

Report of a Working Group on Berries

Second Meeting of the ECPGR Berries Working Group
17–19 June 2025, Kaunas, Lithuania

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The **European Cooperative Programme for Plant Genetic Resources (ECPGR)** is a collaborative programme among most European countries. It aims to contribute to the rational and effective conservation of plant genetic resources for food and agriculture (both *ex situ* and *in situ*), as well as to provide access to these resources and to increase their sustainable use (<http://www.ecpgr.cgiar.org>).

The Programme, which is entirely financed by the member countries, is overseen by a Steering Committee composed of National Coordinators nominated by the participating countries. The Coordinating Secretariat is hosted by the Alliance of Bioversity International and CIAT.

The Programme operates through Working Groups composed of experts nominated by the National Coordinators. The ECPGR Working Groups deal with either specific crops or general themes related to plant genetic resources (such as crop wild relatives, cryopreservation, documentation and information, and on-farm conservation). Members of the Working Groups carry out activities aligned with specific ECPGR objectives, using ECPGR funds and/or their own resources.

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SUMMARY REPORT OF THE MEETING

Introduction

The second meeting of the Working Group on Berries of the European Cooperative Programme for Plant Genetic Resources (ECPGR) was held on 17–19 June 2025 in Kaunas, Lithuania. It was organized in collaboration with the Lithuanian Research Centre for Agriculture and Forestry.

Opening of the meeting

Monika Höfer, Chair of the Working Group, opened the meeting and welcomed all participants, wishing success for a fruitful collaboration and the establishment of a new joint project.

Audrius Sasnauskas welcomed all to Lithuania and briefly showed two videos introducing the participants to the beauties of the country and the self-made dynamic city of Kaunas. He then thanked his colleague Rytis Rugenius, who helped in the organization of the meeting, before presenting the Lithuanian Research Centre for Agriculture and Forestry.

The Centre is structured in three institutions: the Institute of Agriculture and regional branches, the Institute of Horticulture and the Institute of Forestry. The main priorities are the development of high-level research, the enhancement of internationalization, further development of doctoral studies, cooperation between science and business, community mobilization and expansion of services to the public. Research directions include biopotential of plants, sustainable forestry, plant protection, smart horticulture, soil quality and productivity, genetics and plant breeding. The release of new cultivars (13 in 2023 and 9 in 2024) is among the key achievements. The Centre is currently involved in 58 international projects and 76 national projects, it has 95 ongoing contracts with business entities and is constantly open to international collaboration.

A. Sasnauskas continued chairing the afternoon session.

ECPGR in Phase X – outcomes and perspectives

Lorenzo Maggioni, ECPGR

The Secretary of the European Cooperative Programme for Plant Genetic Resources (ECPGR) provided an update on the current Phase XI (2024–2028). He outlined the programme's key objectives for this phase, which encompass:

- Strengthening both *ex situ* and *in situ* conservation (including crop wild relatives and on-farm management)
- Reinforcing documentation systems for plant genetic resources (PGR)
- Promoting the enhanced use of PGR.

A summary of ECPGR's main achievements over the past 45 years was presented, highlighting its pillar initiatives:

- **AEGIS:** A quality-based system for the conservation of unique accessions
- **EURISCO:** The European search portal for PGR holding information from national inventories
- **EVA:** The European Evaluation Network for the characterization and evaluation of accessions
- **Genetic Resources:** The ECPGR-affiliated scientific journal.

The Working Group (WG) was also briefed on the key decisions made by the ECPGR Steering Committee for Phase XI. These included:

- The adoption of a new Table of Priorities
- Updated Terms of Reference for all ECPGR bodies and mechanisms
- The establishment of a new network for genebank managers
- The approved budget for Phase XI.

Finally, clear instructions were provided on the mechanisms for the WG to access ECPGR funding, either by submitting proposals under the Grant Scheme or by applying for support to organize WG meetings.

Presentations of WG members (National reports)

Czech Republic

Jiří Sedlák, RBIP Holovousy Ltd., Holovousy

RBIP Holovousy Ltd. maintains field collections of various berry crops. Some of these, including strawberry, red currant, black currant and highbush blueberry, are utilized on a large commercial scale. Others, such as raspberry, blackberry, gooseberry, cranberry and lingonberry, are kept in the collection despite more limited commercial use. The institute has initiated a raspberry breeding programme, addressing a gap left by the absence of activity in this area from other Czech breeders.

The management of these collections faces several challenges. Virus infections, such as raspberry bushy dwarf virus (RBDV) and strawberry mild yellow edge virus (SMYEV), compromise plant vigour and evaluation reliability, necessitating regular molecular diagnostics. Ongoing studies focus on raspberry sanitation procedures using *in vitro* culture, cryotherapy, thermotherapy and chemotherapy. Additional issues include pest infestations and genetic erosion, all of which can reduce the collection's representativeness and usability. Valorization examples within existing projects include developing procedures for pathogen detection and elimination. Broader international cooperation with genetic centres in both EU and non-EU countries, such as China, Kazakhstan and the USA, is considered highly desirable.

Estonia

Hedi Kaldmäe, Polli Horticultural Research Centre, Tartu

The fruit and berry genetic resources collections held by the Estonian University of Life Sciences originate from the breeding work begun at the Institute of Horticulture and Apiculture, established in Polli in 1945. The collections are part of the Estonian plant genetic resources network, initiated in 1994. The *ex situ* field collections, comprising both local and introduced genotypes, are available upon request for research and education under the Standard Material Transfer Agreement (SMTA).

