STO STORAGE COMMITTEE

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	Research topics / Activities	**3 year (2007-10) target**	**Progress in 2008**
Output 1: Enhancing wet storage potential	**Characterising species of economic importance**: horticulture / forestry	(1A) > 100 economic species characterised as orthodox or non-orthodox (seed physiology)	(1A) **Tim Marks, Richard Nair, Hugh W Pritchard, Suzy Wood (Kew, UK):** Numerous species of palms have been screened for germination after dehydration with silica gel. *Deckenia nobilis, Dictyosperma album, Guihaia argyrata, Guihaia grossefibrosa, Latania loddigesii, Livistonia carinensis, Phoenix dactylifera* and *Pritchardia pacifica* seeds tolerated drying with germination levels between -8 and +32 % compared to initial germination. Seedlots of *Basselinia gracilis*, *Burretiokentia hapala, Cythophoenix elegans, Iriarta deltoidea, Latania verschafeltii, Nypa fruiticans, Pinanga coronata, Rhopaloblaste augusta* and *Tahinia spectabilis* failed to survive desiccation. **Pat Berjak, Sershen (RSA):** 1) Since the inception of the programme we have screened the seeds of 55 species, 50 of which have exhibited non-orthodox post-harvest seed behaviour (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*).

			Isolde D. K. Ferraz, Lilian Procópio, Daniel L. Oliveira (Brazil) 5 species of the genera Couratari (Meliaceae) have been screened for germination after dehydration with silica gel - all showed to be tolerant to desiccation. The species *C. atrovinosa, C. guianensis, C. longipedicellata, C. stellata* and *C.taurari* are timber species and known by the same popular or trade name tauari.
Output 1: Enhancing wet storage potential	**New methodologies**: cryo / in vitro	(1B) > 5 species cryopreservation methods produced (seed cryobiology)	(1B) **Jayanthi Nadarajan, Ilse Kranner, Hugh W Pritchard (Kew, UK):** *In vitro* shoot tips from seedlings produced by germinating recalcitrant seeds of *Parkia speciosa* have been cryopreserved using encapsulation – vitrification. Also an oxidative burst of superoxide in embryo axes of recalcitrant sweet chestnut seeds has been determined following excision and desiccation, which may have pleoitropic effects: immediate cleansing of the cut surface, plus downstream cumulative and pernicious oxidative stress. **Pat Berjak, Sershen (RSA):** 1) Treatment of recalcitrant seeds with surfactants like benomyl fungicide prior to wet storage has proven to be ineffective in curbing fungal proliferation in the seeds of a number of species we work on. This prompted the screening of a range of systemic fungicides, two of which (namely: Celest and Heritage) have considerably improved storage longevity and reduced in-storage fungal proliferation in the recalcitrant seeds of *Avecinnia marina*, *Protorhus longifolia* and *Trichelia dregeana*. 2) Successful cryopreservation protocols have been developed for the recalcitrant embryonic axes of 10 Amaryllid species and 1 palm (namely: *Phoenix reclinata*). 3) Nodal explants of a number of tropical species have proven to be far to wet, even after physical and chemical dehydration however, recent experiments on the cryopreservation of meristem tips of tropical species indicate that for tropical species this explant type may be far more suitable for cryopreservation protocols involving alternate explants. **Elena Gonzalez-Benito (Spain):** Cryopreservation of seeds of *Passiflora* species, and several cactus species. Cryopreservation of *Xolantha macrosepala* and *Tuberaria major* (Cistaceae, orthodox). Cryopreservation of eight species endemic to Canary Islands.
Output 2: : Improving dry storage performance	**New methodologies**: cryo / in vitro	(2A) Somatic embryogenesis resolved for 2 species (seed biotechnology)	(2A) **Dave Mycock (RSA):** Indirect organogenesis for several Eucalyptus clones and hybrids. Cryopreservation success with one

			hybrid. Investigating the mode of death *viz.* apoptosis or necrosis of isolated *in vitro* axillary buds that are partially dried in preparation for cryopreservation. Direct organogenesis for endangered Protea spp
Output 2: : Improving dry storage performance	**Manipulate pre- and post-storage responses**: ultradry / long-term / health	(2B) > 70 species long-term storage data reviewed (seed 'banking')	(2B) **Celia de la Cuadra, Isaura Martín, Reyes Blanco (Spain):** The viability of 808 accessions of 25 species from Base Coll.ection and 669 accession of 20 species from Active Collection, were revived after 20 years of conservation (-20ºC, low moisture content). In both cases the percentage of germination was in average > 94%. 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. **Elena Gonzalez-Benito (Spain):** Studies (short-term) are carried out on effect of temperature and water content on seeds of several Spanish wild species **Dave Mycock (RSA):** Storage conditions, including cryostorage for *Protea roupelliae*. Tests spanning 24 months, the 6 month data have been collected.
Output 2: : Improving dry storage performance	**Manipulate pre- and post-storage responses**: ultradry / long-term / health	(2C) Risks of ultradrying assessed on 10 species (seed biophysics)	(2C) **Elena Gonzalez-Benito (Spain):** Studies (short-term) are carried out on effect of temperature and water content on seeds of several Spanish wild species
Output 2: : Improving dry storage performance	**Manipulate pre- and post-storage responses**: ultradry / long-term / health	(2D) Thermotherapy applied to 5 species (seed health)	(2D) No progress in 2007-08
Output 3: Communic-ations / dissemination	**Organise sponsored workshop**	(3A) Co-sponsor with IUFRO 'Trees, seeds in a changing climate' (UK, 2008)	(3A) Scientific meeting held between 22 – 25 September 2008 at the Royal Botanic Gardens Kew, Wakehurst Place and University of Sussex, UK. Supported by RBG Kew, Univ of Sussex, IUFRO, the International Tree Foundation and BGCI. See attached conference report.

