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| International Union for the Protection of New Varieties of Plants |  |

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| Technical Working Party on Testing Methods and Techniques  Third Session Beijing, China, April 28 to May 1, 2025 | TWM/3/29  Original: English  Date: May 1, 2025 |

REPOrT

Prepared by Office of the Union

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# Opening of the session

1. The Technical Working Party on Testing Methods and Techniques (TWM) held its third session, in Beijing, China, from April 28 to May 1, 2025. The list of participants is provided in Annex I to this report.
2. The session was opened by Ms. Nuria Urquía Fernández (European Union), Chairperson of the TWM, who welcomed the participants.
3. The TWM was welcomed by Mr. Yan Li, Deputy Director General of Plant Variety Protection Office and Executive Director General of the Development Center of Science and Technology, Ministry of Agriculture and Rural Affairs (MARA), China.
4. The TWM was also welcomed by Mr. Jianren Zhou, Deputy Director General of the Plant Variety Protection Office and the Science and Technology Development Center, National Forestry and Grassland Administration (NFGA), China.
5. The TWM received a presentation on MARA activities from Ms. Jing Li, Deputy Director of New Plant Variety Protection Division, Development Center of Science and Technology, MARA, China. A copy of the presentation is provided in Annex II to this report.
6. The TWM received a presentation on NFGA activities from Mr. Yongqi Zheng, Researcher of the Chinese Academy of Forestry, China. A copy of the presentation is provided in Annex III to this report.

# Adoption of the agenda

1. The TWM adopted the agenda as provided in document TWM/3/1 Rev.2

## Software and statistical analysis methods for DUS examination

### Development of big data platform for DUS examination

1. The TWM received a presentation from Mr. Kun Yang (China) on “Development of big data platform for DUS examination”, a copy of which is reproduced in document TWM/3/19.
2. The TWM noted the software used for management of DUS trial data, including data management, statistical and image analysis. The TWM noted the plans for further developing the platform and invited the expert from China to report developments at its fourth session.

### Grading criteria of Anthurium DUS quantitative characteristics by multiple comparison

1. The TWM received a presentation from Ms. Yunxia Chu (China) on “Grading criteria of Anthurium DUS quantitative characteristics by multiple comparison”, a copy of which is provided in document TWM/3/12.
2. The TWM noted the possibility of reducing the error rate in the analysis of measured quantitative characteristics in Anthurium by the multiple comparisons method.

### COYU development update 2025

1. The TWM received a presentation from Ms. Trudyann Kelly (United Kingdom) on “COYU development update 2025”, a copy of which is provided in document TWM/3/5.
2. The TWM received an update on the implementation of the combined over years uniformity criterion with Splines (COYUs). The TWM noted that the analysis had been developed and tested in DUSTNT and R software and that the software would be updated following feedback from test users (Finland, Netherlands (Kingdom of the), and United Kingdom). The TWM noted that the software would be made available to UPOV members and invited the United Kingdom to provide an update on the software, the experience of implementation in United Kingdom, and guidance on how to manage extrapolation within COYU, at its next session.

## Phenotyping and image analysis

### A new perspective on the DUS test of eggplant fruit color based on lab color parameters

1. The TWM received a presentation from Ms. Yiying Zhang (China) on “A new perspective on the DUS test of eggplant fruit color based on lab color parameters”, a copy of which is provided in document TWM/3/13.
2. The TWM noted that the Test Guidelines for Eggplant were being revised and invited Ms. Zhang to present the analysis of fruit skin color to the subgroup of experts, at the next session of the TWV.

### Length data collection device pro

1. The TWM received a presentation from Ms. Shan Lu (China) on “Length data collection device pro”, a copy of which is provided in document TWM/3/14.
2. The TWM noted that members and observers interested in the data collection device could contact the expert from China for further information and collaboration.

## Developments in molecular techniques and bioinformatics

### Latest developments in molecular techniques and bioinformatics

#### Data science activities at Naktuinbouw towards genotyping and phenotyping: an update

1. The TWM received a presentation from Ms. Sanchari Sircar (Netherlands (Kingdom of the)) on “Data science activities at Naktuinbouw towards genotyping and phenotyping: an update”, a copy of which is provided in document TWM/3/16.
2. The TWM noted the development of software at Naktuinbouw and the invitation for collaboration on data science activities, including image analysis and phenotyping, workflow developments, artificial intelligence and other collaborative efforts.

