Cryopreservation activities in Belgium

Bart Panis
Importance of banana/plantains/cooking bananas

- Staple food for **400-1,000 million** people
- Produced in **>120** countries
- Banana and plantain (**Musa** spp.): Largest fruit crop in the world with an annual production of **158 million tonnes** (2020, FAO)(Apple: 87 million tonnes)
- International banana trade: yearly turnover of **~6 billion USD**
Production

Production of Bananas: top 10 producers

2020

Production of Plantains and cooking bananas: to...

2020
Problems in banana cultivation

Diseases (viral, fungal, bacterial, nematodes, insects).
- TR4 attacking the export banana worldwide
- BBTV threatening plantain production

Stress due to climate change
- Storms
- Drought

Fruit
- Shelve life
- Fruit quality
- Yield

Where do “new cvs” or “characteristics have to come from”?
1. Forgotten cvs
2. Classical improvement
3. Modern improvement

Access to the widest possible genetic diversity is essential
The banana world collection in Leuven, Belgium

- Established in 1985 at KU Leuven, Belgium
- Food and Agriculture Organization of the UN ‘in trust’ collection (1994)

Cryopreserved base collection 1195 accessions

In vitro active collection 1682 accessions

Lyophilized leaf tissue collection 939 accessions

Off site black box safety back-up (IRD, France) 996 accessions
Germplasm health testing

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<tr>
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<th>Cryotherapy</th>
<th>Electrotherapy</th>
<th>Chemotherapy</th>
<th>Thermotherapy</th>
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<tr>
<td>CMV</td>
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<td>BBTV</td>
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<td>BSV</td>
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<td>BanMMV</td>
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Specific tests (knowns):
- Multiplex PCR for BBTV/CMV/BBrMV/BSVs
- PCR for BanMMV

Non-specific tests (unknowns):
- Visual inspection for symptoms
- Minipreps/EM

1/ Pre-indexing
Testing of accession lines grown in greenhouse at 3 months
Specific tests:
- PCR for BBTV/CMV/BBrMV/BSVs/BanMMV


Methodologies

\[\text{ITC Leuven} \rightarrow\]
Musa Germplasm Information System (MGIS)

Holds passport data from 5000 Musa accessions maintained in 18 genebanks around the world.

By Clicking on some parts of the schema, you can access further details.
Development of protocols

- **Potato** (CIP, Peru; CRPGL, Luxemburg; VIR, Russia)
- **Ulluco** (CIP, Peru)
- **Sweet potato** (CIP, Peru)
- **Chicory** (CRA, Gembloux, Belgium)
- **Strawberry** (CRA, Gembloux, Belgium)
- **Taro** (SPC, Fiji)
- **Pelargonium** (INH, Angers, France)
- **Date Palm** (Université de Sfax, Tunisia)
- **Banana** (CIRAD, France; NBPR, India)
- **Thyme** (Univ Alicante, Spain)
- **Olive** (IFAPA, Malaga, Spain)
- **Hop** (Univ Oviedo, Spain)
- **Photinia** (CNR, Firenze, Italy; Gebze, Turkey)
- **Vitis** (CNR, Palermo, Italy; PFR, Palmerston, NZ)
- **Apple** (Fruit Tree Research Institute, Italy)
- **Cassava** (IITA, Nigeria; CIAT, Colombia)
- **Tomato** (University of Valencia, Spain)
- **Bituminaria** (University of Valencia, Spain)
- **Narcissus** (Daffodil) (University of Krakow, Poland)
- **Galanthus** (Snowdrop) (University of Krakow, Poland)
- **Lily** (PRI, the Netherlands)
- **Rose** (University of Krakow, Poland)
- **Yacon** (University of Prague, Czech Republic)
- **Coconut** (RDA, South Korea)
- **Spuce** (Slovak academy of science)
- **Pine** (Slovak academy of science)
- **Ash** (CNR, Firenze, Italy)
- **Byrsonima** (UFLA, Brasil)
- **Callerya** (INTAS, China)
- **Stevia** (KU Leuven)
- **Raspberry** (FTRI, Italy)
establishing CRYopreservation Methods for Conserving European PlanT germplasm collections

CRYMCEPT
plant cryopreservation

QLK5-CT-2002-01279
1 November, 2002 - 31 October, 2005
Physico-biochemical parameters related to plant cryopreservation

Water thermal behavior
Membrane components
Cytoskeletal protein
Proteins
Sugars
Polyamines
Oxidative stress
Crymcept workshops

Workshops on Cryopreservation in Support of the Conservation of European Plant Genetic Resources

Organized by the International Plant Genetic Resources Institute (IPGRI) (Rome, Italy) in collaboration with the partners of the CRYMCEPT project:
- Katholieke Universiteit Leuven, Leuven, Belgium
- University of Aberystwyth, Aberystwyth, UK
- University of Derby, Derby, UK
- Institut de Recherche pour le Développement, Montpellier, France
- DVM2-Deutsche Sammlung von Mikroorganismen und Zellkulturen GmbH, Emnshausen, Germany

Sponsored by the European Union Project Mission

Venues and dates:
- The First Workshop will be hosted by the Katholieke Universiteit Leuven (Leuven, Belgium), 12-22 September 2005.
- The Second Workshop will be hosted by the Institut de recherche pour le développement (Montpellier, France), 16-21 October 2005.
Participating Countries: 16

Chair: BE
BG, CZ, DK, FI, FR, DE, IT, NL, PL, PT, CS, SK, ES, UK, GR, LU, CH

Non-COST:
Vavoliv, Russia
New Zealand
Tunisia

Duration: 4 years
The first International Symposium on Cryopreservation in Horticultural Species was held in Leuven (5 to 8 April, 2009)

149 participants from 43 countries

Acta Horticulturae 908, 65 articles, 511 pages
Training on plant cryopreservation

- Over the past 25 years about 140 researchers from 44 countries were trained on plant cryopreservation techniques in Leuven.
- The length of their training ranged between 3 days and 1 year and they were financed by different sources (FWO, World Bank, EU, Development cooperation, ....).
Other Cryopreservation activities in Belgium

- Cryopreservation of azalea (ILVO)
- Cryopreservation of *Abies nordmanniana* (CRA-W)
- Cryopreservation of chicory meristems and chicory seeds (Plantenteelt, KU Leuven)
- Cryopreservation hairy root cultures of *Maesa lanceolata* and *Medicago truncatula* (U GENT)
- Cryopreservation of Stevia (Plant Physiology Lab, KU Leuven)