
Contents

<i>Preface</i>	<i>v</i>
1. Introduction to Plant Biotechnology	1-44
1.1. What is Plant Biotechnology?	
1.2. Plant Tissue Culture	
1.3. Plant Genetic Engineering	
1.4. Applications of Transgenic Plants	
1.5. Biotechnology and Plant Productivity	
1.6. Agricultural Impacts of Plant Biotechnology	
1.7. Market Value of Biotech Crops	
2. Plant Tissue Culture	45-86
2.1. Introduction to Cell and Tissue Culture	
2.2. Theory of Tissue Culture	
2.3. Tissue Culture Laboratory	
2.4. Physical Environment	
2.5. Tissue Culture Media	
3. Types of Plant Tissue Cultures	87-121
3.1. Types of Cultures	
3.2. Single Cell Cultures	
3.3. Shoot and Meristem Culture	
3.4. Organogenesis	
3.5. Somatic Embryogenesis	
3.6. Micropropagation	

3.7. Anther and Pollen Culture

3.8. Ovary/ Ovule Culture

4. Tissue Culture Applications 122-163

4.1. Production of Haploids

4.2. Somaclonal Variations

4.3. Gametoclonal Variations

4.4. Germplasm Conservation

4.5. Production of Secondary Metabolites

4.6. Enhancing the Production of
Secondary Metabolites

4.7. Plant Cell Culture for Production of
Chemicals

4.8. Bioreactors Systems for Mass
Cultivation of Plant Cells

5. Plant Transformation Technology 164-198

5.1. Genetic Transformation

5.2. Transformation Using Agrobacterium

5.3. Direct Gene Transfer Methods

**6. Plant Genetic Engineering and
Biotic Stress Resistance 199-216**

6.1. Applications of Plant Genetic Engineering

6.2. Herbicide Resistance

6.3. Insect Resistance

6.4. Virus Resistance

**7. Plant Genetic Engineering and
Abiotic Stress Resistance 217-242**

7.1. Abiotic Stress

7.2. Molecular Alphabets of
Plant Abiotic Stress Responses

7.3. Abiotic Stress Tolerance

7.4. Drought

8. Molecular Farming and Industrial Products	243-263
8.1. Molecular Farming Process	
8.2. Economic Opportunities	
8.3. Host Systems and Expression Technology	
8.4. Developments in Molecular Farming	255
9. Metabolic Engineering	264-284
9.1. Strategies for Metabolic Engineering	
9.2. Metabolic Engineering for Plant Secondary Metabolites	
9.3. Metabolic Engineering of Plant Volatiles	
Bibliography	285-288
Index	289-292

Biotechnology is a branch of technology that is concerned with the forms of industrial production which use micro-organisms and their biological processes. The impact of this technology are felt in agriculture, industry, medical treatment and environment. New species of plants, manure, insecticides, cloning, genetics, etc. are also influenced by this interdisciplinary field of study and research.

One definition of biotechnology is "the deliberate manipulation of DNA molecules to produce commercial products from living organisms." All life is composed of cells that contain genes, and genes are made of DNA molecules. DNA contains information used by cells as a "blueprint" or plan for the animal, plant, or other organism. All the characteristics, or traits, of any living thing are determined by the information in the DNA plan.

Scientists are learning how to transfer genes from one animal, plant, or other organism into another. Theoretically, almost any trait found in nature can be transferred into any chosen organism, even if it has never had this trait before. This process, called genetic engineering or recombinant DNA technology, is an important aspect of biotechnology. It can be used to produce new food crop plants, livestock, proteins, vaccines, and drugs.

The field of plant biotechnology is concerned with developing ways to improve the production of plants in order to supply the world's needs for food, fibre and fuel. In addition, plants provide