

## Micropropagation (of Orchids)

Micropropagation is the process used to replicate plants such as orchids, the word Micropropagation means simply propagation in miniature. It is done under sterile conditions in a laboratory using plant seed or tissue.

With Orchids it is the only way to reproduce the plants as naturally Orchids are mutually beneficial with a type of fungi. This symbiotic association means that the orchid uses the fungi to aid seed germination and to supply energy; it does this as the Orchid itself has no internal food supplies known as endosperm.



A flowering *Prosthechea cochleata*

The process of Micropropagation does not use this fungus and so is asymbiotic. The process is very useful as it produces many seeds from a single seed pod. In the case of orchids the plant is grown on a media known as agar, this gives the plant the right nutrients until it is ready to be planted out. The problem with using agar however is that bacteria and fungi grow extremely well and rapidly on it. This means that the Micropropagation of the orchids is done in sterile conditions as to avoid any contamination from microbes.

To sterilise all the equipment needed a number of things have to be done. The micropropagation is done a laminar air flow, a work space that has a special air flow system that removes any dust or microbes from the air. The jars of media in which the orchids are grown are also sterilised before hand, using a pressure cooker. A pressure cooker uses high pressure to heat up and kill any infective agents; the same process is applied to any other equipment such as tweezers that may also be needed in propagation. The work surface is also sterilized using bleach or ethanol. The person undertaking the task must also be wearing latex gloves, which are rinsed in bleach before beginning.

Replating is the transferring of an Orchid plant, this is needed when the plant grows in size and therefore needs more space. The plant is split up and placed in new agar giving it more room to grow and also providing a higher number of plants, replating is also needed if the agar has been used up by the plant.

Replating is a form of micropropagation and so is done in the *aseptic*<sub>1</sub> conditions mentioned earlier. An orchid plant will be on average replated 5-6 times before being planted out.

Another form of micropropagation is seed sowing which is the first step in the development of an orchid plant. The seed pod of an orchid contains hundreds and thousands of seeds. These seeds are collected and kept in cool conditions until they are sown. Before sowing the seed must be checked to see how fertile or viable it is, as it is no good sowing seed that won't germinate. The viability is checked using a microscope, looking at individual seeds to determine if the seed contains an embryo. If a high proportion does contain embryos, then seed sowing can be undertaken.



Seed sowing under sterile conditions within the lab

As the process is done in aseptic conditions the seed must also be sterilised to remove any unwanted outside agents. This is done using a syringe and bleach. The seed and bleach are mixed together in a syringe and shaken, as to make sure every seed is sterilised. The bleach is then removed and the seed rinsed in sterile water within the syringe, the seed is then injected onto the agar. This however is only one method for seed sowing with there being many methods all with advantages and disadvantages.

The cultivation and propagation of orchids is an extremely useful way of conserving endangered or extinct plants. Samples of seed are taken from the endangered plant and are sown *in vitro*<sub>2</sub> in a micropropagation lab, they are then cultivated and re plated. Then, once the orchid has reached a certain size it is reintroduced into its original habitat. However, this is only one aspect of the conservation of orchids, many other aspects have to be addressed in order to successfully reintroduce and conserve a species. People in the surrounding area have to be educated on preserving the plant and importantly micropropagation techniques must also be taught and funded as to continue the *in vitro* cultivation of the plant.

An example of the conservation of orchids can be seen on the volcanic island of Montserrat, where an orchid species known as *Epidendrum montserratense* which is *endemic*<sub>3</sub> to Montserrat was red listed, meaning it was critically endangered. The Royal Botanic Gardens at Kew took samples of the orchid seed and took them back to the *Millennium Seed Bank*<sub>4</sub> where seeds can be stored and reserved. A sample was also propagated in the labs at Kew and is being cultivated as to reintroduce the species.



The flowers of *Epidendrum montserratense*

There are however, disadvantages of using micropropagation, the cost, for example is extremely high and so for many plants that can germinate easily *in vivo*, propagating *in vitro* is not economically viable. But, because Orchids are symbiotic and are very difficult to germinate *in vivo*, micropropagation is the best option for producing orchids. Genetically reproducing plants *in vitro* can cause the plants to become less resistant to diseases and infections.

The cultivation and growing of orchids and other plants *in vitro* is an extremely important asset to the conservation and preservation of plants, especially those that are endangered or at risk of extinction.

### John O'Rourke

*Aseptic*<sub>1</sub> – Sterile conditions, therefore without contamination.

*In vitro*<sub>2</sub> – In glass, or grown out of an organism. Opposite of *In vivo* (in a living organism)

*Endemic*<sub>3</sub> – Native to or Belonging to a certain area or country

*Millennium Seed Bank*<sub>4</sub> – A project associated with the Royal Botanic Gardens, it stores seeds in large frozen underground vaults. To date it has 10% of the world's wild plant species.