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“Filling gaps and removing traps
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Survival Is Insufficient: A Cryopreservation Case Study on Cassava

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Abstract

Food security is one of the sustainable development goals of the United Nations. Most of the regions that are affected by this insecurity are areas with infertile or dry soils, often located in the tropics. An essential crop in such environments that provides food security is cassava, an important source of carbohydrates and the third most important crop in the tropics. Even though there is only one cassava species, there are plenty of varieties, each with its own characteristics, allowing the species to survive in many different areas. Having access to such a diversity within the species is important for farmers since it allows them to adapt to different situations.

The cassava diversity can be kept in field and *in vitro* genebanks but the ultimate way of preserving cassava for the long term is using cryopreservation. In these conditions plant tissues are cooled to the temperature of liquid nitrogen (-196°C). At this temperature all biological and chemical processes come to a halt. However for cassava this cryopreservation protocol is not yet optimised. In this study, different parameters during the cryopreservation protocol were varied, such as the application of a sucrose preculture, different loading solutions and the use of apical versus axillary meristems and this on three different cassava varieties. One month after recovering from the liquid nitrogen exposure, this resulted in survival rates of up to 91% for some cultivars. Under survival we understand that new green leaves were formed. However after this initial growth, the shoots completely stopped growing and this for both control and cryopreserved meristems, suggesting that the storage in liquid nitrogen is not the main bottleneck. Regeneration towards normal rooted plants is thus the next hurdle to overcome, before we can speak about a cryopreservation protocol that is applicable to an *in vitro* collection.

Keywords: Cassava, cryopreservation, genebanks, *in vitro* culture