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CELLULAR TOTIPOTENCY

INTRODUCTION :— The technique of cloning of isolated single cell in vitro has recognised about somatic cells, under appropriate condition can differentiate to a whole plant. This capability of cell to grow & develop a multicellular higher organism is termed cellular totipotency.

Since the potentiality lies mainly in cellular differentiation are within individual cells & many of them that remain inactive in differentiated tissues or organs are able to express only under adequate culture condition.

Definition & Differentiation →

→ Development of an adult organism form a single cell (zygote) is the result of integration of cell division.

→ Isolated cells from differentiated tissue are generally non-dividing & quiescent to express totipotency.

→ The phenomenon of a mature cell reverting to a meristematic cell step & forming undifferentiated callus tissue is termed dedifferentiation.

Thus cell differentiation is the basic event of development in higher organism & reffered to as cyto differentiation.

→ In animal the differentiation is irreversible. This is in contrast to the plant, where even highly mature or differentiated cell have the ability to regress to a meristematic step as known they are viable.

→ Tissue culture technique after can excellent

opportunity to study factors responsible for differentiation of cells

There factor control cellular totipotency through cytological & Organogenic differentiation.

→ One of the efficient system for the study of cyto differentiation in vitro is xylogenesis

→ Xylogenesis is the differentiation of parenchymatous into cell that have localized secondary wall thickenings, as seen in the xylem of vascular plant.

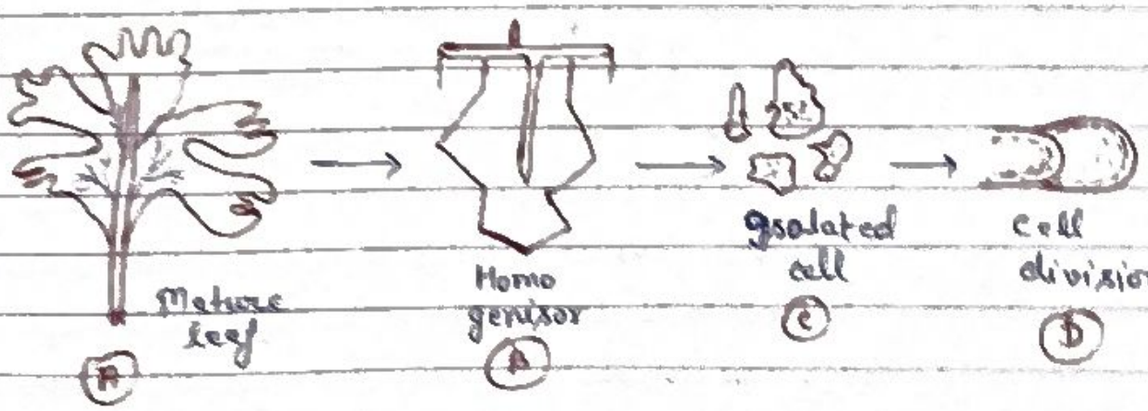
→ By the help of tracheary element of xylem we can understand the mechanism of differentiation in higher plant cells because —

