RAMA UNIVERSITY

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FACULTY OF ENGINEERING & TECHNOLOGY

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

Semester: 5th
Sub Name: Plant Biotechnology

LECTURE 4

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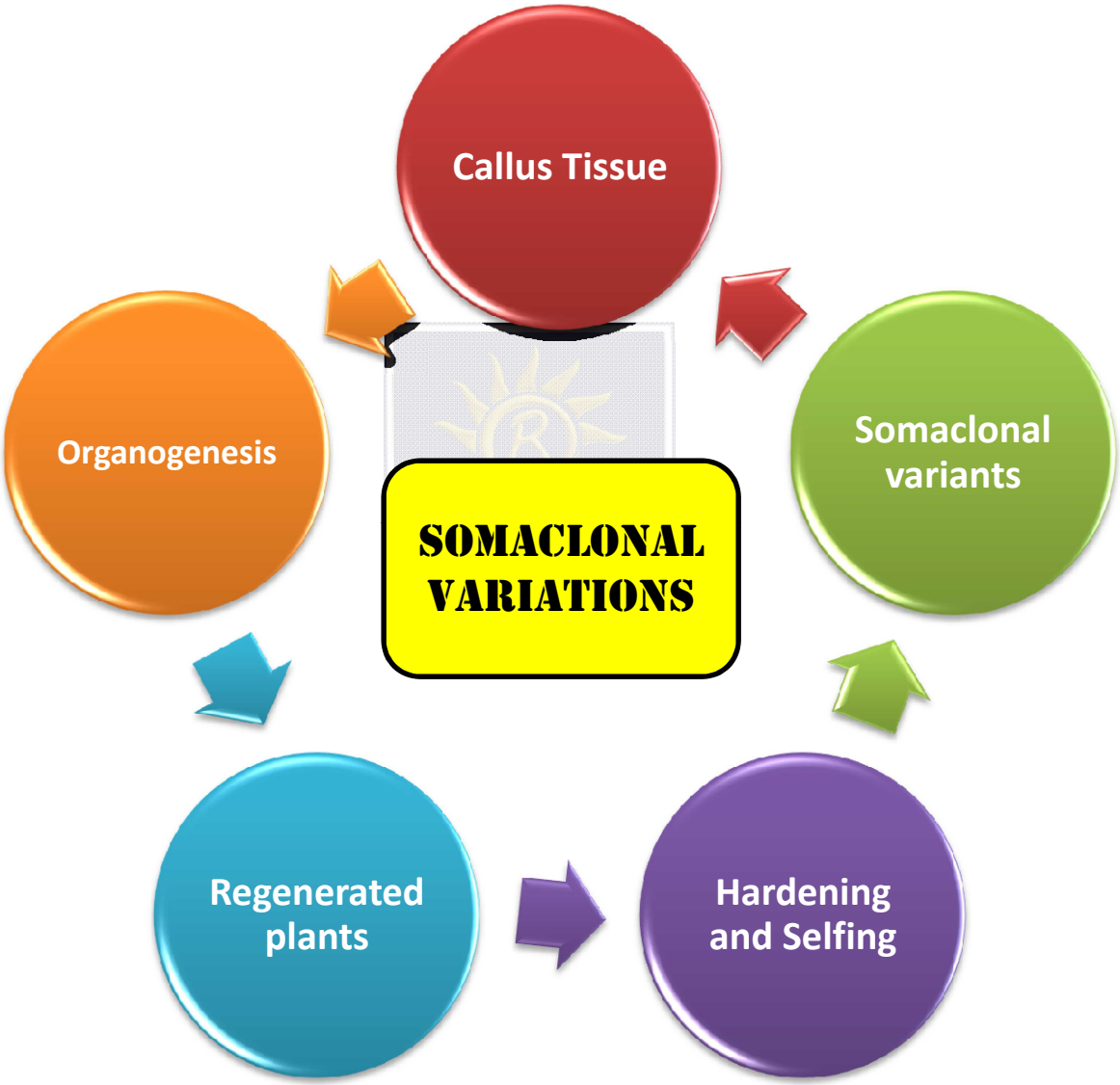
Steps involved in induction and selection of Somaclonal Variations



Causes of Somaclonal Variations

Physiological Cause

- Exposure of culture to plant growth regulators.
- Culture conditions

Biochemical Cause

- Lack of photosynthetic ability due to alteration in carbon metabolism
- Biosynthesis of starch via carotenoid pathway
- Nitrogen metabolism
- Antibiotic resistance.

Genetic Cause

1. Change in chromosome number
   - ❖ aneuploidy – gain or loss of one or more chromosomes
   - ❖ polyploidy – gain or loss of an entire genome
   - ❖ translocation – arms of chromosomes switched
   - ❖ inversion – piece of chromosome inverted

2. Change in chromosome structure
   - ❖ Deletion
   - ❖ Inversion
   - ❖ Duplication
   - ❖ Translocation

3. Gene Mutation
   - ❖ Transition
   - ❖ Transversion
   - ❖ Insertion
   - ❖ Deletion

4. Plasmagene Mutation

5. Transposable element activation

6. Change in DNA sequence

Advantages of Somaclonal Variations

- ✓ Help in crop improvement
- ✓ Creation of additional genetic variations
- ✓ Increased and improved production of secondary metabolites
- ✓ Selection of plants resistant to various toxins, herbicides, high salt concentration and mineral toxicity
- ✓ Suitable for breeding of tree species

Disadvantages of Somaclonal Variations

- ✓ A serious disadvantage occurs in operations which require clonal uniformity, as in the horticulture and forestry industries where tissue culture is employed for rapid propagation of elite genotypes
- ✓ Sometime leads to undesirable results
- ✓ Selected variants are random and genetically unstable
- ✓ Require extensive and extended field trials
- ✓ Not suitable for complex agronomic traits like yield, quality etc.
- ✓ May develop variants with pleiotropic effects which are not true.