PRUNUS WG REPORT FOR PHASE IX (2014-2018)

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1. CONTRIBUTION TO ECPGR OBJECTIVES

1.1. Achievements and success stories

Outcome 1. AEGIS is operational. Accessions in AEGIS are characterized and evaluated. (PRUNDOC, EU.CHERRY, Prunus Alignment, standards)

Outcome 2. Quantity and quality of data in EURISCO, including in situ and on-farm data, have been increased. Functionality of EURISCO meets users' expectations (PRUNDOC, EU.CHERRY)

Outcome 5. Relations with users of germplasm are strengthened (EU.CHERRY)

- (outcome 1) The AQUAS quality system was adopted and implemented by the WG through the approval in January 2016 of the *Prunus*-specific standards genebank for genebank management and of the *Prunus*-specific standards for field genebanks.

- (outcomes 1, 2) The PRUNDOC project was aimed to characterize, morphologically and genetically, the diversity of a selected set (based on the possession of interesting traits) of plum (*Prunus domestica*) accessions of European origin, maintained at the collections of the ECPGR WG *Prunus* members.
  PRUNDOC partners carried out phenotypic analysis of 91 plum accessions from 10 European countries, based on an agreed set of descriptors (First Priority Descriptors, developed early in the Project by the PRUNDOC partners). These data were prepared for inclusion into the European *Prunus* Database and EURISCO. Moreover, leaf samples from 38 accessions were delivered to the Laboratory of the Swedish University of Agricultural Sciences at Balsgård for SSR analysis. These accessions of diverse genetic origin with unique genetic profiles are potential candidates for the AEGIS European Collection. However, phytosanitary requirements for distribution of the material currently cannot be met by the collection holders.

- (outcomes 1, 2, 5) The EU.CHERRY project was aimed to progress in the harmonized characterization of the sweet cherry (*Prunus avium*) accessions conserved in the various European collections. In order to ensure harmonization, EU.CHERRY Partners agreed on a list of characterization and evaluation (C&E) descriptors to be used in the characterization of the cherry collections.
  18 European countries and Morocco participated in this project: 9 EU.CHERRY partners, and 9 partners from the COST ACTION FA1104. They provided 324 samples of sweet cherry accessions native from 25 countries and C&E data about 187 of these accessions. Leaf samples from 324 accessions were delivered to the Laboratory of the NIAB EMR, East Malling (UK) for SSR analysis with a selected set of SSR markers. Passport and C&E data obtained have been assembled in an Excel sheet prepared by the *Prunus* DB manager and will be submitted to the ECPGR *Prunus* DB and EURISCO (when capability is developed). The accessions of diverse genetic origin with unique genetic profiles are potential candidates for the AEGIS European Collection.

- (outcome 1) The Prunus Alignment project is aimed to further progress in the characterization activity initiated in the PRUNDOC and EU.CHERRY Activities. The alignment of genotyping data

from existing resources provides an opportunity to both increase the coverage of genotypic data and to make the data more available to curators and researchers in a wider range of countries.

Positive results

C&E of the *Prunus* accessions in the European genebanks
Since the beginning of Phase IX, the number of well-described *Prunus* accessions (for several traits with common protocols/descriptors) has increased. During PRUNDOC, 95 plum (*P.domestica*) landraces original from 10 European countries have been described with plum FPD (First Priority Descriptors), and a subset of 38 have been genotyped with a set of 9 SSRs, showing distinct SSR profiles. During EU.CHERRY, 171 cherry (*P. avium*) landraces maintained in 9 EU countries have been described with cherry FPD and genotyped with a set of 14 SSRs; 132 out of 171 accessions showed distinct SSR profiles.

Relationship among *Prunus* WG members
PRUNDOC and EU.CHERRY projects were important opportunities for establishing and/or strengthening relationships between *Prunus* member participating as Activity partners. A success story: some EU.CHERRY Partners were simultaneously involved in the COST FA1104 (2011-2016) action on cherry. A bridge between the two networks was established allowing: significant enlargement of the geographical origin and the number of European sweet cherry accessions analysed with common SSR markers, thanks to the inclusion of many accessions of COST members; the access to COST meeting and network of those EU.CHERRY members previously non COST members; common initiatives such as the publication of papers/book chapters of mutual interest.

