**Cryopreservation to secure crop genetic resources for future generations**

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Since the world’s population is expected to reach 10 billion by 2050, reliable and sustainable improvements in yield will be needed. The conservation and sustainable utilization of plant genetic resources are the keys to improving this agricultural productivity and sustainability.

Cryopreservation (or storage of biological materials at ultra-low temperatures) plays an essential role in the safe conservation of important plant genetic resources of crops like bananas, cassava, potato, yams, sweet potato, coconut and many fruit trees. In these cases, seed preservation at -20°C, the most convenient method to store plant germplasm, is not an option since those crops are (i) sterile (do not produce viable seeds, like banana), (ii) produce only recalcitrant (non-storable) seeds (like cocoa and coconut) or (iii) specific gene combinations need to be maintained (potato and many fruit species such as apple).

In this presentation, the state of the art of plant cryopreservation will be presented focusing on its history, the importance of avoiding ice crystal formation during cooling, which protocol to use for your specific tissues, regenerating normal plants after cryopreservation and more practical issues of cryopreservation such as “what is the post-thaw regeneration rate needed in order to consider a cryopreservation protocol as practically useful”.

Research on cryopreservation of plant tissues already started in the 80ties but it was only with the development of vitrification-based protocols and more recently with the use of droplet vitrification that a significant portion of important vegetatively propagated crop collections is now stored in liquid nitrogen. Currently, over 10,000 accessions starting from in vitro cultures are safely preserved for the long term through cryopreservation. Significant efforts to introduce and promote cryopreservation were made by CGIAR (the Consultative Group on International Agricultural Research) collections in collaboration with the Global Crop Diversity Trust.

In 2017, the “Feasibility study for a safety back-up cryopreservation facility” was published (see <https://www.bioversityinternational.org/fileadmin/user_upload/Feasibility_Acker_2017pdf.pdf>). This report addressed the following issues i. Cryopreservation as a long-term conservation method, ii. Assessment of current and future potential use of a safety back-up, iii. Policy and technical requirements for the location and operation of a safety backup and iv. Costs of establishing and running a safety back-up cryopreservation facility. It also shows that more than 80 % of cryopreserved accessions belong to only 5 crops; potato, cassava, bananas, mulberry and garlic. Other significant cryopreservation collections representing thousands of accessions are those of dormant apple buds.