Importance of Tissue Culture Techniques in Sustainablity of Endangerd plant Species

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Abstract

Tissue culture techniques have profound importance in mass propagation of various commercial crops in practice as in well known fruit tree rootstocks, a few vegetable and especially ornamental plants as well as some undomesticated plant species. Herbaceous species are somewhat easier to propagate compared to woody ones by tissue culture techniques. These techniques have not affectively applied to native plant species due to economical concerns although so many native plant species have been under threat and therefore they have been facing with extinction in all over the world. Human interferences is the main cause of the extinction of wild species especially in highly populated areas as it is the case in Marmara, Aegean and Coastal Mediterranean regions of Turkey because of new settlements, infrastructural works, overgrazing and uncontrolled collections. Thus, a big number of wild plant species are disappearing every year. Tissue culture techniques have merit value to propagate the endangered wild plant species to release the encountering pressure on these plants

Keywords: Tissue culture, endangered species, sustainability

1.What is an endangered plants

An endangered species is a population of organisms (animals or plants) which is at risk of becoming extinct because it is either few in numbers or threatened by changing environmental or predation parameters. The International Union for Conservation of Nature (IUCN) has calculated the percentage of endangered species.

Many nations have laws offering protection to conservation reliant species: for example, forbidding hunting, restricting land development or creating preserves.

In spite of the conservation activities, the threat is a real universal problem. About 9,322 plant species are under threats in the world. Unfortunately, the problem is getting bigger in every next year. The U.S.A is a world leader in endangered plants. The Turkish Flora has a similar problem. The threats facing the Turkish flora are diverse and fall into no fewer than 25 categories, ranging from agricultural reclamation, intensive forestry and industrial/urban development's (which often affect sites to a large and highly damaging extent), to less obvious threats such as the collection of species for trade and the spread of invasive alien plant species into environment. Conservation of the endangered species will require a range of approaches to be taken from improved legislation to on-the-ground site management (Özhatay et al., 2005). Due to uncontrolled collection, mainly in herbaceous plants including aromatic and medicinal plants have been facing with threat for years. Unfortunately, there is no official status for these plants yet. The wild plant collectors and traders are getting the advantage of gaps of the status and legislations for uncontrolled wild collections mainly on Western Taurus Mountains. Some of these plants are heavily under threat. Beside flowering geophytes (Galanthus elwesii, Anemone blanda, Eranthis hyemalis, Cyclamen spp. and Stenbergia candida), a list of top ten of these aromatic and medicinal plants are given in Table 1(Özhatay et al., 1997).

Table 1: A List of Ten Aromatic and Medicinal Plants Which are Under Threat

Scientific Name	Family	English Name	IUCN Categories
1. Acorus calamus	Araceae	Sweet flag	Endangered (ED)
2.Ankyropetalum gypsophylloides	Caryophyllaceae	Siirt gypsum	Data deficient (DD)
3. Ballota cristata	Labiatae	Foetid, horehound	Rare (R)
4.Barlia robertiana	Orchidaceae	Orchis, salep	Endangered
5.Gentiana lutea	Gentianaceae	Gentian, bitter root	Endangered
6.Gypsophiyla arrostii var. nebulosa	Caryophyllaceae	Arrost's baby's-root	Rare
7.Lycopodium annotinum	Lycopodiaceae	Wolf's claw	Data deficient
8.Origanum minutiflorum	Labiatae	Marjorum	Rare

9. Paeonia mascula	Paeoniaceae	Peony	Rare
10. Ruscus aculeatus	Liliaceae	Butcher's broom	Vulnerable (VU)

*Özhatay et al., 1997.

DD-Data deficient: A taxa is DD when there is inadequate information about its distribution and/or population status.

ED-Endangered: A taxa is ED when it is not critically endangered but is facing a very high risk of extinction in the wild in the near future.

VU- Vulnerable: A taxa is VU when it is not critically endangered but it is facing a high risk of extinction in the wild in the medium-term future.

R-Rare: A taxa is R when it is small world populations that is not at present endangered or vulnerable but it is at risk.