### Cooperation between international organizations

#### ISTA

1. The TWM received a presentation from Ms. Ana Vicario, International Seed Testing Association (ISTA), on “ISTA update on the use of techniques for variety identification and verification”, a copy of which is provided in document TWM/3/25.
2. The TWM noted that the markers selected for detecting perennial types in annual ryegrass were not necessarily associated with morphological characteristics and were based on varieties from different countries. The TWM noted that the markers identified in the project would be published in the ISTA rules.
3. The TWM noted that the neural network used in support of variety identification was a proprietary software.

#### OECD

1. The TWM received a presentation from Mr. Csaba Gaspar, Organisation for Economic Co-operation and Development (OECD), on “Latest developments in the application of BMT under the OECD Seed Schemes”, a copy of which is provided in document TWM/3/26.

#### Joint activities

1. The TWM considered possible joint activities with OECD and ISTA and the possible harmonization of terms, definitions and methods in relation to molecular techniques. The TWM agreed to invite the expert from France to lead discussions to organize relevant information on terms and definitions. The TWM noted the expression of interest of the experts from Argentina, China, Germany, Netherlands (Kingdom of the), United Kingdom, CIOPORA and ISF to contribute to the exercise.

1. The TWM noted the report from the representative of OECD that the OECD Seed Schemes had already endorsed the collaboration with UPOV for possible harmonization of definitions and terms.
2. The TWM recalled that the outcomes of the survey of UPOV members on the use of molecular markers per crop was available as a spreadsheet at the webpage of the Technical Committee, at its fifty-eight session (see: <https://www.upov.int/meetings/en/doc_details.jsp?meeting_id=67786&doc_id=586962>).
3. The TWM discussed the possibility of a joint meeting with participants from the TWM, OECD Seed Schemes and ISTA Variety Committee to discuss cooperation on the use of molecular markers for the purposes of each organization. The TWM agreed that organizing a joint meeting with experts from the three organizations would require specific arrangements and should be further discussed by UPOV, OECD and ISTA.
4. The TWM discussed the establishment of common sets of molecular markers for variety identification and agreed to invite UPOV, OECD and ISTA to further consider the challenges and opportunities of this initiative, such as crop(s), scale of harmonization (e.g. regional, global); and molecular marker-related aspects. The TWM agreed that working with breeders could facilitate selecting marker sets representing those breeding programs.

### Report of work on molecular techniques in relation to DUS examination

#### Guidelines for the validation of a new characteristic-specific molecular marker protocol as an alternative method for observation

1. The TWM received a presentation from Ms. Cécile Marchenay (Netherlands (Kingdom of the)) on “Guidelines for the validation of a new characteristic-specific molecular marker protocol as an alternative method for observation”, a copy of which is provided in document TWP/9/4.
2. The TWM noted that the proposed procedure related to one possible procedure for the validation of molecular markers and agreed that molecular markers could be validated through their publication in peer reviewed literature.
3. The TWM agreed that information in paragraphs 21 and 28 of document TWP/9/4 should be revised to clarify the validation methods. The TWM agreed that the text box for item 8 on the table should be amended to read as follows:

“In case the DNA marker test result does not confirm the declaration in the Technical Questionnaire, a field trial or bio-assay should be performed. ~~to assess the correctness of the declaration in the Technical Questionnaire~~.’”

#### Latest developments in characteristic-specific molecular markers at Naktuinbouw: a call for knowledge exchange

1. The TWM received a presentation from Ms. Claire Kamei (Netherlands (Kingdom of the)) on “Latest developments in characteristic-specific molecular markers at Naktuinbouw: a call for knowledge exchange”, a copy of which is provided in document TWM/3/7.
2. The TWM noted that Naktuinbouw was initiating a project for the selection of molecular markers for lettuce and that interested experts should contact the expert from the Netherlands (Kingdom of the) for possible partnerships.
3. The TWM agreed that organizations should consider pooling resources in support of common projects. The TWM considered options to make available information about projects developed by UPOV members and observers and agreed they could be reported before each TWM session for inclusion in document TWM/3/2 “Reports on Developments in Plant Variety Protection from Members and Observers”.
4. The TWM welcomed the proposal from the Netherlands (Kingdom of the) to lead the updating of the list of molecular markers used per crop, that had been reported to the Technical Committee, at its fifty-eight session (available at: <https://www.upov.int/meetings/en/doc_details.jsp?meeting_id=67786&doc_id=586962>).

#### The use of biomolecular technology in DUS testing - a case study on barley

1. The TWM received a presentation from Ms. Vanessa MacMillan (United Kingdom) on “The use of biomolecular technology in DUS testing - a case study on barley”, a copy of which is provided in document TWM/3/20.
2. The TWM noted the report provided in the document and invited the expert from the United Kingdom to report progress at the fourth session of the TWM.

