Seed storage committee (STO)
Annual report 2007-08

Chair: Hugh W Pritchard
vice-Chair: David Mycock
Presenter and STO Member: Fabio Gorian
Seed Storage Committee: 2007-10

Objectives          Science topics                                Members (new)

O1: Enhancing wet storage potential

Characterising species of economic importance: horticulture / forestry

New methodologies: cryo / in vitro

Manipulate pre- and post-storage responses: ultradehydration / long-term storage / health

X-Y. Yang - China
M. Sacande - UK
I. Ferraz - Brazil
H. Pritchard - UK
H. Msanga - Tanzania
P. Berjak - RSA
S. Ajayi - Nigeria
S. Ashmore - Australia
E. G-Benito - Spain
D. Mycock - RSA
N. Sershen - RSA
F. Gorian – Italy
R. Blanco - Spain
P. Leon-lobos - Chile
C. Cuadra - Spain
I. Martin - Spain
Progress against targets 2007-10
Output 1: Enhancing wet storage potential

1A: Species characterisation:
Target > 100 economic species characterised as orthodox or non-orthodox (seed physiology).

- (Pritchard et al [UK]; Yang [China]) 16 species of palms have been screened for germination after dehydration with silica gel:
  Desiccation tolerant seeds: Guihaia argyrata, Guihaia grossefibrosa, Latania loddigesii, Livistonia carinensis, Pritchardia pacifica (germination -8 and +32 % compared to initial germination), Trachycarpus fortunei
  Desiccation sensitive seeds: Burretiokentia hapala, Cythophoenix elegans, Iriartia deltoidea, Latania verschafeltii, Nypa fruiticans, Calamus yunnanensis var. densiflora, Calamus nambadiensis var. alpinus, Calamus nambadiensis var. xishuangbanna, Calamus kariensis, Livistona saribus
Progress against targets 2007-10
Output 1: Enhancing wet storage potential

1A: Species characterisation:
Target > 100 economic species characterised as orthodox or non-orthodox (seed physiology).

• (Pat Berjak, Sershen [RSA]): Since the inception of the programme we have screened the seeds of 55 species:
  Desiccation tolerant seeds: 5 species;
  (Desiccation sensitive) non-orthodox post-harvest seed behaviour: 50 species, includes tree, shrub and geophyte representatives. These species are not of formal economic importance but are traded within the traditional medicine industry in Africa, exacerbating their threatened status, e.g. Amaryllidaceae (above).

1A Summary: > 60 / 100 species investigated = ON TARGET
Progress against targets 2007-10
Output 1: Enhancing wet storage potential

1B: New methodologies: cryo / in vitro

Target > 5 species cryopreservation methods produced (seed cryobiology)

• (Nadarajan, Kranner, Pritchard [UK]): *In vitro* shoot tips from seedlings produced by germinating recalcitrant *Parkia speciosa* (above) seeds cryopreserved using encapsulation – vitrification.

• (Berjak, Sershen [RSA]): Successful cryopreservation protocols for recalcitrant embryonic axes of 10 amaryllid species and 1 palm (namely: *Phoenix reclinata*). Meristem tips appear more suitable for cryo than nodal explants of tropical species.
Progress against targets 2007-10
Output 1: Enhancing wet storage potential

1B: New methodologies: cryo / in vitro

Target > 5 species cryopreservation methods produced (seed cryobiology)

- (Nadarajan, Kranner, Pritchard [UK]): An oxidative burst of superoxide in embryo axes of recalcitrant sweet chestnut seeds occurs on excision (above) and desiccation (cleansing of the cut surface and downstream oxidative stress).

- (Berjak, Sershen [RSA]): Systemic fungicides far more superior than surfactants in improving storage longevity and reducing fungal proliferation in recalcitrant seeds of *Avicennia marina*, *Protorhus longifolia* and *Trichilia dregeana*.

