

Darwin Initiative

Half Year Report (due 31 October each year)

PLEASE NOTE: Due to the increased number of reports expected in 2005, we will not be able to confirm receipt of reports but will contact you individually should any questions arise

Project Ref. No.	14-056
Project Title	Cryo-Conservation Centre of Excellence for Sub-Saharan Africa (CCESSA)
Country(ies)	UK & RSA
UK Organisation	Royal Botanic Gardens, Kew – Seed Conservation Department/ MSBP
Collaborator(s)	University of KwaZulu-Natal
Report date	October, 2005
Report No. (HYR 1/2/3/4)	1
Project website	http://www.sles.und.ac.za/plantgermcons/ (present); http://www.ukzn.ac.za/biology/plantgermcons/ (probable change [in near future])

1. Outline progress over the last 6 months (April – September) against the agreed baseline timetable for the project (if your project has started less than 6 months ago, please report on the period since start up).

- July, 2005: RSA-based planning session held, involving Project Leader (Dr Chris Wood), main and all other project partners. Meeting with, and presentation of projects by, research students. Funds for first half-year made available.
- August, 2005: Appointment of two research assistants (support staff).
 - Planning of Honours Cryobiology Module (Cryo-course) by all Durban-based partners. (Note: Module to be the basis of Cryo-course open also to extra-mural participants from 2006.)
- August - end October, 2005: Projects implemented and ongoing:
 - **Database development.** A Surveyed Geography (SURGEO) database, allowing extraction of data (e.g. geology, rainfall, temperatures, biome, etc.) for South Africa by entering coordinate values (either decimal degrees or Degrees/minutes/seconds) into a graphic user interface. Additionally, a Plant Information Management System (PIMS) based on Seed Information Database ideology being implemented, which facilitates storage, management, access and data modification. (SCD project leader familiarised with database development via a live demonstration and Q & A session, in July, 2005.)
 - **Seed screening and storage** (under various water content and temperature conditions). Noting that May - October encompasses the Winter period when only a limited spectrum of species produce fruits/seeds, screening has been/is being carried out for seeds of *Encephalartos natalensis*, *E. gratus* (Zamiaceae); *Bulbine natalensis* (Amaryllidaceae); *Strychnos spinosa*, *S. madagascariensis*, *S. decussata*, *S. gerrardii*, (Loganiaceae); *Strelitzia reginae*, *S. nicolai* (Strelitziaceae); *Bersama lucens* (Melianthaceae); *Harpephyllum caffrum* (Anacardiaceae) and *Bruguiera gymnorhiza* (Rhizophoraceae). Earlier-studied seeds, identified as being recalcitrant, presently being utilised for other investigations (below) include those of *Telfairia occidentalis* (Cucurbitaceae); *Cordyla africana* (Caesalpiniaceae) and *Theobroma cacao* (Sterculiaceae). Additionally, the first phase of a wide-ranging study on seed behaviour and cryopreservation of a spectrum of species in the Amaryllidaceae has recently been completed: continuation studies are ongoing.
 - **Fungicide trials.** The inherent mycoflora of non-orthodox, and especially, recalcitrant, seeds pose a major problem both to short-/medium-term hydrated storage and *in vitro* growth and development of excised embryonic axes. Hence systemic fungicide trials are presently an important focus of the programme (which also includes the xerotolerant fungal pathogen associated with *Welwitschia mirabilis* seeds). Fungicides having the active principles, triazoles, strobilurins and phenylpyrrole, are presently under

investigation.

- **Cryopreservation protocols - development and improvement.** Partial dehydration and cryopreservation studies have recently been focused on excised embryonic axes of *Trichilia dregeana*, *T. emetica*, *Ekebergia capensis* (Meliaceae) and *Strychnos gerrardii*. In all cases, protocols have been optimised and result in acceptable survival levels, but shoot production from the apical meristem upon axis retrieval from liquid nitrogen, is a prevailing problem. (This seems to be characteristic of most tropical/sub-tropic species.) To this end, we are presently focusing on the aetiology of the serious damage which is associated with severing of the cotyledonary connections at the axis surface. This aspect is to be explored in the context of AOS production as a consequence of wounding, and currently, experiments are also being planned that might ameliorate the excision-related damage.
- **Synthetic seed (synseed) production** has been achieved for axes of *Ekebergia capensis* by alginate encapsulation after cryostorage, and a paper (emanating from research that preceded the present award) is currently in the press. This approach is to be extended to axes of other species, as soon as seeds are once again available, the first being those of *Trichilia emetica*. The work on *E. capensis*, in which a protocol that promoted adventitious bud formation from the cotyledonary lesions was developed, is now being followed by investigations aimed at synseed production from axes in which the integrity of the shoot apical meristem has been preserved (see above), and involving the use of explants alternative to excised zygotic axes (below).
- **Alternative explants** being developed for cryopreservation include: axillary buds of *E. capensis*, *Theobroma cacao* and *Telfairia occidentalis*; and work is currently underway with inflorescences and developing fruits/seeds of *Garcinia livingstonei* (Clusiaceae [=Guttiferae]) and *Barringtonia racemosa* (Lecythidaceae), both of which produce large, undifferentiated, hypertrophied axes that are entirely unsuitable for cryopreservation.
- **Other relevant experiments** on recalcitrant seeds currently include effects of chilling for several species; an extension, also to several species, of our earlier work on 'sub-imbibed' storage (which is emerging as generally deleterious); studies of the responses of cyto- and nucleoskeletons to dehydration and chilling; the relationship between metabolic activity and desiccation sensitivity; seed water relations; and, as a side, but related issue, the generation and cryopreservation of alternative explants of sugarcane.
- September - November, 2005: Implementation of Honours Cryobiology Module; all Durban-based partners involved.
 - Enlisting of, and bursary applications (other sources) for, new post-graduate students to initiate their studies in February, 2006.
- October - November, 2005: Finalisation of web facility.
- October - November, 2005: Sourcing new capital equipment.

2. Give details of any notable problems or unexpected developments that the project has encountered over the last 6 months. Explain what impact these could have on the project and whether the changes will affect the budget and timetable of project activities.

No problem, but one unexpected developments. In early September Dr Chris Wood announced that he would be leaving Kew in early October, and his Project Leader role has been assumed by Hugh W. Pritchard. Dr Pritchard, who is cited as a Kew contributor on the original submission, is Head of Research in the Seed Conservation Department and visiting professor in cryobiology at the University of Luton (UK).

Have any of these issues been discussed with the Darwin Secretariat and if so, have changes been made to the original agreement?

Yes an email exchange has occurred between the DS and Dr Wood and in future Dr Pritchard will be shown on the paperwork as the Project Leader.

Discussed with the DI Secretariat: Yes (email exchange) in 10 / 2005 (month/yr)

Changes to the project schedule/workplan: None needed in.....(month/yr) N/A

3. Are there any other issues you wish to raise relating to the project or to Darwin's management, monitoring, or financial procedures? NO.

If you were asked to provide a response to this year's annual report review with your next half year report, please attach your response to this document.

Please note: Any planned modifications to your project schedule/workplan or budget should not be discussed in this report but raised with the Darwin Secretariat directly.

Please send your **completed form by 31 October each year per email** to Stefanie Halfmann, Darwin Initiative M&E Programme, stefanie.halfmann@ed.ac.uk. The report should be between 1-2 pages maximum. **Please state your project reference number in the header of your email message.**