

**Technical Working Party on Testing Methods and Techniques**

**TWM/1/14**

**First Session**

**Virtual meeting, September 19 to 23, 2022**

**Original:** English

**Date:** August 31, 2022

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**UPDATE ON IMODDUS ACTIVITIES**

*Document prepared by an expert from the European Union*

*Disclaimer: this document does not represent UPOV policies or guidance*

The annex to this document contains a copy of a presentation on “Update on IMODDUS activities”, prepared by an expert from the European Union, to be made at the first session of the TWM.

[Annex follows]



## Update on IMODDUS activities

UPOV-TWM Online – Sept 2022

### IMODDUS Background



- ❖ **IMODDUS** = Integration of **MO**lecular **D**ata into **DUS** testing.
- ❖ CPVO BMT working group for the promotion of the use of bio-molecular techniques in DUS testing and variety identification.
- ❖ Set up by CPVO Administrative Council in the framework of its R&D Strategy in 2016, and confirmed in the revised Strategy in 2021.
- IMODDUS works as a **think-tank** for the development of strategies supporting the integration of BMT into DUS testing.
- IMODDUS has a **practical approach** which aims at assisting the CPVO in identifying and assessing **R&D projects proposals** for species where BMT could improve the **quality** and potentially the **cost efficiency of DUS testing**.



## Meetings of IMODDUS WG

1st meeting Paris, April 2016

2<sup>nd</sup> meeting Paris, Jan 2017

3rd meeting Paris, April 2018

No meeting in 2019 → INVITE consortium

Meeting cancelled in 2020 due to Covid19

4th meeting online, Feb 2021



**5th meeting Bruxelles, May 2022 → 22 participants (physical meeting)**



## Update on the revision of the EU PRM regulation (DG-SANTE – P. Mannerkorpi)



### Steps taken until now :

- COM study submitted to Council and EP in April 2021 : pointing to the need of revision
- Consultation activities mostly finalised / analysis initiated (by ICF)
  - public consultation (21/12/2021 – 27/03/2022)
  - targeted survey and interviews by ICF (03/03/2022 – 01/04/2022)
  - SME test may-June 2022

→ **Objective = Impact assessment finalized and Commission's proposals for the revision of the legislation adopted by end 2022.**

**Role of BMT / IMODDUS : ongoing reflection on the basis of CPVO proposal (sub. Feb 2022)**

(advisory group for recommendations on the use of molecular tools ? contribution to the definition of specific actions for Horizon Europe ?... )



## Update on the new OECD BMT Work Group

(OECD-BMT - C. Rouillard)

→ **IMODDUS to provide input from its horizon scanning on new developments in BMT**



## Update on the evolution of the US PVP system (PVPO - R. Guo)

### - piloting of breeders' trials

- Shadow Canada at on-site DUS examinations
- Conduct mock on-site DUS examinations and complete DUS reports with first visit in 2022
- Engage **CPVO**, NAKT, and Canada to expand knowledge of the pilot project

### - implementation of new molecular approach in soybean

- Have met with Canada, **CPVO**, NAKT + plan to coordinate with other UPOV Countries

(Varieties with a similarity below 96% can be considered distinct from each other)

## Feedback from breeders on the concept of vmD

(Joint presentation ISF/Euroseeds – S. Csörgő)



- ❖ Survey amongst forage & turf members
- ❖ Conducted in February 2021
- ❖ Answers received from members from: UK, DE, CH, SA, NZ, AUS, DK, JP
- ❖ Discussion within IP committee
- ❖ Explanatory & discussion paper drafted
- ❖ Further exchange in forage & grass section in spring 2021

Many questions & concerns raised  
But wish to avoid that varieties with improved end-used value are rejected  
Better understanding of the « problem » is needed  
Possible use of other solutions should be better looked at.  
The concerns raised with the proposal may be further discussed

→ NAKT proposed to prepare a draft document for the next CPVO-AEM + Feedback from Euroseeds



## IMODDUS projects in 2021-2022

- Finalized : apple, cannabis, oilseed rape
- On going : tomato, DurdusTools
- Granted co-financing in 2021 (for a start in 2022) : Hydrangea, ToBR-Ag



## New IMODDUS project

### Hydrangea



*"Harnessing molecular data*

*to support DUS testing in ornamentals: a case-study on Hydrangea. "*

- Aim: develop an optimal molecular toolset that associates neutral and gene-specific markers to improve the management of the reference collection and secure field trials by checking the varietal identity of cuttings prepared from the collection before starting DUS examinations
- Granted co-financing in Oct 2021
- Coordinator : GEVES
- Project partners are Bundessortenamt (GER) and INRAE (GDO-IRH, FR)
- Duration : 18 months (results expected mid-2023)



## New IMODDUS project

### Tomato – Pepper –Melon (“ToBR-Ag”)



“Updating DUS resistance tests (biotests and markers) according to pests’ evolution:

- Setting up resistance tests to ToBRFV for tomato and pepper
- Improvement of resistance test melon/Aphis gossypii”

- Granted co-financing in Oct 2021
- Coordinator : **GEVES** (FR)
- Project partners: EOs = NAKT (NL), INIA (ES), CREA (IT)  
+ breeding companies = BASF, Bayer, Enza Zaden, Gautier Semences, HM Clause, Rijk Zwaan, Sakata, Takii, Vilmorin  
+ research institute (INRAE, FR)
- Duration : **36 months** (results expected in 2024)