Activities for conservation, evaluation and distribution are governed by the National Programme 'Collection, conservation and use of plant genetic resources for food and agriculture for 2021–2027'. The collection holds 848 fruit and berry accessions, 190 of which are berries. Key challenges include extreme weather events, increasingly milder winters with less snow cover, virus infections, and still-limited safety duplication. However, agreements are in place with growers who maintain accessions that are part of the collection.

The collection is documented on the web portal of the [Fruit Genetic Resources of the Estonian University of Life Sciences](#). Only Estonian material is registered in the European EURISCO catalogue.

Valorization of genetic resources is currently underway through the project ‘Knowledge-based health and natural products to create higher added value in the horticulture and food sector’, which focuses on using local cultivars and genetic resources for processing and investigating relevant technological traits.

Other ongoing projects include:

- ‘Blackcurrant, gooseberry, raspberry and blueberry breeding’
- ‘Modern breeding tools for smart food security (MARTA)’
- ‘Development of germplasm for berry crops (Nordic-Baltic PPP project on raspberry and strawberry) 2024-2027’.

New insect-proof greenhouse and *in vitro* laboratory facilities are currently under construction.

Finland

Tuuli Haikonen, Natural Resources Institute Finland (Luke)

The Finnish National Genetic Resources Programme for Agriculture, Forestry and Fishery is coordinated by the Natural Resources Institute Finland (Luke). The PGR programme, encompassing horticultural and agricultural plants, is led by National Coordinator Elina Kiviharju. Within this programme, Tuuli Haikonen, based at the Piikkiö Experimental Station, holds responsibility for fruit and berry genetic resources. Luke serves as the primary repository for the clonal collections of vegetatively propagated horticultural species.

A key driver for cultivar adaptation in Finland is the short growing season and the significant climatic variation across the country's considerable length. Although horticulture occupies only about 1% of the cultivated land area, it holds substantial economic value.

The central berry collections comprise 250 accessions, with approximately 10% secured through cryopreservation. Material is distributed using the SMTA, or a hobbyist SMTA for non-commercial use, except for commercially available varieties. Beyond the national programme, breeder's collections of *Fragaria* (strawberry), *Vaccinium* (blueberry), *Pyrus* (pear), *Hippophaë* (sea buckthorn) and *Chaenomeles* (flowering quince) are also maintained.

Many accessions predate the formal PGR programme, being over 20 years old. These include unreleased breeding materials, particularly in *Hippophaë* and *Rubus* hybrids, as well as native species selected from the wild, such as the lingonberry ‘Otson Karkki’ and the hermaphroditic cloudberry ‘Nyby’.

Breeding work at the Piikkiö station has been ongoing for decades, featuring a particularly strong strawberry programme. The duplication status of the collections is species-dependent, utilizing *in vitro* culture, cryopreservation at Luke, or maintenance at two separate field locations.

Maintenance protocols for field collections are detailed in field and *in situ* manuals provided to private partners. Notably, 20 berry accessions are backed up at *in situ* sites funded by the EU Common Agricultural Policy, which also supports their use for demonstration and education.

At the Piikkiö station, woody perennials like *Vaccinium*, *Ribes*, *Chaenomeles* and *Hippophaë* are maintained in the field. The *Rubus idaeus* (raspberry) and strawberry collections are held on outdoor nursery platforms, while other *Rubus* species are grown in raised beds. A recent

addition is an evaluation collection of 16 Finnish accessions of musk strawberry, which have been characterized morphologically and with SSR markers.

The most pressing challenges for the collection include:

- The transition of strawberry maintenance from field to pot systems, requiring the development of new protocols
- An increasing risk of virus infections, necessitating an expansion of cryopreservation efforts
- A need for increased funding to improve public access to PGR
- A priority to collect and evaluate gooseberry and the crop wild relative Arctic bramble (*Rubus arcticus*).

These efforts are supported by ongoing projects, such as 'BERRIES,' funded by The Nordic Public-Private Partnership for Pre-Breeding in Plants (Nordic PPP). This project aims to develop genetically and phenotypically well-defined strawberry and raspberry germplasm to significantly widen the gene pool available for Nordic and Baltic breeding programmes.

France

Justine Perrotte, Invenio

Invenio is a non-public institution (association) that operates as a service provider for fruit producers and the broader value chain. Its three experimental stations are integrated into a French national network dedicated to applied fruit and vegetable science (IRFEL).

Invenio's core activities focus on many fruit trees and vegetables, including strawberry. Strawberry activities encompass breeding programmes, field trials, and the maintenance of the French national collection of cultivated strawberry germplasm. The collection of wild strawberry species is conserved by INRAE. The institute also conducts evaluations of raspberry, though it does not maintain formal raspberry collections. The institute also manages a chestnut collection.

Key facilities include extensive nursery areas, quarantine tunnels, an *in vitro* laboratory, and insect-proof tunnels. The strawberry collection is comprehensive, comprising 450 old and new genotypes from all continents, dating from the late 19th century to the present. Invenio also maintains mother plants of approximately 50 commercial varieties and produces quality-certified, virus-free runner tips *in vitro*. These sanitized plants are essential for the breeding programme.

A collection database (CIRCEE) is currently under development and is not yet publicly available.

Invenio's genetic resources are actively utilized in several research projects:

- BreedingValue: Genotyping and phenotyping over 200 cultivars
- SENTINELLE: Virus testing 100 accessions, funded by the French Ministry of Agriculture
- Regional Project: Characterizing the phenotypes of old genetic resources in modern cultivation systems (e.g. soilless, greenhouse), funded by the New Aquitaine region.

Invenio is candidate to be officially designated by the French Ministry of Agriculture as the manager of the national strawberry collection. Notably, despite this recognition, no public funding is provided for the collection's maintenance.

