



Blueberry  
Europe

2018

**FROM SCIENCE TO FORK**  
DALLA RICERCA AL CONSUMO

TRENTO - ITALY, 12-14/11/2018



FONDAZIONE  
EDMUND  
MACH



**ciF**

**SantOrsola**  
Piccoli produttori, grandi sapori.

ATTIVITA' REALIZZATA  
NELL'AMBITO DEL PROGETTO DI RICERCA E SVILUPPO  
'APPLE & BERRY' LP 6/99 ART. 5  
DELLA PROVINCIA AUTONOMA DI TRENTO



## **Scientific Committee**

Chad Finn, Oregon State University, USA

Massimo Iorizzo, Fruitnet.com, USA

Lara Giongo, Fondazione Edmund Mach, Italy

Gianluca Savini, Sant'Orsola, Italy

Gianfranco Anfora, University of Trento, Italy

Brian Farneti, Fondazione Edmund Mach, Italy

Francesco Emanuelli, Fondazione Edmund Mach, Italy

## **Organizing Committee**

Luca Lovatti, Consorzio Innovazione Frutta Trentino, Italy

Floriana Marin, Fondazione Edmund Mach, Italy

Paula Poncetta, CIF & Fondazione Edmund Mach, Italy

Marcella Grisenti, Fondazione Edmund Mach, Italy

Paolo Martinatti, Fondazione Edmund Mach, Italy

Matteo Ajelli, Fondazione Edmund Mach, Italy

Cristina Castellani, Fondazione Edmund Mach, Italy

Gonzalo Cervantes, Fondazione Edmund Mach, Italy

Paolo Zucchi, Sant'Orsola, Italy

Sara Fontanari, Sant'Orsola, Italy

Daniela Mott, Sant'Orsola, Italy



### **Fondazione Edmund Mach**

In order to improve agriculture in what was then Tyrol, in 1874 the Austro- Hungarian Empire approved the institution of an agricultural school to be located in the Augustinian monastery of San Michele all' Adige. After the First World War, the Agricultural Institute of San Michele (IASMA) came under the control of the Italian government which in turn passed it over to the authority of the Autonomous Province of Trento since 1948. In 2008 the Institute's organisations and activities were transferred to a new legal body, the Fondazione Edmund Mach (FEM), a public agency under private law. Since 2008 the Research and Innovation Centre (CRI), within FEM, focuses its research on genetics and genomics of fruit plants, agrifood and nutritional quality, biodiversity and molecular ecology, sustainable agro-ecosystems and bioresources, and computational biology. These research areas were selected to meet the interests and needs of local economy. A brand new Campus with 200 m<sup>2</sup> of greenhouses, 30 hectares of breeding fields and state of the art technologies are other relevant traits. In 2008 an external site for berries research was developed, where labs and fields grow in the most typical berries area in Trentino. A young and dynamic environment, international researchers, collaborations with universities and institutions throughout the world: all these together place the Centre in a global context, which encourages the exchange of ideas and the development of innovation and produces internationally-recognised results.

### **Sant'Orsola**

Sant'Orsola is an Italian farmer association specialized in production and sale of berries: strawberries, blackberries, raspberries, blueberries, red and white currants, wild strawberries, baby kiwis, late-fruiting cherries and gooseberries. Founded in the early 1970s as an association of volunteers, it became a cooperative in 1979 and a few years later achieved the important recognition of "Producers' Organization" from the European Community. Sant'Orsola is represented by more than 800 members from Trentino, Calabria, Sicily and Veneto regions. Every day each member commits to the passion that makes unique the Sant'Orsola's small fruits. Sant'Orsola currently is the main Italian brand in the berries category and its headquarter is located in Trentino.

Sant'Orsola has started an intense and continuous Research & Development work to select the best varieties of strawberries and berries. Expert hands cross in natural ways pollens and flowers of different varieties of the same species in order to identify those that are best suited to ensure a top quality production for taste, quality, storability and resistance to disease and winter cold.

### **Cif**

CIF (Fruit Innovation Consortium) is a private company active from 2012. Members of CIF are : APOT and Fondazione Edmund Mach.

APOT is an APO of the Producer Organisations: La Trentina and Melinda. The two PO's represents 90% of the total fruit production in the Trentino Province. In total, through APOT, we represent the fruit innovation for 5.000 growers, 8.000 hectares and 450.000 t of fruit sold in the market.

