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Commentary

Arecaceae *in Vitro* Methods of Gremination and Perservation

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ABOUT THE STUDY

Arecaceae plants are well-known around the world for both their attractive plant qualities and their delicious and nutritious fruits. However, it is not widely known that about 26% of Arecaceae species are on the Red List, which is maintained by the International Union for Conservation of Nature (IUCN). *Corypha taliera Roxb*. and *Cryosophila williamsii* P.H. Allen are two examples of them that are regrettably already "extinct in the wild" (EW). A native Arecaceae of the South Brazilian Atlantic Forest, *Butia eriospatha* (Martius Ex Drude) Beccari is also listed as an endangered species in Brazil and as "vulnerable" (VU) by the IUCN. Due to extensive human involvement, such as local and worldwide illegal trade, overharvesting of fruits and habitat replacement by exotic trees and cattle farming, *B. eriospatha's* conservation status is worrying.

Because of this, the genetic diversity of the few remaining *B. eriospatha* plant populations is minimal. Additionally, seeds are the only way for plants to reproduce, and due of their dormancy, they might take up to a year to germinate only about half of the time, which is a problem for the establishment of seedlings and the preservation of species. *In vitro* culture procedures have been researched to conserve the genetic variety of the *B. eriospatha* species, who's concerning genetic situation, has been described in numerous articles. However, there is still a lack of knowledge surrounding its reproductive biology, particularly in regards to seed germination and desiccation resistance physiology, which are crucial for the preservation and restoration of the species.

The majority of trees in tropical forests, including species of the Arecaceae family, generate seeds that are resistant to desiccation. Since soil bank seeds are not common for the majority of species of resistant seeds, these seeds are shed with high water content and if they do not find the correct conditions to germinate, they perish. *Ex situ* conservation projects have become increasingly significant in tropical ecosystems as a result of climate change and declining forest cover. To conserve tissues, seeds, and embryos from several plant species that cannot be stored in normal seed banks, are from rare collections, or have innate problems germination, they have mostly used biotechnology tools. Since they are still developing organs, zygotic embryos make a good target for cryopreservation techniques and are a source of genetic variation.

Many efforts have been made to establish cryopreservation protocols for Arecaceae species tissues, for instance *Elaeis guineensis. Jacq*., *Phoenix dactylifera L*., *Cocos nucifera L*., *Sabal* spp, including *Butia capitata*, *B. odorata* and *B. yatay*. Nevertheless, different species call for various cryopreservation techniques, and not all of the earlier Arecaceae investigations sought to cryopreserve zygotic embryos. The conservation condition of *B. eriospatha* is frightening, and scientists are scrambling to come up with *ex situ* conservation measures and learn more about the physiological behaviour of seeds that can aid in restoration and conserve the remaining plant population of this species. According to our theory, *B. eriospatha* embryos have a unique metabolic profile and a low desiccation tolerance threshold that make them amenable to cryopreservation and *in vitro* germination.

An illustration of the biochemical condition of *B. eriospatha* embryos after cryopreservation and *in vitro* germination, as well as its integration with an *ex situ* conservation method. Our research demonstrates for the first time that *B. eriospatha* embryos can germinate more than 90% of the time in a water content range between 2.56 and 0.14 gH_2O gDW^{-1}. The large-scale seed germination of the remaining plant population ensured by this germination process using culture medium mixed with hormones and antioxidants ensures the genetic diversity maintenance. We also present connections between amino acids, antioxidant activity, and polyamines under desiccation stress, making strides in our understanding of the physiological behaviour of desiccation tolerance.

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