MTT Agrifood Research Finland

Core collection of Northern European gene pool of Ribes – RIBESCO
AGRI GEN RES action 071

co-funded by the European Commission
under Council Regulation (EC) Nº 870/2004¹

www.mtt.fi/ribesco

1. Background

Black currant, red currant and gooseberry (Latin name: *Ribes*) have a long cultivation history in Northern Europe. The plants provide voluminous crops at reasonable costs. The berries are used for producing juice, liquor and jam, both at household and industrial levels. They are also good for consumption as fresh. Thanks to their high contents of vitamin C and antioxidants, currants are particularly valuable in terms of human health, and are exploited in functional foods and cosmetics as well.

In Northern Europe, both black and red currant species grow wild. The region is the leading production area of currants worldwide. There are valuable genetic resources worth preserving in the Northern European countries.

The local currant and gooseberry types are adapted to the hard winter conditions and a short growing season. These characteristics are important for the purposes of breeding new varieties, and the traditional plant material is thus very valuable. Collections of old and more modern currant and gooseberry types have been established by several institutes, often to support plant breeding. Costs for keeping these collections are high, however, and efforts to reduce the costs are much needed.

Modern currant cultivation is characterised by large areas and the use of few cultivars. The on-farm conservation of clonally propagated material is thus risky because the plants may be replaced by other, newer varieties.

The aim of the RIBESCO project was 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 of edible currants and gooseberry [1].

‘Venny’ is a modern green-fruited blackcurrant variety with very high content of vitamin C.
1.1 The existing collections and their potential threats

At present, the European agricultural research is facing a pressure to rationalise germplasm preservation, especially as regards the collections of those plants that cannot be conserved as seeds but must be maintained as plants, mainly in field collections. For sustainable future production and development of new varieties, it is necessary to keep the genetic variability safe.

The first stage of the RIBESCO project was to gather information about the currant and gooseberry varieties and strains in the existing collections. It was found that more than 600 black currant, 300 red currant and 400 gooseberry varieties and strains were kept in collections in eight Baltic Sea countries participating in the project.

The project revealed the poor state of some currant collections in field conditions. This is due to the spreading of a pest, gall mite, and the viral disease caused by black currant reversion virus (BRV), which is transmitted by the mite. The project thus showed that we must prioritise efforts on virus-cleaning of currants and saving the most valuable ones in safety collections, as long as they still are available.

The currant and gooseberry plants in the existing collections were evaluated by their growth habit and characteristics that may be useful for future breeding purposes. For instance, they were observed for their tolerance to six different diseases and six different pests. Also various chemical analyses were conducted, including fruit sugar content, fruit acidity, fruit total anthocyanin, and fruit vitamin C assessments.

The varieties and strains were also documented by means of photographing, and information of their origin was recorded, when available.

Black currant foliage expressing the symptoms of reversion virus (BRV).
A part of RIBESCO core collection is conserved deep-frozen in a cryopreservation tank.

1.2 Establishing a core collection

In order to establish the core collection, we selected about 300 currant and gooseberry varieties and strains to be maintained with highest priority and with special efforts. This means that one quarter of the original collections were found to possess special value for future needs. The selection was based partly on agronomic, historical or other cultural values. The quality of berries was one selection criterion.

In addition, varieties and strains representing a high level of variance in both outward appearance and genetic properties were selected. We utilised DNA fingerprint markers to see the genetic relationships between the varieties and strains. This method also revealed several duplicate and even some mislabelled varieties in the existing collections. Some previously unnamed strains were identified as known varieties.

The original idea was to propagate the selected varieties and strains vegetatively and to maintain the core collection mainly in field collections. Because plant health is an important aspect in making such collections, we had to pay particular attention to freeing the plants from blackcurrant reversion virus, and keeping them
in a mite-safe environment. The work for cleaning of plants from viruses is still going on.

In the meantime, part of the varieties are being grown as microplants in laboratory conditions. One advantage of establishing these in vitro cultures through shoot apex culture is virus elimination, at least, in some degree [2].

Cryopreservation is a new method for conserving vegetative plant material. In cryopreservation, specific pieces of plants, in this case buds, are stored deep-frozen. Different methods for the cryopreservation are in use at the project coordinating institute, MTT Agrifood Research Finland [3]. We utilised this technique to save the most urgent part of varieties before virus elimination. Dormant buds of the selected 55 black currant varieties were transferred to the gas phase of liquid nitrogen below –150 °C using the protocol developed for silver birch and aspen [4]. Pieces of microplants of five varieties were cryopreserved as well.

Experience of the use of cryopreservation is still limited, but a number of studies using different techniques have indicated that varieties keep their genetic properties when cryopreserved [5]. The method might be helpful even in getting rid of viruses through “cryotherapy”, as shown in some other species [6].

