RAMA UNIVERSITY

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# FACULTY OF ENGINEERING & TECHNOLOGY

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Course: B. Tech Biotechnology
Sub Code: BBT-515

Semester: 5th
Sub Name: Plant Biotechnology

# LECTURE 3

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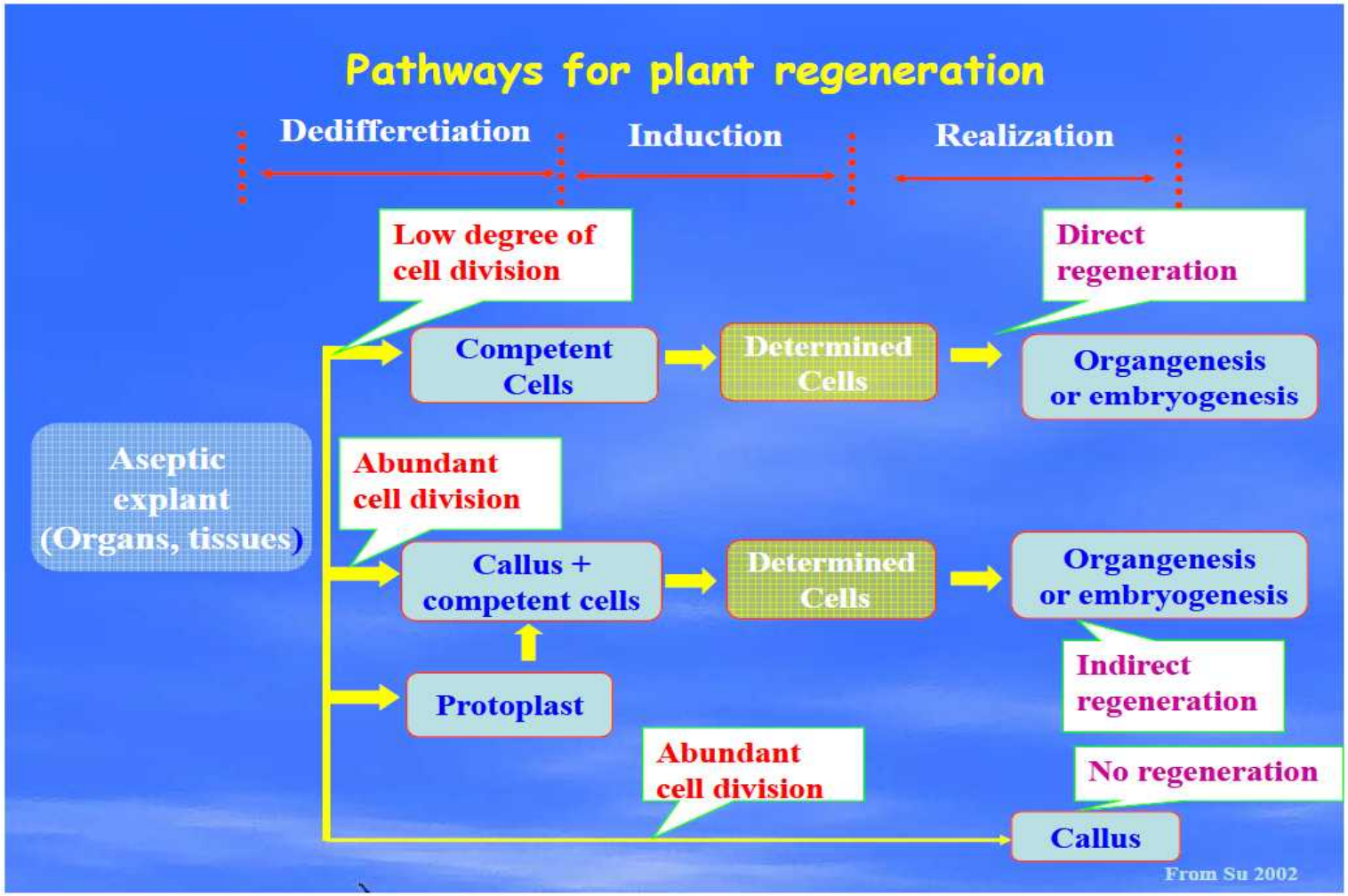
Pathways for plant regeneration
Dedifferetiation
Induction
Realization
Low degree of cell division
Direct regeneration
Competent Cells
Determined Cells
Organgenesis or embryogenesis
Aseptic explant (Organs, tissues)
Abundant cell division
Callus + competent cells
Determined Cells
Organgenesis or embryogenesis
Indirect regeneration
Protoplast
Abundant cell division
No regeneration
Callus
From Su 2002

# ORGANOGENESIS & SOMATIC EMBRYOGENESIS

| ORGANOGENESIS | SOMATIC EMBRYOGENESIS |
|---|---|
| The series of organized integrated processes, which transforms an amorphous mass of cells into a complete organ in the developing embryo. | An artificial process in which a plant or embryo is derived from a single somatic cell. |
| The process, which generates plant organs including shoot and root from vegetative tissue. | The process, which generates embryonic callus from vegetative tissue. |
| A natural process occurs in nature and it can also be induced artificially. | An artificial process occurs under laboratory conditions. |

| ORGANOGENESIS | SOMATIC EMBRYOGENESIS |
| --- | --- |
| Proceeds through two hormone signals to induce shoot and then the root separately. | Proceeds through a single hormone signal. |
| Results in the formation of a complete plantlet with shoot and root. | Results in the formation of a somatic embryo. |
| The shoots and roots have a strong connection with their maternal tissue. | The somatic embryos have no vascular connection with the maternal callus. |

# SOMACLONAL VARIATION

Introduction

- Soma'' mean the somatic cells and "clones" means the generations.
- The term Somaclonal Variation was first coined by Larkin and Scrowcroft in 1981. (Larkin,1981).
- According to Larkin and Scowcroft , "Somaclonal variation is the genetic variability which is regenerated during tissue culture" or plant variants derived from any form of cell or tissue cultures. (Larkin,1981)
- Genetic variations in plants that have been produced by plant tissue culture and can be detected as phenotypic traits.

## Basic Features of Somaclonal Variations

- ✓ Variations in number and structure of chromosomes are commonly observed.
- ✓ Regenerated plants with altered chromosomal changes often show changes in leaf shape and colour, growth rate and habit, and sexual fertility.
- ✓ It is generally heritable mutations and persist in plant population even after plantation into the field.

# Mechanism of Somaclonal Variations

**1. Genetic (Heritable Variations)**

• Pre-existing variations in the somatic cells of explant

• Caused by mutations and other DNA changes

• Occur at high frequency

**2. Epigenetic (Non-heritable Variations)**

• Variations generated during tissue culture • Caused by temporary phenotypic changes

• Occur at low frequency

# QUIZ