

Report of a Working Group on Berries

First Meeting, 14-15 January 2020, Dresden, Germany
L. Maggioni and V. Bryant





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Federal Ministry
of Food
and Agriculture

The European Cooperative Programme for Plant Genetic Resources (ECPGR) is a collaborative programme among most European countries aimed at contributing to rationally and effectively conserve *ex situ* and *in situ* Plant Genetic Resources for Food and Agriculture, provide access and increase utilization (<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 pools of experts nominated by the National Coordinators. The ECPGR Working Groups deal with either crops or general themes related to plant genetic resources (documentation and information and *in situ* and on-farm conservation). Members of the Working Groups carry out activities based on specific ECPGR objectives, using ECPGR funds and/or their own resources.

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Cover illustration

Home garden berries species and cultivars in Latvia. Courtesy of © V. Laugale, Institute of Horticulture (LatHort), Dobeles, Latvia.

CONTENTS

SUMMARY REPORT OF THE MEETING	1
Introduction	1
Opening of the meeting	1
ECPGR IN PHASE X (2019-2023)	1
Presentations of Working Group members (National reports)	2
Albania	2
Denmark	2
Estonia	3
Finland	3
France	4
Germany	4
Greece	5
Latvia	5
Lithuania	6
Norway	6
Portugal	7
Romania	7
Slovenia	8
Sweden	8
Switzerland	9
Turkey	9
United Kingdom	10
The ECPGR European Evaluation Network (EVA)	10
Results of the GENBERRY project	11
Results of the RIBESCO project	11
Results of the GoodBerry and EUBerry projects	12
The EURISCO database	13
FUTURE COOPERATION - PROPOSALS FOR JOINT ACTION	13
APPENDICES	17
Appendix I. Proposal to the ECPGR Executive/Steering Committee for a Berry WG	17
Appendix II. List of species, their common names and related presentations	23
Appendix III. Agenda	25
Appendix IV. List of participants	27

Related presentations are available online
([here](#))

SUMMARY REPORT OF THE MEETING

Introduction

The first meeting of the Working Group (WG) on Berries of the European Cooperative Programme for Plant Genetic Resources (ECPGR) was held on 14-15 January 2020 in Dresden, Germany. It was organized in collaboration with the Julius Kühn-Institut (JKI), Institute for Breeding Research on Fruit Crops, Dresden, Germany and financially supported by the German Federal Ministry of Food and Agriculture.

A proposal to establish a Working Group on Berries was submitted to the Secretariat in November 2018 by Monika Höfer, Julius Kühn-Institut (JKI), Institute for Breeding Research on Fruit Crops, Dresden, Germany (see letter of submission in Appendix I, page 17). The proposal was evaluated by the ECPGR Executive Committee as good, justified and of relevance for the society as a whole owing, among others, to the health benefits of anthocyanins contained by several berries. A request for approval was sent to the Steering Committee and the Working Group on Berries was officially approved in February 2019.

Based on received 'Expressions of Interest', the ECPGR Executive Committee nominated Monika Höfer as Chair of the Berries Working Group in March 2019.

For a list of scientific names of berries' species and the corresponding common names, see Appendix II, page 23.

Opening of the meeting

Monika Höfer welcomed all the participants to the meeting and to the historical town of Dresden. She asked all the participants to briefly self-introduce.

Henryk Flachowsky also welcomed the group and gave a quick introduction of the Institute for Breeding Research on Fruit Crops, Dresden-Pillnitz (<https://www.julius-kuehn.de/zo/>), one of the 17 institutes of JKI, acting as Coordination Centre of the German National Fruit Genebank (<https://www.deutsche-genbank-obst.de/>), but also involved in breeding research and fruit breeding. The institute has acquired very new storage facilities for *ex situ* preservation. It is also collaborating with Non-Governmental Organizations (NGOs) to conserve *in situ* *M. sylvestris* in the vicinities and *Pyrus pyraster* near the Baltic Sea. Cryopreservation facilities are also very important since the field is endangered by fireblight and other diseases. Phenotyping for genetic resources identification and evaluation breeding is implemented also with new digital and sensor-based tools. Phytopathology studies concern, among others, the isolation and identification of pathogens, the establishment of pathogen collections, the evaluation for resistance to pathogens and the diagnosis of viral infections on strawberry and raspberry.

Structural and functional genome analysis focus, among others, on Quantitative Trait Loci (QTL) analysis on fruit diseases and development of a Single Nucleotide Polymorphism (SNP) array to carry out Genome-Wide Association Study (GWAS) of the apple collection. Research on bud dormancy is currently very important for climate change.

ECPGR IN PHASE X (2019-2023)

Lorenzo Maggioni

The Objectives for ECPGR Phase X (2019–2023), the membership, funding and structure of the programme were presented. The new Berries Working Group has 49 members, 19 of which were able to attend this meeting from 17 countries. Before the creation of the WG,

previous ECPGR activities related to berries included a workshop on Minor Crops held in 1999 in Turku, Finland (report available [here](#)). Also an [ECPGR Ribes and Rubus Database](#) was established in 2011 at the Vilnius University, Vilnius, Lithuania. It was pointed out that the WG may consider whether there are sufficient reasons and resources to continue maintaining and development of the crop specific database, or rather to use the European Search Catalogue for Plant Genetic Resources (EURISCO) database, which is permanently funded and supported by ECPGR.

The ECPGR's Mode of Operation for Phase X provides for two budget lines of similar amounts. One is for "Meetings", the other for "Other activities". Principles, practices and limitations were explained. An upcoming call for proposals to be submitted to the ECPGR Grant Scheme was offering €20,000 per activity, with a deadline for submission on 14 February 2020.

The initiative for 'A European Genebank Integrated System' (AEGIS) has the objective to conserve, in a collaborative way and at agreed quality standards, the genetically unique and important accessions for Europe of all crops, and to make them available for breeding and research through the Standard Material Transfer Agreements (SMTA). This system is intended to bring significant benefits to users.

The WG should define the crop specific standards for the conservation of the berries' accessions, based on the generic FAO genebank standards. It was pointed out that so far only one accession of strawberry from the Nordic countries is part of AEGIS and the expectation is that the WG will promote the inclusion of more accessions, starting with *Fragaria*, *Ribes*, *Rubus* and *Vaccinium*.

Presentations of Working Group members (National reports)

Albania

Alban Ibraliu

More than 30 species of berries belong to the Albanian flora that occur in the wild. Among others, juniper, blueberry and myrtle are used by the Albanian distillery industry producing essential oils. Rose and elder are also used for their volatile oils and other nutraceutical compounds. *In situ* conservation of wild genetic resources has recently improved indirectly in Albania, thanks to the increase of the protected areas reaching 16% of the country's territory. However, a comprehensive inventory of berry species occurring in protected areas is presently missing, and management plans do not specifically address issues related to the conservation and management of berries. An inventory of crop wild relatives and wild food plants has started with a case study in the Shebenik-Jabllanice Protected Area.

The Albanian genebank, based at the Agricultural University of Tirana, is the institution acting as National Coordinator for plant genetic resources. The genebank conserves six berries' taxa collected from the wild, mainly *Vaccinium myrtillus* (39 accessions), but also *Juniperus communis* (5), *Cornus mas* (4), *Juniperus oxycedrus* (1), *Rubus idaeus* (1) and *Rubus ulmifolius* (1).

