Prunus-specific standards (PGS) for genebank management

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INTRODUCTION

During the Eighth Meeting of the ECPGR *Prunus* Working Group (7-9 September 2010, Forlì, Italy), a parallel session was organized to discuss the *Prunus*-specific standards for genebank management (hereafter PGS). A brief synthesis of the first decisions and indications of the task force established in Forlì is available in the report of the meeting (pp. 16-17).

According to the Workplan for the second part of Phase VIII agreed by all *Prunus* WG members, a more detailed PGS has been prepared. Note that this PGS version takes due account of the guidelines set out in the Genebank Standards for Plant Genetic Resources for Food and Agriculture endorsed by the FAO Commission for Genetic Resources for Food and Agriculture at its Fourteenth Regular Session held in April 2013, in particular those inherent to the technical standards for field genebank management, by far the most common form adopted in Europe for the conservation and use of fruit tree species. Since the preparation of the PGS started before the endorsement of the FAO Genebank Standards, sections addressing similar management issues are numbered differently in the two documents. However, in order to facilitate parallel consultation, a column has been provided to indicate the corresponding section in the FAO document.

We recognize the FAO Genebank Standards and accept their applicability to *Prunus* field genebank collections. Thus, the Working Group decided to combine the general FAO field genebank standards with the more detailed *Prunus* standards. Consequently, the PGS document consists of a combination of the general and specific standards, and is based on more practical considerations for the management of *Prunus* germplasm collections.

Some documents and/or protocols cited in the present document that are important for its implementation are being developed by specifically appointed task forces of *Prunus* experts. Once completed, they will be integrated into the PGS. Note that, although developed for *Prunus*, these standards could be valid and largely applicable to *Malus/Pyrus* and to *Vitis* genebank collections as well.

For more information about general genebank standards, the *Prunus* WG members should consult the aforesaid FAO Genebank Standards and also consider using the final version of the Template for operational genebank manual provided by the ECPGR Secretariat to complete the genebank manual for their operations (as this is one of the agreed requirements for AEGIS Associate Members).

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Genebank activities	***Prunus*-specific standards recommended by the ECPGR *Prunus* WG**	**Corresponding section of the FAO Genebank Standards**
1. GERMPLASM ACQUISITION AND ACCESSIONING Germplasm sources: – Collecting missions – Germplasm exchange – Researchers and Breeders	**All germplasm accessions added to the genebank should be legally acquired, with relevant documentation** When registering an accession in the genebank documentation system : ✓ Add to the genebank register all relevant FAO/Bioversity Multi-crop passport descriptors, at least the minimum list of passport data which were agreed by the *Prunus* WG: ACCENUMB, ACCENAME (if existing), INSTCODE, GENUS, SPECIES (if known) and ORIGCTY (if known). ✓ If the material received from a third party (e.g. other genebanks, researchers, breeders) is not accompanied by mandatory passport data (i.e. ACCENUMB, ACCENAME, GENUS, SPECIES and ORIGCTY), phytosanitary and other legal documents governing the movement/acquisition of genetic resources, ask the third party to provide missing information as otherwise the accessions with missing documents cannot be accessed into the genebank. ✓ If germplasm has been acquired by the genebank through collecting missions, it is recommended to add in the genebank register available information about the location of the collecting site (appropriate FAO/Bioversity Multi-crop passport descriptors n°14 to 16 such as COLLCODE, COLLDESCR, COLLSITE, LATITUDE, etc.).	**Section 5.2.** **See also section 5.8**

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2. GERMPLASM PROPAGATION	**Grafting is the normal form of propagation/cultivation of *Prunus* species and the following aspects should be considered and, when applicable, followed:** ✓ Choose the most appropriate grafting method and grafting time for the specific *Prunus* species; ✓ Select a rootstock suited to the properties of the site soil, that is able to overcome specific soil problems (e.g. calcareous, poorly drained, replanted soils), or soil diseases and pests, if any. Although not mandatory, soil analysis for pH, mineral composition, pathogen/nematode load, salinity, texture of the soil site is recommended to better address the rootstock choice; ✓ Choose a rootstock which is compatible with most scion genotypes of the specific *Prunus* species; ✓ Use rootstocks complying with the phytosanitary standards issued by the European Community i.e. virus-free or C.A.C. (Conformity Assessment Certificate); ✓ Use whenever possible the same rootstock for the same species in the same location to minimize rootstock influence on phenology of the accessions, especially when characterization/evaluation activities are a collection's purpose; ✓ Graft a number of individuals per accession sufficient to grant the minimum number of trees (see point 3.1 of PGS) ensuring accession's safety; ✓ Ensure correct and clear labelling. Tags should report, at least, the FAO/Bioversity descriptor ACCENUMB, the unique collection number essential to identify unambiguously the accession; ✓ Capture and ensure traceability information about the grafting process, i.e. who did what, when, where and how.	**Section 5.5.**
2.1 Re-propagation	✓ Re-propagate the accession whenever the tree number per accession is insufficient to ensure accession's safety (see point 3.1 below) or the trees become too old or weak; ✓ Follow the same procedure as in section 2. 'Germplasm propagation' of the PGS.	

