Berry genetic resources in Greece: conservation and cultivation

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- Cereals
- Cotton
- Tobacco
- Cannabis
- Rice
- Deciduous trees
- Acorns
- Greek native flora
- Aromatic medicinal plants

- Greek Gene Bank
- Balkan Botanic Garden of Kroussia

- Plant collection, conservation, utilization
- Breeding
- Precision agriculture
GREEK GENE BANK

- Conservation of national plant genetic resources (local landraces and wild crop relatives) threatened by genetic erosion or extinction, for the benefit of future generations,
- > 14,000 accession numbers of local landraces and wild crop relatives,
- > 250 local varieties of vines.
Balkan Botanic Garden of Kroussia: protection, conservation and sustainable use of plant genetic recourses.
Relative ongoing projects (national and international level)

✓ **Title:** Highlighting of local traditional and native wild fruit trees and shrubs (EcoVariety, T1ΕΔΚ-05434),
✓ **Duration:** 2018-2021
✓ **Partners:**
  1. University of Ioannina, Faculty of Agriculture (Arta) - Coordinator
  2. HAO-Demeter, IPBGR - Scientifically responsible
  3. SYSTADA – Systems of Forest and Environmental Development
  4. Verus+ Informatics and Development Systems (Thessaloniki)
  5. Nurseries Vitsios (Arta)
  6. Nursery Agriherb (Vasilika)

✓ **Study of 8 wild species:** *Rubus idaeus, Vaccinium myrtillus, Sambucus nigra, Prunus spinosa, Rosa canina, Cornus mas, Rhus coriaria, Amelanchier ovalis*,

✓ **Objectives for the native wild species**
  - Species selection, botanical collections
  - Documentation (geographical & ecological information, botanical name, accession numbering, DNA barcoding)
  - Asexual propagation
  - Evaluation (crop characteristics, fruit analysis)
  - Pilot sustainable utilization and promotion
Methodology

✓ Bibliographic overview to prepare, organize and carry out the botanical expeditions
✓ Botanical collections in sites of Northern Greece
✓ Collection of propagation material, leaves for DNA analysis, soil sample and fruit sample for analysis
✓ Documentation of the material (geographical & ecological information, botanical name, accession numbering, DNA barcoding)
**Rubus idaeus (red raspberry, Rosaceae)**

- **Ex situ** conservation of 5 populations

- 16 known sites in the wild in total (for further study)
Vaccinium myrtillus (European blueberry Ericaceae)

Ex situ conservation of 3 populations

15 known sites in the wild in total (for further study)
In BBGK’s collection ex situ: *Fragaria vesca* (strawberries, Rosaceae)

Ex situ conservation of 3 wild populations
Identification of *Rubus ideaus* using ITS2 DNA barcoding region
F.A. (Phil) Aravanopoulos, Forest Genetics Lab
Aristotle University of Thessaloniki (FGL-AUTH)
Greece
1. Strawberry tree, *Arbutus unedo*: range-wide collection of populations in Greece, genetics and morphology diversity studies (in progress)

2. Elderberry, *Sambucus nigra* identification of populations range-wide

3. Yew, *Taxus baccata* genetics, epigenetics and metabolomics studies (in progress)
<table>
<thead>
<tr>
<th>Species</th>
<th>DNA Bank</th>
<th>Ex situ collection</th>
<th>Phenotypic data</th>
<th>Genetic analysis</th>
<th>Populations identified</th>
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</thead>
<tbody>
<tr>
<td><em>Arbutus unedo</em></td>
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<td><em>Sambucus nigra</em></td>
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<td><em>Taxus baccata</em></td>
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</tbody>
</table>
Title: Selection of strawberry genotypes for variety breeding and integration into modern commercial production systems

Acronym:          FragaGen

Budget:           215,700 €

Participants:     Berryplasma World LLC (http://berryplasma.gr/)
                  Department of Agriculture, University of Patras, Greece (Assoc. Professor V. Papasotiropoulos)
                  Department of Pharmacy, University of Patras, Greece (Assoc. Professor F. N. Lamari)
Aim: Evaluation of advanced selections of strawberry genotypes already developed by Berry Plasma LLC. Selection of superior ones for variety breeding and integration into modern commercial production systems.

WP1: Cultivation of ten advanced selections of strawberry genotypes and comparison with commercial varieties (e.g. Camarosa, Fortuna, Victory, Rociera). Selection of the most promising ones.

- Evaluation based on agronomic and production traits: size, shape, texture, weight, color, and number of fruits per plant, % of commercial fruits at maturity, vegetative development, blooming, concentration of sugars, acids, anthocyanins etc.
- Selection of superior genotypes.
**WP2:** Final evaluation of selected genotypes – Large scale cultivation – Development of commercial varieties.

- Large scale cultivation of the selected genotypes (3000 plants/genotype).
- Selection of the most advanced ones as commercial cultivars

**WP3:** Molecular and chemical characterization of the genotypes selected in WP2

- Sensorial evaluation of aroma and taste of fruits
- Determination of volatiles (lactones, esters, aldehydes, ketones, furans) through microdistillation and GC/MS analysis
- Determination of the antioxidant compounds such as polyphenols, anthocyanins, ascorbic acid, DPPH, FRAP
- Determination of sugar non-volatile compounds
- Genetic characterization of the selected genotypes with molecular markers (SSR’s SNP’s)
- Expression profiling of selected genes responsible for aroma and taste in strawberry fruits (*SAAT, FaFAD1, FaOMT, FaPG1*)
- RNAseq analysis for the detection of genetic markers related to size and aroma of strawberry fruits.
Constraints to efficient conservation of wild population

- The quality and availability of accession-level information
- Lack of adequate funds is the greatest impediment leading to deficiencies in labour, infrastructure, and materials, and to postponement of regeneration activities beyond the ideal interval
- Availability of resources for regeneration, collecting, and research
- Lack of skilled staff is a constraint especially evident in more difficult or poorly researched species and genotypes
So, we think that this group will help a lot towards the conservation and exploitation of Greek berries.

Thank you!