

शासकीय कमलाराजा कन्या स्नातकोत्तर स्वशासी महाविद्यालय ग्वालियर (म.प्र.)  
स्नातकोत्तर स्तर पर सेमेस्टर पद्धति के अन्तर्गत वनस्पतिशास्त्र विषय के  
अध्ययन मण्डल द्वारा अनुशंसित तथा अकादमिक परिषद द्वारा अनुमोदित

**Syllabus for P.G. Classes of Botany Under Semester System as recommended  
by Board of Studies and approved by the Academic council of the college.  
Effective from Session 2019-2020  
M.Sc. Botany – IV sem**

## **BOT 401: GENETICS, PLANT BREEDING AND EVOLUTION**

### **UNIT I**

A brief history, scope and significance of genetics.  
Mendel's law of inheritance.  
Lethality and Interaction of genes.  
Quantitative inheritance: polygenic inheritance.  
Nature and concept of chemical basis of heredity.

### **UNIT II**

Multiple alleles.  
Self sterility.  
Linkage and its measurement.  
Crossing over: theories of crossing over.  
Mapping of genes on chromosomes.

### **UNIT III**

Genetic recombination in bacteria: conjugation, transformation and transduction.  
Cytoplasmic inheritance.  
Mutations : types, methods of artificial induction, method of detection of mutants.  
Biochemical genetics of *Neurospora*.

### **UNIT IV**

Origin of life.  
Mutation and evolution.  
Genetics and evolution.  
Genetic drift.  
Speciation.

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## UNIT V

Method of plant breeding, plant introduction, mass, pure line and clonal selection.  
Aims and objectives of hybridization types: inter specific and intergeneric; back crossing.

Grafts hybrids, chimeras and bud spot.

Heterosis: theories and applications with reference to maize.

Plant breeding work done in India with reference to wheat and rice.

### PRACTICAL 401:

1. Determination of probability of tossing for one coin.
2. Determination of probability for the throw of dice.
3. Determination of probability for tossing of two coins.
4.  $X^2$  test as applied to the result of above three experiments.
5. Determination of size of the leaves on a specific size of two population of a species and calculation of standard deviation and standard error.
6. Permutation and combination.
7. Correlation analysis.
8. Determination of genotype from the data provided.
9. Determination of linkage values from the data provided and preparation of chromosome map.
10. Determination of various mendelian ratio by checker board as well as by binomial equation.
11. Study of gene frequency in the populations.
12. Use of Anderson's scatter diagrams in the differentiation of the genetic population.
13. Emasculation of flower.
14. The working of the instruments used in various experiments must also explained./ At least 60% of the above mentioned exercises be performed and must be handed over to the external examiner who will select out the exercise to be distributed among at the time examination.

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## **BOT 402: PLANT BIOTECHNOLOGY: IN VITRO CULTURE, GENETIC ENGINEERING AND IPR ISSUE**

### **UNIT I**

Concept and scope of Biotechnology.

Techniques of tissue culture, cell culture and organ culture.

Sterilization, culture media.

In-vitro auxotrophs, disease resistance, salt and drought resistance, nutritional quality and herbicide resistance.

### **UNIT II**

Micropropagation.

Production of haploids: anther culture and pollen culture

Somatic embryogenesis, somaclonal variation.

Protoplast culture: isolation, culture and fusion of protoplast.

IPR-general idea about patents. Copyright, trademark and geographical indication.

### **UNIT III**

Biotransformation: production of useful compounds through cell culture; factors affecting yield: bioreactors.

Strategies of microbial strain improvement.

The recombinant DNA concept and principle of cloning.

Isolation and purification of DNA.

### **UNIT IV**

Restriction endonuclease : properties and types.

Blotting southern, northern and western

Selection and screening of recombinant clone.

Cloning vehicles salient features: plasmid, cosmid & Ti plasmid.

### **UNIT V**

Single stranded DNA viruses CaMV Lambda phage vectors M13 vectors.

Expression vectors.

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Cloning construction of genomic and DNA libraries  
Application of r- DNA technology in plant improvement.

**PRACTICAL 402:**

1. Selection of salt tolerance / amino acid analogue resistance through cell culture.
2. Isolation and culture of protoplast.
3. Isolation and screening of industrially important microorganism.
4. Isolation of plant DNA, plasmid DNA, bacteriophage DNA.
5. Genetics colonization and tumour induction Agrobacterium Ti plasmid.
6. Restriction analysis and molecular weight DNA.
7. Sequencing and polymerase Chain Reaction.