Germany

Erik Shulte, Federal Plant Variety Office

The Federal Plant Variety Office is an independent federal authority under the German Ministry for Agriculture, Food and Regional Identity (BMLEH). Its tasks include protecting breeders' rights, maintaining the National Listing, registering fruit varieties, and preserving genetic resources. The head office is in Hannover, with a testing station in Wurzen. The Wurzen station maintains large field collections of fruit trees and describes varieties. The Office is a partner of the German Fruit Genebank, cooperating on the collecting and coordination of a collection of 1,400 accessions. Further cooperation is ongoing with AEGIS, the RIBESCO project, the Virus-Free core collection, and EURISCO.

Monika Hofer, Julius Kühn-Institute

The Julius Kühn-Institute (JKI) for Breeding Research on Fruit Crops in Dresden-Pillnitz maintains the central coordination of a decentralized genebank network for fruit genetic resources in Germany. The German Strawberry Genebank has two partner institutions: the Dresden genebank and the Wurzen testing station. Of the 274 strawberry cultivars maintained, 212 are under the mandate of the German Fruit Genebank (i.e. German cultivars and those with a social, cultural, local or historical relation to Germany). The second part of the collection includes 281 *Fragaria* wild species accessions, belonging to 25 primary or hybrid species, making it one of the largest such collections in Europe.

For maintenance, a box system is used in the orchard, featuring automatic shading and irrigation. Each cultivar/accession is represented by two boxes containing three plants each. Replanting occurs every two years, while spraying and fertilization follow an integrated pest management system. All accessions are overwintered inside a greenhouse.

Cryopreservation is implemented using PVS2 vitrification with cold acclimation. The average recovery rate for tested cultivars and wild species was 87% and 85%, respectively—well above the minimum threshold of 40%. Therefore, the method will be extended to all accessions. The safety duplication rate for cultivars and wild species has reached 84% and 24%, respectively. In February 2020, eleven samples of native *Fragaria* species (pure seeds obtained via controlled crossing) were deposited in the Svalbard Seed Vault.

A small *Rubus* collection includes 21 cultivars belonging to the German Fruit Genebank. These are maintained as potted plants in a screenhouse (tested for *Rubus* stunt) or as potted plants in the orchard with irrigation. Three pots, each containing one plant, are maintained per cultivar. Replanting takes place every five years, with spraying and fertilization according to the integrated pest management system. The database of the German Fruit Genbank is available online (<https://www.deutsche-genbank-obst.de/>). Data sheets are prepared for each cultivar, including passport, characterization and evaluation (C&E) data, and molecular data analysis. The institute participated in the BreedingValue project with several tasks and responsibilities.

Italy

Bruno Mezzetti, Università Politecnica delle Marche, Ancona

The Mezzetti Lab group within the Department of Agricultural, Food, and Environmental Sciences is not a formal PGR centre, but it maintains PGR and carries out research activities and services. These include breeding programmes, sensorial and nutritional quality

assessment, plant micropropagation, seed germination protocols and biotechnology applications to improve agronomical traits in fruit tree species.

Work focuses on several berry and fruit tree crops, principally strawberry breeding and genetic engineering to improve disease resistance and nutritional quality. The long-term breeding programme begins with wild material to generate pre-breeding material for new breeding programmes, eventually leading to new variety releases. A raspberry breeding programme is also ongoing, in collaboration with the private company Battistini Vivai.

Sensorial analysis and panel tests are conducted to study fruit quality, with the aim of creating strawberries with increased health benefits.

Data collected over 25 years of breeding activity are documented in a database shared with the German Research Center for Bioinformatics (FZJ). Data visualization is available on the Germinate platform, showing that strawberry breeding has resulted in reduced fruit weight, increased fruit yield, and increased polyphenol content.

New protocols that significantly increase seed germination rates for strawberry and blueberry were fine-tuned (the strawberry protocol is patented). *In vitro* techniques are regularly used to ensure healthy propagation material and for the maintenance of genetic material.

Latvia

Valda Laugale, Institute of Horticulture (LatHort)

The Genetic Resources Centre in Silava, near Riga, is responsible for coordinating the maintenance of horticultural plant genetic resources in Latvia. The Institute of Horticulture (LatHort) holds the country's largest collection of fruit and vegetable crops. The national genetic resources comprise 1,342 accessions, maintained at Dobeles (962 accessions) and Pūre (779 accessions). Among berry crops, the collection includes blackcurrant, strawberry, raspberry, gooseberry, red and white currants, blackberry, honeysuckle, elderberry, rowan, *Viburnum* spp., corinth tree (*Amelanchier* sp.), barberry, sea buckthorn and golden currant. Cranberry and lingonberry are conserved at the National Botanical Garden of Latvia in Salaspils. Activities include characterizing genetic diversity and selecting valuable material for future breeding.

Accessions included in the list of national genetic resources must meet the following criteria:

1. Cultivars and parent lines of registered hybrids created in Latvia
2. Cultivars and hybrids of Latvian origin repatriated from genebanks and collections in other countries
3. Clones, lines and elite hybrids of local origin with valuable quantitative or qualitative characteristics
4. Local landraces, accessions collected during expeditions and evaluated for at least three harvest years, and historical cultivars (grown and propagated in Latvia for a long time)
5. The core collection of the genus *Ribes*, selected during the North European project RIBESCO
6. Reference cultivars.

