# *MALUS/PYRUS* WG REPORT (2024–2025)

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## 1. CONTRIBUTION TO ECPGR OBJECTIVES

### 1.1. Achievements and success stories

- To efficiently conserve and provide access to unique germplasm in Europe through AEGIS and the European Collection:

  As the AEGIS concept is founded on the mutual and safe conservation of unique and original accessions, the issue of duplication based on true-to-type genotypes analysis is of utmost importance. Without such true-to-type analysis, we know that a significant number of 'duplicates' can be expected within EURISCO. Especially for pome fruit species, we also need to take into account the considerable phenotypic variation caused by mutations and sports, which are not detected by conventional molecular markers.

  The initiative launched a few years ago to develop the MUNQ/PUNQ concept represents a very valuable step forward and is essential for improving our understanding of the current situation (Database with > 20.000 apple and > 8000 pear accessions genotyped with harmonized SSR markers, coordinated by INRAe) . We still need to determine how to incorporate MUNQ/PUNQ information into EURISCO as a future key component, if we want to make substantial progress regarding the *Malus/Pyrus* and *Prunus* AEGIS European Collections. The FRUITTREEDATA Grant Scheme project has greatly contributed to advancing coordinated efforts on these topics.

- To provide passport and phenotypic information of actively conserved European PGRFA diversity *ex situ* and *in situ* through the EURISCO catalogue

  i. The FRUITTREEDATA Grant Scheme project has made a major contribution to defining and implementing protocols for encoding C & E data into EURISCO. As a significant overall outcome, 261,299 C & E apple data points from 8 European collections, covering 8,541 accessions, were uploaded to EURISCO during the past year (2025). Similarly, for pear, 140,321 data points from five European collections, covering 3,500 accessions, were also uploaded to EURISCO.
  ii. In the framework of the Horizon Europe project 'InnOBreed', a European survey and a stakeholder meeting provided a selection of first and second priority traits to be evaluated, aiming at selecting potential parents for breeding in the context of biotic and abiotic stresses induced by climate change. On apple and pear, a total of 20 first-priority traits have been defined, which are evaluated using ECPGR harmonized descriptor lists. Emphasis is mainly placed on traits linked to biotic –

emergent and new pests & diseases – and abiotic stress resilience, robustness traits and quality parameters.

- To improve *in situ* conservation and use of crop wild relatives

  - In the framework of the EU project FRUITDIV, which aims to monitor, characterize, use, and conserve the diversity of wild species related to cultivated fruit trees (crop wild relatives (CWR)), with a particular focus on pome fruits (*Malus*, *Pyrus*) and stone fruits (*Prunus*), several key deliverables have already been achieved:

    **I.** A survey was organized to reach stakeholders, including other European institutes, and invite them to integrate their data into FRUITDIV and join a broader European-wide effort to list *ex situ* fruit CWR collections. Responses were received from 15 countries, providing information on 74 collections and a total of 766 *Malus* and *Pyrus* CWR accessions. In addition, a search was conducted in the EURISCO database (https://eurisco.ipk-gatersleben.de/apex/eurisco_ws/r/eurisco/home).

    **II.** Specific characterization and evaluation descriptors for *Malus* and *Pyrus* CWR have been discussed and adapted.

    **III.** Activities focus on valorizing wild pear as a parent in pre-breeding crosses, as rootstock material for cultivated fruit production, for perry processing, and for potential ornamental uses.

- To promote on-farm conservation and management of European PGRFA diversity

Since 1999, a Belgian on-farm case study project has been establishing a coordinated network of repository orchards directly linked to the CRA-W *ex situ* collections. Such initiative is a complementary action included in a safe conservation strategy and is contributing to public awareness, pedagogic purposes to fruit biodiversity and economic valorization of original, local old landrace cultivars. A recent update shows that the network now includes:

- 199 hectares of mapped orchards
- 115 existing orchards
- 615 preserved varieties
- More than 15,000 inventoried trees
- 20 updated and signed partnership agreements.

