Tissue culture. The technique of developing new plants from cells and tissues is called plant tissue culture. The whole plant can be regenerated from any cell or any part of the plant. This capacity to generate a whole plant from any cell is called totipotency. The basic principle on which tissue culture is based is cellular totipotency. F.C. Stewart first experimentally demonstrated totipotency by obtaining carrot plant from

secondary phloem tissue. The term totipotency was coined by Morgan. The culture technique has three important aspects. Nutrient medium. Several nutrients containing inorganic salts, vitamins and sucrose, growth regulators like auxins, cytokinins, promote cell division and cell elongation. All the nutrients are added in distilled water. pH of the medium should be maintained at 5.8. Nutrient medium for providing support during culture of plant parts. The medium is solidified by addition of agar. The nutrient medium

without growth regulators is called basal medium. Basal medium is used for germinating seeds for simple callus cultures. The septic, to make the medium free from microorganisms it should be made a septic by sterilizing. Sterilization is carried out in a steam sterilizer called autoclave. Any part of the plant which is introduced into culture medium to grow into full-fledged plant in vitro is called X-plant. Examples are auxiliary bud, leaf, stems, root tips, shoe tips, anther, ovary, and endosperm, etc. The transfer of eggplants onto sterilized nutrient culture vessels is called inoculation.

Example, high auxin and low cytokinine induce root development from callus and is called rhizogenesis. Aeration. Sterilized air is pumped into the medium. A small tissue is placed in a suitable nutrient medium. The mass of undifferentiated cells, called callus. Each embryoid develops

ll plant called plantlets. It is possible to achieve propagation of large number of plants in short duration. This method of producing thousands of plants through tissue is called micro propagation. Each of these plants will be genetically identical to the original plants from which they are grown, that is, they are soma clones. Meristem culture. Though the plant is infected with virus, apical and auxillary is free of virus. Thus healthy plants can be recovered from diseased plants.

Example, mary stems of banana, sugarcane and potato etc. can be cultured. Somatic hybridization. Isolated protoplasts which are grown to form new plants. These hybrids are called somatic hybrids and the process is called somatic hybridization. Applications 1. Many plants are produced in short time.

2. Sex of the plants cannot be recognized prior to flowering. It is economically lost to cultivate male plants. To prevent loss, female plants can be produced by tissue culture. 3. By culturing meristematic tissue, disease-resistant plants with more vigor can be produced. 4. plants can be stored in culture, form, in large numbers and less space. flowchart of tissue culture, preparation of medium, plant, medium taken in test tubes, sterilization in autoclave. Explant, external sterilization.

Inoculation, under sterilized condition. Explant. Callus formation, embryoids, embryogenesis. Plantlets, transform to medium, containing growth regulation, Organogenesis, somatic,

Root shoot formation, Plantlets Artificial seed preparation Transform to medium containing growth substance Germination Plantlets

Summary:

- **Plant tissue culture** is a technique of developing new plants from **cells or tissues** using the principle of **totipotency**, which means a **single plant cell can develop into a whole plant**.
- **F.C. Stewart** first demonstrated totipotency in carrot plants, and the term was coined by **Morgan**.
- The **nutrient medium** is essential for plant growth and contains **inorganic salts, vitamins, sucrose, auxins, and cytokinins** to promote **cell division and elongation**.
- **Micropropagation** allows the production of **thousands of genetically identical plants** in a short time.
- **Meristem culture** helps produce **virus-free** plants.
- **Somatic hybridization** is the **fusion of protoplasts** to create **somatic hybrids**, leading to new plant varieties.
- The **tissue culture process** involves sterilization, **callus formation, embryogenesis, and plantlet development**.
-
-

Question 1:

What is **totipotency** in plant tissue culture?
A) The ability of a plant cell to photosynthesize
B) The ability of a single cell to regenerate into a whole plant ✅ (Correct)
C) The ability of plants to resist disease
D) The ability of plants to survive without water

Question 2:

Who first experimentally demonstrated **totipotency**?
A) Charles Darwin
B) Gregor Mendel
C) F.C. Stewart ✅ (Correct)
D) Morgan

Question 3:

What is **micropropagation**?

A) The process of growing a single large plant from one tissue

B) The production of thousands of genetically identical plants in a short time ✅ (Correct)

C) The cloning of animals in a laboratory

D) The artificial pollination of flowers

Question 4:

What is **somatic hybridization**?

A) The crossing of two different species through genetic engineering

B) The fusion of **isolated protoplasts** to form hybrid plants ✅ (Correct)

C) The production of genetically modified crops

D) The process of natural hybridization in a field