Relationship between WGs
The Prunus Aligment project will work in line with complementary activities (Pomefruit - C&E Project) carried out by the *Malus/Pyrus* group, allowing a more consistent approach to be taken within the fruit crops under ECPGR.

1.2. Gaps or constraints identified

Major gaps/constraints.
Major constraints for *Prunus* AEGIS implementation: Uniqueness/true-to-type ascertainment (homonyms/synonyms), country of origin, sanitary status of the accessions conserved in European collections.
Both PRUNDOC and EU.CHERRY projects revealed a high degree of uncertainty among the partners about how to handle the material and what is required once the accessions would become part of AEGIS. Regarding the selection of unique accessions, many challenges are to be faced. Firstly, old landraces can be named with a high number of synonyms. Old varieties have been historically exchanged repeatedly between international partners and very often the original name of the cultivar was translated by the recipient countries to make it more familiar. Additionally, mutations occurring to old cultivars led to a large number of similar, though distinct, phenotypes. These small changes might not be identified by the SSR analyses, therefore phenotyping is a key factor for distinguishing such varieties. Several cases of synonyms were revealed by the SSR genotyping carried out during EU.CHERRY, some related to old varieties claimed to be original by different countries. In such cases, it might be difficult to establish exactly in which country the original type was selected and, therefore, to assign the responsibility of conservation to the actual country of origin.

EURISCO consultation. In order to allow users to benefit the most from the data included in the DB, especially the C&E data, it is necessary that the interrogation system allows finding easily the needed information. If, as a user, I am interested in finding the accessions having interesting traits (e.g. high sugar content, large size, long storability, late flowering, etc.) independently from the collection and the country where they are located, I should be able to ask to the DB easily and select first all the accessions having that trait (giving priority to those expressing it more, e.g. in a 1-to-9 scale the highest scores will come first). The DB should allow also comparing those accessions meeting the requirement on the basis of other traits in order to choose those meeting my specific needs (e.g. climatic context) of breeder or grower Finally, also the molecular data could be an important information for excluding homonyms/synonyms. At the moment, EURISCO does not seem to give these opportunities, but these functionalities are priorities.

2. GRANT SCHEME ACTIVITIES

- **Grant Scheme proposals (submitted: 3; approved: 3)**

1. Identification of a representative set of *Prunus domestica* accessions of European origin, well documented and characterized, to be included into the AEGIS system (PRUNDOC) – First Call (2014)
2. Collaborative action for updating, documenting and communicating the cherry patrimonial richness in EU (EU.CHERRY) – Second Call (2015)
3. Testing, Use and Alignment of genetic data to distinguish unique and characterized accessions in *Prunus* (Prunus Alignment) – Fifth Call (2017)

- **Total number of partners involved: 20 from 18 countries**
  - ECPGR-funded: 20 from 17 countries
  - Self-funded: 6 from 5 countries

- **Meetings held**

1. PRUNDOC meeting, 20-21 April 2015, Leuven, Belgium
2. EU.CHERRY meting, 6 April 2016, Naoussa, Greece

- **Reports and related data**

1. PRUNDOC

Minutes of the PRUNDOC meeting, 20-21 April 2015, Leuven, Belgium

Final Activity Report and related data:

- Identification of a representative set of *Prunus domestica* accessions of European origin, well documented and characterized, to be included into the AEGIS system (PRUNDOC) – Activity report- Revised version, September 2016
- Plum accessions described in PRUNDOC
- Genetic diversity of *Prunus domestica* selected from ten countries across Europe (Poster presented at the ISHS IX International Symposium on Plum and Prune Genetics, Breeding and Pomology held 17-21 July 2016 in Freising-Weihenstephan, Germany)

