V. NEEHARIKA.

M.PHARM.Iyr.IIsem.

MEDICINAL PLANT - BIOTECHNOLOGY.

SOMATIC - EMBRYOGENESIS.

INTRODUCTION:

- Formation of embryo is known as “Embryogenesis”.

- Two types of Embryogenesis occurs in plants are Zygotic Embryogenesis and Somatic Embryogenesis.

ZYGOTIC EMBRYOGENESIS:

It is the process in which female gamete fuses with male gamete and form an unicellular zygote, which gives rise to a multicellular embryo.

SOMATIC EMBRYOGENESIS:

The development pathway of numerous well-organised, embryoids resembling to zygotic embryo from the embryogenic potential somatic plants cells of the callus tissue or cell suspension culture is known as somatic embryogenesis.

- Somatic embryogenesis mostly occurs indirectly via an intervening callus phase or directly from initial explant.
- Invitro somatic embryogenesis is an important prerequisite for the use of biotechnological tools for genetic improvement, as well as for mass propagation.

EMBRYOGENIC POTENTIAL:

The capacity of somatic plant cells to produce embryoids is known as embryogenic potential.

EMBRYOIDS:

It is a small, well organised structure comparable to the sexual embryo, which is produced in tissue culture of dividing embryogenic potential somatic cellls.

HISTORY.

- J. Reinert (1958-59) –

  Reported his first observation of in vitro somatic embryogenesis in *Daucus carota* (carrot).

- N.S. Rangaswami (1961) –

  Studied in detail the somatic embryogenesis in *Citrus sp*.

PRINCIPLE:

Somatic embryogenesis.

Direct embryogenesis.

Cells of explant undergo direct embryogenesis from proembryogenic determine cells in absence of callus proliferation.

Indirect embryogenesis.

Cells of explant first undergo callus proliferati on & embryoids develops within the callus tissue from induced embryo-geneic cells.

Indirect somatic embryogenesis under in vitro condition 2 types of media required –

- Initiation media containing auxin.
- Second media in which auxin is totally absence or present in very concentration, for development of embryoids.

The embryogeneic cells are characterised by dense cytoplasmic contents, large starch grains and a relatively large nucleus with a darkly stained nucleolus.

In the development of embryoid, each developing embryoids passes through three sequential stages –

- Globular stage,
- Heart stage,
- Torpedo stage, and cotyledonary stage.

FACTORS AFFECTING :

- Growth Regulators:

  Auxins.

  Cytokinin.

  ABA.

  Gibberelline.

- Reduced Nitrogens:

  In carrot culture, the addition of reduced nitrogen (ammonium chloride) produced more numbers of embryoids.

  Glutamic acid, glutamine, urea and alanine are found to partially replace ammonium chloride.

- Oxygen Concentration –

  Amount of dissolved oxygen in the medium should be below the critical level of 1.5mg/ltr to allow embryo development.

- Charcoal –

  It facilitated embryogenesis in several culture. It absorbs a wide variety of inhibitory substance as well as hormones.

SIGNIFICANCE:

- Production of artificial seeds are made experimentally by a technique where somatic embryoids derived from plant tissue culture are encapsulate by a hydrogel and such encapsulated embryoids behave like true seeds if grown in soil and can be used as substitute of natural seeds.

  The embryos coated with sodium alginate solution are dipped in calcium chloride solution to produce small gel beads each containing an encapsulated embryo.

  This artificial seeds can be maintained in a viable state in liquid nitrogen till they are planted.

- Somatic embryogenesis leads to production of adventitious embryo which develops directly into complete plantlet.
- Somatic embryo arise from single cell so it is special significance in mutagenic studies.
- Plant derived from this techniques may be free of viral and other pathogenic infection.

Disadvantages:

- High probability of mutation arising.
- This method is usually rather difficult.
- Induction of embryogenesis is often very difficult or impossible with many plant sps.

THANK YOU.