CryoLetters **28(5)**, 387-399 (2007)

CRYOPRESERVATION OF EMBRYONIC AXES OF SELECTED AMARYLLID SPECIES

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Abstract

A study on cryopreservation of excised embryonic axes of fifteen species of the Amaryllidaceae is reported. Embryonic axes that after flash-drying had a water content in the range 0.4 to 0.1 g g^{-1} and survival ≥60% were selected for cryopreservation procedures. The highest post-thaw viabilities (roots and shoots produced) across all species were recorded for embryonic axes subjected to rapid rather than slow cooling. With rapid cooling and no cryoprotection, the highest post-thaw viabilities for the fifteen species investigated was 0% in one species; ranged between 10 and 35% for nine species; and between 45 and 55% for five species. With cryoprotection and rapid cooling the highest post-thaw viabilities for these fifteen species was 0% for one species; ranged between 15 and 35% for six species; and between 40 and 75% for eight species. The highest post-thaw survival in ten out of fifteen species was obtained for axes dried to between 0.24±0.06 and 0.14±0.08 g g^{-1} (and rapidly cooled). With only one exception (*Strumaria discifera*; 45%), post-thaw survival after slow cooling ranged between 10 and 30%. Survival after vitrification plus slow cooling was achieved for seven species but was never higher than post-thaw survival in non-cryoprotected, rapidly cooled axes. The results suggest that species within the same family can exhibit commonalities in terms of amenability to cryopreservation techniques but for maximum success, axis water content and cooling rate particularly, must be optimised for each species in the family independently.

Keywords: Amaryllidaceae, embryonic axes, cryoprotection, cooling rate

INTRODUCTION

The potential of cryopreservation for the long-term conservation of non-orthodox seed germplasm, which, otherwise cannot be stored using conventional seed storage methods for any useful period, has been reported for some time now (3,reviewed by 6,27,50,52).

Recalcitrant seeds are generally large and shed at relatively high water content (WC), but as most of the seed is constituted by cotyledons or endosperm, sufficiently small explants for cryopreservation can usually be obtained by excising the embryonic axes (originally used by 27), which are then subjected to partial dehydration to water contents (WCs) sufficiently low for successful cooling (e.g. *Quercus robur* [4]; *Hevea brasiliensis* [27]; *Ekebergia capensis* [31]; *Araucaria hunsteinii* [34]; *Poncirus trifoliata* [49]; *Camellia sinensis* [50]; *Aesculus hippocastanum* [52]). The need for partial dehydration stems from the suggestion