1B Summary: > 10 / 5 species investigated = MET TARGET
Progress against targets 2007-10
Output 2: Enhancing dry storage potential

2A: New methodologies: cryo / in vitro
Target Somatic embryogenesis resolved for 2 species (seed biotechnology to enable dry storage of embryos)

- (Mycock [RSA]): Indirect organogenesis for several *Eucalyptus* clones and hybrids. Cryopreservation success with one hybrid. Direct organogenesis for endangered *Protea* spp

- (Gonzalez-Benito, Perez-Garcia [Spain]): Seed cryopreservation of 3 *Passiflora* species and several *Halimium* and *Helianthemum* species (orthodox)

2A Summary: 2 / 2 species investigated = MET TARGET
Progress against targets 2007-10
Output 2: Enhancing dry storage potential

2B: Manipulate pre- and post-storage responses: ultradry / long-term / health

Target > 70 species long-term storage data reviewed (seed ‘banking’)

- (de la Cuadra, Martín, Blanco [Spain]): 808 accessions of 25 species from Base Collection and 669 accession of 20 species from Active Collection tested after 20 years of conservation (-20°C, low moisture content). In both cases > 94% germination.
- (Gonzalez-Benito, Perez-Garcia [Spain]): Effect of CO₂ in long-term seed conservation (4 Brassicaceae species). Medium-term (5-6 years) storage of Hirschfeldia incana (Brassicaceae) in several conditions.
- (Mycock [RSA]): Storage conditions for Protea roupelliae including cryo

2B Summary: > 45 / 70 species investigated = ON TARGET
Progress against targets 2007-10
Output 2: Enhancing dry storage potential

2C: Manipulate pre- and post-storage responses: ultradry / long-term / health

Target: Risks of ultradrying assessed on 10 species (seed biophysics)

- (Gonzalez-Benito, Perez-Garcia [Spain]): Studies (short-term) carried out on effect of temperature and water content on seeds of several Spanish wild species

- (Montebelli, Pasquini, Gorian [Italy]): Ultradry (3%) storage of *Larix decidua* (Pinaceae)

2C Summary: few / 10 species investigated = ON TARGET
Progress against targets 2007-10
Output 2: Enhancing dry storage potential

2D: Manipulate pre- and post-storage responses: ultradry / long-term / health

Target: Thermotherapy applied to 5 species (seed health)

- (de la Cuadra, Martín, Blanco [Spain]): Five accessions of *Phaseolus vulgaris* from germplasm bank with low percentages of germination were analysed for bacteria and fungi presence – absence. The percentage of these micro flora was very low and they seems to be not pathogens.

2D Summary: 0 / 10 species investigated
= NO PROGRESS AGAINST TARGET
Progress against targets 2007-10
Output 3: Communications / dissemination

3A & B: Organise sponsored workshops

Target: 2 workshops

Tree Seeds 2008
Trees, Seeds and a Changing Climate

- Sponsor session of Seed Desiccation Workshop in RSA in early 2010. May well be held in 2011, if bid to host ISSS Congress in RSA is accepted. If so, plan to run Desiccation Workshop in tandem.

3A, B Summary: 1 / 2 meeting confirmed = ON TARGET
Progress against targets 2007-10
Output 3: Communications / dissemination

3C: Write / edit book

Target: Write book on seed viability (30 years since 'Viability of Seeds' by Eric Roberts) subject to finding established authors, funding and publisher.

3C Summary: = NO PROGRESS

3D: Data gather

Target: Design, distribute and analyse questionnaire on seed storage needs, capacity, and capability in ISTA labs.

3D Summary: = NO PROGRESS
Progress against targets 2007-10
Output 3: Communications / dissemination

3E: Produce Guidelines

Target: Draw up guidelines on seed storage for possible incorporation into the ‘rules’.

- 3 book chapters published that serve as practical guides to the cryopreservation storage of desiccation-tolerant (Pritchard, 2007; Pritchard & Nadarajan, 2008) and desiccation-sensitive seeds (Walters et al., 2008).
- Progress yet to be made on guidelines for the conventional storage of seeds in the trade and of immediate relevance to the ‘rules’.
- 16 papers published by STO members (9 in peer-reviewed journals)

3E Summary: = ON TARGET
Need for guidelines: current rules

2.8 Storage of samples

2.8.1 Before sampling

If delay [in testing] is unavoidable, the sample shall be stored in a cool well-ventilated room in such a way that changes in the quality of the seed are minimised.

2.8.2 After sampling

To provide for re-testing..., submitted samples on which...Certificates have been issued shall be stored for one year.... Storage of the sample shall be done in conditions calculated to minimise any change in quality.

International Rules for Seed Testing  Effective from 1st January 2004