2. Tissue Culture

Tissue culture (micro propagation) involves the production of plants from very small plant parts, organs, tissues and cells under aseptic conditions in test tubes or various other containers. The environmental conditions and special media either semi solid or suspension which contain inorganic nutrients as well as phytohormones, vitamins, carbohydrates and some others depends on the plant species and cultivars (Murashige and Skoog, 1962). The environmental conditions and light regimes are strictly controlled throughout the cultural activities. The ability to grow plant tissue and various plant organs such as stems, flowers, roots, embryos, and side products in university and research institutes laboratories and also in commercial laboratories has been in effect for many years. Tissue culture is a general term which has been universally accepted for micro propagation of the plants in even though it has specific uses. The application of tissue culture techniques to the regeneration and commercial propagation of a good number of economical plants has been widely used in many countries. Therefore, the tissue culture practices became good alternative for conventional propagation methods for a wide range of important plant species (Babaoğlu et al., 2004; Baktır et al., 2003). Tissue culture systems have two primary uses beside many secondary ones

1) Rapid mass propagation of clones and

2) Development, maintenance and distribution of specific pathogen tested clones especially virus free ones

Some of the secondary uses of tissue culture systems are;

1) Propagation of the difficult to root species and cultivars

2) Easiness of selecting promising individuals

3) Various applications in plant breeding

4) Preserving endangered species in stock houses

5) Very practical and useful techniques for gene banks

6) Producing side (secondary) products such as pharmaceuticals' in cell suspension systems and so forth.

Tissue culture works are a kind of long chain works with a few important steps as shown in Figure 1.

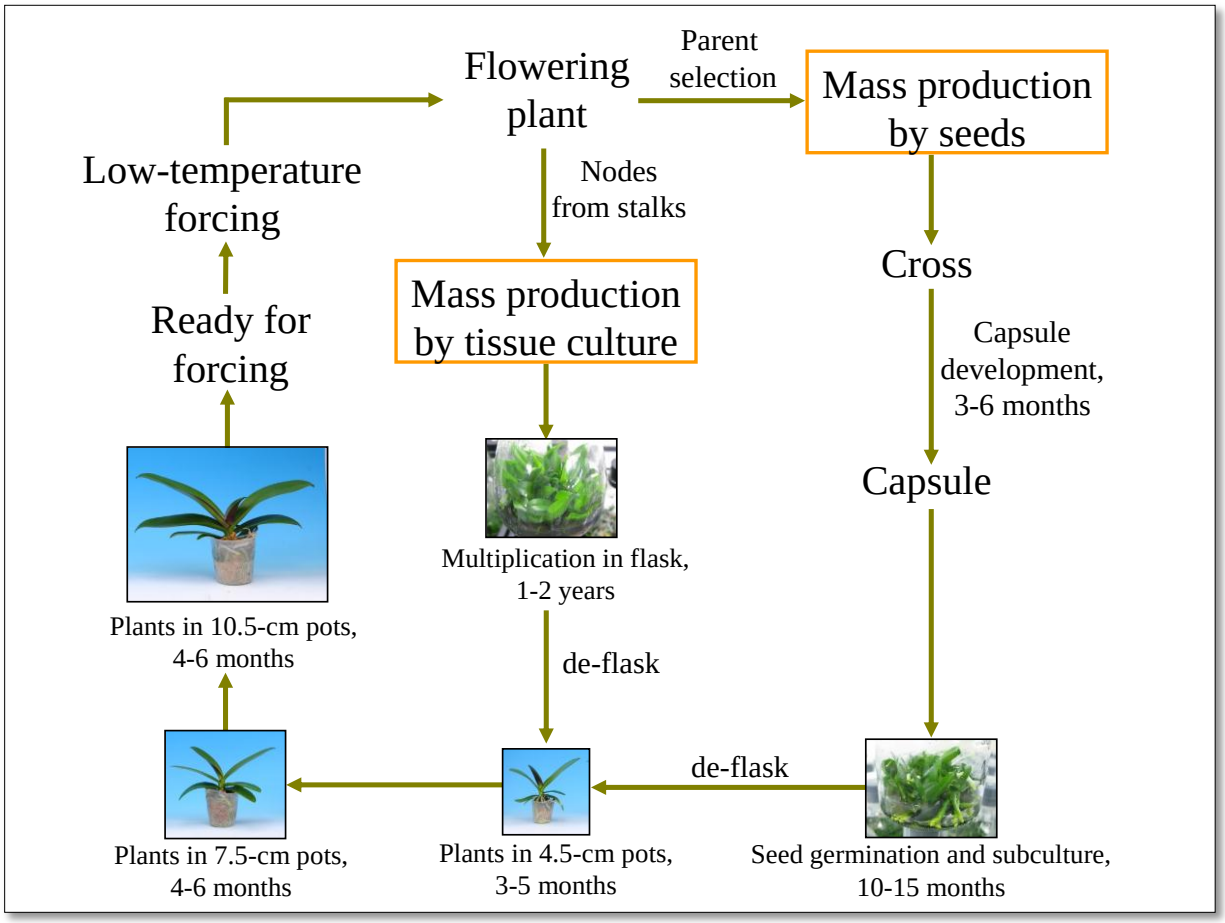

Fig. 1: A detailed schema of tissue culture practices step by step(Chang, 2012)

Tissue culture techniques can be easily used for rapid and mass propagation of endangered plant species in order to release the present pressure and also sustainable uses of them.

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