

**Educational Objectives**

- For students, Plant Therapeutics offers an advanced research ability in related field, to decide strategically to solve the scientific problem and produce the solutions.
- Such courses assist in gaining background knowledge in various fields such as molecular genetics, gene expression, transformation and plant pharmacology, along with hands-on experience in laboratory techniques.

**Course Outcomes**

1. Learning about biosafety regulations for plant therapeutics.
2. Facts on the importance of plants in protein production.
3. Knowledge about production of therapeutic proteins in plants.
4. Informative data on production of therapeutics in transgenic seeds.
5. Understanding about immunity and allergenicities of plant proteins.

**Course Contents**

- Introduction of plant-made biologics
- Evolution of plant based therapeutics
- The pharma-plant projects
  - Tobacco plants: living vaccine factories
- Plant therapeutic proteins
- Synthetic biology approach in plant therapeutics
- Methods for the production of plant based vaccines
- Therapeutic transgene expression and protein accumulation
  - Protein folding, assembly and glycosylation, promoter and targeting system; for therapeutic proteins expression in plants
- Production of therapeutic crops
  - Importance of plants in proteins production
  - Production practices
  - Regulatory oversight
- Isolation of recombinant proteins from plants
  - Suspension cultures and recombinant proteins

- Plant based antibiotics derivatives
- Immunogenities and allergenities of plant-based therapeutics
- Biosafety regulations for plant-based biologics
- Benefits of plants as bio-factories
  - Edible vaccines
  - Plant derived antibodies in clinical trials
- Future challenges of plant-made therapeutics

### **Recommended Readings**

#### **Text Books**

- Commercial Plant-Produced Recombinant Protein Products: Case Studies. Jhon A. Howard and Elizabeth E. Hood. Springer Heidelberg NewYork Dordrecht London 2014.
- Plant-derived Vaccines: Technologies and Applications. Franco M Buonaguro. Future Medicine Ltd Unitec House, London N3 1QB, UK 9781780840925, 2011.

#### **Reference Book**

- Plants as Factories for Protein Production. Elizabeth E. Hood, J. A. Howard. Springer Science and Business Media, 2013.