

**Long-Term Conservation of Plant Genetic Resources via Cryopreservation**Ergun KAYA

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**Aim of the study:** Plant genetic resources for food and agriculture are the basis of global food security. Cryopreservation aims to the storage of biological samples at ultra-low temperature, usually that of liquid nitrogen (-196 °C), and is considered as an ideal means for long-term storage of plant germplasm. At this temperature, cell division and metabolic activities remain suspended and the material can be stored without changes for long periods of time. Cryopreservation is the only available method for long-term conservation of vegetatively propagated plant germplasm. In this study, we aimed to describe advances in cryogenic techniques for the long-term preservation of plant germplasm.

**Material and Methods:** In the last three decades a number of different cryopreservation protocols, such as classical slow-cooling, vitrification, droplet vitrification, encapsulation / dehydration and encapsulation / vitrification protocols have been developed and utilised for germplasm storage. The choice of cryopreservation method to attain the highest survival rates is largely dependent on the plant species and tissue type that is being cryostored. Slow cooling or controlled rate cooling techniques involve the simple dehydration of plant material before cryogenic storage in LN. This is can be done by slow cooling of the plant tissue to a temperature of approximately -40°C. Encapsulation-dehydration method involves encapsulating shoot tips and then, silica gel or airflow is used to dehydrate the beads until the moisture content drops to 20-30%, before they are immersed in LN. Vitrification involves the treatment of tissues in a mixture of highly concentrated penetrating and non-penetrating cryoprotectants applied at non-freezing temperatures, followed by rapid cooling in LN. The droplet-vitrification technique is a modification of the basic vitrification protocol that involves placing the sample within a droplet of 1-10 µl of cryoprotective solution on a piece of aluminium foil before immersion in LN.

**Results:** Many plant species have been successfully cryopreserved through the development of various cryopreservation methods. As a standard protocol, vitrification and droplet vitrification are widely applied. Fundamental studies looking at membrane composition, membrane damage and repair are likely to help to elucidate why some species are cryosensitive and how cryopreservation protocols can be improved for those species.

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**Keywords:** Cryopreservation, Cryoprotectant, DMSO, Liquid Nitrogen.