Denmark

Torben Toldam-Andersen

The Danish collection of berries at the Pometum of the University of Copenhagen includes strawberries (200 accessions), gooseberries (136), red, white and black-currants (63), and elderberries (66). A collection of *Rubus* (22 raspberries and 22 blackberry hybrids) was unfortunately lost. Strawberries are represented by 14 species and 85 accessions are unique

in Europe, including old historical cultivars, advanced selections from Danish breeding of the 1980s and wild species. The strawberries were in the field since the start of the collection in 1863, while since 2018 they are kept in pots (4 plants per accession, of which 2 are renewed each year). Mostly they are virus infected, although a cleaning process has started via heat treatment and tissue culture and eventually to be conserved under a new net protected house. All accessions are in the process of being genotyped as part of the “Nordfruit” Private Public Partnership project.

Gooseberries and currants are maintained in a field collection with five plants each of 136 accessions and three plants each of 63 accessions respectively. These were all phenotyped in the RIBESCO project, including for chemical data (sugars, acids, aroma). Fifty gooseberry and 32 currants were also genotyped.

The 66 accessions of elderberries are not phenotyped or genotyped. These field collections also possibly suffer from some virus and disease problems. Constraints in funding and lack of staff only barely allow the maintenance of the collection, but there is no, or only very limited, backup of the collections and threats of loss are high due to diseases or attacks from the European water vole. Ideally, the European collaboration should enable a sustainable conservation based on permanent funding, since this is not provided either by national or Nordic institutions.

Estonia

Hedi Kaldmäe

The fruit collections date back to the beginning of breeding work at the Institute of Horticulture and Apiculture established in Polli in 1945. Now these collections are part of the Estonian Plant Genetic Resources Network initiated in 1994. They are kept as *ex situ* field collections, including local and introduced genotypes. Material is available upon request for research and education. Agreements have also been made with growers who are keeping accessions that are a part of the collection. The berries' collection includes 369 accessions and is composed, among others, of black-currants (94), strawberries (57), raspberries (55), edible honeysuckle (47), gooseberries (41), red and white currants (26) and cranberries (5). The database of the fruit genetic resources of the Estonian University of life science provides online searchable data of all the accessions of national and foreign origin at <http://sordivaramu.emu.ee/>. Passport data of the 317 small fruit accessions of Estonian origin are also included in EURISCO.

Phenological evaluation data from 1945-2003 exist and are partly digitalised. Morphological data of *Ribes* were collected within the RIBESCO project and are available via the crop specific database (which was however not updated after the project).

The intention is to link genetic resources and research in order to add value to the genetic material. Ongoing projects involve blackcurrant, gooseberry, raspberry and blueberry breeding as well as the development of cultivation, harvesting and processing technologies for new fruit and berry cultures.

No work has been done with crop wild relatives, and currants can be found in nature, but it should be verified whether they are originally wild or they escaped from botanic gardens.

Finland

Saila Karhu

A national working group for fruit and berries has been established, as part of the Finnish National Programme for Genetic Resources, coordinated by the National Resources Institute Finland (Luke). Even though there is a strong Nordic cooperation on genetic resources, vegetatively propagated crops are taken care at the national level and the resources are

limited and not continuous, but mostly based on projects and depend on the interests of researchers, not on national priority.

Vegetatively propagated, long-term preserved plant genetic resources are maintained nationally in field collections. The berry accessions in the Finnish national clonal archives in the year 2019 included 238 accessions, of which 123 'accepted' and 115 'temporary/pending', which means that they are project material. The list of species in the collection includes *Fragaria x ananassa*, *Fragaria moschata*, *Hippophaë rhamnoides*, *Ribes nigrum*, *Ribes rubrum*, *Ribes spicatum*, *Ribes uva-crispa*, *Rubus arcticus* (and hybrids), *Rubus idaeus* (and hybrids), *Vaccinium corymbosum* and *Vaccinium angustifolium* (and hybrids).

Conservation of currants, gooseberries and strawberries is partly secured under cryopreservation or *in vitro*. Documentation of clonal accessions is updated on the Nordgen data management system SESTO (passport data). If the wild species are not endangered, they are not collected. No species is known to be endangered, expect perhaps *Rubus arcticus*.

Long-term plant genetic resources collections of Luke are public. Accessibility directly from Luke can be obtained through SMTA (Standard Material Transfer Agreement), Luke-MTA or hobby-MTA (MTA=Material Transfer Agreement). There is also the Finnish Elite (FinE) trademark, which was sold by Luke to the nursery association 'Taimistoviljelijät ry'. Healthy and genuine material can be obtained through the FinE-pathway

Future needs of developments include:

- use of DNA-marker based methods to assess diversity, rationalize collections and enhancing via pre-breeding;
- database developments to enable storage and retrieval of characterization data;
- cryopreservation methods to ensure economic and secure conservation;
- virus detection and eradication (small-RNA profiling);
- safety duplication in collaboration with private and non-profit sector;
- re-organization of field collections.

It is expected that the Berries WG will enhance cooperation toward methodological progress, submission of collaborative projects, increase access to collections and to characterization data for research and breeding.

France

Béatrice Denoyes

The National Agronomic Research Institute (INRA) is mainly maintaining strawberry genetic resources for the diploid species. The entire collection of *Fragaria x ananassa* was donated twenty years ago to the French grower association Création Variétale Fraises Fruits Rouges (CIREF), which is now Invenio, whose main goal is to develop new strawberry varieties which correspond to French producers' needs. At INRA, there are 40-60 genotypes of *Fragaria vesca* and additional wild species that are used to do phylogenetic analysis. The collection of *Fragaria x ananassa* is kept in soilless conditions by Invenio at Douville (south-west of France) and is renewed each year. It is planned to evaluate it in cultural conditions. Phenotyping is focused on breeding targets and there are plans to do genotyping. There is no permanent budget to maintain the genetic collection.

Germany

Monika Höfer

The German Fruit Genebank, with the aim to ensure effective and long-term conservation and utilization, is organized as a decentralized network under the coordination of the Julius-Kuhn Institute (JKI). Specific fruit species networks of collections exist for apple, cherry, strawberry, plum, *Rubus*, pear and wild fruit species cultivars, involving 21 partners and 51

collections around the country.

Fruit accessions are maintained in field collections. Virus-free strawberry material is maintained under insect-proof screenhouses. Strawberry cultivars as well as wild species are also increasingly maintained under cryopreservation as a duplicate collection. Cryopreservation is effective, with an average recovery of 86% of the samples. Wild species are maintained in field collections in Dresden, as one of the largest collections in Europe of wild *Malus* and *Fragaria* species (297 accessions from 22 different *Fragaria* species).

The *Rubus* network is coordinated by the Federal Plant Variety Office and is also intending to establish virus-free material.

Information on all accessions maintained by the partners is available online from the German Fruit Genebank database (www.deutsche-genbank-obst.de/). The number of conserved strawberry cultivars (*Fragaria* spp.) is 240, while *Rubus* spp. cultivars is 45. A next step will be to establish a *Ribes* network coordinated by the Federal Plant Variety Office. Field collections (3 plants/cv.) already include redcurrant (62), blackcurrant (79), gooseberry (63) and jostaberry (7). Part of this material is already virus-free and conserved under insect-proof screenhouse.

Greece

Eleni Maloupa

Conservation of berries' genetic resources takes place in the Greek Genebank, Thessaloniki and in the Balkan Botanic Garden of Kroussia (BBGK).

