Proposal to the ECPGR Executive/Steering Committee for the establishment of a Berry Working Group

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 characterization, 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, labor, 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 (2 years or even 1 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 this 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 be enhanced by two EU-funded DG AGRI GEN RES projects ending in March 2011. However, in 2018 only passport data of the strawberry database are 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 of European genetic resources, the lack of money 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 an 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,
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