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3. ESTABLISHMENT AND MANAGEMENT OF THE FIELD COLLECTION	**An appropriate site and a sufficient number of healthy trees per accession should be ensured for safety and characterization** ✓ The planting site(s) should be selected to minimize major physical, chemical and biological soil problems and to maximize physical security.	**Section 5.1**
3.1. Ensure sufficient number of trees/accession	✓ Plant and maintain at least 2 trees of each accession; ✓ Maintain trees adequately labelled (field labels should be in indelible ink and as indestructible as possible). Labels should be substituted whenever corrupted; ✓ Provide, maintain and update field maps, as a backup to labels.	**Section 5.3.1** **Section 5.3.2**
3.2. Ensure sufficient space and follow appropriate cultivation practices	✓ Space each tree in the collection widely enough to allow regular growth, vegetative renewal and cropping. The growth habit and the adult size of the tree need to be considered when calculating the spacing among the trees, taking into account the *Prunus* species, the rootstock used and the soil characteristics as well as the climatic situation; ✓ Both in the vegetative and productive phases, manage the trees according to the appropriate standard cultivation practice for the specific *Prunus* spp. Apply pruning, thinning, watering, weeding, fertilizing and phytosanitary control whenever needed. A good standard practice should ensure not only tree survival but also reliable characterization and enough material available for distribution; ✓ Protect the trees against quarantine pests and diseases. See the Council Directive 2000/29/EC of 8 May 2000 on protective measures against the introduction into the Community of organisms harmful to plants or plant products and against their spread within the Community; ✓ Inspect visually the trees in collection, at least once a year. Tune the inspection timing with the moment of highest visibility of symptoms. E.g. sharka symptoms are highest on flowers (especially showy ones) and on fully expanded leaves on young shoots. Avoid the summer period because high temperatures mask the symptoms; ✓ If suspect symptoms occur, test immunologically/molecularly their sanitary status for quarantine pests and diseases.	**Section 5.3.3.** **Section 5.4**

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4. ENSURING SECURITY		
4.1. Organize safety-duplication of every accession	**Every accession should be safety-duplicated in at least one more field genebank site and/or backed up by an alternative conservation method/strategy** Field collections are the main type of genebank adopted in Europe for the conservation and use of fruit trees species, such as *Prunus* or *Malus/Pyrus* species, which require a long life cycle to generate breeding and/or planting material. To ensure the physical security of the trees, the following aspects are regarded as essential elements for achieving the objective. Mandatory: ✓ Safety-duplication. To ensure the accessions against any risks of loss, each accession should be maintained at a minimum of two distinct conservation sites in two different places, whenever possible at a significant distance from each other. These two sites could be managed by the same genebank, or preferably by two different genebanks (whenever possible in two different countries and continents). ✓ Conservation sites should be appropriate to the specific *Prunus* species, both for climate and soil characteristics. Also, the conservation site should be designed so as to minimize risks of natural disasters (e.g. flooding) or burglars (e.g. fences).	**Section 5.10.4**
4.2. Consider alternative methods to secure germplasm	Other conservation methods such as the '*in vitro* slow growth' or 'cryopreservation' cultures are secondary compared to the maintenance of *Prunus* germplasm in a field collection. However, they could be useful for safety-duplication purposes with a potentially reduced cost (certainly at the long run), or to maintain those accessions which, for a series of reasons, cannot be put in the open field. The guidelines in the FAO Genebank Standards for '*in vitro* culture and slow growth storage' (Section 6.4) and 'cryopreservation' (Section 6.5) are valid and applicable also to *Prunus* genebanks. Technical documents detailing optimal conditions for application of these storage techniques to the various *Prunus* species need to be developed by the WG.	**Chapter 6. Genebank standards for *in vitro* culture and cryopreservation** **Section 6.4** **Section 6.5**