The ongoing (2018-2021) national project 'EcoVariety' contributes to collecting local traditional and native wild fruit trees and shrubs (*Rubus ideaus*, *Vaccinium myrtillus*, *Sambucus nigra*, *Prunus spinosa*, *Rosa canina*, *Cornus mas*, *Rhus coriaria*, *Amelanchier ovalis*). These wild species are documented, molecularly identified, propagated, evaluated and included in pilot projects of sustainable use. The best selected populations as mother plant material with the protocols of propagation and an MTA was delivered to local nurseries in Arta and Thessaloniki areas. In the case of red raspberry and blueberry, respectively five and three populations were included in *ex situ* conservation in Greece, together with three populations of wild strawberry (*Fragaria vesca*) included in the BBGK *ex situ* collection.

Other berries' research activities at the Aristotle University of Thessaloniki focus on the genetic diversity of Greek populations of strawberry tree (*Arbutus unedo*), elderberry (*Sambucus nigra*) and yew (*Taxus baccata*).

Another public-private partnership project (FraGen) is carrying out the evaluation of advanced selections of strawberry genotypes developed by Berry Plasma LLC from their breeding and introduction into modern commercial production systems.

Some constraints that are currently limiting the efficient conservation of wild berries' populations in Greece are related to the quality and availability of accession-level information, the lack of adequate funds to cover staff, infrastructure and materials, and to carry out timely regeneration activities. Availability of resources for regeneration, collecting and research is also a limiting factor, together with the lack of trained staff on poorly researched species and genotypes.

Latvia

Valda Laugale

The Genetic Resources Centre, Salaspils, is responsible for coordinating all Latvian genetic resource activities, including crop and fruit species, vegetables, aromatic and medicinal species, forestry, animal and fish genetic resources. The Centre incorporates the Latvian genebank, the central database and a genetic analysis laboratory

(www.silava.lv/69/section.aspx/View/6).

The Institute of Horticulture (LatHort), based in Pūre and Dobele, maintains the largest collections and carries out characterization of germplasm and its genetic diversity, including selection of new, valuable material for future breeding. Other collections are held at the Latvia National Botanical Garden, Salaspils.

The main berry crops' collection at LatHort conserves blackcurrants (319 accessions of which 33 are of national origin), strawberries (150/38), raspberries (122/13), gooseberries (85/25), red and white currants (62/10) and blackberries (19/2). A few accessions of less grown berry crops are also conserved (honeysuckle, elderberry, shadbush, *Viburnum* spp., barberry, sea buckthorn and golden currants).

Descriptors for characterization and evaluation were developed nationally for the fruit crop genetic resources and have been applied to some accessions of raspberry, red and white currants, gooseberry and blackcurrant.

The National Botanic Garden of Latvia holds one of the richest living plant collections in Northeast Europe, where more than 14,000 taxa are grown. Among these are also blackcurrant, blueberry, cranberry, honeysuckle, *Viburnum* spp., sea buckthorn, red and white currants and cowberry - <https://database.smartgardens.eu/>.

A Virtual Hall of Latvian breeders achievements is available at <https://www.nbd.gov.lv/lv/slavas-zale>.

Various national and international projects on berries' genetic resources are ongoing, such as the Public Private Partnership project NORDFRUIT on pre-breeding for future challenges in Nordic fruits and berries (2018-2020), coordinated by Graminor with participants from seven Nordic and Baltic countries and related to apples and strawberries.

Other projects are on *Ribes* mites and viruses, where inventory, evaluation and recovery of local *Ribes* germplasm is carried out, and on *Vaccinium* genetic resources in Latvia.

Lithuania

Audrius Sasnauskas

The Lithuanian Plant Genebank was being reorganized in 2020 and merged to the State Forest Service, taking care of national plant genetic resources. Berries' genetic resources are part of the orchard plants, which are conserved in various locations, including the Institute of Horticulture, the Botanical Garden of the Vilnius University and the Kaunas Botanical Garden of Vytautas Magnus University.

At the Institute of Horticulture, 475 accessions of currant, gooseberry, strawberry, wild strawberry, blackberry and raspberry are conserved in the field, but also *in vitro* and under cryopreservation. The national genetic resources database is available online at <https://agb.amvmt.lt/search.aspx>.

The Institute of Horticulture is focused on breeding of horticultural plants, the creation of new varieties as well as acquisition and preservation of genetic resources, modelling of agro-biological systems for quality and productivity, processing and storage and analysis of biologically active compounds in fresh and processed production, etc. The Institute is involved in several international projects including, recently, RIBESCO and GENBERRY (see below).

Norway

Dag Røen

The Norwegian Genetic Resource Centre, established by the Ministry of Food and Agriculture as a part of Norwegian Institute of Bioeconomy Research (NIBIO), holds the responsibility for genetic resources in Norway. Activities are based on national regulations

and priorities as well as on international collaborations and agreements. As the Nordic countries genebank at NordGen in Sweden does not hold collections of clonally propagated plants, except potatoes, clonal collections are maintained at national level. The Clonal Archive Network Working Group of NordGen is a meeting place to facilitate cooperation among the national field genebanks. The clonal archives and backup collections in Norway are spread in small centres, that are trying to work better together. The Elite Plant Station, Sagaplant maintains the cryo-collection. Berries' accessions in Norway include red and white currant (*Ribes rubrum*) (55 accessions), blackcurrant (*Ribes nigrum*) (75), gooseberry (*Ribes uva-crispa*) (55), raspberry (*Rubus idaeus*) (35), blackberry (*Rubus* spp.) (35), cloudberry (*Rubus chamaemorus*) (5), cultivated strawberry (*Fragaria x ananassa*) (50), sea buckthorn (*Hippophaë rhamnoides*) (25), other strawberries (*F. vesca*, *F. virginiana* x *F. chiloensis*), arctic bramble (*Rubus arcticus*, *R. x stellarcticus*), and blue honeysuckle (*Lonicera caerulea*).

A list of mandate cultivars for conservation in Norway (mainly Norwegian bred cultivars) has recently been updated for strawberry (16), raspberry (13), red currant (5), blackcurrant (8), and cloudberry (4).

A lot of work remains to be done on proper cultivar identification and better characterization, which require investment. The new national strategy, established in 2019, recommends that some clonal collections are given the role as national genebanks for clonally propagated crops.

The main constraints to face are insufficient funding and infrastructure and the risk of losing accessions due to diseases and pests, as well as the consequent restrictions on delivery of material.

Portugal

Pedro Nogueira Brás de Oliveira

The berry collection at Instituto Nacional de Investigação Agrária e Veterinária (INIAV), Oeiras, originally contained only cultivars of *Rubus* and *Vaccinium*, but a decision was made not to work on commercial varieties, but rather look for genetic resources. A small breeding programme on raspberry was started in 2017, which gave rise to five new advanced selections. The programme continued in 2020 with more than 3,500 seedlings. The collection of blackberries is rich of *R. ulmifolius* ecotypes and contains other endemic species from Portugal and Spain, as well as non-commercial interspecific hybrids. Characterization of wild material is ongoing.

Crowberry (*Corema album*) only grows on the Atlantic coasts of Portugal and Spain; its wild distribution has been monitored at more than 80 sites. It is considered an endangered species. Seedlings from several genotypes have been planted for an *ex situ* collection.

Other two endemic species of *Vaccinium* exist in the Azores (*V. cylindraceum*) and Madeira (*V. padifolium*). The Azores endemism has been collected and successful crosses have been made with blueberry to investigate the possibilities for breeding improvements.

A constraint for blackberry conservation is the *Rubus* stunt disease which is caused by phytoplasmas and is becoming also a serious problem for growth and trade, especially in the south of Portugal. INIAV is investigating the presence of the infection via polymerase chain reaction (PCR) techniques.

