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Conservation of Endangered Medicinal Plants: Challenges and Options

PE Rajasekharan, S Ganeshan and Sunitha Bhaskaran

Division of Plant Genetic Resources, Indian Institute of Horticultural Research, Hessaraghatta Lake PO, Bangalore-560089, Karnataka

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India has about 8000 species of known medicinal plants. Using the current global rates of species extinction around 10 to 12% of the plants *i.e.*, around 800–1000 species are likely to be threatened. For developing conservation strategies it is essential to study their extent of occurrence (geographic range, endemism), assess their degree of threat based on International Union for the Conservation of Nature (IUCN) categories *viz.*- vulnerable, endangered, critically endangered *etc.*, harvesting practices, habitat specificity and growth forms (Mali and Ved, 1999). More of shrubs and less of herbs, which is expected from a random distribution among natural flora, appear to be among the rare/endangered (RE) group (Lokesha and Vasudeva, 1997). This suggests that shrubs have a higher risk of becoming endangered than herbs. Data on mode of dispersal suggest that a greater fraction of species that disperse their propagules through biotic agents than through wind, water or by passive means are likely to become RE. It may be important to use these syndromes as indications to identify the RE species and concentrate conservation efforts on these species. As a concept, rarity is a phenomenon in time as well as space (Harper, 1986).

Criteria used to assess the threat status of plant species as the class of rarity vary. Correct definition is important for formulating conservation policies especially for countries like India with 11% of world's floral diversity.

Plant tissue culture techniques are now being used globally for the multiplication of medicinally important plant species and monitoring of their secondary metabolites. The application of micropropagation techniques for medicinal plants gives many benefits to the breeders as it enables to increase the rate of rapid multiplication of plants which in a particular climate do not provide seeds or where seeds have low germination, the availability of plants throughout the year, producing uniform clones from highly heterozygous plants, production of plants with changed genotypes, conservation of genetic resources of species and threatened plant and improvement by regeneration technique (Srivastava and Pande, 1998). Successful *in vitro* regeneration of medicinal plants could be made possible with varied explants such as leaf and stem segments, shoot buds, hypocotyls, cotyledons, roots, and seedlings.

Micropropagation holds promise as a major component in medicinal plant breeding. Its benefits derive from *in vitro* culture and multiplication of axenic shoots excluding callus formation and association problems (Constabel, 1990). Axenic shoot (tip) cultures can be employed not only for multiplication, but also for storage.

Development of efficient plant regeneration protocols for threatened plants of medicinal and aromatic value is a recent phenomenon. The methods for the micropropagation include stimulation of axillary bud, proliferation from shoot tip and nodal explants, induction of somatic embryogenesis using explants.

Plant materials were collected from the Western Ghats of Kerala and Karnataka and relocated in the *ex situ* conditions in Bangalore for the establishment of Field Gene Bank (FGB).

Shoot tips and single nodal cuttings of *ex situ* established plants were taken and surface sterilized using 0.1% $HgCl_2$ for 5 min in *Rauvolfia* and *Tylophora*, 7 min in *Aristolochia*, *Curculigo* and *Gloriosa* and for 10 min in *Kaempferia*. Inoculations were done in MS medium (Table 1).

Rooted shoots were taken out, washed and transferred to polybags containing soilrite and kept in a hardening chamber for four week. After this the plants were ready for planting in the field. Cultures were transferred to 10°C or 15°C with dim light for storage studies.

Thus, protocols were optimized for micropropagation of above mentioned threatened species of medicinal importance. Species response to *in vitro* culture was varied. In all cases, MS medium gave good response. The micropropagated plants were successfully planted out in pots with over 90% survival. Once the protocols for propagation are optimized *in vitro* raised conservation also attempted by shifting the *in vitro* plants to low temperatures like 10°C or 15°C with low light. Most of the *in vitro* plants survived the low temperature treatment.

Table 1. *In vitro* multiplication of different threatened medicinal plant species

Species	Medium	No. of weeks for first response	No. of shoots in 3 months	Rooting	No. of months for in vitro plant
A. tagala	½ MS, MS	2 weeks	2–5	Simultaneous	1 month
Curculigo orchiodes	½ MS MS ½ MS+ 5 mg/IBAP WPM WPM	15 days	3.5 5 3 3 3-5	Simultaneous	1 month
Gloriosa superba	MS	1.5 months	3	Simultaneous	1.5 month
Kaempferia galanga	½ MS + 8.87 µM BAP	4 weeks	10	Simultaneous	2 months
Rauvolfia serpentina	½ MS+ 8.87 µM BAP +0.54 µM NAA	3 weeks	10	Simultaneous with shoot regeneration	3 months
Tylophora indica	½ MS+ 4.44 µM NAA BAP ++ 0.54 µM NAA	2 weeks	7	Simultaneous with shooting regeneration	1 month

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