Plant cryopreservation: progress and prospects

Florent Engelmann

Cirad-flhor, TA 50/PS4, Boulevard de la Lironde, 34398 Montpellier cedex 5, France. (florent.engelmann@cirad.fr)

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Cryopreservation (liquid nitrogen, -196 °C) represents the only safe and cost-effective option for long-term conservation of germplasm of non-orthodox seed species, vegetatively propagated species and of biotechnology products. Classical cryopreservation techniques, which are based on freeze-induced dehydration, are mainly employed for freezing undifferentiated cultures and apices of cold-tolerant species. New cryopreservation techniques, which are based on vitrification of internal solutes, are successfully employed with all explant types, including cell suspensions and calluses, apices, somatic and zygotic embryos of temperate and tropical species. The development of cryopreservation protocols is significantly more advanced for vegetatively propagated species than for recalcitrant seed species. Even though its routine use is still limited, there are a growing number of examples where cryopreservation is employed on a large scale for different types of materials, including orthodox and intermediate seeds, dormant buds, pollen, biotechnology products and apices sampled from *in vitro* plantlets of vegetatively propagated species. Cryopreservation can also be employed for uses other than germplasm conservation, such as cryoselection, *i.e.* the selection through freezing of samples with special properties, or cryotherapy, *i.e.* the elimination of viruses from infected plants through apex cryopreservation. Because its high potential, it is expected that cryopreservation will become more frequently employed for long-term conservation of plant genetic resources.

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