Romania

Monica Sturzeanu

There is a long tradition of berry research and collection in Romania. Before 2006, two centres were involved in collecting and conserving berries' genetic resource, i.e. the Research Station for Fruit Growing (RSFG), Cluj, and the Research Institute for Fruit Growing (RIFG),

Pitesti. Today, activities are reported only from RIFG Pitesti, where 362 genotypes are preserved, including strawberry (107 cultivars, of which 7 from Romania), blackcurrant (68/6), gooseberry (14/2), raspberry (22/6), blackberry (26/2), blueberry (45/9), sea buckthorn, blue honeysuckle, black chokeberry, elderberry, cornelian cherry and rose hip.

Objectives of work on berries at RIFG Pitesti include, among others, studies of genetic variability and inheritance of major characteristics in fruit trees and berries, preservation and evaluation of the fruit germplasm *ex situ* and possibly *in situ*, breeding of new cultivars and rootstocks, improvement of nursery techniques such as macro- and micro propagation.

Blueberry and strawberry are the main cultivated berries in Romania.

Germplasm maintenance was financed by the Ministry of Agriculture, including the characterization and evaluation.

Conservation takes place in open fields with a minimum of 4-5 plants per accession.

An intense breeding activity has enabled the release of several cultivars during the last twenty years.

Slovenia

Darinka Koron

Similar to other countries, the Slovenian berries' genebank at the Agricultural Institute of Slovenia finds it difficult to efficiently preserve its genetic resources without sufficient funding support. Only simple maintenance is currently guaranteed, without characterization and evaluation activities and also no breeding programme is active.

The genebank only includes old varieties. In Slovenia there is cultivation of berries on 425 ha, but no autochthonous varieties are used and the product is not used for export.

Several wild berry species are present in nature, often harvested directly in the forest as wild food.

The genebank of berries is split into two institutes, the Agricultural Institute of Slovenia in Ljubljana with 232 berry species from Slovenia, and the Faculty of Agriculture and Life Sciences in Maribor, with 39 raspberry accessions from eastern Slovenia, which also maintains accessions *in vitro*. The collection is in good condition. The estimated life of individual accessions is variable; strawberry requires continuous replacement, therefore its maintenance was terminated.

Sweden

Inger Hjalmarsson

The Swedish National Programme for cultivated plants (POM) is engaged to select and recover old berry cultivars. The mandate cultivars are old cultivars locally developed, cultivars bred in Sweden and cultivars of foreign origin with a long Swedish growing tradition.

Since 2016 the Swedish National Genebank for Vegetatively Propagated Horticultural Crops has maintained two plants of each mandate cultivar in the field at the Swedish University for Agricultural Sciences (SLU) in Alnarp, with backup of virus-free plants at the Swedish Elite Plant Station in pots. However, the backup is not yet fully completed. The selection of mandate cultivars was based on a literature review and now the list comprises 150-200 berry cultivars. Some old cultivars might never be found again. Some 'new' cultivars might be added as a result of POM's survey. The list of mandate cultivars contains approximately 35 gooseberries, of which more than 50% have non-Swedish origin, 55 red and black-currants, 30 raspberries, five Swedish bred cultivars of *Rubus x stellarcticus* and 35 strawberries. Additionally, some cultivars of other species such as *Vaccinium* are also preserved.

Thanks to the collaboration with Luke, Finland, very endangered cultivars can be sent there for cryopreservation, which is a very useful backup method. Checking for true-to-typeness is often a problem and more molecular genetics work would be useful for this purpose.

Switzerland

Claudio Niggli

Pro Specie Rara (PSR) is the largest NGO in Switzerland for cultural biodiversity, with a centralized organisation and decentralized conservation. It provides a label for marketing varieties with Swiss tradition. Within the PSR 'portfolio', hundreds of berry varieties are available to network members for free. The list is available from an online variety finder.

The PSR berries collection includes more than 500 varieties of strawberry, raspberry, blackberry, gooseberry and currant that are part of the National Programme, while others do not satisfy the programme's criteria. Out of six collections of the National Programme, four are managed by PSR. The berries' national collection is centralized. PSR maintains its collection in the field, and the materials are also duplicated outside of PSR *in vitro*, under cryo and in greenhouse.

An extensive description of large part of the varieties, based on UPOV standards, is available and is progressively documented on the web site, including a photographic documentation and the preparation of A4 variety sheets. Genetic analysis of 367 accessions of *Ribes*, *Rubus*, and *Fragaria* has been carried out at Agroscope, Nyon.

The PSR database is complementing the National database, especially with information related to use and history of the varieties. Expectations from the new Working Group include the possibility to meet other experts and their collections and exchange insights about different conservation programmes. Also, the potential for methodological standardization and the establishment of a collection with verified reference accessions for named cultivars are among the aspirations.

Finally, it is expected to exchange results about pomological research, genetics and systematics, and trueness-to-type (with primary focus on *Ribes*).

Turkey

Havva Merve Yilmaz

The Turkish Ministry of Agriculture and Forestry coordinates and implements agricultural research and development activities through the General Directorate of Agricultural Research and Policies (TAGEM), with a mission to increase yield and quality, develop new varieties and technologies, conserve genetic resources and ensuring their sustainable use. Berries genetic resources are conserved in field genebanks in four centres across the country: the Atatürk Horticultural Center Research Institute, Yalova; the Alata Horticultural Research Institute Mersin; the Middle Black Sea Transitional Zone Agricultural Research Institute, Tokat; and the Apricot Research Institute, Malat. Strawberries are the most studied. Local varieties 'Ereğli' in Zonguldak, 'Arnavutköy' in İstanbul and 'Karşıyaka' in İzmir provinces were selected from wild strawberries and were grown for many years until today. 'Osmanlı', the most aromatic local cultivar among the known strawberries, was grown in the surroundings of Ankara. Many adaptation experiments were carried out in various ecological regions.

Strawberry and (black and white) mulberry breeding is ongoing at the Atatürk Horticultural Center Research Institute in Yalova. After strawberry, mulberry is the most cultivated berry in Turkey, mostly *Morus alba* L. (white mulberry), and much smaller percentages of *M. rubra* L. (red or purple mulberry), and *M. nigra* L. (black mulberry).

In the Black Sea region, blueberry has a wide variety of wild populations. Adaptation experiments were started, using foreign blueberry varieties.

Future perspectives of TAGEM focus, among others, on the improvement of new Turkish varieties for fresh and processing berry industry, enhancing marketable fruit quality and export, extending the production season to the whole year, promoting annual cultivation systems and improving berry germplasm resources conservation both *in vitro* and in field conditions.

United Kingdom

Felicidad Fernández Fernández

The value of the UK berry market (2017 values) reaches over £530M for home grown product and over £590M for import. Strawberry is the largest segment of this market (£455) but growth in volume and value is slowing down. Imports taking place primarily during the 'off-season' (November-May) have been shown to maintain 'customer loyalty' to berry sales, driving sales up in the UK season.

The National Fruit Collection's website (<http://www.nationalfruitcollection.org.uk>) indicates 208 accessions of currants and 159 of gooseberries. These collections are old and have proven very difficult to maintain and to propagate owing to serious plant health issues. They have limited life in the soil or pots and require lots of attention. They are thus in the process of being discontinued and 'transferred' to other institutions, such as botanical gardens.

Germplasm is maintained, not really as a genebank in research institutes, but for breeders use for historical value. The National Institute of Agricultural Botany (NIAB) (formerly EMR) in Kent has a breeders' collections of *Fragaria*, *Rubus*, *Vaccinium* and *Lonicera*. These are characterised for agronomic/breeding performance, with variable health status and not fully accessible.

