



Instytut Hodowli i Aklimatyzacji Roślin
Państwowy Instytut Badawczy



CURRENT CRYOPRESERVATION ACTIVITIES IN POLAND

Karolina Tomiczak

National Centre for Plant Genetic Resources:
Polish Genebank (NCPGR),
Plant Breeding and Acclimatization Institute -
National Research Institute
Radzików, 05-870 Błonie, Poland
k.tomiczak@ihar.edu.pl

1st Meeting of the ECPGR Cryopreservation Working Group, Prague, 3-4 May 2023

FEW WORDS ABOUT ME

➤ A new member of the ECPGR Cryopreservation Working Group

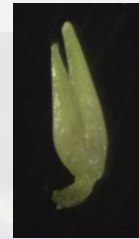
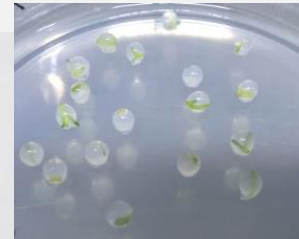
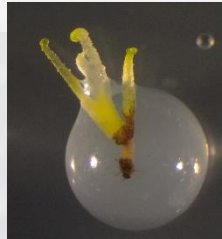
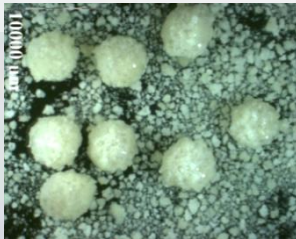
➤ Place of employment (since 2 May 2023)

National Centre for Plant Genetic Resources: Polish Genebank (NCPGR), Plant Breeding and Acclimatization Institute - National Research Institute in Radzików (PBAI-NRI Radzików), Błonie - the coordinator and implementer of the National Crop Plant Genetic Resources Protection Program in Poland

➤ Previous place of employment

Plant Biotechnology and Micropropagation Team, Polish Academy of Sciences Botanical Garden - Center for Biological Diversity Conservation in Powsin (PAS BG-CBDC), Warsaw

- ✓ cryopreservation of embryogenic cell suspensions, somatic embryos, shoot tips and fern gametophytes from in vitro culture
- ✓ assessment of genetic stability using flow cytometry and molecular markers
- ✓ participation in the COST Action 871 „Cryopreservation of crop species in Europe”



CRYOBANKS IN POLAND

4 cryobanks, but the first 2 have specialized mainly in the long-term storage of seeds of rare and endangered plant species

1. The Kostrzyca Forest Gene Bank (Kostrzyca FGB)



Kostrzyca Forest Gene Bank

2. The Polish Academy of Sciences Botanical Garden - Center for Biological Diversity Conservation in Powsin (PAS BG-CBDC)



POLISH ACADEMY OF SCIENCES
BOTANICAL GARDEN

3. The European Tripartite Garlic Cryobank in the Institute of Horticulture - National Research Institute in Skierniewice (InHort)



4. Młochów Research Center of the Plant Breeding and Acclimatization Institute - National Research Institute (PBAI-NRI Młochów RC)



Instytut Hodowli i Aklimatyzacji Roślin
Państwowy Instytut Badawczy

CRYOBANKS IN POLAND

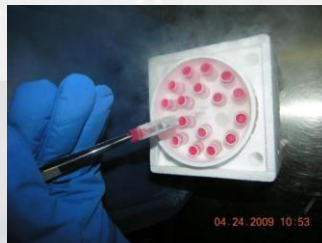
Location on the map



1. The Kostrzyca Forest Gene Bank (Kostrzyca FGB)

- Kostrzyca FGB belongs to The State Forests. It was established in 1995 for the routine cryostorage of forest plant species.
 - ✓ Seeds of 31 species (19 genera) of forest trees and shrubs; 1,064 accessions - *direct freezing*
 - ✓ Dormant buds of common ash (*Fraxinus excelsior* L.); 47 accessions - *programmed freezing*
 - ✓ Plumules (apical meristems of the embryonic axes) of 2 oak species [*Quercus robur* L. and *Q. petraea* (Matt.) Liebl.]; 115 accessions - *vitrification*
 - ✓ Seeds of 237 rare and endangered herbaceous species (41 botanical families), growing in Polish forests and meadows; 372 accessions - *direct freezing*