Most material is documented in the Nordic Baltic Genebanks Information System (GeNBIS). A recent project funded by the European Regional Development Fund focused on resistance breeding of *Ribes* and developed a virus-free *Ribes* core collection. The EUROPE.BERRIES project enabled the inventory of local berry genetic resource collections, with description data sent to EURISCO. The Nordic–Baltic partnership project (PPP_BERRIES - Development of germplasm for berry crops) includes plans for phenotyping and genotyping of the LatHort

Rubus collection. Raspberries and currants are included in a programme to develop breeding material that supports conventional, integrated, and organic agricultural crop production technologies.

Lithuania

Audrius Sasnauskas, Institute of Horticulture (LAMMC)

Since 2020, the Lithuanian State Forest Service has assumed the functions of the Plant Genebank, coordinating the activities of a network of universities and research centres. Horticultural plants are primarily managed by the Lithuanian Research Centre for Agriculture and Forestry and by Vilnius University. Data are deposited in the Central Database of national PGR.

The *Fragaria* collection includes 54 accessions across four taxa. Of these, 42 accessions of *Fragaria* × *ananassa* are partially conserved *in vitro* and through cryopreservation, and have been partially characterized.

Over the past ten years, several projects on *Fragaria* and *Ribes* have been conducted, focusing on breeding, preservation, the introduction of healthy plant material, berry quality and sensory analysis, genetic resource inventorying, cold acclimation studies, and research on the expression of anthocyanin synthesis genes under stress conditions. Strawberry cultivars and hybrid clones were characterized using SSR and AFLP markers.

The *Ribes* collection consists of 51 accessions (45 *Ribes nigrum* and six other species). The collection is conserved in the field and partly *in vitro*, with plans to check its virus status. Research on *Ribes* focuses on molecular mechanisms for resistance to Reversion Virus and Gall Mite, as well as on anthocyanin composition. Blackcurrant breeding is promoted with an emphasis on organic production.

Possible future activities include fingerprinting and comparative analysis using molecular markers, cryopreservation of all accessions (or a selected core collection), and virus testing of all accessions to protect against viruses and their vectors.

Romania

Monica Sturzeanu, Research Institute for Fruit Growing, Pitești – Mărăcineni (ICDP)

The objectives of genetic resources conservation at ICDP are the reorganization of the pomological collections, supplementation with local and foreign species and cultivars, evaluation of genotypes according to international descriptors, and identification of genitors for breeding programmes. The genebank conserves both major and minor berry species, comprising 322 cultivars of strawberry, blueberry, currants, raspberry, blackberry and gooseberry of Romanian and international origin. Phenotypic and molecular characterization are carried out alongside conservation.

Based on biometrical traits, three groups of strawberry and seven groups of local blueberry varieties have been identified within the collection. Screening for disease resistance in strawberry is performed using available molecular markers.

Slovenia

Tina Ternjak, University of Maribor

The Slovene Plant Gene Bank operates as a public service under the 2008 Agriculture Legislative Act (Official Gazette of the Republic of Slovenia No. 45/2008, 78/23). Several

institutions participate in this programme, with the Ministry of Agriculture, Forestry and Food and Agricultural Institute of Slovenia as the main coordinators, working in cooperation with institutions (the Biotechnical Faculty, University of Ljubljana, the Institute for Hop Research and Brewing, and the University of Maribor's Faculty of Agriculture and Life Sciences), NGOs, botanical gardens and schools. The berry collection (205 accessions) is maintained at two locations: one at Kmetijski inštitut Slovenije (KIS) (containing all berry species from Slovenia, 166 accessions) and the other at the University of Maribor (focusing on raspberries from eastern Slovenia, 39 accessions).

At KIS, new plantations have been established for the berry collection, and existing collections were relocated. The collection will be expanded with selected wild accessions of raspberry, strawberry and blueberry, which are currently monitored *in situ* and will be transferred *ex situ* if threatened. Virus detection methods will be further developed in line with ECPGR guidelines, particularly following the recent identification of two problematic viruses in commercial plantations. The gooseberry and blackberry collections will be renewed and expanded, and the characterization of accessions added over the past five years will continue. At the University of Maribor, the berry collection includes 39 raspberry accessions comprising cultivated varieties, wild and semi-wild genotypes. These exhibit remarkable diversity and are widely distributed along the edges of the Pohorje region. One raspberry accession is also preserved *in vitro*.

Several constraints to efficient conservation exist. As fruit plantations are permanent, they are vulnerable to adverse weather conditions and disease outbreaks, such as cane blight in raspberries. Depending on the species' lifespan, collections are renewed every few years, which requires frequent replanting. Challenges are also posed by wildlife, including deer and rabbits, and various pests. Establishing a safety duplicate for the most important accessions is under consideration. For many accessions, detailed descriptions and thorough evaluations have not yet been performed, which limits their practical value and utilization. Molecular markers have been used to determine the cultivar authenticity of raspberries.

Materials from the Slovene Plant Gene Bank are available under an SMTA for researchers and breeders, but not for commercial growers.

An ongoing European-Slovenian Rural Development Programme is reviewing, inventorying, and monitoring PGR important for food and agriculture that are maintained on-farm.

Expectations from the Working Group's activity include the standardization of descriptors for individual species to ensure all institutions use the same set. Collaboration in establishing safety duplicates for berry collections would also be highly valuable.

Spain

José F. Sanchez Sevilla, Centro IFAPA de Málaga

The IFAPA Strawberry Germplasm Collection was established in 1992 to support a strawberry breeding programme at the IFAPA Centre of Churriana (Málaga), Spain. While breeding activities are no longer conducted at IFAPA due to sufficient private breeding company activity in Spain, the collection remains. It includes accessions acquired through nursery donations, exchanges with other collections, and the collection of wild material. Currently, the collection maintains 280 accessions of historic strawberry cultivars and approximately 340 wild accessions from the *Fragaria* genus and related species. IFAPA contributed to the COST 863 European Strawberry Core Collection, committing to preserve at least ten accessions representing the European genetic heritage.