CIF develops and promotes new apple varieties from different breeding programs. Within this project the CIF has two main tasks: addressing the objectives of growers and commercial structures and validate new selections primarily produced in the province of Trento.

CIF collaborate in the development of new selections and varieties coming from different apple breeding programs in the world and also is active in cooperating in strawberry (BerryLab) and blueberry (FEM) variety development and testing of new sweet cherry and apricot variety.

CIF is also involved in several projects with the objective to increase the sustainability in fruit production through: orchard design (Apple Pedestrian Orchard), enhancing the development of new and local varieties (blueberry and Dro Plum) and better control of pests (Sterile Insect Technology).

## MONDAY 12.11

- 17:00 - 17:30 Participants registration  
 17:30 - 19:00 Welcome drink

## TUESDAY 13.11 "SCIENTIFIC DAY"

- 08.00- 09.00 Participants registration
- 09.00- 09.30 **Opening of the Conference**
- Breeding and horticulture**  
**FIRST SESSION**  
**chairperson: Chad Finn**
- 09.30- 10.00 **Chad Finn (USDA ARS, Usa)**  
 Breeding of northern and southern highbush blueberry
- 10.00- 10.20 **Rolf Nestby (NIBIO, Norway)**  
 The possibility of better exploiting the wild European blueberry (*Vaccinium myrtillus* L.)
- 10.20- 10.40 **David Charles Percival (DALHOUSIE UNIVERSITY, Canada)**  
 Unmanned Aerial Vehicle use for Phenotype and plant growth and development assessment in wild blueberry production
- 10.40- 11.00 *Coffee break*
- 11.00- 11.20 **Pedro Bràs de Oliveira (INIAV, Portugal)**  
 Early and late highbush blueberry production in substrate
- 11.20- 11.40 **Felix Koschnick (NIEDERSACHEN, Germany)**  
 Blueberry growing in Europe, remarks on the northern season 2018, what will happen in the future, where are the opportunities
- 11.40- 12.00 **Angela Koort (ESTONIAN UNIVERSITY OF LIFE SCIENCES, Estonia)**  
 Comparison of bioactive compound content of new half-highbush blueberry cultivar 'Are' with selected blueberry clones

**Genetics & genomics****SECOND SESSION**

chairperson: Massimo Iorizzo

12.00 - 12.30 **Massimo Iorizzo** (NORTH CAROLINA STATE UNIVERSITY, Usa)  
Genome and genomic tools in northern and southern blueberry

12.30 - 12.50 **Francesco Emanuelli** (FEM, Italy)  
Blueberry genetics: germplasm evaluation and QTL mapping

12.50 - 13.10 **Luca Bianco** (FEM, Italy)  
From genomes to genomic tools: bioinformatics at FEM

question time

13.20 - 14.00 *Lunch*

**Blueberry fruit quality and postharvest****THIRD SESSION**

chairperson: Lara Giongo

14.00 - 14.30 **Lara Giongo** (FEM, Italy)  
A glance on blueberry fruit quality

14.30 - 14.50 **Nenad Magazin** (UNIVERSITY OF NOVI SAD, Serbia)  
6-benzyladenine affects chemical composition of northern highbush blueberry (*Vaccinium corymbosum* L.) fruits

14.50 - 15.10 **Cinzia Mannozi** (UNIVERSITY OF BOLOGNA, Italy)  
Effects of different polysaccharides-based coatings on quality of fresh Blueberries during storage

15.10 - 15.30 **Rosalba Lanciotti** (UNIVERSITY OF BOLOGNA, Italy)  
Innovative strategies to increase safety, quality and sustainabilities of Berry productions

15.30 - 15.50 **Brian Farneti** (FEM, Italy)  
Tailored storage management can positively affect blueberry fruit quality

15.50 - 16.45 Posters short presentation (five minutes talk)



