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SS. 65-A  
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## BOT 101: BACTERIOLOGY, VIROLOGY & GENERAL MICROBIOLOGY

### UNIT I:

- Bacterial taxonomy;
- Identification of bacteria.
- General characters of *Rickettsia* and *Chlamydia*.
- Diseases caused by *Rickettsia* and *Chlamydia*.
- Mode of nutrition in bacteria; autotrophy, heterotrophy, symbiosis.

### UNIT II

- General account of sterilization culture media, pure culture techniques;
- A general idea about bacterial toxins and enzymes;
- Bacteriophage;
- Bacterial diseases: caused by *Escherichia coli*, *Shigella*.

### UNIT III

- General properties and evolution of viruses;
- Cultivation of virus and viral assay;
- Transmission of plant viruses and control measures.
- Oncogenic viruses and tumorigenesis;
- Viral diseases: Encephalitis, Hepatitis AIDS and Rabies.

### UNIT IV

- Biological nitrogen fixation: symbiotic and non symbiotic nitrogen - fixation;
- Fermentation technology: principle and types of fermentation.
- Microbial degradation of pesticides and hydrocarbons.
- Mycoplasma: general account and important diseases caused by them.

### UNIT V

- Microbial conversion of waste product with particular reference to alcohol and biogas
- General account of Immunity, properties of antigens and antibodies.
- Allergy and types of allergies.
- Mycotoxins and their harmful effects.

### PRACTICALS 101:

1. Preparation of culture media.
2. Isolation of *Bacillus* and *Rhizobium* spp form soil and nodules.
3. Various methods of bacterial staining to study cell wall, endospore, capsule and flagella.
4. Identification of important genera by using biochemical tests: *Escherichia*, *Azotobacter*, *Staphylococcus*, *Bacillus*, *Pseudomonas*, *Rhizobium*, *Streptomyces*, *Xanthomonas*.
5. Construction of bacterial growth curve.
6. Quantitative estimation of bacteria in milk.
7. Isolation of streptomycin – resistant mutants of bacteria.
8. Sensitivity test of bacteria using different antibiotics.
9. Purification of TMV and study of thermal inactivation point and dilution point.
10. Virus concentration determination by local lesion on host.
11. Study of common vectors of plant virus: Nematodes, fungi and insects.
12. Bacteriophage isolation
13. Isolation and enumeration of bacteria: Actinomycetes and fungi from soil, rhizosphere and seed using different techniques.
14. Use of selective media for isolating micro- organisms.
15. Fermentation of alcohol and biogas from waste materials (Demonstration)

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## BOT 102: BIOLOGY AND DIVERSITY OF FUNGI AND PLANT PATHOLOGY

### UNIT I

Recent trends on the classification of fungi with reference to morphological and paramorphological criteria;

Comparative study of following sub-division;

Mastigomycotina: *Albugo*, *Peronospora*, *Plasmopora*

### UNIT II

Comparative study of following sub-division;

Zygomycotina: *Mucor*, *Rhizopus*, *Syncephalastrum*

Ascomycotina: *Tapharina*, *Emericella*, *Penicillium*, *Chaetomium*, *Morchella*

### UNIT III

Comparative study of following sub-division;

Basidiomycotina: *Puccinia*, *Melampsora*, *Ustilago*, *Polyporus*, *Cyathus*

Deuteromycotina: *Fusarium*, *Cercospora*, *Colletotrichum*.

Mushroom cultivation: Mycorrhizal application in agriculture and forestry;

Fungal cytology and genetics: Heterothallism, heterokaryosis, parasexual cycle, mutation.

### UNIT IV

Symptomatology in fungal, bacterial and viral infection of plants

Etiology and control of the following crop diseases

1. Paddy: paddy blast, paddy blight
2. Wheat: Black stem rust, Bunt of wheat
3. Bajara: green ear and Ergot
4. Sugarcane: Red rot disease of sugarcane.
5. Ground nut: Tikka disease
6. Maize Smut

### UNIT V

Role of enzymes and toxins in pathogenesis;

Disease control by physical, chemical and biological methods, resistant varieties;

Crop rotation, plant quarantines, seed certification

### PRACTICAL 102:

Study of the morphological characters and reproductive structures of the genera mentioned in the theory. Study of symptomatology of diseased species. Carbon and nitrogen utilization by fungi (in culture) vitamin requirement, staining techniques, induction and isolation of mutants.

1. Study of diseased specimens of plants with reference to symptomatology.
2. Isolation, purification and single spore culture of pathogens.
3. Measurement of the activity of enzymes of fungal pathogens: Cellulose, Pectinases.
4. Laboratory testing of fungicides (systemic and non-systemic) against pathogenic fungi.
5. Demonstration of biological control of pathogenic fungi *in vitro*.

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**BOT 103: BIOLOGY AND DIVERSITY OF ALGAE, BRYOPHYTES AND LICHENS****UNIT I**

Comparative survey of important systems of classification of algae;  
 Criteria for algal classification and modern trends;  
 Diagnostic features of algal phyla, range of thallus and reproductive diversity; life history patterns, parallelism and evolution.