The collection is maintained *in vitro* at 4°C in the dark. After five to six subcultures *in vitro*, new plants are grown *in vivo* before restarting the *in vitro* cultivation cycle from meristems. Following disease indexing and genetic stability control, quality-certified *in vitro* material is used for national or international distribution. A DNA bank has also been established for sample exchange with other laboratories.

Additional holdings include a collection of strawberry varieties from different countries and periods, a reference collection for the Community Plant Variety Office (CPVO) (not for distribution), and two genotyped mapping populations.

The institute regularly conducts morphological and physiological evaluations at an experimental farm under commercial conditions. Approximately 80% of the strawberry collection has been genotyped. A new database (NOAH) is under development and is expected to be online within approximately one year. There is interest in collaborating with ECPGR and its EVA network.

Switzerland

Claudio Niggli, Pro Specie Rara

Pro Specie Rara (PSR) is an NGO that receives funds from the Swiss government for a National Berry Project and manages four out of six national berry collections. A central berry field collection near Basel distributes material to other collections within the national programme. Approximately 60% of the accessions belong to the national programme, while the remainder are maintained using PSR's own resources. A significant challenge is verifying the authenticity of cultivars from old material. Constraints include diseases like ringspot virus and strawberry mites, which prevent the distribution of affected accessions to private individuals.

The collection is characterized using UPOV standards, and fact sheets in German have been prepared for 305 varieties.

The PSR label adds value to the material, identifying it as part of the Swiss heritage. Labelled varieties are relatively rare in commerce, typically older cultivars, guaranteed to be non-invasive and not F1 hybrids, ensuring farmers can reproduce them.

The collection is documented with an extensive list of published references. Approximately 900 accessions of *Fragaria*, *Ribes* and *Rubus* have been genetically analyzed with SSR markers, with additional markers being tested for *Ribes*. In collaboration with the USDA in Corvallis, genetic groups of the *Ribes* collection are being compared to verify accession identity and establish correct cultivar names. This work has revealed that about one-third of the *Ribes* accession denominations are incorrect (e.g. the name 'White Versailles' appears in different genotypic groups).

High emphasis is placed on valorization through a network of institutions, experts, nurseries, public gardens, private collections, on-farm conservationists, markets, and gastronomy professionals. The online 'Variety Finder 3.0' database, available from 2025, provides documentation on the historical presence of varieties in the country and their suitability for different altitudes. Around 150 rare, small-fruit cultivars are available from nurseries and private conservationists. Products such as fresh fruit, dried fruit, jam and spirits made from specific cultivars are labelled, and associated recipes are provided.

Providing data to EURISCO has not been possible because the PSR database is structured at the cultivar or genotype level rather than the accession level.

Türkiye

Fatih Gokhan Erbas, General Directorate of Agricultural Research and Policies (TAGEM)

The conservation of genetic resources and ensuring their sustainable use are part of the mission of the General Directorate of Agricultural Research and Policies (TAGEM) under the Turkish Ministry of Agriculture and Forestry. Several national field genebanks for berries are distributed across the country, with the main one located at the Atatürk Horticultural Center Research Institute in Yalova.

Strawberries are the most extensively studied cultivated berry species in Türkiye. Commercial cultivation also includes blackberries, raspberries and blueberries. The first strawberry cultivation began with local varieties such as 'Ereğli' (Zonguldak), 'Arnavutköy' (İstanbul), and 'Karşıyaka' (İzmir), which were selected from wild strawberries and are still cultivated today. The highly aromatic local cultivar 'Osmanlı' is grown in Central Anatolia near Ankara, while foreign cultivars are used in other areas. A list of registered local strawberry and mulberry varieties includes ancient Ottoman cultivars.

Research has focused on mulberry and strawberry, with several strawberry varieties bred in Yalova. Blueberry and raspberry breeding studies are also ongoing. Mulberries are the second most cultivated berry species after strawberries. The cultivated types consist of 95% *Morus alba* L. (white mulberry), 3% *M. rubra* L. (red or purple mulberry), and 2% *M. nigra* L. (black mulberry).

Cultivation of blackberry (*Rubus* spp.), raspberry (*Rubus* spp.), red currant (*Ribes* spp.), gooseberry (*Ribes* spp.), blueberry (*Vaccinium* spp.), rosehip (*Rosa* spp.), elderberry (*Sambucus* spp.) and gilaburu (*Viburnum opulus*) is less common, though wild forms are often harvested for local consumption.

In the Black Sea region, blueberries, which have diverse wild populations, are known by different local names. The adoption of foreign varieties has begun recently. Due to specific soil requirements (low pH), soilless culture is becoming very popular for blueberries.

Future plans include breeding new Turkish varieties for the fresh and processing industries, improving marketable fruit quality for export, extending the production season year-round, and promoting hydroponic cultivation systems for all berries.

United Kingdom

Felicidad Fernández, NIAB

Within the UK's conservation structure, NIAB East Malling focuses on fruit crops, including crop science, production systems, genetics, breeding, and pest and pathogen ecology.

The UK National Fruit Collection includes apples, pears, cherries, plum, and vines. However, for berries (*Rubus*, *Fragaria*, *Ribes*, *Vaccinium*, and *Lonicera*), there are only breeding programmes or informal collections, with no government funding for formal national collections. The Royal Horticultural Society (RHS) maintains small collections, predominantly of *Ribes* and some ornamental *Rubus*, but there are no designated national berry collections. Breeders and enthusiasts maintain working collections, which do not meet genebank standards for true-to-type maintenance and documentation. Breeding programmes are private or public-private partnerships (e.g. James Hutton Ltd – JHI). Amateur and semi-professional collections exist, but access to their records is limited or non-existent.

