



DIPARTIMENTO DI SCIENZE AGRARIE



Training course on High-throughput wheat phenotyping

Cosmopolitan Hotel, Via del Commercio Associato 9, Bologna, (Italy)

17-18 September 2018

Organizers: Luigi Cattivelli, Roberto Tuberosa, Bettina Berger, Fernanda Dreccer

Dissecting the genetic basis of phenotypic traits and, ultimately, the genetic progress in wheat breeding relies on accurate phenotyping protocols. Plant phenotyping refers to a quantitative description of the plant's morphological, phenological, physiological and yield-related properties. During the last decade, the technologies for plant phenotyping have broadened from drones, phenomobiles and high-throughput platforms to hand-on devices and smartphone-based apps. The adoption of the most appropriate and cost-effective technologies and protocols is fundamental to achieve an accurate genetic dissection of many agronomically relevant traits.

The training course organized by Wheat Initiative through the Expert Working Groups on Durum Wheat Genomics and Breeding, Wheat Phenotyping and Adaptation of Wheat to Abiotic Stress will present an overview of the most recent tools and platforms used to phenotype wheat and will report on practical hands-on analysis and interpretation of some case studies. The course will offer an opportunity to train wheat geneticists and breeders from the private and public sectors on essential tools to support genetic analysis and wheat selection. The course is limited to 50 participants accepted on a first-come, first served basis; a limited number of travel grants to attend the course will be made available through the Wheat Initiative.

The course will be followed by (i) the annual meeting of the Expert Working Group on Durum Wheat Genomics and Breeding (from 17.00 to 19.30 on 18 September) and (ii) the congress From Seed to Pasta III (19-21 September; for details, see <https://www.fromseedtopasta.com/>).

We look forward to welcoming you in Bologna.

Luigi Cattivelli and Roberto Tuberosa (local organizers)



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September 17

08.30 - Registration and welcome address.

Technologies for phenotyping

09.00 - **Ulrich Schurr** (Forschungszentrum Jülich, Germany). Phenotyping at crossroads: Progress and challenges.

09.30 - **Alessandro Matese** (CNR, Italy). High-throughput field phenotyping using UAV-based remote sensing and imaging techniques.

10.00 - **Scott Chapman** (CSIRO, Australia). UAV phenotyping of crop growth in wheat breeding trials.

10.30 - **Jose Jimenez Berni** (Spain). LiDAR-based phenotyping.

11.00 - *Coffee break*

11.30 - **Roberto Confalonieri** (University of Milan, Italy). Smart technologies for phenotyping.

12.00 - **Shawn Kefauver** (University of Barcelona, Spain). Affordable phenotyping solutions using RGB image analyses.

12.30 - **Onno Mueller** (Forschungszentrum Jülich, Germany). Proximal sensing of chlorophyll fluorescence for high-throughput wheat phenotyping.

13.00 - *Lunch*

14.30 - **Philipp von Gillhaussen** (PhenoSpex, The Netherlands). High-Throughput field phenotyping: challenges for high-precision, ground-based systems for a shoot phenotyping.

15.00 - **Marcus Jansen** (Lemnatec, Germany). Learning from wheat images – applications in research, development, and industry

15.30 - **Michela Janni** (CNR, Italy) Wheat phenotyping in Italy.

16.00 - *Coffee break*

Data analysis

16.30 - **Dries Raymaekers** (VITO, Belgium). Drone-based phenotyping: Moving from proof of concept toward operational implementation.

17.00 - **Noah Fahlgren** (The Donald Danforth Plant Science Center, USA). Image analysis and data management with PlantCV.

17.30 - **Pierre Martre** (INRA, France). From phenotypic data to plant modeling.

18.00 - **Benoît de Solan** (Arvalis, France). Phenotyping data validation and analysis to characterize wheat cultivars.



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September 18

Phenotyping for morpho-physiological traits

09.00 - **Michelle Watt** (Forschungszentrum Jülich, Germany). Wheat root phenotyping in controlled and field environments.

09.30 - **Menachem Moshelion** (The Hebrew University of Jerusalem, Israel). High-throughput phenotyping for water-balance and WUE: Trade-off between two key yield-related traits.

10.00 - **Kerstin Neumann** (IPK, Germany). The genetic architecture of wheat growth under optimal and drought stress conditions revealed by non-invasive phenotyping in controlled conditions.

10.30 - **Pierre Martre** (INRA, France). From phenotypic data to plant modeling.

11.00 - Coffee break

11.30 - **Steven Xu** (USDA-ARS, USA). High-throughput phenotyping of Hessian fly resistance for quick identification and cloning of *R* genes from *Aegilops* species.

12.00 - **José Luis Araus** (University of Barcelona, Spain). Phenotyping wheat for yield potential and stress resilience.

Case studies

12.30 - **Suchismita Mondal** (CIMMYT, Mexico). Integrating new age phenomics in CIMMYT wheat breeding.

13.00 - Lunch

14.30 - **Fred Baret** (INRA, France). Field phenotyping of wheat crops from high-resolution imagery.

15.00 - **Eric Ober** (NIAB, United Kingdom). Wheat phenotyping, forward-genetics screens.

15.30 - **Andrew Sharpe** (University of Saskatchewan, Canada). Leveraging field phenomics for wheat improvement.

16.00 - **Cyril Pommier** (INRA, France). Annotation and publication of phenotypic data.

16.30 - Final remarks and closing.