## WEDNESDAY 14.11 "TECHNICAL COMMERCIAL DAY"

- 08.00 - 09.00 Registration
- 09.00 - 09.30 **Authorities' opening**  
**Luca Lovatti (CIF, Italy)**
- 09.30 - 09.45 **Global overview and market summary of blueberry**  
**Chairperson: Mike Knowles (FRUITNET, United Kingdom)**
- 09.45 - 10.00 **Blueberry business development**  
**Adrian Wallbridge (FALL CREEK FARM AND NURSERY, Spain)**  
European overview of the blueberry business, consumption and main differences among main areas
- 10.00 - 10.15 **Nursery and Certification**  
**Frans Claassen (NAKTUINBOUW, The Netherlands)**  
Blueberry nursery pipeline and plant quality
- 10.15 - 10.30 **Pierluigi Lucchi, Marco Cardoni, Luigi Catalano (CIVI, Italy)**  
CIVI Italia role within plant propagation material certification scheme: proposal for soft fruits
- 10.30 - 10.45 **Substrates**  
**Joris Böinck (LEGRO, The Netherlands)**  
Soil to substrate
- 10.45 - 11.15 *Coffee Break*
- 11.15 - 11.30 **Production**  
**Gianluca Savini (SANT'ORSOLA, Italy)**  
Italian blueberry production and market
- 11.30 - 11.45 **Post-harvest**  
**Luca Montanari (UNITEC, Italy)**  
Sorting and optical selection

# PROGRAMME

- 11.45 - 12.00 **Packaging**  
**Matteo Camillini** (INFIA, Italy)  
R-PET 100% Packaging Sostenibile
- 12.00 - 12.15 **Supermarkets**  
**Sabina Wyant** (TESCO, United Kingdom)  
The status quo and what the future holds
- 12.15 - 12.40 **Resume of the 13th scientific session**  
**Lara Giongo** (FEM, Italy), **Chad Finn** (USDA ARS, Usa)
- 12.40 - 13.00 **Discussion**  
moderated by **Mike Knowles**
- 13.00 - 13.15 **Authorities' closing**  
**Sergio Menapace** (FEM, Italy)
- 13.15 - 15.00 *Lunch and Networking*
- 15.00 - 18.00 Tour to Sant'Orsola and Fondazione Edmund Mach

## Breeding and Horticulture

1. Chad Finn                      chad.finn@ars.usda.gov
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3. David Charles Percival      David.Percival@DAL.ca
4. Pedro Brás de Oliveira      pedro.oliveira@iniav.pt
5. Felix Koschnick              felix.koschnick@lwk-niedersachsen.de
6. Angela Koort                 angela.koort@gmail.com

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- Comparison of bioactive compound content of new half-highbush blueberry cultivar 'Are' with selected blueberry clones \_\_\_\_\_ p. 22

## Genetics and genomics

7. Massimo Iorizzo              miorizz@ncsu.edu
8. Francesco Emanuelli        francesco.emanuelli@fmach.it
9. Luca Bianco                 luca.bianco@fmach.it

- Genome and genomic tools in northern and southern blueberry \_\_\_\_\_ p. 23
- Blueberry genetics: germplasm evaluation and QTL mapping \_\_\_\_\_ p. 23
- From genomes to genomic tools: bioinformatics at FEM \_\_\_\_\_ p. 24

## Fruit quality

10. Lara Giongo                 lara.giongo@fmach.it
11. Nenad Magazin              nrmagazin@polj.uns.ac.rs
12. Cinzia Mannozi              cinzia.mannozi2@unibo.it
13. Rosalba Lanciotti         rosalba.lanciotti@unibo.it
14. Brian Farneti                brian.farneti@fmach.it

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## Pests and diseases

15. Gianfranco Anfora         gianfranco.anfora@unitn.it
16. Dalphy Harteveld         dalphy.harteveld@wur.nl
17. Alberto Grassi              alberto.grassi@fmach.it
18. Daniele Prodorutti         daniele.prodorutti@fmach.it

- Current status of *Drosophila suzukii* management in Trentino, research achievements and perspectives for sustainable control \_\_\_\_\_ p. 27
- Diseases of blueberry in the Netherlands \_\_\_\_\_ p. 27
- The experience of Spotted Wing *Drosophila* (*Drosophila suzukii*) management in Trentino on berry fruits \_\_\_\_\_ p. 28
- Overview of blueberry diseases in Trentino (Italy) \_\_\_\_\_ p. 28

## [7] Genome and genomic tools in northern and southern blueberry

Massimo Iorizzo (1,2), Hamed Bostan (1), Rishi Aryal (2), Qi Xinpeng (3), Molla Fentie Mengist (1), Jeannine Rowland (3), Hamid Ashrafi (2)

- 1 Plants for Human Health Institute, North Carolina State University
- 2 Department of Horticultural Sciences, North Carolina State University
- 3 Genetic Improvement of Fruits and Vegetables Laboratory USDA-ARS, Beltsville