- To promote use of PGRFA

I. To better understand the current organic fruit breeding needs, future challenges and lack of knowledge across Europe, a survey was carried out in the framework of the Horizon Europe project 'InnOBreed'. The survey aimed to get a better identification of the needs in fruit breeding (from genetic resources evaluation and breeding to variety testing and finally, to fruit tree propagation in the nursery) with a focus on pip fruits and stone fruits. The survey was completed by 126 respondents from 11 different countries.

Some results point out the importance of maintenance of genetic resources, which is crucial for breeding, especially the maintenance of old local varieties for resistance breeding. Another problem concerns the maintenance of genetic resources, particularly on the sanitary status of the plant material regarding diseases (e.g. virus, phytoplasma, …) as well as pests (e.g. aphids), and especially quarantine pests & diseases. Regarding access to genetic material, most of the breeders have their own work collection, the others get their genetic material from research institutes, other breeders, genebanks, and a few also from farmers. One third of the respondents expressed difficulty accessing public collections or the lack of public collections in their area or country.

II. In the framework of the Horizon Europe project 'InnOBreed', a European Organic Fruit Breeding Network Charter was established to foster cooperation among breeders, researchers, evaluators, curators, and growers engaged in developing fruit tree cultivars that are more robust, resilient, and better adapted to organic production systems.
The network is governed by a charter that defines common principles and rules for cooperation, governance, and plant material exchange. It promotes participatory breeding approaches, transparency, and equitable access to genetic resources. Plant material exchange – covering genetic resources, pre-breeding, and elite material – is organized annually through an exchange platform and regulated by the FAO Standard Material Transfer Agreement to ensure traceability and legal compliance.

### 1.2. Gaps or constraints identified

There are still some topics that we plan to explore together:

1. Organize the process for uploading MUNQ and PUNQ information into EURISCO. There is a need for ensuring direct traceability to the tree from which the leaf samples used for genetic analysis were collected, and the Accession Number, which is used as the key linking element in EURISCO
2. Compare different data analysis methods for aggregating multi-year data prior to uploading them to EURISCO
3. Develop collaborative work on sharing methods and experiences for establishing on-farm complementary repository orchard networks
4. Develop collaborative work on pre-breeding fruit trees aimed at resilience to climate change, low-input farming systems, and improved nutritional fruit quality
5. Develop collaborative work on sharing methods and experiences for releasing well-evaluated old fruit tree varieties onto the market.

## 2. GRANT SCHEME ACTIVITIES, WG MEETINGS AND EVA ACTIVITIES

- **Ongoing Grant Scheme proposals (Phase X: submitted:1; approved:1)**
  - FRUITTREEDATA (Improvement of Fruit Tree Data Inclusion in EURISCO) in collaboration with the *Prunus* WG

- **Total number of partners involved in Grant Scheme: 19 from 14 countries**
  - ECPGR-funded: 16 from 14 countries
  - Self-funded: 3 from 3 countries

- **Meetings held**

  - EVA Perennials, Workshop of the EVA Boost project towards establishing an EVA Perennials network, Ancona, Italy, 13-14 March 2025
  - FRUITTREEDATA, online meeting, 4 November 2024
  - FRUITTREEDATA, online kick-off meeting, 3 December 2023

- **Total number of partners involved in WG Meeting: n/a**

- **Reports and related data**
  - FRUITTREEDATA poster presented at the 2024 ISHS Plum Apricot conference
  - EVA Perennials/EVA Boost workshop report, Ancona, Italy, 13-14 March 2025
  - Roadmap for the Development and Establishment of the EVA Perennials Network

- **Funds mobilized (ongoing from Phase X)**
  - ECPGR granted funds: €19,387.5 (Total for the FRUITTREEDATA grant: €38,775)
  - Inputs in-kind declared in Grant activities: €18,000 (Total for the FRUITTREEDATA grant: €36,000)

## 3. OTHER ACTIVITIES (CROSS-WORKING GROUP ACTIVITIES, LINKS WITH OTHER NETWORKS, PROJECTS AND INITIATIVES)

- **Cross-Working Group activities**:

In the framework of FRUITTREEDATA and InnOBreed projects, partners belonging to both *Prunus* and *Malus/Pyrus* WG were closely associated in developing advancements for better evaluation and utilization of fruit tree genetic resources.