- **Main Ex Situ Plant Protection Programs:**
FlorNaturLBG (2009-2012), FlorNatur ROBiA (2013-2015), FlorIntegral (2018-2021)



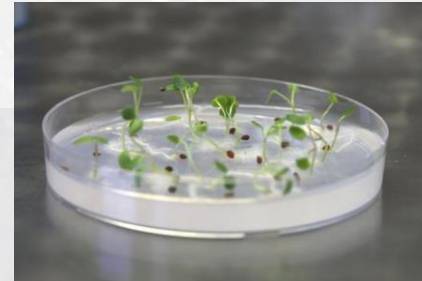
2. The Polish Academy of Sciences Botanical Garden - Center for Biological Diversity Conservation in Powsin (PAS BG-CBDC)

- The first wild flora seed cryobank in Europe was established in 1992. It focuses mainly on the collection and storage of seeds of the most endangered plant species in Poland.

- ✓ Seeds of 241 endangered, rare, and legally protected species of Polish flora - *direct freezing*

- **Main Ex Situ Plant Protection Programs:**

The European Native Seed Conservation Network (ENSCONET) (2004-2009), FlorNaturOB (2009-2012), FlorNatur ROBiA (2013-2015), FlorIntegral (2018-2021)



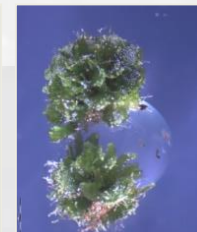
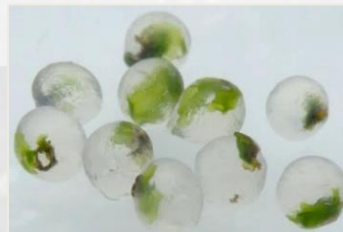
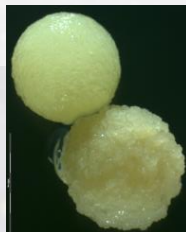
2. The Polish Academy of Sciences Botanical Garden - Center for Biological Diversity Conservation in Powsin (PAS BG-CBDC)

➤ Cryogenic collection of embryogenic cell suspensions and independent-living fern gametophytes, providing sufficient tissue for experimental purposes.

- ✓ Embryogenic tissues of 6 species of the genus *Gentiana* - *encapsulation-dehydration*
- ✓ Gametophytes of 15 fern species (tree and herbaceous) - *encapsulation-dehydration*

➤ Main Projects:

Scientific projects financed by the National Science Center and the Ministry of Education and Science. None of the ex-situ plant conservation programs in Poland include spore plants.



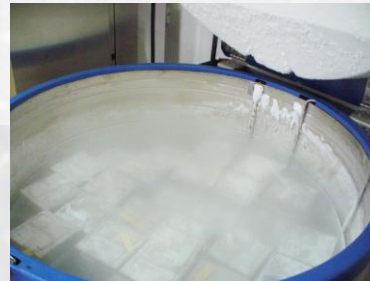
2. The Polish Academy of Sciences Botanical Garden - Center for Biological Diversity Conservation in Powsin (PAS BG-CBDC)

➤ Cryogenic collection of the germplasm of apple trees.

- ✓ The winter dormant buds of 289 historical apple tree varieties (*Malus domestica* Borkh.) with at least 50 buds per each variety. Each year, the collection is expanded by another 15-20 varieties - *programmed freezing*

➤ Main Ex Situ Plant Protection Programs:

The establishment of the collection - project financed by the National Center for Research and Development (2009-2012); the expansion - special purpose subsidy of the Ministry of Agriculture and Rural Development