Also the James Hutton Institute (JHI) in Scotland, partially private/public and formerly the Scottish Crop Research Institute (SCRI), maintains breeders' collections (<https://www.hutton.ac.uk/research/facilities/rubus-and-ribes-germplasm-collections>) of blackcurrant, blackberry, redcurrant and gooseberry.

Other private collections, called National Plant Collections (<https://www.plantheritage.org.uk/national-plant-collections/>), are part of the Plant Heritage (<https://www.plantheritage.org.uk/national-plant-collections/>) network (including *Fragaria*, *Rubus*, *Sambucus* and *Vaccinium*), the Royal Horticultural Society (RHS) Garden (Wisley) with currants and gooseberries, the Cambridge University Botanic Garden (*Ribes* and hybrids) and the Royal Botanic Gardens, Kew.

Main challenges for conservation and utilization are insufficient funding, lack of coordination in approach (for example regarding documentation and access, as well as commercial versus heritage objectives), and technical challenges (need for frequent re-propagation, plant health, trueness to type, etc.).

It is hoped that the Berries' WG will maintain and expand European links for research and development.

The ECPGR European Evaluation Network (EVA)

Lorenzo Maggioni

The European Evaluation Network (EVA), (<https://www.ecpgr.cgiar.org/european-evaluation-network-eva>) approved by the ECPGR Steering Committee in Thessaloniki in

May 2018, was presented, including its objectives, expected benefits, principles and structure. It is currently promoted through a German funded project which is helping to establish private/public partnership's networks for the evaluation of barley, wheat and vegetables' (carrot, lettuce and pepper) genebank accessions, soon to be extended with a maize component.

Opportunities to extend the network to a berries' component will depend on the interest of the WG (genebanks, breeders) and the possibility to raise funds for the public partners in the partnership (through EU proposals, ECPGR grant scheme or other sources) and the activities to be funded (multiplication, genotyping, documentation, travel). The field evaluation would be expected to be carried out by interested private partners at their own cost.

Results of the GENBERRY project

Béatrice Denoyes

The GENRES 036 'GENBERRY' project on European small berries genetic resources (2007-2010) was coordinated by INRA, France, and involved partners from six other countries (Germany, Italy, Lithuania, Poland, Romania and the United Kingdom).

The project followed previous European actions on small fruits (strawberry), such as the AIR-EC concerted action in the 1990s to establish a European Strawberry Variety Network and an European Old Variety Repository; the COST (European Cooperation in Science and Technology) Action 836 on Integrated Berry Production (1998-2003) - 'Towards an organisation of the integrated research in berries: model for a strawberry of quality, in respect with the environment rules and consumers requirements', leading to the creation of a European genetic resources list for strawberry and to breeders' evaluation methods and standards for disease resistance and fruit quality traits; the COST Action 863, EUBerry'' (2005-2010) - 'Euroberry research: from genomics to sustainable production, quality and health'.

The main objective of GENBERRY was to get a better appreciation of the European small berries genetic resources (strawberry and raspberry) with three main deliverables: 1) Create a network for improving the conservation and the evaluation of small berries genetic resources; 2) Standardization of markers for studying genetic diversity; 3) Elaboration of a living European database for strawberry.

A list of the raspberry and strawberry genotypes available to the project partners was compiled, amounting to 817 genotypes in February 2011, after the identification of synonymies with the purpose of rationalization and identification of a core collection. Suitable passport and characterization data were defined, but difficulties were encountered to collect many data due to intellectual protection. Practical difficulties in scoring the traits with reliable standardized ratings were also experienced. The genetic diversity of a representative part of the collections was characterised with already developed microsatellite markers. The collection of strawberry could be distinguished in three main groups, 'Californian varieties', 'old European varieties' and 'intermediate varieties'. Fruit quality was analyzed and resistance to diseases tested.

The GenBerry Database on Strawberry Genetic Resources in Europe was created. The results would later be published.

Results of the RIBESCO project

Saila Karhu, Luke, Finland

The 'RIBESCO' project, coordinated by Luke Institute, Finland, was funded from 2007 to 2011

by the EC under Regulation 870/2004 as AGRI GEN RES Action 071 on 'Multinational Approach for Conserving the European Genetic Resources of Currants and Gooseberry'. The project involved eight Baltic countries and was focused on black and redcurrants and gooseberry. Northern Europe has a long growing and breeding history for these crops and is the leading production area. There is a high number of cultivars and local races and some of these species also grow wild in the area.

The intention was to create a core collection of the Northern European gene pool of *Ribes* including the most important part of the collections, with optimal genetic diversity and to be preserved with special care and safety duplicates. Also, the level of documentation needed improvement with phenotypic and genotypic data eight Baltic countries involved.

The project investigated 776 blackcurrant, 322 red and white currant and 430 gooseberry accessions provided by the partners' national collections.

These accessions were documented at their *ex situ* field locations with common descriptors (CPVO and UPOV) including phenological, morphological and agronomic characters and some fruit quality analyses.

Passport data, photos and phenotypic data were included in the ECPGR *Ribes/Rubus* database. No reference cultivars were present in all the collections; therefore, some data were not comparable.

New Simple Sequence Repeat (SSR) markers were developed to characterize the collection molecularly, thus estimating the genetic relationships among accessions and providing suggestions for an optimal core collection with maximum amount of the genetic variation, as well as to uncover trueness-to-type of cultivars and duplicate accessions.

The establishment of a core collection was based on the following criteria: 1) defining the target number of accessions for the core collection; 2) selecting accessions important for their historical or present value, rareness, etc.; 3) selecting accessions important for breeding and cultivation (resistance to stress, yield quality, etc.); 4) including >10% of the genotypic variability based on the molecular marker analysis; 5) including >10% of the phenotypic variability based on the cluster analysis dendrograms of field evaluation data.

The core collections were established as new field collections in the respective countries. One problem encountered was the blackcurrant reversion virus (BRV) infection, therefore virus indexing and virus eradication were considered as part of national projects.

In vitro collections were experimented. The need for frequent subculturing of redcurrant was problematic. The technique offered the possibility of virus elimination before cryopreservation. For cryopreservation, dormant buds were used for blackcurrant. The use of meristems also needs investigation and further research is required to develop a possible cryotherapy.

For the core collection, partners selected 25% of all accessions: 123 black-currants (23%), 92 redcurrants (27%) and 123 gooseberries (30%). The project offered a model to improve conservation, characterisation, data availability and utilisation of *Ribes* germplasm.

Results of the GoodBerry and EUBerry projects

Béatrice Denoyes

The Horizon2020-funded GoodBerry project (<https://goodberry-eu.eu/>) coordinated by the Universidad de Málaga (UMA), Spain, was concerned with 'Improving the stability of high-quality traits of berry in different environments and cultivation systems for the benefit of European farmers and consumers'.

Among others, the project intended to unravel the genetic architecture of agronomical traits that interact with environment and culture management in different types of berry crops.

The results highlighted the plasticity of several traits, i.e. the different response to different environments (strong genotype by environment interaction). For example, a large variability of flowering time was detected within the same genotype after micropropagation.

The EUBerry project (2011-2013) (<https://www.euberry.univpm.it/Project>), funded under the EC Seventh Framework Programme and coordinated by the Università Politecnica delle Marche, Italy, included partners from ten countries. The project intended, among others, to phenotypically characterize germplasm that was not investigated by the previous projects COST863, GenBerry and RIBESCO and to integrate the data of all projects. At the same time, molecular tools for marker-assisted breeding were developed, with the intention to carry out association mapping. Based on the identification of Quantitative Trait Loci (QTL) and some key genes underlying important developmental and quality traits in strawberry, raspberry and currant, one of the project objectives was to identify the best materials of *Fragaria*, *Rubus*, *Ribes* and *Vaccinium* exhibiting enhanced fruit quality, including nutritional quality and nutraceutical value.

