Callus Induction

Comment

Explant tissues generally show distinct planes of cell division, various specializations of cells, and organization into specialized structures such as the vascular system. Callus formation from explant tissue involves the development of progressively more random planes of cell division, less frequent specialization of cells and loss of organized structures. Consequently, callus is defined as a mass of undifferentiated cells. It is naturally formed on plants in response to wounding. Auxins like 2,4-D have strong effect on initiation of cell division in tissue culture. Callus growth passes five phases:

- Lag phase: Explant cells prepare to divide.
- Exponential phase: The rate of cell division reaches its maximum.
- Linear phase: Cell division slows but rate of cell expansion increases.
- Deceleration phase: Rate of cell division and elongation decrease.
- Stationary phase: Number and size of cells remain constant.

Shoot and root regeneration

Comment

Organogenesis is the ability of plant tissue to form various organs de novo. Organogenesis is divided into three phases: dedifferentiation, induction and differentiation.

- Dedifferentiation involves the reversion to a less committed, more flexible developmental state that may or may not give rise to callus tissue. At the end of this phase, cells acquire a state of competence which is defined by the ability to respond to organogenic stimuli.
- The induction phase is characterized with a cell or group of cells become fully committed to the production of shoot or root.
- At differentiation phase, morphological differentiation and development of the nascent organ begins. It is worth to mention that cytological studies showed that regenerated organs are multicellular in origin.

Auxin : cytokinin ratio regulates morphogenesis in callus:

High ratio promotes root formation,

low ratio promotes shoot formation

while intermediate ratio makes the callus to remain growing as undifferentiated mass of cells.

Micropropagation

Comment

Micropropagation is defined as the true-to-type propagation of selected genotypes using in vitro culture techniques. It achieved through four basic methods: enhanced axillary shoot proliferation, node culture, de novo formation of adventitious shoots through organogenesis or somatic embryogenesis.

Currently, the most frequently used micropropagation method for commercial production utilizes enhanced axillary shoot proliferation from meristematic tissues that provide easy genetically stable method.

In this experiment, we used Shoot culture (shoot tip culture) to stimulation of terminal bud following elongation. Here, basal MS (no growth regulators was used for this purpose.

Shoot Multiplication

Comment

In this experiment, we used Shoot culture (shoot tip culture) to stimulate shoot bud following multiple cell divisions of the terminal bud to increase the number of shoots. Here, BA (4.5 mg/L) was used for this purpose. The presence of BA in multiplication medium promoted shoots formation.

Synthetic Seeds

Comment

A synthetic seed is often described as a novel analogue to true seed consisting of a somatic embryo surrounded (or not according to type) by an artificial coat (like media used in tissue culture solidified with alginate instead of agar) which is at most equivalent to an immature zygotic embryo, possibly at post-heart stage or early cotyledonary stage. Today synthetic seeds represent capsules with a gel envelope, which contain not only somatic embryos but also axillary and apical buds. These plant materials are encapsulated in protecting material (eg: hydrogel or alginate gel) and can be developed into a plant. The coating protects the explants from mechanical damage during handling and allows germination and conversion to occur without inducing undesirable variations. They behave like true seeds and sprout into seedlings under suitable conditions.