

A new tool for plant breeders

Quick-freezing plant cell cultures

At NRC's Prairie Regional Laboratory, a new method of quick-freezing plant material has been developed. Because techniques for regenerating entire plants from cell material have already been worked out for many species, this innovation may solve a pressing problem for plant geneticists: how to safely preserve genetic variety in plants.

For the Canadian "green thumb", amateur gardening brings many joys and occasional sorrows as prized tomatoes develop mysterious diseases and wilt, or potatoes fall prey to armies of bugs. Ordinarily, not much more than the gardener's pride is hurt if his pampered plants succumb to disease or poor weather conditions, but in other parts of the world, crop failure can mean famine and starvation for millions of people.

At NRC's Prairie Regional Laboratory in Saskatoon, Saskatchewan, some far-reaching research projects are aimed at counteracting the effects of plant disease in Canada and the developing countries, in cooperation with the International Development Research Centre. A recent development, actively explored by PRL's Dr. Kutty Kartha, shows considerable promise towards solving some of the problems experienced by plant breeders as they attempt to improve important food crops such as cassava and members of the pea family.

Dr. Kartha and his colleagues have pieced together experimental clues in cell culture that now allow them to preserve plant genetic material in frozen form, alive and retaining the potential of producing full-grown plants when needed.

The new freeze preservation technique is an offshoot of a plant reproduction technique called "meristem" culture. Explains Dr. Kartha: "The extreme tip of a growing plant contains a group of active, growing cells called the meristem. These so-called "undifferentiated" cells divide and ultimately differentiate into leaves, branches and flowers according to the growth phase of the plant. If these cells are isolated under the microscope in aseptic con-

ditions and cultured in a growth medium containing the appropriate nutrients (minerals, vitamins and hormones), they will grow into an exact replica or clone of the mother plant. More important, meristem cells are mostly disease-free. The cloned plant will therefore be healthy even if the mother plant carries infection."

If techniques could be developed to store these meristem cells in frozen form, to be thawed out for growth into

plants as needed, one of the principal difficulties of plant breeding would disappear.

Currently, plant breeding stations devoted to the improvement of plants such as the field pea, must maintain a large collection of individual plants representing the thousands of strains and varieties whose genes might some day be needed to create a new pea variety. Until Kartha's work, the only practical method of preserving them



Thanks to work at PRL, ampules containing cultures of live plant cells can now be stored for several months in liquid nitrogen at temperatures as low as -196°C . Thawed under carefully controlled conditions, these cultures can be induced to grow, forming tops (left), then roots, and eventually normal whole plants (right). The field peas shown were obtained from cultures kept for seven months in liquid nitrogen.

Kutty Kartha, NRC/CNRC