**UNIT II**

Comparative account of algal pigments ; light microscopic structure, ultra structure and function of cell wall, flagella, chloroplast, pyrenoids and eyespots and their importance in taxonomy.  
 Study of Cyanophyta, Chlorophyta, Xanthophyta, Bacillariophyta, Phaeophyta and Rhodophyta up to the order level with reference to the following genera: *Anabaena*, *Gonium*, *Chlorella*, *Enteromorpha*, *Bulbochaete*, *Clostridium*, *Acetabularia*, *Nitella*, *Botrydium*, *Navicula*, *Cyclotella*, *Batrachospermum* and *Gracillaria*.

**UNIT III**

General characteristics of the division: Diophyta, Chrysophyta and Cryptophyta.  
 Distribution of algae in soil, fresh water and marine environment, role of algae in soil fertility, productivity in fresh water and marine environment algae role in fisheries, algae in symbiotic association, algae in polluted habitats, algae as indicator of pollution, fossil algae, algae in biotechnology.

**UNIT IV**

Origin of Bryophytes: Primitive vs. advanced characters, derived features: evolutionary lines. Classification.  
 Comparative morphological, anatomical and cytological studies of gametophyte and sporophytes of Calobryales, Jungermanniales, Sphaerocarpaceae, Marchantiales, Takakiales, Sphagnales, Andreales and Bryales.

**UNIT V**

Experimental studies in Bryophytes  
 Spore germination, Protonemal differentiation, bud formation  
 Parthenogenesis, apogamy, apospory and regeneration.  
 Bryogeographical regions of India with reference to central India.  
 Lichens: General account, structure and reproduction.

**PRACTICAL 103:**

1. Collection and study of algae mentioned in theory, identification up to generic level using algal monographs.
2. Preparation of synthetic medium and cultivation of algae, unialgal and axenic culture and their maintenance.
3. Collection, preservation of algal herbarium (10 specimens).
4. Preparation of pigments.
5. Staining techniques of cytology studies.
6. Study of electron microscopy of some algae.
7. Morphology and structural study of representative member of the following group using cleared whole amount preparation, dissection and section: Jungermanniales – *Pellia* and *Porella* (or any other leafy liverwort); Marchantiales-*Plagiochasma*, *Dumortiera*, *Fimbriaria*, (*Astralla*, *Reboulia*, *Targionia*, *Conocephalum*/ *Weisnerella*, *Sphagnales*/ *Sphagnum*/ *Bryales*
8. Experiments to study spore germination, formation of protonema and bud development.
9. Study of Bryophytes in their natural habitats

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## BOT 104: BIOLOGY AND DIVERSITY OF PTERIDOPHYTES AND GYMNOSPERMS

### UNIT I

Evolution of Pteridophytes; Soral and stealer evolution .  
Classification of Pteridophytes

### UNIT II

Comparative organography, systematics; reproduction and phylogeny of the following:  
Psilophytales, Rhyniales, Zosterophyllophytales.  
Psilotales.  
Lycopdiales, Lepidodendrales  
Sphenophyllales  
Ophioglossales, Marattiales, Osmundales, Filicales, Marsileales, Salviniiales.

### UNIT III

Speciation and evolutionary trends in ferns;  
Cytology;  
Polyploidy and hybridization;  
Pteridophytic life – cycle, apospory, vegetative apomixes.  
Recent trends in the classification of Gymnosperms

### UNIT IV

Morphology and anatomy of vegetative and reproductive organs, fossil representatives and interrelationship of Cycadales, Ginkgoales, Coniferales, Taxales, Ephedrales, Welwitschiales and Gnetales.

### UNIT V

Structure and evolution of archegonium in Bryophytes, Pteridophytes and Gymnosperms  
Distribution of living and fossil Gymnosperm in India.  
Economic importance of Gymnosperms.

### PRACTICALS 104

1. Study of morphology and anatomy of vegetative and reproductive tissues and organs using cleared whole mounts, dissections, sections, macerations and permanent preparations of living and fossil forms covered under theory.
2. Experiments on spore germination of prothallus, induction of sporophytes.
3. Preparation of models (Plasticine/ thermocol) to demonstrate stealer evolution.
4. Study of Pteridophytes in their natural habitats
5. Comparative study of the anatomy of vegetative and reproductive parts of *Ginkgo*, *Cedrus*, *Abies*, *Picea*, *Cupressus*, *Cryptomeria*, *Taxodium*, *Podocarpus*, *Cephalotaxus*, *Araucaria*, *Agathis*, *Taxus*, *Ephedra* and *Gnetum*.
6. Study of the important reproductive stages through specimens and permanent slides.
7. Preparation of models (Plasticine/ thermocol) to demonstrate the position and structure of microsporangia of *Cycas*, *Pinus*, *Taxus*, *Ephedra*, *Gnetum*. Seed-scale complex in female cone of *Pinus*, embryo of *Pinus*.