#### Artificial Intelligence and molecular markers in soft fruit: a proof of concept

1. The TWM received a presentation from Ms. Margaret Wallace (United Kingdom) on “Artificial Intelligence and molecular markers in soft fruit: a proof of concept”, a copy of which is provided in document TWM/3/24.
2. The TWM noted progress in the genetic prediction of morphological characteristics such as the presence of spines in Raspberry. The TWM discussed factors relating to the genetic prediction of morphological characteristics as they related to the results demonstrated in the proof of concept study.

#### Can better understanding of the genetic architecture of wheat DUS characteristics help streamline the DUS processes?

1. The TWM received a presentation from Ms. Camila Zanella (United Kingdom) on “Can better understanding of the genetic architecture of wheat DUS characteristics help streamline the DUS processes?”, a copy of which is provided in document TWM/3/22.
2. The TWM considered the requirements for implementing molecular markers in routine variety examination and agreed that they should at the same time increase efficiency for the examination authority and benefit the applicants.

#### Genomic prediction for variety collection management wheat

1. The TWM received a presentation from Mr. Adrian Roberts (United Kingdom), on “Genomic prediction for variety collection management wheat”, a copy of which is provided in document TWM/3/6.
2. The TWM noted that adjustments were required for the method to work with notes (ordinal data) instead of actual measurements and invited the expert from the United Kingdom to report progress at the fourth session of the TWM.

#### COYD-GP enhanced distinctness criterion for cross-pollinated agricultural crops

1. The TWM received a presentation from Mr. Adrian Roberts (United Kingdom), on “COYD-GP enhanced distinctness criterion for cross-pollinated agricultural crops”, a copy of which is provided in document TWM/3/4.
2. The TWM noted that the increased efficiency of the new method COYD-GP for distinctness assessments had been calculated for each characteristic and agreed that further investigation would be required on the overall efficiency gain. The TWM invited the expert from the United Kingdom to report developments at the fourth session of the TWM.

#### Community Plant Variety Office (CPVO) R&D activities

1. The TWM received a presentation from Ms. Cecile Collonnier, Community Plant Variety Office (CPVO), on “CPVO R&D activities”, a copy of which is provided in document TWM/3/15.
2. The TWM noted the report on recently concluded and ongoing projects co-funded by the CPVO. The TWM noted that the molecular markers selected under the projects were publicly available and noted the offer from China to exchange a selection of KASP markers.

### Methods for analysis of molecular data, management of databases and exchange of data and material

#### Exploiting crop haplotype-tag polymorphisms marker for pedigree identification

1. The TWM received a presentation from Mr. Yikun Zhao, China, on “Exploiting crop haplotype-tag polymorphisms (HTP) marker for pedigree identification”, a copy of which is provided in document TWM/3/10.
2. The TWM discussed the usefulness of HTP makers for pedigree identification in maize three-way hybrids and its possible use for soybeans. The TWM discussed the statistical methods to assess confidence of the method and noted the correct identification of 94% of samples in the tests performed. The TWM noted that HTP makers could possibly be used for assessing essentially derived varieties (EDVs). The TWM agreed to invite the expert from China to report developments at its fourth session.

#### PAD – an algorithm for progeny-ancestor detection based on genetic profiles

1. The TWM received a presentation from Mr. Emerson Limberger, International Seed Federation (ISF), on “PAD – an algorithm for progeny-ancestor detection based on genetic profiles”, a copy of which is provided in document TWM/3/17.
2. The TWM noted that MNP markers would provide better results, but in the absence of MNP markers, genetic tags based on recombination blocks could be used as alternative, although further testing was necessary. The TWM noted that a test version of the algorithm would be made available for interested experts.

#### DurdusTools: Current state and use in DUS-testing

1. The TWM received a presentation from Ms. Alexandra Ribarits (Austria), on “DurdusTools: Current state and use in DUS-testing”, a copy of which is provided in document TWM/3/21.
2. The TWM noted the use of DurdusTools calculating genetic distances in support of routine DUS examination of the participation authorities since 2024. The TWM noted that the participating authorities covered the operational costs, including database maintenance and molecular data generation.

#### Development of DUS phenotyping tools for and with examination offices: experience gained

1. The TWM received a presentation from Mr. Joseph Peller (Netherlands (Kingdom of the)), on “Development of DUS phenotyping tools for and with examination offices: experience gained”, a copy of which is provided in document TWM/3/27.
2. The TWM noted the availability of a mobile phone application prototype to assess volume and shape ratios of fruits, for images captured from a top down perspective. The TWM noted that the programming code for the application was open source and available at GitHub. The TWM noted the invitation for collaboration to further develop the application, in particular for stabilizing the mobile phone interface. The application and tutorial are available at: <https://play.google.com/store/apps/details?id=com.wur.invite.morph_app&hl=en-US>).
3. The TWM agreed on the importance of applications for hand-held devices in support of increased efficiency in DUS examination.

