

# **BIO 113 VIRUSES, BACTERIA AND LOWER PLANTS. (2Credits) Compulsory**

## **INTRODUCTION TO MICROORGANISMS AND LOWER PLANTS**

Microorganisms are minute living organisms that are mostly invisible to the naked eye but play vital roles in nature. They include viruses, bacteria, fungi, protozoa, and algae. “Lower plants” refer to simple, non-vascular plants such as algae, fungi, and bryophytes (mosses and liverworts). These organisms represent the early evolutionary stages of plant life.

### **Scope of Microbiology and Lower Plant Studies**

Microbiology is the branch of biology that studies microorganisms — their structure, function, classification, and roles in nature. Lower plant studies (Cryptogamic botany) focus on simple plants that reproduce by spores rather than seeds.

### **Microbiology has various branches:**

Bacteriology – study of bacteria

Virology – study of viruses

Mycology – study of fungi

Phycology (Algology) – study of algae

Protozoology – study of protozoa

Microbial genetics and immunology

### **Historical Background**

#### **Early discoveries laid the foundation for microbiology:**

Scientist Contribution Anton van Leeuwenhoek (1674) First to observe living microorganisms using a simple microscope; called them “animalcules.” Louis Pasteur (1822–1895) Disproved spontaneous generation; developed pasteurization; discovered fermentation; produced vaccines for rabies and anthrax. Robert Koch (1843–1910) Identified bacteria that cause tuberculosis, anthrax, and cholera; developed Koch’s postulates to link microbes with diseases.

Joseph Lister (1827–1912) Introduced antiseptic surgery. Edward Jenner (1749–1823) Developed the first smallpox vaccine. 4. Major Groups of Microorganisms

**Viruses** – Acellular entities made up of DNA or RNA enclosed in a protein coat. They can only reproduce inside living cells.

**Bacteria** – Prokaryotic, single-celled organisms that reproduce by binary fission.

**Fungi** – Eukaryotic organisms that may be unicellular (yeast) or multicellular (moulds, mushrooms).

**Algae** – Simple photosynthetic organisms that live mostly in water.

**Protozoa** – Unicellular eukaryotes found in moist environments.

### Cellular Organization

Prokaryotic cells: Simple cells without a nucleus or membrane-bound organelles (e.g., bacteria, cyanobacteria).

Eukaryotic cells: Complex cells with a true nucleus and membrane-bound organelles (e.g., fungi, algae, protozoa, and higher plants).

Acellular organisms: Lack cellular structure (e.g., viruses).

Feature	Prokaryotic	Eukaryotic	Nucleus	Absent	Present	DNA	Circular	Linear	Organelles	None	Present	Examples
	Bacteria	Fungi, Algae										

**Over time, scientists have proposed** different systems of classification:

#### A. Two-Kingdom System (Linnaeus, 1735)

Plantae – All plants

Animalia – All animals Limitation: It could not classify microorganisms properly.

#### B. Five-Kingdom System (Whittaker, 1969)

Monera (Bacteria)

Protista (Protozoa and unicellular algae)

Fungi

Plantae

Animalia

### **C. Three-Domain System (Woese, 1990)**

Based on molecular and genetic evidence:

Bacteria

Archaea

Eukarya

This system shows evolutionary relationships more accurately.

### **Importance of Microorganisms and Lower Plants**

#### **Beneficial roles:**

Decomposition: Break down organic matter and recycle nutrients.

Nitrogen fixation: Convert atmospheric nitrogen into usable forms (e.g., *Rhizobium*)

Food and Industry: Used in yogurt, cheese, bread, antibiotics, and alcohol production.

Medicine: Source of antibiotics (e.g., *Penicillium* → penicillin).

Photosynthesis: Algae produce oxygen and form the base of aquatic food chains.

#### **Harmful roles:**

Cause diseases in humans (e.g., tuberculosis, malaria, HIV).

Cause food spoilage and crop diseases.

### **Characteristics of Lower Plants**

Mostly non-vascular (lack xylem and phloem).

Reproduce by spores.

No true roots, stems, or leaves.

Examples: Algae, Fungi, and Bryophytes.

Found in moist or aquatic environments.

### **Summary**

Microorganisms and lower plants are vital to life on Earth. They form the foundation of ecosystems, drive nutrient cycles, and contribute to biotechnology, agriculture, and medicine. Understanding their biology provides insights into both life's simplicity and complexity.