It is to be noted that GoodBerry and EUBerry projects did not generate public databases or Excel files merging the description of the investigated materials.

The EURISCO database

Stephan Weise

The European Search Catalogue for Plant Genetic Resources (EURISCO) records data on *ex situ* collections of all crops at accession level. It is based on a Network of National Focal Points from 43 countries, providing their national inventories' data. It contains data for over two million accessions, including records of those registered as part of the Multilateral System and as part of AEGIS. Examples of online functionalities for the search of passport data were demonstrated, including the different user-specific export features. Inclusion of non-standardized phenotypic data has also been possible since 2016 and over 84,000 accessions contain this type of data in searchable form. Only the exchange format is standardized and the input of the WG is needed to provide additional data and updated information at accession level. Crop specific databases can receive help to automatically import and update their accession data from EURISCO and evolve towards crop specific portals (see example of the [European Poa Database](#)).

In reply to questions from the audience, it was clarified that data are entered into EURISCO only through the National Inventory Focal Point (NFP) of each country. Therefore, the data represent accessions that are part of the National Plant Genetic Resources Inventories as a contribution to the implementation of the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) and other international mechanisms such as the FAO Global Plan of Action, the Clearing House Mechanism (CHM) of the Convention on Biological Diversity (CBD) and the Global Biodiversity Information Facility (GBIF). Before entering data into EURISCO, NFPs must obtain any necessary permission from third parties to allow the data to be made publicly available and provide only non-confidential data that are not subject to any restrictions to be incorporated into EURISCO. However, there is currently no obligation regarding the terms of availability of the physical material included in the database.

Partial replacement of data is possible whenever updates are necessary. For the inclusion of additional passport descriptors, there is either the option to build specific crop portals (see above), or to raise specific funds for database adjustments, where feasible.

FUTURE COOPERATION - PROPOSALS FOR JOINT ACTION

M. Höfer introduced the discussion with the presentation of proposals for future joint

cooperation. Several collaborative projects on berries were conducted in previous years, but only a limited number of partners/countries could be involved.

Additionally, the time frame for cooperation was always limited and the specific topic 'genetic resources' only covered a very limited part of the projects. It remains difficult to find resources for many countries and specifically on characterization and evaluation of genetic resources. It is also important to have regular meetings to give continuity to the collaboration, as the examples of the *Malus/Pyrus* and *Prunus* Working Groups have shown.

The proposed main objectives of cooperation within the Berries WG could be the coordination of the genebank activities between the national collections and the elaboration of a living European berries' database, sustained by a continuous long-term network cooperation. The main points of cooperation would be the following:

1. Inventory – conservation

- Survey the collection composition – in all European countries especially those not involved in former EU-projects.
- Develop an effective conservation strategy for berry genetic resources – rationalization of conservation in *ex situ* collections (preparation of genebank operational manuals and agreement on common standards). A combination of traditional *ex situ* conservation with cryopreservation has great potential to improve berry germplasm conservation and to foster conservation of valuable germplasm.
- Obtain information about the current status of safety-duplication in all collections and long-term facilities. Partners will be encouraged to make plans for safety-duplication through organization of material exchange.

2. Characterization/evaluation

- Review of passport descriptor lists and of characterization protocols to improve standardization/harmonization and to develop primary and secondary descriptors.
- Characterization of genotypes using molecular markers, identification of healthy nutritional compounds and evaluation of disease resistance.
- Re-establishment of the core collections obtained from the former projects and establishment of a core collection for all berry species.

3. AEGIS and documentation

- Development of criteria for designation of candidates of each berry species to be included in the AEGIS collection.
- Ensure the long-term sustainability of the existing databases and improve their information content (for example, harmonizing the taxonomic names used by different collections).
- Establish suitable links between existing databases, EURISCO and national information systems.

4. Breeding and other uses

- Facilitate the use of berry genetic resources by breeders and other possible users.

Considering the possibility offered by ECPGR to submit a proposal for funding an activity under the Grant Scheme, bearing in mind the limited budget of ca. €20,000, it is necessary to focus on the objectives.

In the following discussion, it was agreed that the first step to take for the WG was to verify what material was currently available in the partners' genebanks and to harmonize passport data (starting with the Multi Crop Passport Descriptors) in order to eventually include correct data into EURISCO. Regarding the scope of the material to inventory, it was considered that 'berry' is not intended as a botanical definition, but rather a commercial term

(for example, 'strawberries' are in scope). Cultivars could be given priority to start the inventory, but there would be no reason to exclude botanical species and minor crops, so the lists could be expanded at the discretion of the genebank curator.

It was agreed to start developing an Excel template (care of M. Höfer, with the help of E. Schulte) to serve as a basis to create an inventory of existing genetic resources of berry, to be circulated to all members and to be used as a basis to submit a proposal to the ECPGR Grant Scheme (care of M. Höfer).

Regarding the evaluation and technical guidelines, E. Schulte informed that the UPOV technical working party on small fruits decides protocols for evaluation, with notes given for the expression of particular characteristics and expressions of values made in comparison with other varieties. Being a member of this working party since 1997, E. Schulte offered to give a lecture to the WG to explain how the guidelines work, how to find them, how to apply them, etc. The offer was appreciated by the WG.

Agreed Workplan:

1. Inventory of existing genetic resources of berries

- Creation of an Excel template according to the specifications of EURISCO, to be circulated to all WG members with instructions (M. Höfer and E. Schulte) (by August 2020).
- Template to be filled in and returned to M. Höfer by all members of the Working Group (by the end of October 2021).

2. Proposal for a project for the Fourth Call for proposals under the ECPGR Activity Grant Scheme (Phase X).

- Preparation of a proposal on 'Collaborative action for updating and documentation of the berry genetic resources in Europe' for submission to the ECPGR Fourth Call for proposals, due to be launched in mid-2020 (M. Höfer).

3. Proposal for the next meeting of the Working Group (tentatively March 2021 in Sweden).

- Preparation of an application for funding, to be submitted to the ECPGR Secretariat for a meeting to be held, tentatively in Sweden in March 2021 (M. Höfer).

Excursion to the JKI Institute

After the meeting, an excursion was organized to visit the JKI laboratories, greenhouse and orchard collection in Dresden-Pillnitz.

APPENDICES

Appendix I. Proposal to the ECPGR Executive/Steering Committee for a Berry WG

The following document, *Proposal to the ECPGR Executive/Steering Committee for the establishment of a Berry Working Group*, was submitted in November 2018 by Monika Höfer for the attention of the ECPGR Steering Committee. The proposal was approved by the Steering Committee in February 2019.

Importance of berries

Horticultural crops have always played a vital role as fresh foods in the human diet. Some of them, especially berries, are particularly interesting for consumers due to the special taste value and high content of health benefits, including dietary fibre, macro and microelements, and vitamins in the fruits.

Annual world production of these berries amounts to approximately 4.0-4.8 Mt. In general, strawberry and raspberry are widely cultivated in Europe, thanks to high adaptability of the plants to environmental conditions and improved growing techniques. However, potential future growth of fruit production depends on maintaining fruit quality as well as meeting market fluctuations. This creates the necessity to support growers by generation of stable core collections useful for European breeding programs.