#### Phenotyping concept for strengthening the plant variety protection chain via combined use of IA&AI

1. The TWM received a presentation from Mr. Zsolt Szani, Hungary on “Phenotyping concept for strengthening the plant variety protection chain via combined use of image analysis and artificial intelligence (IA&AI)”, a copy of which is provided in document TWM/3/28.
2. The TWM considered the use of algorithms for image analysis and agreed they should be described and validated. The TWM agreed that the introduction of phenotyping tools in variety examination requires sufficient amount of variety data for training the algorithms and validation of the analysis generated.

#### Use of DNA databases at Naktuinbouw to improve DUS work

1. The TWM received a presentation from Ms. Cécile Marchenay (Netherlands (Kingdom of the)) on “Use of DNA databases at Naktuinbouw to improve DUS work”, a copy of which is provided in document TWM/3/8.

1. The TWM discussed challenges and opportunities on the use of DNA-based information as the basis to optimize variety collections and the organization of growing trials. The TWM discussed the use of DNA-based information to reduce the number of growing cycles for crops that would normally be examined in two growing trials.

#### Shared molecular database

1. The TWM received a presentation from Mr. Rene Mathis (France) on “Shared molecular database”, a copy of which is provided in document TWM/3/23.
2. The TWM agreed on the usefulness of shared databases and noted the plans for shared databases in the European Union.

### Confidentiality, ownership and access to molecular data, including model agreement template

#### Confidentiality of molecular information

1. The TWM received a presentation from Mr. Marcel Bruins, CropLife International, on behalf of the African Seed Trade Association (AFSTA), the Asia and Pacific Seed Association (APSA), the International Community of Breeders of Asexually Reproduced Horticultural Plants (CIOPORA), CropLife International, Euroseeds, the International Seed Federation (ISF) and the Seed Association of the Americas (SAA) (“breeders’ organizations”), on “Confidentiality of molecular information”, a copy of which is provided in document TWP/9/6.
2. The TWM recalled UPOV guidance on confidentiality of molecular information provided in documents TGP/5, Section 1 “Model Administrative Agreement for International Cooperation in the Testing of Varieties” and INF/15 “Guidance for Members of UPOV”. The TWM noted that no reports on confidentiality of molecular information had been reported to the TWM and agreed on the importance of safeguarding the confidentiality of parent lines and hybrid formulas. The TWM noted that a similar discussion was being held at OECD.

### The use of molecular techniques in the assessment of essential derivation

#### Exploration of identification techniques based on SNP markers for essentially derived varieties of wheat

1. The TWM received a presentation from Ms. Binshuang Pang (China) on “Exploration of identification techniques based on SNP markers for essentially derived varieties of wheat”, a copy of which is provided in document TWM/3/11.
2. The TWM noted the method for establishing a 92% threshold of predominant derivation using at least 20,000 SNPs and commonly known essentially derived varieties (EDV) as the basis for the analysis.
3. The TWM agreed that the variety selection method utilized and its pedigree were important elements for the assessment of essential derivation. The TWM recalled the UPOV guidance in document UPOV/EXN/EDV/3 that a high degree of similarity alone did not automatically mean that a variety had been predominantly derived, such as in the case of convergent breeding.
4. The TWM noted that the method described in the presentation was a recalibration using SNPs of a previously established threshold using SSR markers.

#### Essentially derived varieties (EDV) threshold development in soybeans

1. The TWM received a presentation from Mr. Barry Nelson, International Seed Federation (ISF), on “Essentially derived varieties (EDV) threshold development in soybeans”, a copy of which is provided in document TWM/3/9.
2. The TWM noted that the preliminary threshold would be evaluated by breeders involved in the study according to their current soybean development programs; if the threshold was agreed upon, it would be shared with relevant seed associations for agreement and potential adoption.
3. The TWM agreed on the importance of breeders’ contributions to determining thresholds and avoiding disputes on EDVs. The TWM agreed that implementing a threshold would require looking at variety pedigrees and how to assess remaining criteria for determining essential derivation.

