A Report on the
Periodical seminar on "Cryopreservation and its significance"
25 January, 2018
IFGTB, Coimbatore

A periodical seminar on "**Cryopreservation and its significance**" was held at the Institute of Forest Genetics and Tree Breeding, Coimbatore on 25th January, 2018. Dr. S. Murugesan, Director and Group Coordinator Research chaired the seminar and highlighted the significance of cryopreservation. Dr. R. Anandalakshmi, Scientist E, Seed technology Division of the institute presented the lecture. Scientists, officers and research staff including SRFs, JRFs, RAs and FAs of the Institute participated in the seminar.

Plant genetic resources are among the most essential world's natural resources and these resources are lost at alarming rate due to various anthropogenic threats and other threats such as climate change, pollution, genetic erosion and population growth. Plant Genetic Resources are the foundation of breeding programme. To ensure source material for future breeding and other uses is a challenge for plant geneticists and breeders. One of the main strategies behind germplasm conservation is to maintain the biological integrity and provide germplasms with validated phenotypic and genetic descriptions. Hence efforts on collection and conservation of germplasm have been practiced. A complimentary application of *in situ* (on site) in the wild or on the farm, or *ex situ* (off-site) in a gene bank outside the plant's natural habitat are the techniques recommended for their effective conservation. *Ex situ* gene bank includes Field gene bank, cryo gene bank, seed gene bank and *in vitro* gene bank .Without *ex situ* conservation it is to use the genetic material in breeding. *Ex situ* conservation in the form of cryopreservation is a viable option for storage of plant cells, tissues, shoot tips, seed and embryos. Over the past 40 years scientists have developed and tested a range of cryopreservation techniques for preserving plant cells and tissues, and thus significant progress has been made in routine storage of plant germplasm and recalcitrant species which are under threat of extinction.

Gene Bank: There are about 1,750 individual gene banks around the world that collect, store, regenerate and distribute crop varieties. National Bureau of Plant Genetic Resources (NBPGR) is one such gene bank available in India. Gene banks are represented as *in vivo* and *in vitro* gene banks. Banks in which genetic resources are preserved by conventional methods, for example, seeds, vegetative propagules, etc., are called *in vivo* gene banks, whereas banks in which the genetic resources are preserved by nonconventional methods such as cell and tissue culture methods are called *in vitro* gene banks. Both these ensure the availability of valuable germplasms to a breeder to develop new and improved varieties. Field gene banks are not very secure, but very expensive and require more space. Hence *in vitro* storage method (short- to medium-term ie.1–15 years) is administered for the conservation of forest trees. Tissue culture is considered for rare endangered species where seed availability is less and for species like bamboo which flowers and produce seeds once in 40-50 years and those seeds are viable for short period only. This technique is time consuming and labour intensive. Hence, plant breeders

and scientists advocated a strategy for long-term storage of seed that is the most popular and economical means of germplasm conservation. Long term storage is not always feasible because under natural conditions the seeds of many tree species lose their viability in a short span of time and are recalcitrant to storage due to decline in moisture content and temperature and some species do not produce viable seeds for several years. Orthodox seeds can be stored for long periods whereas recalcitrant seeds are sensible to desiccation, long storage causes shift in metabolism and also change in temperature changes its viability and a significant number of forest species do not produce orthodox seeds and storage of the recalcitrant seed germplasm is, therefore, difficult. In such case cryopreservation is an alternate useful method for long-term storage of germplasm. It is cost effective, reduces the risk of loss due to diseases, disasters etc and can offer selected genetic material for improved breeding in the future.

Cryopreservation: Cryopreservation is a method used for long-term storage of germplasm at ultra-low temperatures by freezing and storing material below −80°C, typically at or near the temperature of liquid nitrogen (−196°C) whereby all metabolic activities and biological functions are suspended /preserved. It is a cost effective option that allows for long-term storage, reduces the risk of loss, requires limited space and minimal maintenance, but does not allow for continued genetic adaptation. Cryopreservation includes freezing, storage, thawing and growth recovery and the process is to replace water in the cells with other compounds which will not crystallize. During 1990s a set of new, vitrification-based protocols became available and latter a new technique termed encapsulation dehydration was developed for cryopreservation. Cryopreservation techniques developed are encapsulation dehydration, vitrification, encapsulation-vitrification, droplet vitrification and vacuum infiltration vitrification. The key for successful cryopreservation is dehydration tolerance and orthodox seeds respond well than others. Salient utility of cryopreservation is that it is used to preserve cell culture, cell suspensions, pollens, meristematic tissues, rust free callus, pest and disease free cell lines and reproductive cells.

Application: Scope for research on forest seeds and genetic material conservation through cryopreservation is very high. Challenges on these lines are less attempted in our country which is one of the mega biodiversity nations. Hence, various research outcomes like hybrids, RET seeds, pollens used for breeding programmes need investigation to use cryopreservation technique for conservation.


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