South African Journal of Botany 2004, 70 (1) : 102–108

Biotechnological aspects of non-orthodox seeds: an African perspective

Authors: P Berjak[1] and NW Pammenter[1]

[1]*School of Life and Environmental Sciences, University of Natal, Durban 4041, South Africa*

Corresponding Author: P Berjak (E-mail: berjak@biology.und.ac.za)

Abstract:

Storage of seeds at low water content and sub-zero temperature in genebanks is the most convenient way of conserving the genetic resources of most spermatophytes. However, the seeds of many, particularly tropical, species are desiccation sensitive and are not amenable to storage under these conditions. Not only is long-term conservation of this germplasm difficult, but the characteristic of desiccation sensitivity also places limits on short-term storage of the seeds. This paper briefly reviews the physiology of these 'non-orthodox' seeds, and considers the progress that has been made in extending storage lifespan of the seeds, and in the cryopreservation of the germplasm. Short- to medium-term storage lifespan of hydrated seeds can be extended by reducing temperatures as low as possible — where chilling sensitivity permits — although not below zero. Long-term cryopreservation of whole seeds is precluded because of ice crystal damage to the hydrated tissue, but a novel approach in dealing with this problem is described. Excised embryonic axes are dried very rapidly (flash dried) to water contents low enough to reduce ice crystal formation on freezing, but not so low as to introduce desiccation damage, and the partially dried axes are frozen very rapidly by plunging in sub-cooled liquid nitrogen ('nitrogen slush') to reduce potential ice crystal damage. Subsequent storage in liquid nitrogen affords the means for long-term conservation of the zygotic axes (and buds, apical meristems, callus or somatic embryos) and hence the genetic resources of species producing even the most recalcitrant of non-orthodox seeds.