## 4. WORKING GROUP DOCUMENTS AND PUBLICATIONS


- Đurić, G., Skytte af Sätra, J., Gaši, F. et al. Genetic diversity of apple heirloom germplasm in Bosnia and Herzegovina, as revealed by SNP markers. *Tree Genetics & Genomes* 20, 28 (2024). https://doi.org/10.1007/s11295-024-01658-6
- Larsen, B., Howard, N.P., Denancé, C. et al. Cultivar fingerprinting and SNP-based pedigree reconstruction in Danish heritage apple cultivars utilizing genotypic data from multiple germplasm collections in the world. *Genet Resour Crop Evol* (2024). https://doi.org/10.1007/s10722-024-02104-1
- Larsen, B., van Dooijeweert, W., Durel, CE. et al. SNP genotyping Dutch heritage apple cultivars allows for germplasm characterization, curation, and pedigree reconstruction using genotypic data from multiple collection sites across the world. *Tree Genetics & Genomes* 20, 21 (2024). https://doi.org/10.1007/s11295-024-01655-9
- Service tree descriptors, Mendel University, Brno, Czech Republic, 2025, doi: https://doi.org/10.11118/978-80-7509-992-1
- Dumont, B., Rondia, A., Delpierre, L., Dupont, P., Donis, T., Ferrier, V., Reyser, J., Jorion, A., Mingeot, D., Houben, P. and Pennetreau, Y., Lateur, M. (2025). Safeguarding, evaluating and valorizing fruit tree genetic resources in Belgium: Insights from nearly half a century of unsprayed orchard management. *Genetic Resources*, Vol. 2, pp. 185-202.

- Dumont, B., Schmitz, S., Mulot, E., Ghesquiere, A., Chandelier, A., & Lateur, M. (2024) First report of *Diplocarpon coronariae* causing apple blotch disease of apple tree in Belgium. *New Disease Reports*, 50, e70003. https://doi.org/10.1002/ndr2.70003
- Lateur, M., Dumont, B., Rondia, A. (2024). Principles & methods for collecting, safeguarding and evaluating Fruit Tree Genetic Resources: from case study to a European vision. *InnOBreed* International Training Course online (14/05/2024).
- Lateur, M., Dumont, B., Rondia, A., Delpierre, L., Dupont, P, Ferrier, V., Van Roozendael, F. (2024). How to directly valorize best performing disease tolerant and more robust cultivars from fruit tree genetic resources collections? 'A Belgian example. *InnOBreed* International Training Course online (16/05/2024).
- Lateur, M., Maggioni, L. (2025). Organisation de la conservation, l'évaluation et de l'utilisation des Ressources Phytogénétiques en Europe et complémentarité avec des systèmes nationaux. Invited speaker to the « 3ième Rencontre des Acteurs des Ressources Phytogénétique des espèces cultivées et apparentées sauvages. Lille, 19-20 of June.
- Cerisier, B., Van Rozendaele, F., Chaplier, J., Lateur, M. (2025). 'Réseau Wallon des Vergers Conservatoires' - Création et suivi de vergers contribuant à la sauvegarde et à la valorisation de la biodiversité et du patrimoine fruitier Wallon - Vade-mecum. Gembloux, pp. 29.

## 5. EXPECTED ADDITIONAL ACHIEVEMENTS AND FUTURE ACTIVITIES

In the framework of the EU Horizon Europe InnOBreed project, several deliverables will be completed by the end of 2026:

1. Improvements to the ECPGR *Malus* and *Pyrus* descriptor lists, as well as updates to methods and the seasonal calendar for characterization and evaluation activities.
2. Development of software capable of analyzing multi-year flowering phenology data, with the objective of classifying accessions according to their relative ECPGR flowering period and uploading the aggregated data to EURISCO.
3. Assessment of a robustness trait, namely 'Global tree foliage health', carried out in three apple genetic resources collections; the resulting data will be analyzed and published.

Furthermore:

4. Finalizing the deliverable: *"European Historical Pear Cultivars & Landraces Description" (EcoHisPy).*
5. We propose to organize a joint physical meeting of the *Prunus* and *Malus/Pyrus* Working Groups by late 2026 or early 2027.