Challenges include the fact that informal collections are seldom tested for viruses. Breeding programmes may test for specific viruses (e.g. RBDV), but only key or pre-commercial

germplasm is maintained in insect-proof facilities. There are limited testing and clean-up facilities available in the UK. Maintaining and repropagating field-based collections is costly, and genotypes can be lost due to weed pressure or encroachment by other accessions. With the exception of *Lonicera*, the NIAB berry collections will be mostly grown in containers from 2025. There is an intention to molecularly identify the material using SSR markers in collaboration with the James Hutton Institute (JHI).

Further limitations for utilization include the requirement for a full phytosanitary certificate to move plants to continental Europe. Limited accessions from closely related species are maintained, and they are often poorly characterized. Genotype verification is not always performed after each propagation or plant movement.

Recent projects involving NIAB include the EU-funded BreedingValue project with JHI (2021–2025), and projects on resistance/tolerance to Spotted Wing Drosophila (SWD) in strawberry and raspberry (2022–25), artificial intelligence and molecular markers for soft fruit (2023–25), the use of *Lonicera* for winemaking at NIAB (2024–26), and the Soft Fruit Genetic Improvement Network (2024–29). The latter's key objectives are identifying genetic markers for water use efficiency in strawberry, nitrogen use efficiency in blueberry, and resistance to large aphid in raspberry; developing genetic/genomic resources for honeyberry and blackberry; and creating gene editing tools for strawberry and raspberry. The project engages all key UK breeders and growers, facilitating discussions on using their material for genetic characterization and sharing the resulting data.

Results of the EUROPE.BERRIES project

Monika Höfer summarized the context that led to the establishment of the Berries Working Group (WG). Prior to its formation in 2019, collaborative activities for berry genetic resources relied on European projects. However, these projects had limitations, including a restricted number of partner countries, fixed timeframes and narrow scopes.

The Berries WG was established in 2019, with its first meeting held in Dresden, Germany, in January 2020. Subsequently, the project **EUROPE.BERRIES** was developed and submitted under the 4th Call for Proposals of the ECPGR Activity Grant Scheme (Phase X). It was approved for funding in December 2020, with the primary aims of improving the documentation of berry genetic resources and defining crop-specific standards.

Running from November 2021 to December 2023, the project involved 17 partners with the primary aims of improving the documentation of berry genetic resources and defining crop-specific standards.

Participants provided data based on EURISCO descriptors for the core genera *Fragaria* (strawberry), *Rubus* (raspberry, blackberry), *Ribes* (currant, gooseberry), and *Vaccinium* (blueberry), as well as for 'other berry species.' The latter category included *Morus* (mulberry), *Sambucus nigra* (elderberry), *Hippophae rhamnoides* (sea buckthorn) and *Sorbus aucuparia* (rowan/mountain ash). Two additional descriptors—virus status and variety check—were added for future WG work.

During the project, standardized lists of accessions for each genus were compiled, and taxonomy and variety names were revised. Variety denominations were standardized to the name used in the country of origin, with all other known names from partners or pomological literature listed as synonyms. Passport data were enriched using information from partners, project members, and previous projects like the EU GENBERRY (INRAE, France) and RIBESCO (Luke, Finland) projects.

The final transfer of data to EURISCO remained the responsibility of the respective National Inventory Focal Points. In total, documentation for 4,061 accessions of berry genetic resources was prepared for the inventories, though significant collections from Italy and Spain are still missing.

All objectives of the EUROPE.BERRIES project were successfully achieved, despite a slight delay as partners familiarized themselves with the EURISCO descriptors. The project served as a crucial first step toward the long-term goal of conserving, characterizing, documenting, and utilizing genetic resources for berries in Europe.

The data collection activities for EUROPE.BERRIES on *Fragaria*, *Ribes*, *Rubus* and *Vaccinium* were presented by the respective sub-group coordinators: Rytis Rugenius, Tuuli Haikonen (on behalf of Saila Karu), Erik Schulte, and Monika Höfer (on behalf of Darinka Koron). Their tasks included checking, revising and updating the data received from partner institutions.

Ribes inventories were received from 13 partners, making it the second-largest genus in terms of accessions. The predominant form of preservation was 'field only.' The most frequent biological status was traditional cultivar/landrace or advanced cultivar, and the primary identification method was pomological description, though molecular technology was also used in some institutes. Trueness-to-type verification has been completed for 57% of the accessions. The following varieties were selected for further characterization to identify unique accessions for AEGIS:

- *Ribes nigrum*: 'Brödtorp', 'Titania', 'Öjebyn'
- *Ribes rubrum*: 'Blanka', 'Jonkheer van Tets', 'Junifer', 'Red Lake', 'Rote Hollandische', 'Rovada'
- *Ribes uva-crispa*: 'Captivator', 'Hinnonmäen Keltainen', 'Invicta'

For *Fragaria*, fifteen institutions from 14 countries provided data on approximately 1,500 accessions. Similarly, the field collection was the most frequent storage form. The virus status is unknown for 67% of accessions, and only 2.2% are confirmed virus-free. Pomological testing had been performed on 42.6% of accessions, and molecular methods on 34%. The inventory is comprised of 92% *F. x ananassa*, 5% *F. moschata*, 2% *F. vesca*, and 0.5% *F. vescana*, *F. chiloensis*, and *F. virginiana*. In terms of biological status, 76.5% were advanced or improved cultivars, while 21.8% were traditional cultivars or landraces. The joint list contained 766 different *F. x ananassa* genotypes, 541 of which were unique accessions stored in only one collection. Widespread cultivars like 'Honeoye' and 'Senga Sengana' are held in nearly all collections. Recommendations for future work include constantly updating data, promoting molecular studies, maintaining healthy planting material, expanding virus testing, safety-duplicating accessions across Europe, and applying cryopreservation more widely.