Output 3: Communic-ations **/** dissemination	**Organise sponsored workshop**	(3B) Sponsor session of Seed Desiccation Workshop in RSA in early 2010	(3B) 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.
Output 3: Communic-ations **/** dissemination	**Write / edit book**	(3C) Write book on seed viability (30 years since 'Viability of Seeds' by Eric Roberts) subject to finding established authors, funding and publisher.	(3C) No progress in 2008.
Output 3: Communic-ations **/** dissemination	**Data gather**	(3D) Design, distribute and analyse questionnaire on seed storage needs, capacity, and capability in ISTA labs.	(3D) No progress in 2007-08.
Output 3: Communic-ations **/** dissemination		(3E) Draw up guidelines on seed storage for possible incorporation into the 'rules'.	(3E) Three book chapters have been published that serve as practical guides to the cryoperservation 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'.

PUBLICATIONS BY COMMITTEE MEMBERS: 2008

1	Berjak P, Farrant JM, Pammenter NW. (2008)	Seed desiccation-tolerance mechanisms. In: *Plant desiccation tolerance* (eds Wood, A.J. and Jenks, M.A) CABI, Wallingford, Oxon, UK. pp. 151-192.
2	Berjak P, Pammenter NW (2008)	From *Avicennia* to *Zizania*: Seed recalcitrance in perspective. *Annals of Botany* **101**, 213-228. (on line Aug. 2007).
3	Hamilton, K.N., Ashmore, S.E. and Drew, R.A. (2008)	Desiccation and cryopreservation tolerance of near mature seeds of *Citrus garrawayi*. *Seed Science and Technology*, 36:157-161.
4	Hamilton, K.N., Ashmore, S.E. and Drew, R.A. (2008)	Morphological characterization of seed of Australian wild species of Citrus (Rutaceae). *Genetic Resources and Crop Evolution*, 55: 683-693.

5	Kaity, A., Ashmore, S.E., Drew, R.A. and Dulloo M.E. (2008)	Assessment of Genetic Integrity of Papaya following Cryopreservation. *Plant Cell Reports*. 27:1529-1539.
6	Nadarajan J, Monsor M, Krishnapillay B, Staines HJ, Benson EE, Harding K. (2008)	Applications of differential scanning calorimetry in developing cryopreservation strategies for *Parkia speciosa*, a tropical tree producing recalcitrant seeds. *CryoLetters* **29**, 95-110.
7	Padayachee, K., Watt, M.P., Edwards, N & Mycock, D.J. (2008)	Physiological responses of *Eucalptus in vitro* axillary buds to cryopreparative desiccation and osmotic preculture: effects of abscisic acid. *South African Journal of Botany* **74**, 639-646.
8	Pérez-García, F., & González-Benito, M.E. (2008)	Seed cryopreservation of *Halimium* and *Helianthemum* species. *CryoLetters 29:271-276.*
9	Pérez-García, F., González-Benito, M.E. & Gómez-Campo, C. (2008)	Germination of fourteen endemic species from the Iberian Peninsula, Canary and Balearic Islands after 32-34 years of storage at low temperature and very low water content. *Seed Science and Technology* 36: 407- 422.
10	Pritchard HW, Nadarajan J (2008)	Cryopreservation of orthodox (desiccation tolerant) seeds. In *Plant Cryopreservation: A Practical Guide*, (ed) BM Reed, Springer, pp. 485-501.
11	Roach T, Ivanova M, Beckett RP, Minibayeva FV, Green I, Pritchard HW, Kranner I (2008)	An oxidative burst of superoxide in embryo axes of recalcitrant sweet chestnut seeds as induced by excision and desiccation. *Physiologia Plantarum* **133**, 131-139. (D.o.i. 10.1111/j.1399-3054.2007.00986.x)
12	Sershen, Berjak P, Pammenter NW (2008)	Desiccation sensitivity of excised embryonic axes of selected amaryllid species. *Seed Science Research* **18**, 1-11.
13	Sershen, Pammenter NW, Berjak P (2008).	Post-harvest behaviour and short- to medium-term storage of recalcitrant seeds and encapsulated embryonic axes of selected amaryllid species. *Seed Science and Technology* (in press).
14	Whitaker C, Berjak P, Pammenter NW. (2008)	Abnormal morphology of the embryo and seedling of *Welwitschia mirabilis*, and some observations on seed-associated fungi. *South African Journal of Botany* **74**, 338-340.
15	Whitaker C, Pammenter NW, Berjak, P. (2008)	Infection of cones and seeds of *Welwitschia mirabilis* by *Aspergillus niger* var. *phoenicus* in the Namib-Naukluft Park. *South African Journal of Botany* **74**, 41-50.