MUTAGENESIS

EDITION OF SBW INTERNATIONAL BV

IN THIS FLYER

Breeding and Mutagenesis

Breeding of plants takes place through crossing (hybridisation) and selection. The majority of new varieties is achieved using thismethod. Sometimes mutants are found in existing varieties whichare in fact worth marketing as separate varieties. These mutants are generally very interesting because they appear to be the same as the varieties from which they originate, apart from one aspect such as a divergent colour flower. This offers the breeder the possibility of marketing a broad assortment from one specific variety.

Breeders often do not want to wait until these mutants reveal themselves spontaneously. The breeder will look to mutation breeding: intentionally introducing mutants by using mutagenic irradiation. In some cases chemcials such as EMS will be used to force the mutation. Mutagenesis involves introducing variation in a random manner into an existing variety.

The majority of the variants acquired will not be useable, just as with the normal hybridisation breeding, but there are often a few interesting variants which can be selected for further analysis.

Mutagenesis via tissue culture

There are a number of reasons why the combination of mutagenesis with tissue culture can be advantageous;

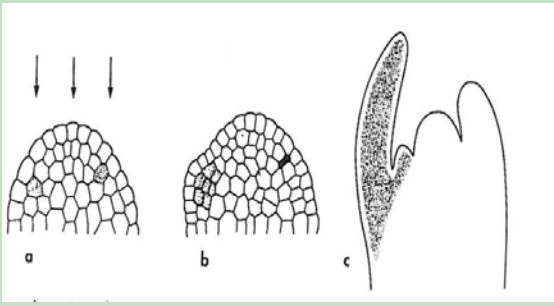
a. Tissue-culture plants are generally very small making it easier to treat a lot of material.
b. Propagation via tissue culture is fast and not dependent on seasons. Therefore, the preparation of plant material for mutagenesis treatment, propagation or regeneration of plants can take place quickly and all year round.
c. Tissue culture takes place in special conditioned areas making the whole process easier to control and measure.
d. Tissue culture takes place in well equipped laboratories, ensuring the safe use of chemicals required for mutagenesis.

The prerequisite is that there is already a procedure for propagation in tissue culture for each crop concerned.

Flowering tests

Procedure

In general, well-established parts of the plants will be treated with mutagenic irradiation or chemicals. This treatment will cause damage to the cells DNA. Because this occurs entirely at random, the scale of damage will differ in each cell. Further, the DNA repair mechanism within the cell will restore some of the damage so not all damage will result in a real change in the DNA sequence. In the treated part of the plants each cell might have a different DNA sequence due to the damage and repair process of the DNA. Whether or not this damage will result in notable characteristics can only be judged when a plant has been grown from one of these cells.
See the the schematic diagram of the meristem



The arched cells are mutated by radiation. The right cell dies off, the left cell grows out. This results in a chimera that will produce a fully mutated plant from its ovules in the one of the next propagation phases. This is one of the reaons why the plants will be propagated 3 times. Another reason is that the change in DNA will stabilise due to propagation. A significant population of plants will need to be delivered so that there is an accurate representation of the induced variation and to increase the possibility of selecting an useable mutant.

Spontaneous mutations

If a plant which has a spontaneous mutation appears in a crop, then it is known as a chimera. For example, the colour of the flower has mutated, where a portion of the leaf also has another colour. If the portion of the plant that has mutated is too small to take a cutting, it is possible to take pieces from the mutant leaf introduce it in vitro and attempt to regenerate plantlets from the leaf explants Complete mutant plants can result.

Further

The method with the most perspective for your crop depends on the crop, the availability of material and of tissue culture techniques at SBW International. If you want to start mutagenesis, then the crop to be mutated must be introduced into tissue culture and propagated to 250 plants. In most cases the plants will be radiated with 4 different doses of gamma radiation. After this treatment the plants will be multiplied three times, and a maximum of 3000 plants will be produced. The success rate depends on the available tissue culture expertise at SBW International for the crop, and the reaction of the crop to the radiation.

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