The role of tissue culture in plant genetic resources

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Introduction

Until recently many species of plants could only be conserved in field genebanks where the material is maintained in the vegetative state. Some of these vegetatively produced plants, such as banana (Musa sp.) and sweet potato (Ipomoea batatas), seldom produce viable seeds while others, such as potato (Solanum tuberosum) and cassava (Manihot esculenta), are outcrossing and produce variable seed. The seeds of some other species, for instance mango (Mangifera indica) and avocado (Persea americana), are physiologically damaged by drying and therefore can not be stored for long periods.

Plants conserved in field genebanks require space and management and are at the mercy of climatic conditions, pests and diseases.

Recent advances in tissue culture techniques have provided the means to conserve many of these plants in a protected environment while using minimal space.

In vitro culture

Any cell of a given plant is totipotent. That means that any plant cell has the genetic make-up to develop into a new plant given the right conditions.

In tissue culture, this totipotency is used by keeping alive and growing a few cells, taken from a plant, on different culture media which usually consist of an agar base with a mixture of nutrients needed for growth of these cells. The group of cells forms a callus (undifferentiated tissue) which can be kept in this form or can be stimulated to form roots and/or shoots by altering the concentrations of growth regulators such as auxins and cytokinins.

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**Tissue culture project**

According to surveys done some years ago, certain areas in the southern and western parts of Namibia, are well suited for the production of dates. Dates, like potatoes, produce variable seeds and on average, only 20% of seeds taken from a good mother plant, will grow to be a profitable producer. The potential of seed-grown trees can only be assessed once they start bearing fruit which will take at least five years.

By using tissue culture, cells of a high yielding plants with good fruit qualities can be used to produce young plants with the same genetic make-up as the mother plant. These young plants will grow up to have the same yielding capacity as the mother plant.

Several commercial laboratories in Europe already use tissue culture to propagate date trees for the market. Buying and importing these trees is, however, very costly and after a feasibility study it was decided to have a laboratory built in Namibia with the facilities to do *in vitro* work.

The Windhoek Tissue Culture Centre is currently under construction and should reach completion by the end of February 1992. The building is divided into two sections. The first section consists of the tissue culture laboratory with additional laminar flow room, wash room and two culture rooms. The other section of the building will house the national genebank and consists of a laboratory, a room for the freezers, threshing room and a documentation office.

Although it was only by chance that the need for a genebank arose when the tissue culture laboratory was in the planning phase, and was subsequently included, it would seem appropriate that the two sections are housed in the same building.

View of the completed building housing the Tissue Culture Unit and the Genebank.
Different views of the building site during construction of the Tissue Culture Unit and the Genebank.