Considering all these facts, wide analysis of genetic resources in this sector in regard to yield quality, adaptation to different climate conditions in Eastern, Western, Northern and Southern Europe (including climate changes), tolerance to the most important pest and diseases, etc, seems to be crucial to European fruit breeding programmes and, in consequence, European competitive berry production.

The adoption of the community agro-environmental measures according to the current and future EU policies specifically address the exploitation of genetic resources in terms of the identification of varieties better suited for cultivation in accordance to the above-mentioned priorities.

Maintaining berry genetic resources and evaluating their diversity and genetic structure is thus of great importance. In addition, the importance of strawberry was highlighted by its inclusion on the Annex 1 list of the International Treaty on Plant Genetic Resources for Food and Agriculture.

Conservation of berry genetic resources

The cultivated strawberries, the raspberries and several other berries belong to the *Rosaceae* family, and the *Rosoideae* sub-family. *Fragaria* as well as *Rubus* are comprised of a highly heterozygous series with a range of ploidy levels. The number of species is particularly high for *Rubus*, greater than 500.

Blackcurrants (*Ribes nigrum* L.), redcurrants (*Ribes rubrum* L.) and gooseberry (*Ribes uva-crispa* L.) belong to the *Saxifragaceae* family; whereas some other berry crops belong to the *Ericaceae*.

For most of these cultivated species, domestication has resulted in a reduction of both morphological and genetic diversity with modern cultivars being genetically similar. Therefore, it is important to keep all the variability available today in order to limit the decrease of the genetic basis of small berries genetic resources.

Most of the temperate fruit species are genetically heterozygous and vegetatively propagated. Unique heterozygotic individuals which have been identified and selected for their special combination of genetic attributes, and which cannot be regenerated by seed, are the focus of breeding and commercial fruit production. Collections of berry genetic resources are maintained in the field as active collections where the accessions are available for comprehensive characterisation, evaluation, and distribution. However, there are several disadvantages that limit the efficiency of active collections and threaten their security. The genetic resources are exposed to pests, diseases and to natural abiotic hazards. Field genebanks require considerable input in the form of land, labour, management and materials and, therefore, their capacity to ensure the maintenance of the diversity present in a species is limited.

For *Fragaria*, the field plantings have some special disadvantages, such as a regular careful monitoring to avoid contaminations by runners from different accessions and naturally spread viruses, which require periodic replanting. The turnover is much shorter for strawberry (two years or even one year for some institutions) than for raspberry (5 - 8 years). Ideally, the berry germplasm has to be stored as potted plants under insect-proof screens with an active integrated pest management program to reduce the risk of virus infection. Backups for the plant material in active collections are needed to provide security in case of a disease or environmental disaster. A safety backup collection comprises accessions of an active collection at different locations; i.e. maintained at a second site as a field collection, in greenhouses, or held as *in vitro* cultures in the laboratory as short and medium term storage or cryopreservation as long-term storage.

Collections of the cultivated strawberry and other berries in Europe

During an earlier European AIR project in the years 1994 and 1995, a first inventory of strawberry was created with 900 cultivars of the main European collections. In 1998 the European COST action 836 'Integrated research in berries' was started to coordinate the scientific activities in 22 partner countries. A first overview of the responsible working groups for genetic resources has shown that the collections of the participating institutes have been changed significantly within these few years. At the end of the COST action 836 the database includes entries of 1056 strawberry cultivars from 20 collections. Nearly half of the listed cultivars are grown only at one site and at least six important old cultivars seem to be still lost. Therefore, 108 important cultivars were selected as the core mainly for historical reasons.

An improvement of the European cooperation regarding the genebank work was reached with the EU project AGRI GEN RES 036 'European small berries genetic resources' (2007 - 2011). The objective of the EU GENBERRY project was to ensure that agricultural biodiversity of small berries, strawberry and red raspberry is preserved and characterized for using them in further breeding programs. This project was based on the notion of networking, considering that maximum added value can only be reached by bringing together otherwise rather scattered competences on techniques of cultivation, phenotypic description, molecular biology, as well as evaluation for health value compounds and disease resistance. This project involved ten partners located in eight European countries (France, Italy, Germany, Great Britain, Lithuania, Poland, Romania and Spain).

For edible currants and gooseberry, the RIBESCO project (2007 - 2011) was realized with the aim to establish cooperation between national collections in different countries in order to find the most valuable part of each collection and organise a decentralised core-collection for the safe and recognised conservation. This project involved nine partners located in eight European countries within the Baltic Sea Region (Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland and Sweden). During the project the existing European Central *Ribes / Rubus* Database under construction at the Vilnius University, Lithuania was utilised and completed (<http://projektai.vu.lt/ribes-Rubus/>).

Based on these two projects the main objective of the following EUBerry project (2011 – 2014) was to provide the necessary knowledge and tools to facilitate development of high quality, consumer-desirable fresh berry fruits of high nutritional quality, optimal for human health at a competitive cost. The further objective was the development and validation of a set of tools to improve competitiveness of European berry production and consumer accessibility to berry fruits. One deliverable was the data mining of existing characterisation data, which should have been enhanced by two EU-funded DG AGRI GEN RES projects ending in March 2011. However, in 2018, only passport data of the strawberry database were available on the ECPGR website.

The present running project, GoodBerry will use novel approaches for genetic improvement of berries in different environments which is absent in current breeding programs - caused by the genetic complexity of these species and the complex plant environment interaction and particular management practices. Seven European countries and China and Chile are involved.

Reasons

The disadvantages of the above-mentioned projects are (1) only a limited number of countries could be involved, (2) the time frame was limited and (3) the topic 'genetic resources' covers only a very limited part of what is needed. However, due to changes of persons responsible for European genetic resources, the lack of funding and phytosanitary problems, genetic resources works are endangered today. A long-term coordinated work with extending collaborative actions of berry genetic resources on the European level is necessary. This could only be realized by a European working group under the umbrella of ECPGR.

Many partners of the above mentioned European projects support the idea to build a regular coordination framework to improve the current status of berry genetic resources conservation, characterization, evaluation and use in Europe.

Objectives

- Coordination of the genebank activities between the national collections - Elaboration of a living European berries database sustained by a continuous long-term network co-operation:
- Survey the collection composition – in all European countries especially those not involved in former EU-projects.
- Development of an effective conservation strategy for berry genetic resources – rationalisation of conservation in ex situ collections (manual). A combination of traditional ex situ conservation with cryopreservation has great potential to improve berry germplasm conservation and to foster conservation of valuable germplasm.
- Obtain information about the current status of safety-duplication in all collections and long-term facilities. Partners will be encouraged to make plans for safety-duplication through organization of material exchange.
- Re-examination of passport descriptor lists and characterization protocols to improve standardization/harmonization and to develop primary and secondary descriptors.
- Characterization of genotypes using molecular markers, identification of health nutritional compounds and diseases evaluation.
- Re-actualisation of the core collections obtained from the former projects and establishment of a core collection for all berry species.
- Development of criteria for acceptance to candidates to implement AEGIS collection of each berry species.
- Improve the information contained in the present databases – ensure the long-term durability of the databases.
- Establish suitable links between these databases, EURISCO and national information systems
- Facilitate the use of berry genetic resources by breeders and other possible users.

Proposal

Following the very positive feedback of the partners of the former European berry projects mentioned above, I submit the request for the establishment a Berry Working Group within the ECPGR for consideration and approval by the Executive/Steering Committee of ECPGR. We believe that the formalization of this ECPGR Working Group on Berry would be a major step to establish and strengthen collaboration to the entire European region.