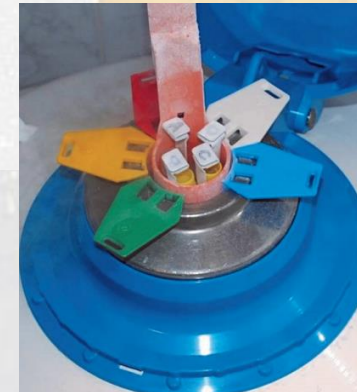


3. The European Tripartite Garlic Cryobank in the Institute of Horticulture - National Research Institute in Skierniewice (InHort)

- Founded in 2011 under the framework of the EURALLIVEG project to establish a European integrated *Allium L.* core collection, to preserve the national collections of Germany, the Czech Republic, Poland, Italy, France, and Nordic countries. The Cryobanks Network was organized by 3 project partners: InHort-Poland, Crop Plant Research Gatersleben (IPK) in Germany, and the Crop Research Institute (CRI) in the Czech Republic.
 - ✓ Shoot tips isolated from bulbils (bolting forms) or cloves (non-bolting forms) of 228 garlic accessions from 3 partner countries, with 100 explants per each accession. Each year, the collection is expanded by another 10 accessions - *vitrification in PVS2 and PVS3*
- **Main Ex Situ Plant Protection Program:**
Vegetative *Allium L.*, Europe's Core Collection, Safe and Sound (EURALLIVEG) (2007-2011) funded by the European Commission Directorate-General for Agriculture and Rural Development

4. Młochów Research Center of the Plant Breeding and Acclimatization Institute - National Research Institute (PBAI-Młochów RC)

- The cryogenic collection of potato (*Solanum tuberosum* L.) accessions was initiated in 2005 as part of the National Center for Plant Genetic Resources.
- ✓ Shoot tips of 56 outstanding diploid interspecific hybrids - *vitrification in PVS2*
- ✓ Pollen grains of 96 diploid hybrids, 19 diploid wild *Solanum* L. species, and 17 tetraploid *Solanum tuberosum* L., including varieties and breeding lines - *direct freezing*



PROBLEMS WITH CRYOPRESERVATION IN POLAND

- ✓ poor implementation of the cryogenic techniques for the storage of crop germplasm, despite the development of cryopreservation techniques and protocols for many plant species >>> a lack of a backup for the collections of clonally propagated plant species (except garlic and apple tree varieties)
- ✓ a lack of a central cryobank in the National Centre for Plant Genetic Resources: Polish Genebank (NCPGR)
- ✓ very poor salaries for technicians and specialists >>> the cryogenic collection of apple trees in the PAS Botanical Garden-CBDC in Powsin is supervised by only one person (a pensioner)

OUR FUTURE PLANS

- To build a central cryobank and to set up the National Cryogenic Collection in the National Centre for Plant Genetic Resources: Polish Genebank (NCPGR), Plant Breeding and Acclimatization Institute - National Research Institute for:
 - ✓ vegetatively propagated crops (potatoes, hops, fruit trees and shrubs)
 - ✓ seeds of crop wild relatives
 - ✓ pollen grains of crop plant species
 - ✓ DNA and tissues of crop plant species (in frame of the Global Genome Biodiversity Network)
- We have prepared and submitted 2 big projects to cover the purchase cost of the full cryogenic equipment:
 - ✓ for the Ministry of Education and Science (INWEST)
 - ✓ For the Ministry of Agriculture and Rural Development (from the Recovery and Resilience Facility)

...keep your fingers crossed



REVIEW ARTICLES

1. Zimnoch-Guzowska E, Chmielarz P, Wawrzyniak MK, Plitta-Michalak BP, Michalak M, Pałucka M, Wasileńczyk U, Kosek P, Kulus D, Rucińska A, Mikuła A (2022) Polish cryobanks: Research and conservation of plant genetic resources. Acta Soc Bot Pol, 91, Article 9121. <https://doi.org/10.5586/asbp.9121>
2. Mikuła A, Chmielarz P, Hazubska-Przybył T, Kulus D, Maślanka M, Pawłowska B, Zimnoch-Guzowska E (2022) Cryopreservation of plant tissues in Poland: science contribution, current status and application. Acta Soc Bot Pol, 91, Article 9132. <https://doi.org/10.5586/asbp.9132>



THANK YOU FOR YOUR ATTENTION