

Course Contents

Objectives

1. Studying the mechanisms involved in transduction of environmental and internal signals in the plant cell, from the receptor to target genes. This is an advanced level course covering different aspects of Plant signalling cascades. The course was specially designed to train the young scientist affiliated with innovative research in plant sciences

Outcomes

2. On successful completion of this module, students should be able to design experiments dealing with plant immune responses, how plant responds to attack of pathogen and trigger immune responses and various other aspects of plant immunity. They can analyse papers on immune signalling pathways and the study can be further imparted to applied research in plants disease resistance.

- a. **Course Code PBT-805**
- b. **Credit hours 3(3-0)**
- c. **Contents with proposed contact hours**

Content with proposed contact hours

Yellow: Existing contents, Green: New contents, Blue: Repetition on contents.

Existing course contents	Revised course contents
<ul style="list-style-type: none">• Signal transduction mechanisms involved in plant defense will also be taught.	<ul style="list-style-type: none">• Plant Immune System<ul style="list-style-type: none">○ Recognizing self from non self○ Plant Resistance Mechanism

- Importance will be given to Mitogen Activated Protein Kinase (MAPK) family in plant signal transduction.
- Salient topics that will be covered are:
 - Why study plant immunity?
 - Resistance mechanisms in plants and resistance genes,
 - Classes of plant immune responses,
 - Basal response,
 - Hypersensitive response,
 - Systemic acquired immunity,
 - Jasmonic Acid/Ethylene pathway,
 - Non-host immunity,
- Signaling in plant disease resistance mechanisms,
- MAPKS and other receptor like kinases, (Repetition in content)
- Molecular diagnostics,
- Plant volatiles in defense, Plant stress interaction

- Post - Infectious Structural Defense Mechanisms

- **Plant disease**

- Disease process
- History of Plant diseases
- Useful plant pathogens
- Plant pathogen as medicinal

- **Type of Plant Disease Resistance**

- Horizontal resistance
- Vertical resistance
- Defense Signaling in Non host resistance
- Role of metabolic defense

- **Basal Resistance (MAMP- Triggered Immunity)**

- Pathogen Effectors
- Bacterial MAMP or PAMP
- Fungal MAMP or PAMP
- Suppression of PTI by Pathogen Effectors

- **Gene for Gene Hypothesis**

- Disease Resistance or susceptibility
- Pathogenicity genes in phytopathogen
- Virulent and avirulent gene
- R gene and protein
- Direct Interaction Model
- Indirect Interaction Model
 - Guard Hypothesis
 - Decoy Hypothesis

	<ul style="list-style-type: none">• The Hypersensitive response<ul style="list-style-type: none">○ Thermo Regulation○ Cell to cell propagation○ Oxidative Burst in HR• Systemic Acquired Resistance<ul style="list-style-type: none">○ Historical Perspective○ Characteristic of SAR○ SAR and SA (Salicylic acid)○ SAR vs ISR• Induced Systemic Resistance<ul style="list-style-type: none">○ Localized Induced resistance○ Systemic induced resistance○ Type of Localized induced resistance○ Properties of PGPR○ The Negative effects of ISR• Plant-microbe Interaction<ul style="list-style-type: none">○ Bacteria○ Viruses○ Fungi• MAPK Cascades in Plant Disease Resistance Signaling
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d. Details of lab work/workshop practice, if applicable

Not applicable

Recommended reading, including textbooks, reference books

1. Molecular Biology of the Cell by Bruce Albert and Dennis Bray. Garland Publishing Inc, New York and London.
2. Handbook of Cell Signaling Vol 1-3, by Ralph Bradshaw, and Edward Dennis.
3. Cell Signalling, by John T. Hancock, 2nd ed. Oxford University Press.
4. Apoptosis, Cell Signaling, and Human Diseases: Molecular Mechanisms, Volume 2 by Rakesh Srivastava.
5. Cell Signaling and Growth Factors in Development: From Molecules to Organogenesis by Klaus Unsicker (Editor), Kerstin Krieglstein.
6. Signal Transduction by Bastien D. Gomperts.
7. The Biochemistry of Cell Signalling by Ernst J. M. Helmreich.