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5. EVALUATING AND CHARACTERIZING EACH ACCESSION; VERIFYING ITS IDENTITY	**The accessions should be characterized/evaluated using agreed *Prunus*-specific descriptors** The *Prunus* WG recognized the importance of using standardized characterization protocols and consensus descriptors to describe or measure each trait, with a view of allowing an easier comparison of data from different collections. The WG has endorsed the General protocols for using the ECPGR descriptors for *Prunus* spp. to assist curators in performing the evaluation/characterization of accessions in their collections.	**Section 5.6**
5.1. Morphological and phenological characterization	Species-specific documents listing the set of First (FPD) and Second (SPD) priority descriptors have been prepared for Peach (ECPGR Priority Descriptors for Peach [*Prunus persica* (L.) Batsch]) and are being completed for Plum. The WG will develop similar documents for the other *Prunus* spp. ✓ Use the FPD and the SPD descriptors, if available; ✓ Use internationally used descriptors (e.g. ECPGR The European *Prunus* Database – A new list of *Prunus* passport data and descriptors (2011); UPOV).	**Sections 5.6 and 5.7**
5.2. Molecular characterization	The WG recognizes the importance to standardize the set of molecular markers, the DNA extraction and PCR protocols in order to harmonize genotyping of accessions and facilitate data comparison. ✓ Use the SSR marker set (or part of it) recommended by the WG, if available (for sweet cherry, consult Clarke and Tobutt, 2009[1]). ✓ Include reference varieties to harmonize SSR allele scoring.	
5.3. Photographs	A photograph of the fruit of each accession should be provided according to the specifications given by Szalatnay and Bauermeister (2006).[2]	

[1] Clarke JB, Tobutt KR. 2009. A standard set of accessions, microsatellites and genotypes for harmonising the fingerprinting of cherry collections for the ECPGR. In: Socias y Company R, Espiau MT, Alonso JM, editors. Proceedings of the Twelfth Eucarpia Symposium on Fruit Breeding and Genetics, 20 March 2009, Zaragoza, Spain. Acta Horticulturae 814:615-61.

[2] Szalatnay D, Bauermeister R. 2006. Obst-Descriptoren NAP / Descripteurs de fruits PAN. Agroscope Changins-Wädenswil ACW and Vereinigung FRUCTUS. Stutz Druck AG, Wädenswil, Switzerland. 89pp.

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5.4. Verification of accession identity	A standard protocol needs to be developed by the *Prunus* WG. Pending a standard procedure agreed by the WG, it is highly recommended: ✓ Characterize the accession as completely as possible (as indicated in sections 5.1., 5.2, 5.3 of PGS); ✓ Upload passport and C&E data in EURISCO; ✓ Upload passport and C&E (including molecular scores, if available) also in the European *Prunus* Database.	**Section 5.5.3.**

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6. MANAGING DATA (I.E. PASSPORT DATA, CHARACTERIZATION AND EVALUATION DATA, PICTURES) **AND ENSURING TRACEABILITY OF PLANT MOVEMENTS**	✓ Passport data and C&E data for all accessions should be documented using the appropriate standards (see 5.1., 5.2., 5.3. of PGS); ✓ Register passport and characterization/evaluation data into dedicated files or databases; ✓ Ensure traceability information of each individual since the acquisition step to its death, i.e. for each tree information about the grafting process (who did what, when, where and how), the plantation process (who did what, when, where and how), and the location of each tree in the field genebank collection (conservation site name and location, plot name, rank number, position on the rank); ✓ Yearly, update all data in EURISCO and in the European *Prunus* Database.	**Section 5.8.**

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7. PROVIDING PLANT MATERIAL AND ADEQUATE INFORMATION	**All germplasm should be distributed in compliance with national laws and relevant international treaties and conventions, accompanied by adequate information and documentation**	**Section 5.9.**
7.1. Providing plant material to a third party	✓ Provide good quality propagation material for shipment (e.g. discard terminal/younger buds; discard insufficiently lignified budwood); ✓ Protect budwood from breaking or drying out by using appropriate measures; It is recommended to wrap with para-film the two cut ends of each cutting or put the cuttings into plastic bags to reduce moisture loss; to use cushioned shipping envelopes to avoid breaking, etc.; ✓ Minimize the time between collecting from the genebank and shipping; ✓ Dispatch an adequate quantity of plant material for each requested accession. The minimum quantity per accession is: - 2 budwood sticks, for grafting purposes; - 2-3 seeds of the same tree, for propagation of non-domesticated *Prunus* species, seedling rootstocks, progenies; - 5 leaves of the same tree for fingerprinting purposes.	
7.2. Providing adequate information with the plant material to a third party	✓ Dispatch material with corresponding labels and at least the minimum list of passport data which were agreed by the *Prunus* WG (i.e. ACCENUMB, ACCENAME, INSTCODE, GENUS, SPECIES, ORIGCTY), appropriate phytosanitary paperwork, Standard Material Transfer Agreement (if necessary); ✓ When available, add also recommended passport data and useful C&E data; ✓ Maintain a record of the transaction details (date of dispatch, quantity, information provided, etc.).	**Section 5.9.3**