For *Rubus*, 16 institutes from 13 countries submitted data for 578 accessions, representing 384 varieties and 12 species. The majority (439) are *R. idaeus*. Seventeen varieties are held in more than three collections (e.g. *R. idaeus* 'Heritage' and 'Willamette' are in six collections), 76 varieties are in at least two collections, while 310 varieties are held in only one collection, indicating no safety duplicates. Information on breeding history was unavailable for 212 accessions (37%) and 201 varieties (52%). Key decisions included classifying Boysenberry and Loganberry as varieties rather than species and including Japanese Wineberry in the inventory. Selected cultivars for future research include 'Heritage', 'Meeker', 'Malling Promise', 'Schönemann', 'Autumn Bliss', 'Golden Queen', 'Lloyd George', and 'Malling Exploit' for *R. idaeus*, and 'Black Satin' and 'Loch Ness' for *Rubus* section *Rubus*.

For *Vaccinium*, 213 accessions were inventoried.

A question was raised regarding the omission of *Rubus occidentalis*, to which Erik Schulte replied that it is protected by intellectual property and is therefore not considered a genetic resource.

Results and discussion of the first draft of crop-specific technical guidelines for genebank management of berries genetic resources

Monika Höfer explained that the first step in preparing crop-specific standards for the conservation of berry genetic resources was a survey among the members on the ‘type of germplasm storage’. As most temperate fruit species are genetically heterozygous and vegetatively propagated, a seed collection does not represent the true genotypes of clonal accessions (cultivars). Therefore, collections of berry genetic resources are maintained in the field or greenhouse as active plantations, where the accessions are available for characterization, evaluation and distribution. Backups for the plant material are essential to provide security against disease or environmental disaster. A safety duplicate could be held at a second field site, or consist of *in vitro* cultures or cryopreserved material. The survey results showed that, currently, only for *Fragaria* do *in vitro* culture and cryopreservation make a significant contribution to safety duplication.

A second survey requested detailed conservation methods from partners for various forms of *ex situ* maintenance. Replies from 18 partners were used as the basis for compiling the first draft of the crop-specific guidelines. A draft revised by the Chair and Vice-Chair was then sent to all working group members for discussion in May 2025.

The document was discussed step-by-step during the meeting, a final version was agreed upon, and it was subsequently published on the AEGIS [website](#).

ECPGR: the EVA Network – Towards the implementation of a European Evaluation Network for Berries and Fruit Trees

Bruno Mezzetti reported on the European Evaluation Network (EVA) Boost Perennials kick-off meeting that took place in Ancona, Italy, on 13-14 March 2025. The meeting represented a key milestone in strengthening European collaboration on the evaluation and sustainable use of plant genetic resources for berries and fruit trees. Organized under the EVA Boost initiative, funded by the German Ministry of Agriculture, Food and Regional Identity, the meeting engaged over 30 stakeholders, including researchers, breeders, genebank managers, NGOs, and private companies from more than ten countries. It set the groundwork for adapting the EVA framework to perennial crops. Two subgroup sessions focused on the specific needs of different perennial crop categories, highlighting operational gaps and outlining strategic targets.

Key challenges and priorities for an EVA Perennials Network were identified as follows:

- Definition of target crops
- Definition of the scope of the genetic material
- Data quality and accessibility
- Trait prioritization
- Legal and procedural barriers
- Geographical inclusivity

A post-workshop survey involving 27 participants (mostly from research institutions, with only two private companies) indicated blueberry as the priority crop for the network, with disease resistance, yield, and fruit quality identified as the priority traits.

The report then covered the recently concluded project ‘Breeding Value,’ which offers a strong contribution towards implementing a European Evaluation Network for Berries. The project aimed to investigate the effect of domestication on allelic diversity and to determine the level of resilience of the breeding base for future breeding. Six plant categories were defined: old cultivars (until 1960), modern cultivars (1960–2005), newly released cultivars (2005 till now), pre-breeding advanced selections, species, and populations.

The project increased the value of berry genetic resources through genotyping, phenotyping and consumer science analysis. Evaluations were conducted under different climates, and a Life Cycle Assessment (LCA) of fruit production was carried out. DAPC genetic analysis divided the garden strawberry cultivars into five groups that somewhat reflected their ancestry. Molecularly assisted selection (MAS) was developed in strawberry breeding using a new low-density SNP array. Genomic prediction was tested in early-stage strawberry breeding. Using genome-wide association studies (GWAS), novel QTL regions were identified for winter survival and 19 plausible candidate genes were identified. In raspberry, genetic diversity was analyzed, and MAS and GWAS were carried out.

New non-destructive phenotyping methods were tested, including near-infrared spectroscopy (NIR), hyperspectral imaging, 3D imaging, and architecture phenotyping. The aim was to link image/spectral signatures to biotic and abiotic stresses, resilience, fruit quality traits, and yield. Consumer responses helped to identify key fruit quality attributes for European berry genetic resources. Experts reached a consensus on the meaning of 26 flavour and taste attributes, and these English terms were translated into six languages. Sensory attributes for fruit quality were linked to metabolite data.

Data from the Breeding Value project were included in the Germinate database, which covers 6,000 berry accessions.