### The use of molecular techniques for enforcement

#### Use of DNA techniques for plant variety right (PBR) enforcement in Peru

1. The TWM received a presentation from Mr. Diego F. Ortega Sanabria (Peru) on “Use of DNA techniques for plant variety right (PBR) enforcement in Peru”, a copy of which is provided in document TWM/3/3.
2. The TWM noted the procedures in Peru for field inspections of infringement cases, including the role of the administrative authority to conduct field inspections and the existence of guidelines for DNA-based information. The TWM noted that in Peru the plaintiff should demonstrate the specificity of the markers to be used identifying the protected variety.
3. The TWM noted the challenges reported in relation to enforcement on exported fruits due to the amount of time required for variety identification. The TWM agreed that it was important to strengthen cooperation among authorities in UPOV members on enforcement matters.

#### Use of molecular markers as a tool to enforce plant variety right (PBR) in soybean in Uruguay

1. The TWM received a presentation from Ms. Vanessa Sosa and Ms. Pilar Zorilla (Uruguay) and Mr. Diego Risso (Seed Association of the Americas) on “Use of molecular markers as a tool to enforce plant variety right (PBR) in soybean in Uruguay”, a copy of which would be provided as an addendum to document TWM/3/18.
2. The TWM noted that in Uruguay the breeders’ association and the National Seeds Institute conducted field inspections. The TWM noted that the procedure for variety identification could take up to two days, in some cases. The TWM noted that infringement fines in Uruguay were based on the value of the harvested material and considered an effective measure.
3. The TWM noted that image analysis was also used for variety identification using seeds of protected varieties.

# Matters for information

## Reports on developments in UPOV

1. The TWM noted a report from the Office of the Union on developments in UPOV.

## Reports from members and observers

1. The TWM noted the information on developments in plant variety protection from members and observers provided in document TWM/3/2. The TWM noted that reports submitted to the Office of the Union until May 1, 2025, would be included in the final version of document TWM/3/2.

## Other matters for information

1. The TWM noted the information provided in the following documents:
2. Procedures for DUS examination (document TWP/9/1)
3. UPOV Information databases (document TWP/9/2)
4. Test Guidelines: support for drafters; additional characteristics; and methods of propagating the variety (document TWP/9/3)
5. Proposal for a revision of document TGP/7 “Development of Test Guidelines”, GN 28 “Example Varieties” (document TWP/9/5)

# Date and place of the next session

1. At the invitation of the United Kingdom, the TWM agreed to hold its fourth session in Cambridge, from June 1 to 4, 2026.

# Future program

1. The TWM agreed that documents for its fourth session should be submitted to the Office of the Union by April 17, 2026. The TWM noted that items would be deleted from the agenda if the planned documents did not reach the Office of the Union by the agreed deadline.
2. The TWM proposed to discuss the following items at its fourth session:
3. Opening of the session
4. Adoption of the agenda
5. Matters for consideration

3.1 Software and statistical analysis methods for DUS examination

3.2 Phenotyping and image analysis (papers invited)

3.3 Developments in molecular techniques and bioinformatics (papers invited)

(a) Cooperation between international organizations (papers invited)

(b) Reports of work on molecular techniques in relation to DUS examination (papers invited)

(c) Management of databases and exchange of data and material (papers invited)

(d) Confidentiality, ownership and access to molecular data

(e) The use of molecular techniques in the assessment of essential derivation (papers invited)

(f) The use of molecular techniques in variety identification (papers invited)

(g) The use of molecular techniques for enforcement(papers invited)

4. Matters for information

(a) Reports from members and observers (written reports to be prepared by members and observers)

(b) Report on developments in UPOV (general developments, including variety denominations, information databases, exchange and use of software and equipment, guidance and information materials)

5. Date and place of the next session

6. Future program

7. Adoption of the Report on the session (if time permits)

8. Closing of the session

# VISIT

1. On the morning of April 29, 2025, the TWM visited Institute of Vegetables and Flowers (IVF), Chinese Academy of Agricultural Sciences in Beijing, observed the molecular marker laboratory and the experimental plots where image analysis was performed using a self-propelled analyzer. The TWM received a presentation on the activities of the IVF by Mr. Feng Cheng, Assistant Director of IVF, a copy of which is provided in Annex IV to this document. The TWM also visited the Information Technology Research Center, Beijing Academy of Agriculture and Forestry Sciences.

1. In the afternoon of April 29, 2025, the TWM visited the Chinese Academy of Forestry in Beijing, including the cultivation of new species of woody plants in laboratories with controlled environments and glasshouses. The TWM received a presentation on the activities of the Chinese Academy of Forestry by Mr. Yongqi Zheng, Researcher of the Chinese Academy of Forestry, a copy of which is provided in Annex V to this document. Further information is provided in Annex VI to this document.
2. *The TWM adopted this report at the end of the session.*

[Annex I follows]

LIST OF PARTICIPANTS

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[Annex II follows]

*[please see the PDF file for Annexes II to VI]*

[End of Annex VI and of report]