Blueberry (*Vaccinium corymbosum*) is one of the few fruit crops native to North America. Driven by recognition of the health benefits associated with blueberry consumption, blueberry production and demand continue to expand globally. To sustain this growth, blueberry stakeholders including producers, processors and marketers consider breeding cultivars with improved fruit quality (texture, taste, shelf life) as the top priority. Marker Assisted Breeding (MAB) can expedite the conventional breeding process to fulfill this need. However, the genomic resources needed to implement MAB for blueberry are limited. To expand the genomic resources, ongoing efforts include sequencing a tetraploid *V. corymbosum* cv. O'Neal (Southern Highbush) blueberry and a diploid *V. caesariense* (clone W85-23), presumed the closest diploid progenitor of tetraploid *V. corymbosum* (Northern Highbush). The *V. caesariense* primary genome assembly covers 638 Mb (N50=50Mb), 96% of the estimated genome size (670Mb), and the longest primary scaffolds represent the 12 blueberry chromosomes. Additional 470 Mb, were assembled into associated contigs, representing the alternative haplotypes. A linkage map of a diploid interspecific population representing the W85-20 genome, including 3,090 markers, spanning 1,107 cM, was used to correct chimeric regions and anchor the diploid genome. O'Neal primary genome assembly covers 1.24 Gb (N50=5.9 Mb), 96% of the estimated genome size. An additional 129 Mb were assembled into associated contigs. Efforts to compare the two genomes and to annotate the genome integrating transcriptome data from multiple tissue are ongoing and will be discussed.

## [8] Blueberry genetics: germplasm evaluation and QTL mapping

Francesco Emanuelli (1), Brian Farneti (1), Marcella Grisenti (1), Matteo Ajelli (1), Iuliia Khomenko (2), Paolo Martinatti (1), Paula Poncetta (1,6), Nahla Bassil (3), April Nyberg (3), David Chagné (4), Rubina Jibrán (4), Franco Biasioli (2), Michela Troggio (1), Luca Bianco (5), Lara Giongo (1)

- 1 Genomics and Biology of Fruit Crop Department, Fondazione Edmund Mach, via E. Mach 1, 38010 San Michele all'Adige, Trento, Italy
- 2 Food Quality and Nutrition Department, Fondazione Edmund Mach, via E. Mach 1, 38010 San Michele all'Adige, Trento, Italy
- 3 USDA-ARS National Clonal Germplasm Repository, 33447 Peoria Road, Corvallis, OR, 97333, USA
- 4 The New Zealand Institute for Plant & Food Research Limited, Private Bag 11600, Palmerston North, 4474, New Zealand
- 5 Computational Biology Unit, Fondazione Edmund Mach, via E. Mach 1, 38010 San Michele all'Adige, Trento, Italy
- 6 CIF Fruit Innovation Consortium, Trento, Italy

Cultivation and consumption of highbush blueberry (*V. corymbosum*) have greatly increased in the last years with most of the breeding programs focusing on fruit quality and plant adaptability to more extreme environmental conditions. Thus, there is an urgent need to exploit the genetic diversity present in the blueberry germplasm and to delve deeper into the genetic determination of several key traits to generate robust markers for Marker Assisted Breeding (MAB). The present research is aimed to genetically characterize the *Vaccinium* germplasm present at the Fondazione Edmund Mach and to dissect the genetics of phenology-related traits and fruit quality (texture, volatile organic compounds -VOCs-, and chemical composition) at harvest and postharvest by QTL mapping. One hundred and ten accessions were genotyped with 13 SSR markers and could be separated into clusters reflecting species/ploidy and pedigree (northern highbush -NHB- and southern highbush -SHB-). A set of 30 blueberry cultivars maintained at the National Clonal Germplasm Repository in Corvallis (USA) were used to standardize SSR allele naming and binning. Genotyping-by-sequencing (GBS) was applied to 186 individuals of a F1 mapping population generated from a cross between two tetraploid cultivars, the NHB Draper and the SHB Biloxi. The parents and the progeny were sequenced (Illumina SE100) in two 96-plex GBS libraries generating 911 M reads. Sequences were aligned against the diploid blueberry genome (2013 version) and genotype calling was performed by taking into account allele dosage. A total of 5,977 SNP markers were identified and 4,720 of them were used to build an integrated genetic map of 12 linkage groups (LGs) with 43 and 44 out of 48 expected homologues found for 'Draper' and 'Biloxi' respectively. Putative QTLs have been found and together with the above mentioned results represent a pivotal step towards providing the framework for MAB in blueberry.