Sincerely yours,

Dr Monika Höfer

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Appendix II. List of species, their common names mentioned in this report and related presentations¹

<i>Amelanchier ovalis</i> Medik; <i>Amelanchier</i> spp.	Juneberry, Serviceberry, Shadbush
<i>Arbutus unedo</i> L.	Strawberry Tree
<i>Arctostaphylos uva-ursi</i> (L.) Spreng.	Bearberry, Mountain Cranberry
<i>Aronia melanocarpa</i> (Michx.) Elliott	Black Chokeberry, Chokeberry
<i>Berberis vulgaris</i> L.; <i>Berberis</i> spp.	Barberry
<i>Corema album</i> (L.) D. Don	Portuguese Crowberry
<i>Cornus mas</i> L.	Cornelian Cherry
<i>Cornus sanguinea</i> L.	Common Dogwood, Bloody Dogwood
<i>Fragaria</i> spp. (<i>chiloensis</i> (L.) Mill.; <i>moschata</i> Weston; <i>vesca</i> L.; <i>virginiana</i> Mill.; <i>viridis</i> Weston; x <i>vescana</i> Rud.Bauer & A.Bauer; x <i>ananassa</i> Duchesne)	Strawberry (F.c. = Beach Strawberry, Chiloe Strawberry; F.m. = Hautbois Strawberry; F.vesca = Alpine Strawberry, Wild Strawberry; F.vg = Virginia Strawberry; F.xa. = Garden Strawberry)
<i>Hippophaë rhamnoides</i> L.	Sea Buckthorn
<i>Juniperus communis</i> L.	Common Juniper
<i>Juniperus oxycedrus</i> L.	Cade Juniper, Prickly Juniper
<i>Lonicera caerulea</i> L.	Blue or Edible Honeysuckle, Haskap berry
<i>Lycium barbarum</i> L.	Gojiberry, Box thorn, Matrimony vine, Chinese wolfberry
<i>Morus alba</i> L.	White Mulberry
<i>Morus rubra</i> L.	Red or Purple Mulberry
<i>Morus nigra</i> L.	Black Mulberry, Common Mulberry
<i>Myrtus communis</i> L.	Common Myrtle
<i>Prunus spinosa</i> L.	Blackthorn
<i>Rhus coriaria</i> L.	Sicilian sumac
<i>Ribes alpinum</i> L.	Alpine Currant, Mountain Currant
<i>Ribes aureum</i> Pursh	Buffalo Currant, Golden Currant
<i>Ribes nigrum</i> L.	Blackcurrant
<i>Ribes rubrum</i> L. Synonym: <i>Ribes sylvestre</i> Syme	Redcurrant, White Currant
<i>Ribes spicatum</i> E. Robson	Downy Currant
<i>Ribes uva-crispa</i> L.	Gooseberry
<i>Ribes x culverwelli</i> Macfarl. <i>Ribes x nidigrolaria</i> Rud. Bauer et A. Bauer	Jostaberry

¹ Table compiled with inputs from E. Schulte, M. Höfer, R. Rugienius and L. Maggioni

<i>Rosa canina</i> L.	DogRose;
<i>Rosa rugosa</i> Thunb.	Japanese Rose
<i>Rosa x damascena</i> Mill.	Damask Rose
<i>Rubus</i> sect. <i>Rubus</i>	Blackberry, Bramble
<i>Rubus arcticus</i> L.	Arctic Bramble
<i>R. x stellarcticus</i> (E.G.K. Larsson) H.E. Weber	
<i>Rubus chamaemours</i> L.	Cloudberry
<i>Rubus idaeus</i> L.	Raspberry
<i>Rubus nessensis</i> Hall	
<i>Rubus scaber</i> Wehie	
<i>Rubus ulmifolius</i> Schott	Elmleaf Blackberry
<i>Rubus x binatus</i> H. Lindb.	Nectar Raspberry
<i>Sambucus ebulus</i> L.	Danewort, Dwarf Elder
<i>Sambucus nigra</i> L.	Common Elder, Elderberry
<i>Sambucus racemosa</i> L.	Red Berried Elder, Red Elderberry
<i>Taxus baccata</i> L.	Yew
<i>Vaccinium angustifolium</i> Aiton	Lowbush Blueberry
<i>Vaccinium corymbosum</i> L.	Highbush Blueberry
<i>Vaccinium cylindraceum</i> Sm.	Azores Blueberry
<i>Vaccinium macrocarpon</i> Aiton	Cranberry
<i>Vaccinium microcarpum</i> (Turcz. ex. Rupr.) Schmalh.	Small Cranberry
<i>Vaccinium myrtilus</i> L.	Bilberry, (European) Blueberry, Common Bilberry, Whinberry, Whortleberry
<i>Vaccinium oxycoccos</i> L.	Wild Cranberry
<i>Vaccinium padifolium</i> Sm.	Madeira Blueberry
<i>Vaccinium uliginosum</i> L. Synonym: <i>Vaccinium gaultherioides</i> Bigelow	Bog Bilberry
<i>Vaccinium vitis-idaea</i> L.	Lingonberry, Cowberry, Foxberry
<i>Viburnum opulus</i> L.	European Cranberrybush, Guelder Rose

Appendix III. Agenda

First Meeting of the ECPGR Berries Working Group

Tuesday, 14 January 2020

Arrival of participants

15:00 - 15:05	Welcome (<i>Monika Höfer, JKI Dresden, Germany</i>)
15:05 - 15:15	Short self-introduction of the participants
15:15 - 15:30	Julius Kühn-Institute, Institute for Breeding Research on Fruit Crops (<i>Henryk Flachowsky, JKI Dresden, Germany</i>)
15:30 - 16:00	ECPGR in Phase X (<i>Lorenzo Maggioni, ECPGR</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 <ul style="list-style-type: none"> • Albania • Denmark • Estonia • Finland • France • Germany • Greece • Latvia • Lithuania

Wednesday, 15 January 2020

09:00 - 10:20	Presentations of the WG members (continued) (<i>10 minutes per country</i>) <ul style="list-style-type: none"> • Norway • Portugal • Romania • Slovenia • Sweden • Switzerland • Turkey • United Kingdom
10:20 - 10:50	ECPGR: the EVA Network (<i>Lorenzo Maggioni, ECPGR</i>)
10:50 - 11:20	<i>Coffee break</i>
11:20 - 11:50	Results of the GENBERRY project (<i>Béatrice Dénoyes, INRA France</i>)
11:50 - 12:20	Results of the RIBESCO project (<i>Saila Karhu, Luke, Finland</i>)
12:20 - 12:50	Results of the EUBerry project (<i>Béatrice Dénoyes, INRA France</i>)
12.50 - 14.20	<i>Lunch</i>
14:20 - 14:50	EURISCO Database (<i>Stephan Weise, IPK Germany</i>)

14:50 - 16.00	Discussion about future cooperation - proposals for joint action
16:00 - 16.30	<i>Coffee break</i>
16:30 - 17:30	Discussion about future cooperation - proposals for joint action (continued)
19.30	<i>Social dinner in Sophienkeller Taschenbergpalais</i>

Thursday, 16 January 2020

Participants interested and with suitable flights may join the visit to JKI in the morning.

They will be taken to the airport directly after the visit.

Those not joining will travel to airport directly by public means.

08:00 –09:00	<i>Bus transfer to the JKI, Institute for Breeding Research on Fruit Crops, Dresden-Pillnitz</i>
09:00 – 11:00	<i>Excursion to the JKI institute (labs, greenhouse and orchard)</i>
11:00 – 12:00	<i>Bus transfer to the Dresden airport</i>

Departure of participants

Appendix IV. List of participants

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