*Adm*  
22/10/21

*July*  
29/10/21

P. Kulkarni  
20/10/21

*John*

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ELECTIVE PAPERS (OPTIONAL) *paper III*

**BOT E01: INDUSTRIAL MICROBIOLOGY**

**UNIT I**

Development and scope of Industrial Microbiology. Use of Fermentation equipments: Design and construction of fermenters, Batch and Continuous fermenters. Computer control of fermentation process. Characteristics of fermentation media, Raw materials (substrates).

**UNIT II**

Use of microorganisms in industries through ages.  
Strategies for isolation and screening of industrially important microorganism.  
Strategies for improvement of industrially important microbial strains.

**UNIT III**

Industrial product of vinegar.  
Industrial product of citric acid.  
Industrial product of antibiotics; penicillin and streptomycin.  
Industrial product of amino acids; glutamic acid and lysine.

**UNIT IV**

Microbes as a source of Single Cell protein (SCP).  
Mushrooms and food value of mushrooms.  
Dairy product from microorganisms; butter, yogurt and cheese.  
Hygiene and safety in fermentation industries.

**UNIT V**

Biopesticides: bacterial, fungal and viral control of insect pests.  
Biofertilizer: production and method of application.  
Bioremediation

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### PRACTICALS E01:

1. Isolation and identification of bacteria, yeast and fungi from bakeries and fermenters of distilleries.
2. Inoculation of fungi and bacteria on sterilized glucose and sucrose solutions and identification of the different types of amino acids and organic acids in filtrate during different incubation periods. (Chromatography)
3. Isolation and identification of different types of fungi and bacteria from curd, rotten fruits and vegetables.
4. Collection of different types of mushrooms from local area/ region: inventory and analysis of their amino acid contents. (Chromatography)
5. Preparation of spawn for cultivation of edible mushrooms.
6. Observation of the antagonism of three antibiotics against common plant pathogens in Petri plates (disc methods).

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Misc Bot  
IV sem  
M.Sc. Bot. May - June - 18  
M.Sc. Bot. 2019 - 2020

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## BOT E05: PLANT PATHOLOGY AND MYCOTOXICOLOGY

### UNIT I

History and principles of plant pathology.  
Milestones in phytopathology with particular reference to India.  
Historical development of chemicals, legislative, culture and biological protection measures including classification of plant diseases.  
Parasitism and Disease developments. Growth, reproduction, survival and dispersal of plant pathogens. Factors influencing infection, colonization and development of symptoms.

### UNIT II

Physiological and molecular plant pathology.  
Effect of pathogens on plant pathological functions. Molecular mechanisms of pathogenesis: recognition phenomenon, penetration, invasion, primary disease determinant. Enzymes and toxins in relation to plant disease. Mechanism of resistance. Phytoalexins. **PR** protein (pathogenesis related proteins). Antiviral proteins.

### UNIT III

Management of plant Diseases: General principles of plant quarantine.  
Production of disease free seeds and planting materials. Seed certification. Fungicide and antibiotics: Important culture practices and their role in disease management, solarization, integrated disease management.

### UNIT IV

History of Mycotoxins, mycotoxic fungi and related mycotoxins in food and feed, aflatoxins, factors influencing the production of aflatoxins, mycotoxicosis and aflatoxicosis. Detoxification and Regulatory aspects of control of Mycotoxins.

### UNIT V

Phytopathogenic toxins: Helminthosporium toxin, Alternaria toxins, Fusarium toxins, Mushroom toxins, plant toxins and phycotoxins (Algal toxins).

### PRACTICALS E05

1. Preparation of different types of media: solid liquid synthetic, semi synthetic.
2. Isolation of fungi from infected plant material and stored material.
3. Identification of fungi, and micrometry
4. Pathogenesis: Koch's Postulates.
5. Preparation of TLC plate.
6. Extraction of aflatoxin from stored seed samples.
7. Quantitative estimation of aflatoxins.
8. Demonstration of slides/photograph showing important histopathological changes in liver, kidney and intestine of affected animals/birds.
9. Symptomatology: collection of diseases plants and preparation of Herbarium.

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P. Jaisankar  
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