‘Slivovyi’, the gooseberry variety of Russian origin selected to the core collection.
2. Communication value

The RIBESCO project has enabled us to critically study and evaluate the currant and gooseberry collections in different partner countries, and to find their most valuable parts. Thus, we have been able to contribute to European small fruit germplasm collections and discover means of conserving and protecting them for further use in the future. Scientific information regarding the collections was accumulated with documented data of external appearance, fruit chemical properties and genetic relationships.

The improved availability of data in the database will ensure easier access to and utilisation of the collections. This will be of particular benefit for breeding and product development, for instance, to serve the food processing industry. Furthermore, the keeping security was improved: virus elimination and transferring to a virus-free environment will assure the availability of the varieties and strains for future needs.

The outcome of the RIBESCO project will be utilised, together with DG AGRI GEN RES action 036 GenBerry, in a new EU research project, EUBerry, that was launched in May 2011. The results of the two actions will provide knowledge to facilitate the development of high quality fresh berry fruits for European consumers.

Reports on the project have been published in several technical and scientific journals, and we have given presentations at congresses and several other public events to disseminate information. The publications are listed at our website http://www.mtt.fi/ribesco, and through the links you can easily read, at least, the summaries of many of our articles. More articles are in preparation. The database at http://www.ribes-rubus.qf.vu.lt contains plenty of information accumulated in this project.

An unknown Finnish red currant strain with very high content of anthocyanin.
3. The action and the partners

3.1 Action details

The total project cost of the RIBESCO action was 1,069,000 euros, of which the EU has awarded 534,000 euros. Our project started on 1 April 2007 and the closing date was 31 March 2011. MTT Agrifood Research Finland served as the action coordinator. There were nine partners in eight EU countries within the Baltic Sea Region: Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland and Sweden.

The partners acquainting themselves with the currant collection at the University of Vilnius, Lithuania.
3.2 Partner details

**Partner 0 / Coordinator** MTT Agrifood Research Finland
Dr. Saila Karhu
Toivonlinnantie 518, FI-21500 Piikkiö, FINLAND

**Partner 1** Estonian University of Life Sciences
Kreutzwaldi 1, Tartu EE-51014, ESTONIA

**Partner 2** Latvian State Institute of Fruit Growing
Graudu-1, Dobele, LV-3701, LATVIA

**Partner 3** Lithuanian Research Centre for Agriculture and Forestry
Kauno 30, Babtai, Kaunas district, LT-54333, LITHUANIA

**Partner 4** Bundessortenamt (Federal Office of Plant Varieties)
Prüfstelle Wurzen, Torgauer Str. 100, D-04808 Wurzen, GERMANY

**Partner 5** Institute of Horticulture
Pomologiczna 18, PL-96-100 Skierniewice, POLAND

**Partner 7** Swedish University of Agricultural Science
SLU, Balsgård, Fjälkestadsvägen 459, S-291 94 Kristianstad, SWEDEN

**Partner 8** Vilnius University
Kairenu 43, LT-10239 Vilnius, Lithuania

**Partner 9** University of Copenhagen
Institut for Jordbrugsvidenskab, Højbakkegård Alle 13, DK-2630 Taastrup, DENMARK
4. Links

We have made plenty of efforts to make our results and work description available to the public. At our website http://www.mtt.fi/ribesco, you can find more information of the research and achievements, as well as the contact persons in different partner countries. You can also contact the coordinating partner MTT directly by e-mailing to mttpiikkio@mtt.fi.

4.1 The genetic resources

The RIBESCO project interfaces with several national and international bodies and programmes on genetic resources of horticultural plants. More information of one of the most important in the Northern Europe, NordGen – the Nordic Genetic Resource Center, can be found at http://www.nordgen.org/index.php/en.
4.2 The database

During this project, we utilised and completed the existing European Central Ribes/Rubus Database that is managed by the Lithuanian partner, Vilnius University. The database integrates information on the origin and characteristics of various currant and raspberry species. You are welcome to visit the database and find the collected information and photographs of the different currant varieties and strains at [http://www.ribes-rubus.gf.vu.lt](http://www.ribes-rubus.gf.vu.lt).

Black currant varieties from Estonia forced for virus testing.
4.3 List of publications

We are writing scientific and technical reports and publications. At our website http://www.mtt.fi/ribesco, you can find the list of our publications that are already available.

4.2 Other publications and links

The other actions co-funded by the European Commission’s Community Programme on the conservation, characterisation, collection and utilisation of genetic resources in agriculture can be found at http://ec.europa.eu/agriculture/genetic-resources/index_en.htm.

References


Photographs: © MTT Agrifood Research Finland

Disclaimer: The text of this publication is for information purposes only and is not legally binding.