
Session B: Cell, tissue and organ culture, cryopreservation and endophytes



BPL 1: Cell, tissue and organ culture, cryopreservation, endophytes in relation to medicinal and aromatic plants

Satir Singh Gosal

School of Agricultural Biotechnology, Punjab Agricultural University, Ludhiana-141004, India,
email: ssgosal@rediffmail.com

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Abstract

Plant cell, tissue, organ and protoplast culture methods offer a rich scope for creation, conservation and utilization of genetic variability for the improvement and production of elite planting material of medicinal and aromatic plants. Besides, tissue culture techniques are now increasingly being used for the production of bioactive compounds in vitro. Micro propagation ensures true to type, rapid and large scale multiplication under disease free conditions. In the absence of seasonal constraints, 10-30 cycles, depending upon the plant species, can be completed in one year, ensuring 5-50 times multiplication per cycle.

We have developed micro propagation systems for *Mentha* spp., *Aloe vera*, *Chlorophytum borivillanum*, *Stevia rebaudiana*, *Azadirachta indica*, *Bacopa monnieri* and *Capsicum annum*. Meristem (0.2 - 0.4 mm) culturing, followed by disease indexing and micro propagation ensures disease free planting material that is otherwise difficult to obtain in the vegetatively propagated plant species. We have exploited this method for rejuvenation and large scale multiplication of three commercial mint varieties belonging to *Mentha piperita*, *M. spicata* and *M. cardiaca*. Biotization with endophytic fungus, *Piriformospora indica* and bacteria *Pseudomonas fluorescens*, improved survival rate, nutrient acquisition, field performance and saponin content of micro propagated *Chlorophytum borivillanum*. Biotization of micro propagated *Aloe vera* plantlets with *Piriformospora indica* and *Pseudomonas fluorescens* improved the plantlet survival rate in the field. We developed a cell line of *Capsicum annum* that produced 7 times more capsaicin in cell suspension cultures.

Somaclonal variation is a potent emerging aspect for broadening the genetic base and thus obtaining incremental improvement in the commercial cultivars, more particularly, in the vegetatively propagated species. Production of haploids is being exploited for the early release of varieties. Embryo culture is the practical approach to obtain inter specific and inter generic hybrids among otherwise hard to cross parents. Somatic cell hybridization involving fusion of protoplasts from different species is considered an important approach to combine characteristics even from otherwise sexually incompatible species and to obtain cybrids (cytoplasmic hybrids) and organelle recombination not possible through conventional methods.

Tissue culture helps in international exchange of germplasm avoiding the risk of spreading pathogens and insects. In vitro freeze-storage and cryopreservation are very important techniques for germplasm conservation especially of the vegetatively propagated species. The role of endophytes in relation to micro propagated plants will be discussed.