**invite**  
molecular activities

WP1: finding new types of markers

**T1.4 Exploring the use of epigenetic marks** **APPLE**

**variety identification (INRAE)**  
(follow-up of CPVO project on apple mutants : 7 genotypes in 7 locations in the EU)

**and adaptation to environment (IRTA)** (3 varieties in 2 locations)

WP3: Genotyping tools to characterize varieties and their performance

**T3.1: Genome wide marker sets for distinguishing heterogeneous and open pollinated varieties**

**PRG** (TEAGASC, INRAE, Agroscope, GEVES, CPVO, BioSS)

**T3.2: Genome wide marker sets for line and hybrid varieties**

**WHEAT, MAIZE, SOYBEAN** (UHOH, NIAB, INRAE, GEVES, CPVO)

**T3.3: Identification of specific markers for DUS related traits and development of genotyping assays using these markers**

**POTATO, TOMATO, APPLE** (NIAB, INRA, GEVES, CPVO, WU)  
(scab, powdery mildew)

**T3.4: GWAS mapping and genomic prediction of DUS traits**

**WHEAT, MAIZE, PRG, SOYBEAN** (UHOH, NIAB, INRA, BioSS)

**T3.5: Improved models for marker-based evaluation of D and U**

**WHEAT, MAIZE, PRG, SOYBEAN** (UHOH, BioSS)

(genetic U based on genetic variance)

### Task 3.1: Genome-wide marker sets for distinguishing heterogeneous and open pollinated varieties of Perennial Ryegrass (Teagasc- D. Milbourne)



Teagasc will develop a **SNP variant database**

BioSS will test the **predictive power of the large variant set for DUS traits in multiyear dataset in the NL population**. Separate prediction experiments for 2x and 4x varieties: reduces population size ~120-140 per ploidy.

**Subsets of markers**, identified by various methods (variable importance measures, GWAS feature selection, physical distribution), **will be tested for predictive ability** to drive the development of assays that can be used at EOs

INRAE have started to develop sequence capture assays in PRG as a potential route for application – initial results are promising

**WP3 intends to organise a wider non-crop specific workshop to better understand the requirements of EO stakeholders**

1. Heading Date
2. Crown Rust
3. Quality (NIRS)
4. Yield

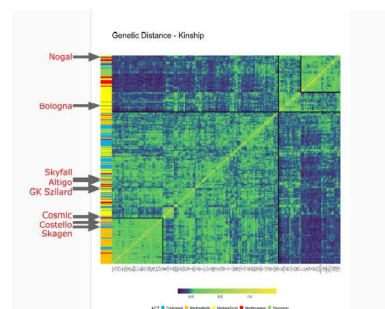
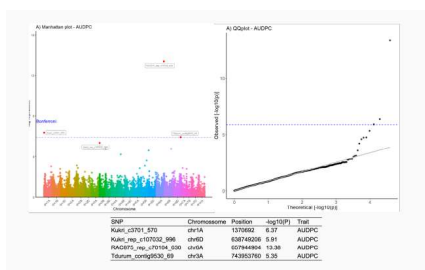
### New molecular tools for DUS and VCU testing in wheat: objectives, methods and first achievements (CBGP-INIA -J. I. y Sanchez)



InnoVar will collate existing and de novo genetic (SNP) database on wheat



- -omics data will be used to « determine genetic similarity thresholds of relevance to DUS ».
- GWAS to identify genomic loci and markers associated with DUS and VCU traits of interest.
- Genotyping platform: Illumina iSelect 90K SNP array

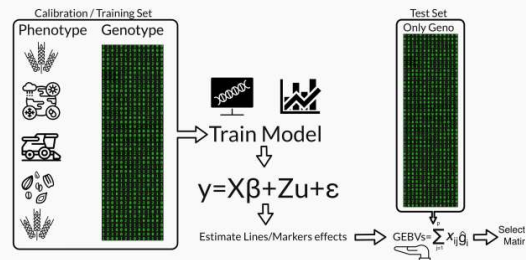


## Machine Learning for the analysis of molecular data in relation to phenotypic data in wheat (Maynooth Univ. Ireland - D. Sarti)



INN@VAR

### Machine Learning



### Modern Plant Breeding is ANALYTICS

- **Phenotypic analysis:** Quality control of locations, experiments, traits.
- **Genomic analysis:** BLUPs, repeatability, spatial
- **Phenomic Analysis:** Predictions, mating design, diversity, QTL, GWAS.
- **Envirotyping Analysis:** GxE prediction, environmental characterization
- **Optimization analysis:** Training population optimization, Optimal design, resources vs. locations
- **Other omics:** Metabolomics, Transcriptomics, Proteomics

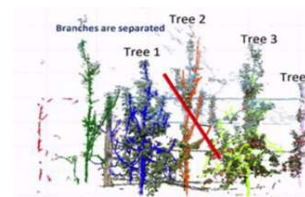


→ study how DUS and VCU attributes “behave in different environments”

## Potential future update of IMODDUS strategy :

Enlarging activities to a wider range of techniques : **phenotyping tools**, ...

(Cf. UPOV-TWM)







Thank you for your attention !

**Questions ?**



[End of Annex and of document]