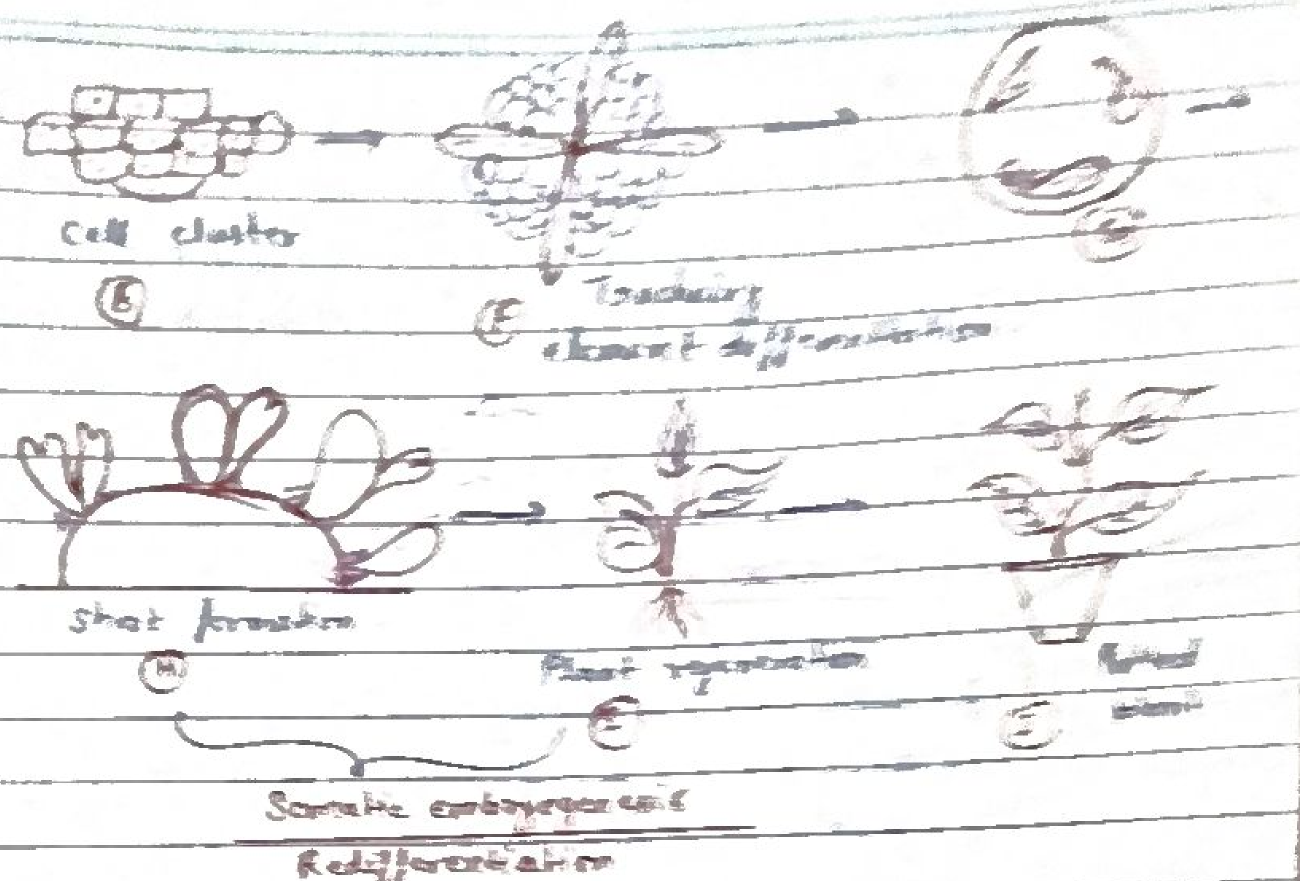
(i) The morphological characters of tracheary element is able us to distinguish differentiated cells from undifferentiated cells.

(ii) The formation of tracheary elements can be induced in tissue & cell culture of many species.

(iii) Specific biochemical events leading deposition of cell wall polysaccharides & lignin make it possible to trace marker protein associated with the process of cytodifferentiation.

(iv) Due to loss of nucleus the tracheary elements losses its capacity for redifferentiation.





Scheme showing redifferentiation in plant cell

Totipotency of epidermal cells :-

Development of embryoid from cultured single epidermal cells of Ranunculus sceleratus is the example of cellular totipotency. Other examples :- *Daucus carota*, carrot, *Nicotiana tabacum* (stem), *Begonia* leaves regenerate complete plants from single cell.

So the diff. betⁿ various cells & tissues of the plants is not due to differences in their genotype.

Totipotency in crown-gall cell → The crown gall system has been extensive used in plant genetic manipulation since regenerated normal plants have been found to be fertile.

These studies proves that temporary loss of totipotency can be restored in crown gall cell under in vitro condition (Yang, 1982).

Regeneration proves that there is no loss of genetic potentialities in various cells & they remain totipotent especially the least differentiated cells like parenchymatous (Steward).

Conclusion →

Thus we may conclude that normal cell during cells of the plant body retain the full genetic potential of the original zygote.