

## Basic concepts of Tissue Culture

Introduction :-

Plant tissue Culture :-

- Gottlieb Haberlandt was the first person to propose the concept of tissue culture and totipotency.
- He cultured the plant cells in vitro by using the plant "Lamium purpureum" in culture medium and obtained upto the callus proliferation and differentiation.
- He was the first to work on the tissue culture hence regarded as the father of tissue culture.
- In vitro is the term that we use in the Latin word which means With in Glass or In Test tubes.

The Basic Concepts are :-

- \* Totipotency
- \* Differentiation
- \* De differentiation
- \* Re differentiation
- \* Plasticity
- \* Competency

### Totipotency:-

- The ability of a cell to divide and re-divide to produce a complete plant under *In vitro* conditions is called totipotency.
- F.C. Steward from Cornell University in 1958 was the first one to demonstrate the capacity of totipotency and obtained the complete plant from the cambial cells of the *Daucus carota* (Carrot).
- The cellular totipotency is controlled by the various hormones, many features can be altered by the application of hormones at various intervals of time.

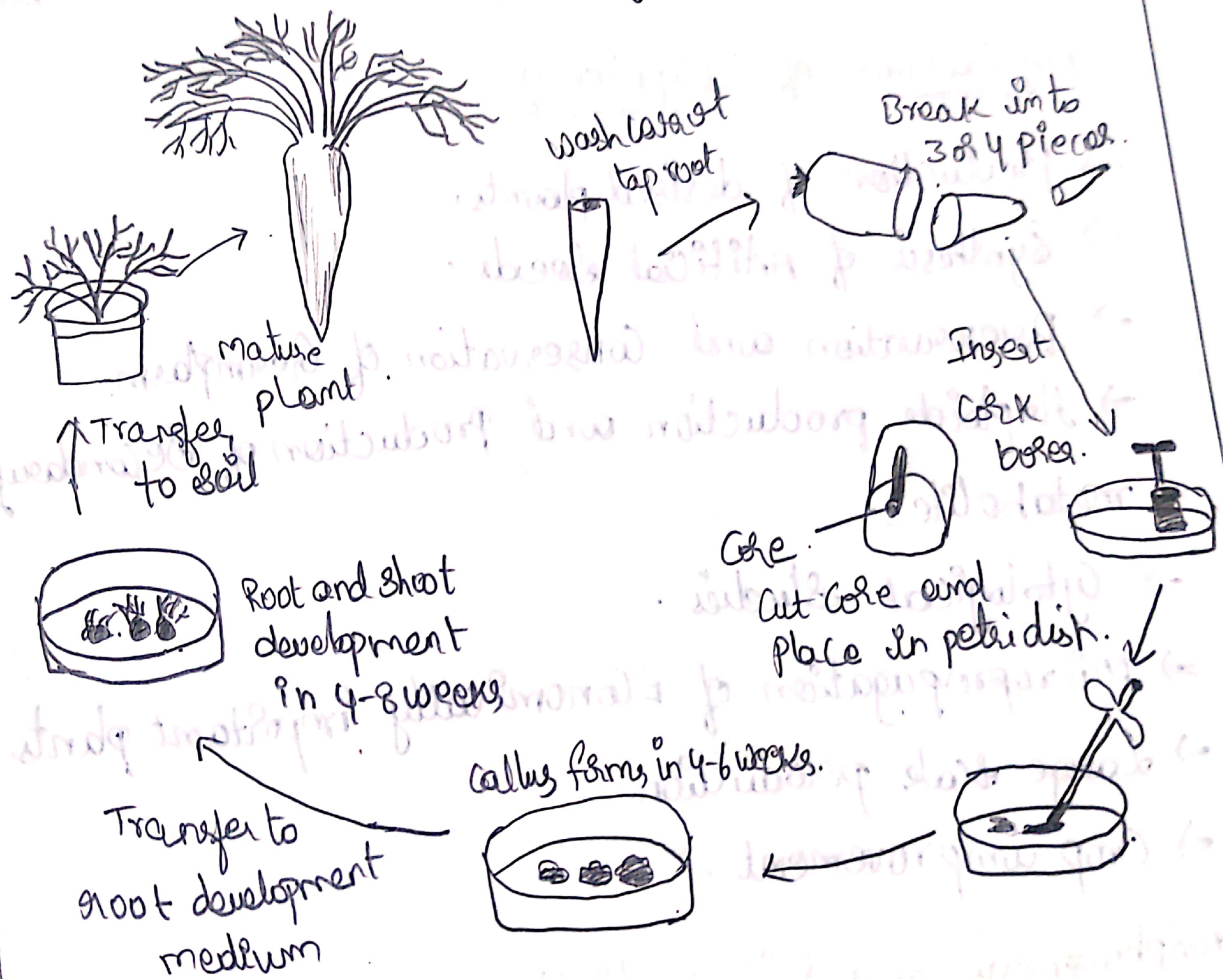
### Steward experiment :-

- Steward kept fully developed tissue of a carrot cambial cell in a flask containing liquid growth medium.
- He observed that when the individual cells are broke away from the fragments, they divide and developed multicellular roots.
- Steward immobilized the roots by placing them in a solid growth medium.
- The roots developed normally into entire mature plants.

⇒ Even in adult tissues the nucleus of individual plant cells are "Totipotent" i.e. Each Cell consists of a set of hereditary instructions and can generate an entire adult individual.

## Steward experiment on

### Totipotency



→ In contrast to animal cells, plant cells can de-differentiate into undifferentiated cells = embryonic cells and be induced into producing a entire organism by re-differentiating into specialized cells.

Cutting → callus induction (Dedifferentiation) → Redifferentiation → whole body

### Applications of Totipotency:

- ⇒ Production of desired plants.
- ⇒ Synthesis of Artificial seeds.
- ⇒ Preservation and Conservation of Germplasm.
- ⇒ Haploids production and production of secondary metabolites.
- ⇒ Cytological studies.
- ⇒ Micropropagation of Economically important plants.
- ⇒ Large scale production.
- ⇒ Crop improvement.