2. EU.CHERRY

Minutes of the EU.CHERRY kick-off meeting, 6 April 2016, Naoussa, Greece

Final Activity report (*currently in preparation)*

- **Funds mobilized**

- ECPGR granted funds: **€** 58 800
- Inputs in-kind declared in Grant activities: **€**37 300

3. OTHER ACTIVITIES (CROSS-WORKING GROUP ACTIVITIES, LINKS WITH OTHER NETWORKS, PROJECTS AND INITIATIVES)

- **Cross-Working Group activities**: none

- **Others**

- Collaboration with the COST Action FA1104 'Sustainable production of high-quality cherries for the European market'.
  This Action aims at creating a dynamic network of scientists and other professionals conducting research to improve sweet or sour cherry production in Europe, the main cherry producer.
  Several WG members participated in the workshop on "Long Term Preservation of Woody Species by Cryo-Techniques", 26-27 March 2015, Area di Ricerca CNR di Firenze, Italy.
  Joint meeting of EU.CHERRY and COST partners, 6 April 2016, Naoussa, Greece, further to which COST partners provided samples of cultivars originally from 11 other countries (Croatia, Hungary, Iran, Lithuania, Romania, Russian Federation, Slovakia, Sweden, Switzerland, Spain and Ukraine).

- WG activities were presented at EUFRIN (2015) and ISHS (2016) events

Opportunities for scientific collaboration on *Prunus* genetic resources

- ✓ Members of the *Prunus* and the *Malus/Pyrus* WG participated in the Call Topic 'Genetic resources and agricultural diversity for food security, productivity and resilience (H2020, SFS-7-2014/2015). The proposal passed the 1st step but not the final one.
- ✓ Members of the *Prunus* and the *Malus/Pyrus* WG participated in the Call Topic 'Sustainable Food Security' (H2020, SF-7-2016/2017). The proposal passed the 1st step and is now under final evaluation

4. WORKING GROUP DOCUMENTS AND PUBLICATIONS

Working Group documents

Prunus-specific standards (PGS) for genebank management (V1, January 2016)
Crop-specific standards for field genebanks (agreed by the *Prunus* WG, January 2016)

Presentations and posters in international meetings

Sehic J. et al. 2016. Genetic diversity of *Prunus domestica* selected from ten countries across Europe. Poster presented at the ISHS IX International Symposium on Plum and Prune Genetics, Breeding and Pomology, 17-21 July 2016, Freising-Weihenstephan, Germany.

Hjeltnes S.H. et al. 2015. PRUNDOC – A Project to Define Accessions for the European Collection. Presentation at III EUFRIN Plum and Prune Working Group Meeting on Present Constraints of Plum Growing in Europe, 20-21 August 2015, Skopelos, Greece.

Articles

Höfer M, Giovannini D. 2017. Phenotypic characterization and evaluation of European cherry collections: a survey to determine the most commonly used descriptors. Scientific Pages of Horticulture 1(1):7-12.

Hjeltnes SH, Giovannini D, Blouin M, Benedikova D, Drogoudi P, Höfer M, Lacis G, Ognjanov V, Lateur M, Engels JM, Maggioni L. 2017. PRUNDOC – a project to define accessions for the European Collection. Acta Horticulturae 1175:19-24. DOI: 10.17660/ActaHortic.2017.1175.5

5. EXPECTED ADDITIONAL ACHIEVEMENTS AND FUTURE ACTIVITIES

Prunus Alignment Activity (start date 1 February 2018)

Prunus Alignment, involving EU.CHERRY and PRUNDOC partners and further *Prunus* members, will allow a further strengthening of results and of the member relationship.

Expected products/results
1. Completed SSR genotyping of PRUNDOC prioritized accessions and additional accessions nominated by new members – data submitted to the ECPGR *Prunus* DB and EURISCO (when capability is developed)
2. Comparison and recommendations on the use of HRM techniques for the identification and discrimination of plum accessions within ECPGR based on previously and/or newly SSR genotyped material.
3. Alignment of EUCHERRY SSR data with existing data generated from national collections submitted for inclusion in the ECPGR *Prunus* DB.

Prunus Alignment meeting, September 2019, Thessaloniki, Greece.