Discussion about future cooperation – proposals for joint action

Tuuli Haikonen chaired the discussion, opening with the aspiration to establish an EVA network. For the immediate Grant Scheme proposal, however, the suggestion was to concentrate on enhancing the documentation status of berry genetic resources.

The WG priorities, as outlined in a 2021 paper by Höfer¹, were referenced. Two of these tasks were considered most topical:

1. The elaboration of passport descriptor lists and characterization protocols to improve standardization and to develop primary and secondary descriptors
2. The characterization of genotypes using molecular markers, the identification of health-related nutritional compounds, and plant disease evaluation.

Examples of activities and achievements from the *Allium*, *Malus/Pyrus* and *Prunus* WGs were presented. It was proposed that the Berries WG could focus on developing descriptors (phenotyping protocols), genotyping characterization, or both.

¹ Höfer M. (2021) Coordination of genebank activities between different national collections of berry genetic resources in Europe in the frame of ECPGR. Acta Hort. DOI 10.17660/ActaHortic.2021.1309.27

Review of Existing Resources:

- **Descriptors:** The existing standards include the IPGRI Strawberry descriptors from 1986 and the preliminary descriptors from the COST Action 863 for strawberry. For blueberry, no standardized descriptors exist, although a *Vaccinium* programme in the US utilizes its own set. UPOV guidelines were also noted; while their primary purpose is distinctness rather than variety description, they contain useful information to consider.
- **Molecular markers:** A limited number of SSR markers were used in the RIBESCO project (2007–2010) for *Ribes* and raspberry. The GENBERRY project (2007–2011) also employed SSR markers for strawberry, but did not establish reference genotypes. More recently, the BreedingValue project (2021–2025) utilized a 50k SNP array (Affymetrix) for strawberry. Regarding genotyping platforms, SSR markers were deemed suitable for a small number of accessions, while SNP arrays are better for large samples; GBS and WGS were considered unsuitable for large genomes.

Following a lively discussion on the topic and scope for the ECPGR Grant Scheme proposal, the following decisions were made:

- The next project will focus on descriptor development
- During this project, the WG will prepare a follow-up project on molecular characterization
- After the first project's completion, the WG will apply for funding (from the ECPGR Meeting's budget) for a descriptor workshop and field training to be held in Wurzen, Germany
- Project coordination was assigned to T. Haikonen, with crop-specific contributions as follows:
 - ***Rubus* spp.:** E. Schulte, J. Sedlák, D. Røen, V. Laugale, I. Kalnina, T. Ternjak
 - **Strawberry:** S. Reim and M. Höfer, R. Rugenius, J. Sánchez Sevilla, E. Schulte, J. Perrotte
 - **Black currant:** H. Kaldmäe, E. Schulte
 - **Red currant:** C. Niggli, E. Schulte, J. Sedlák
 - ***Vaccinium* spp.:** M. Sturzeanu, T. Haikonen, N. Cvelbar Weber, S. Pluta (?)

The meeting concluded with a visit to the Science and Innovation Promotion Centre in Kaunas. The following day, a visit took place to the Institute of Horticulture at the Lithuanian Research Centre for Agriculture and Forestry in Babtai.

ANNEXES

Annex I. Agenda

Second Meeting of the ECPGR Berries Working Group 17-19 June 2025, Kaunas, Lithuania Agenda

Tuesday, 17 June 2025

Arrival of participants

- | | |
|---------------|--|
| 15:00 -15:30 | Welcome (<i>Audrius Sasnauskas, Lithuanian Research Centre for Agriculture and Forestry, Lithuania</i>) |
| 15:30 - 16.00 | ECPGR in Phase XI – Outcomes and perspectives (<i>Lorenzo Maggioni, ECPGR Secretary</i>) |
| 16:00 - 16.30 | <i>Coffee break</i> |
| 16:30 - 18:00 | Presentations of the WG members (<i>10 minutes per country</i>): size, status and availability of the national collection; documentation level of the collection; constraints to efficient conservation; existing use and its valorization; ongoing projects (national and international level); legislation; expectations from WG |

Wednesday, 18 June 2025

- | | |
|---------------|--|
| 09:00 - 10:00 | Presentations of the WG members (continued) (<i>10 minutes per country</i>) |
| 10:00 - 10:30 | Results of the project EUROPE.BERRIES (each member of the project group per genus) |
| 10:30 - 11:00 | <i>Coffee break</i> |
| 11:00 – 12:00 | Results of the project EUROPE.BERRIES (each member of the project group per genus) |
| 12:00 - 12:30 | Results and discussion of the first draft of crop-specific technical guidelines for genebank management of berries genetic resources (<i>Monika Höfer, JKI, Germany</i>) |
| 12.30 - 13.30 | <i>Lunch</i> |
| 13:30 - 14.00 | Discussion about future cooperation - proposals for joint action (<i>Tuuli Haikonen, Luke, Finland</i>) |
| 14:00 - 14.30 | ECPGR: the EVA Network - Towards the implementation of a European Evaluation Network for Berries and Fruit Trees (<i>Bruno Mezzetti, Università Politecnica delle Marche, Italy</i>) |
| 14:30 - 15.30 | Discussion about future cooperation - proposals for joint action (continued) |
| 15:30 - 16:00 | <i>Coffee break</i> |
| 16:30 – 18:00 | Visit to the Science and Innovation Promotion Centre in Kaunas (self-funded) |
| 18.30 | Social dinner at restaurant in Kaunas |

Thursday, 19 June 2025

8:00 – 10:00 Visit to the Institute of Horticulture, Lithuanian Research Centre for Agriculture and Forestry, Babtai.

Participants will be taken to the Vilnius airport directly after the visit.

Annex II. List of participants

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