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Desiccation sensitivity of excised embryonic axes of selected amaryllid species†

undefined Sershen , Patricia Berjak and Norman W. Pammenter

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Cathodic amelioration of the adverse effects of oxidative stress accompanying procedures necessary for cryopreservation of embryonic axes of recalcitrant-seeded species

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Patricia Berjak, Sershen, Boby Varghese and N.W. Pammenter

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Abstract

Several of the procedures necessary for cryopreservation of excised zygotic embryonic axes are known to be accompanied by emission of damaging levels of reactive oxygen species (ROS). These have been shown to be associated with shoot apical meristem necrosis, curtailing subsequent axis development to root production only, particularly for tropical/subtropical recalcitrant-seeded species. Here we report on the application of the principles of electrochemistry in the generation of strongly reducing, high pH cathodic water, by electrolysis of a solution containing calcium and magnesium chloride. The cathodic water in which *Strychnos gerrardii* axes were immersed for 30 min following dehydration, and importantly, after dehydration followed by cryopreservation, was shown to have strongly antioxidative properties in counteracting the damaging effects of ROS bursts and promoting shoot development. In a parallel experiment, axes of *Boophane disticha* exhibited enhanced total antioxidant activity when exposed to cathodic water both immediately following excision, and after flash-drying. For both species, the efficacious effects of cathodic treatment were manifest after the axes had been in culture for 4 h, suggesting that ROS were not quenched at source, but probably counteracted by enhancement of activity of endogenous antioxidants. Cathodic water therefore affords a non-toxic means of amelioration of oxidative, stress-related damage, which, coupled with the strongly fungicidal activity of the acidic, anionic water fraction, offers significant, and apparently non-injurious, advances towards successful cryopreservation of germplasm – and probably generally improved success of *in-vitro*-based procedures for plant tissues.

Keywords

Boophane disticha cathodic water cryopreservation embryonic axes protection reactive oxygen species Strychnos gerrardii superoxide

Type

Research Article

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