

WORKSHOP SCIENTIFIC REPORT

Action number: **CA16212; INDEPTH**

Workshop title: **Industry workshop**

Workshop start and end date: **9:30-11:15, Tuesday 10th December 2019**

Organizers: **Dragana Miladinovic & Serena Varotto**

Location: **EI-Escorial, Spain**

Minutes

1- Dragana Miladinović (Institute of Field and Vegetable Crops, Serbia) (5 min)

Dragana introduce the aim of this first workshop with private partners organized during the SEB/COST Madrid meeting. 1.5 to 2 hrs discussion with private partners in the frame of WG3 meeting to better define the main motivations for academia and industry to collaborate together.

2- Christophe Tatout, Action Chair (University Clermont Auvergne, France) (10 min)

"Introduction to the COST-Action project "INDEPTH" and its objectives".

3- Serena Varotto (University of Padova, Italy)

"Chromatin dynamics for plant breeding: applications and challenges" (10 min)"

- Transfer of knowledge between model and cultivated species is important
- Agriculture has to face a second green revolution: climate change, sustainable food security
- Epigenetics contribute to Phenotypic plasticity **BUT** stability and heritability of epigenetics effects are crucial for breeders
- Selected references
 1. Epigenetics: Potentials and Challenges in Crop Breeding; DOI:<https://doi-org.insb.bib.cnrs.fr/10.1016/j.molp.2019.09.006>
 2. Epigenetic regulation in plant responses to the environment. DOI:[10.1101/cshperspect.a019471](https://doi.org/10.1101/cshperspect.a019471)
 3. Chromatin dynamics during interphase and cell division: similarities and differences between model and crop plants. DOI:[10.1093/jxb/erz457](https://doi.org/10.1093/jxb/erz457)

4- Monika Kloiber-Maitz (KWS SAAT SE & Co. KGaA, Germany)

"Epigenetics in Plant Breeding – Perspectives from Industry" (10 min)

- Interest in stress memory - changes in DNA methylation . Eg. MSH1 memory lines in Maize
- Use DNA methylation variations to create phenotypic variations
- Tools and Methods required to detect epigenetic modifications = "enabling technologies"
 - Adapt Epigenetic technique from sample to sample to Hightroughput (ChIP?)
 - Nanopore sequencing (to detect DNA methylation)
 - TILLING (to create genetic variability)
- Requirement: secure stability and reproducibility

5- Riccardo Aiese Cigliano (Sequentia Biotech, Spain)

“Next Generation Bioinformatics: how to transform data into knowledge” (10 min)

- Bioinformatics company (HQ in Barcelona, Offices in Naples and Tenerife)
- Next Generation Bioinformatics (AIR: for RNA-Seq, Gaia: for metagenomics), data integration , SaaS software and pipeline
- Informatics: docker technology to improve reproducibility, unlimited computational resources, Cloud
- Offer coaching and training
- SME funded by H2020 and Spanish funding instruments

6- David Lapuente (BIOVEGEN, Spain)

BIOVEGEN – “Catalysing R&D activities and business opportunities in plant biotechnology” (10 min) (Cancelled due to illness)

7- Panel discussion: Epigenetics - From Laboratory to Application (25-30 min)

Moderator: Dragana Miladinović (Institute of Field and Vegetable Crops, Serbia)

Participants: Christophe Tatout (University Clermont Auvergne, France), Serena Varotto (University of Padova, Italy), Ales Pecinka (Institute of Experimental Botany, Czech Republic), Eleni Tani (Agricultural University of Athens, Greece), Riccardo Aiese Cigliano (Sequentia Biotech, Spain) and David Lapuente (BIOVEGEN, Spain)

Topics of interest

- **Techniques related to epigenetics** to be transferred & adapt to industry needs: reduce costs, improve throughput; Production of dsRNA
- **Traits:** Biotic and abiotic stress especially through priming (stress memory); Chilling, flowering, epigenetic mechanisms for plant immunity.
- **Phenotypic plasticity:** Involvement of Epigenetics; Create epigenetic variability; study stability across generations (be aware about silencing; example of Paul introgression of nematode resistance gene from wild tomato species into a cultivar, resistance gene was silenced after 9 generations)
- **Agrochemical to modify the epigenome**
- **Others:** Joined PhD, Academic partner can learn about IP

To be keep in mind

- **Economic challenge:**
 - Genomic selection = second green revolution?
 - Application of new knowledge (new breeding biotechnologies) is limited by EU regulation
- **Societal challenges:**
 - Sustainable food security & climate change
 - Be careful about communication (i.e. GMO), be careful about promises

- Public opinion about agriculture and concerns about the new breeding technologies makes plant science less attractive to students
- Relationship much easier in the US than in the EU:
 - history? maize is also a model species in US
 - EU regulations are limiting the collaborations?
- **Scientific challenges:**
 - Stability and inheritance of epigenetic variation; consider somatic (priming) vs germinal (transgenerational)
 - Always initiate collaboration by a simple project
 - How to promote both basic research and cultivated species?
 - increase participation of academic researchers at meetings and events with strong presence of industry and breeders (EUCARPIA, international events devoted to main crops etc)

Ideas to Promote Industry-Academia interactions & final conclusions

- Collect **information** about INDEPTH scientists (topic, species...) and make them available to private partners. This can be achieved by the **INDEPTH search index** at the website.
- Interaction with industry could be increased with common project applications
 - **EU-RISE** application (Research and Innovation Staff Exchange) provide possible internship for academic researcher in industry; Sarah Farrona and Serena Varotto already applied to EU-RISE but were not successful;
https://ec.europa.eu/research/mariecurieactions/news/research-and-innovation-staff-exchange-rise-bridging-ri-sectors-europe-and-worldwide_en
 - offer of industrial PhD (co-supervision between academia and industry); can be through “European Industrial Doctorates” [MSCA-ITN-EID]
<https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/topic-details/msca-itn-2020>
 - creating a new COST or ITN supported project
- Be aware of the limitations of the technology (for instance, trans-generational (in)stability), and try to find solutions for these limitations with industrial partners
- Problem solving approach should be used in contact with industry, that is to offer them to solve the particular problem that they have, rather than to offer finished product or methodology (that is, “Give us a problem to solve” -rather than “we have solution” - Give us the problem approach)
- Special attention should be paid to IP issues, in order to avoid potential problems with ownership and publication of the results.