellow and stem rust**
Keynote speaker: Annemarie Fejer Justesen

14:30-15:30 **Is aggressiveness a significant component of the adaptation of populations of *Puccinia triticina* to the cultivated landscape?**
Cécilia Fontyn

Management of rust diseases using IPM-principles
Lise Nistrup Jørgensen

Tackling a formidable foe: the fightback against a forgotten enemy in Western Europe
Diane Saunders

15:30 **Refreshments break, Garden Room (30 minutes)**

16:00-17:00 **Genebank 2.0: An integrated strategy to a digital catalogue of wheat genetic diversity**
Dimitar Douchkov

What we have learned about wheat stripe rust in Canada – where are we heading?
Gurcharm Brar

Wheat Rust Early Warning System prevents yellow rust epidemic in Ethiopian wheat fields
David Hodson

17:00 **Closing remarks**

SATURDAY 3 SEPTEMBER
Check out by 10 am, Porters Office