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Conservation and Cryopreservation
of Plant Genetic Resources

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CRYOPRESERVATION AT THE GLOBAL BANANA COLLECTION AT THE BIOVERSITY INTERNATIONAL TRANSIT CENTER

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Bananas are the most important fruit crop in the world with a yearly production of 129 million tons and they are cultivated in more than 120 countries in the humid and semi-humid tropics. Bananas and plantains are grown almost exclusively by small-scale farmers and production is based on a wide range of locally important varieties. In many areas however, this production is being increasingly constrained by pest and disease pressure. In response to this, a number of banana and plantain breeding programs around the world are working to produce improved pest- and disease-resistant, high-yielding varieties.

The raw materials for banana breeding are the wild Musa species and diverse varieties found particularly in Asia, the centre of diversity of Musa, but also in Africa and Latin America. These species and cultivars contain the genes necessary for sustainably improved production in the face of pest and disease attacks and changing environmental conditions. In order to ensure the availability of these important resources for future breeding and production, it is essential that Musa germplasm is safely conserved.

Because of their sterility, they are vegetatively propagated making seed conservation not an option for the long term storage of banana germplasm. Until recent, banana collection existed mainly as field and in vitro collections. However, in the year 2003 a cryobank was established at the Bioversity International Transit Centre (ITC), Leuven Belgium. First experiments on banana cryopreservation already started back in 1985 but it was only after the optimization and application of the droplet vitrification protocol to banana that cryobanking of the in vitro collection could start. This method can be applied to meristems excised from rooted in vitro plants as well as to "cauliflower-like" meristem clumps. Which tissue to use depends on the genome constitution of the banana cultivar.

A banana accession is considered as safely stored provide three independent and successful experiments are executed. An experiment is successful if the chance to regenerate at least one shoot from the stored material is at least 95%. Taking these standards into account, one person can cryopreserve on average 45 accessions per year (medium preparation, plant multiplication, post-thaw testing included). Thanks to funds received from donors such as the World bank, The Gatsby Charitable Foundation, The global Crop Diversity Trust, we have until now cryopreserved 932 accessions belonging to all Musa groups (see figure 1). This represents 63% of the accessions stored in vitro and is thus one of the world's largest cryopreserved plant collections percentage wise.

FIGURE 1: Number of accessions per genomic Musa group held in vitro and safely cryopreserved at the ITC.

The natural populations of many CWRs (Crop Wild Relatives) such as those of banana are also increasingly at risk. Their conservation and sustainable use is of outermost for improving agricultural production, increasing food security, and maintaining a healthy environment. Musa seeds are known for their irregular, unpredictable and variable seed germination and storage capacity. Therefore we now aim at the development of efficient and practical germination and conservation methods for Musa seed.