

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

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
- 2nd 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)



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

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

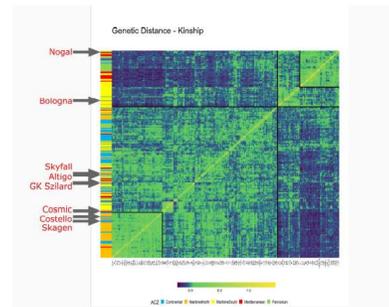
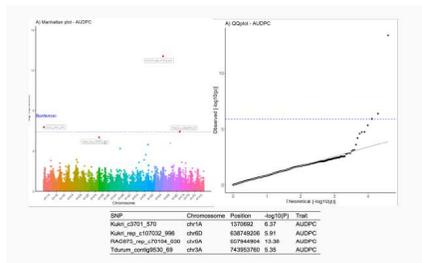
WP3 intends to organise a wider non-crop specific workshop to better understand the requirements of EO stakeholders

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

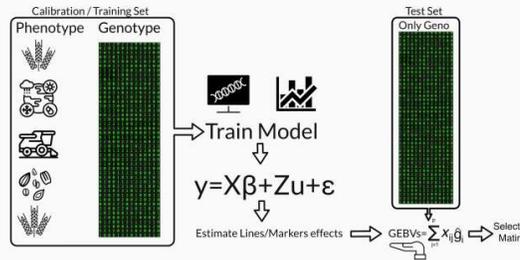
- -omics data will be used to « determine genetic similarity thresholds of relevance to DUS ».
- GWAS to identify genomic loci and markers associated with DUS and VCU traits of interest.
- Genotyping platform: Illumina iSelect 90K SNP array



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



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

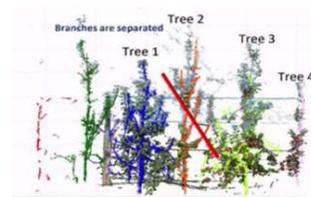


→ study how DUS and VCU attributes “behave in different environments”

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]