

Research Training Program in Biotechnology

Jointly conducted by



APS LABS

MICROBIOLOGY

Training Module

1. Introduction to Microbiology
2. Introduction to lab rules, instruments and sterilization technique.
3. Isolation of Microbes from soil:
 - By pour plate technique
 - By spread plate technique
4. Isolation of Microbes from water:
 - By pour plate technique
 - By spread plate technique
5. Isolation of Microbes from air
6. Purification of Microorganisms by Different streaking techniques.
7. Preservation of purified cultures
8. Identification of microbes by:
 - Morphological Characteristics
 - Staining characteristics
 - Biochemical Tests
8. Growth curve study
9. Antibiotic sensitivity test
10. Isolation of antibiotic producing microorganisms from soil.
11. Effect of temperature/pH/Incubation time on Bacterial growth.
12. Presentation & viva.



Enzymology

Training Module

1. Introduction to Enzymology.
2. Sterilization Techniques.
3. Isolation of Microorganisms from natural sources.
4. Pure culture Preparation.
5. Screening of purified cultures for Enzyme activity.
6. Identification of unknown microorganisms.
7. Fermentation.
8. Downstream Processing.
 - Extraction of Crude Enzyme.
 - Purification of enzyme.
 - Precipitation of Enzyme.
 - Dialysis.
 - Ion Exchange Chromatography
 - Thin Layer Chromatography (depending on enzyme).
9. Characterization of Purified Enzyme
 - A) Total protein estimation
 - Bradford's Method.
 - Lowry's Method.
 - B) Enzyme Assay
 - C) Enzyme Kinetics
 - Effect of pH on Enzyme Activity
 - Effect of Temperature on Enzyme Activity
 - Effect of Substrate Concentration on Enzyme Activity
 - Effect of Activator on Enzyme Activity
 - Effect of Inhibitor on Enzyme Activity
 - d. SDS PAGE
10. Immobilization of Enzymes



Molecular Biology

Training Module

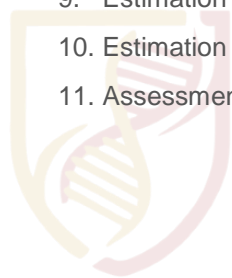
1. Introduction to Molecular Biology.
2. Preparation of solutions.
3. DNA isolation:
 - A) From Plant Source.
 - B) From Animal Source.
4. Agarose gel electrophoresis.
5. Elution of DNA from Gel.
6. Restriction digestion.
7. DNA Ligation.
8. PCR
9. Transformation.
10. Assessment Test



Biochemistry

Training Module

1. Quantitative analysis of Carbohydrates.
2. Quantitative analysis of amino acids.
3. Determination of proteins by Bradford's method.
4. Determination of Achromatic point using Salivary Amylase.
5. Extraction and estimation of Pigments from plant leaves.
6. Quantitative analysis of nucleic acid (DNA).
7. Quantitative analysis of nucleic acid (RNA).
8. Determination of reducing sugar using 3, 5- Dinitro Salysylic acid.
9. Estimation of Urea by Diacetyl Monoxine method.
10. Estimation of Phosphorus by Fiske and Subbarao method.
11. Assessment Test



Biotechnology Training

Training Module

(A). MOLECULAR BIOLOGY

1. DNA isolation from Plant Source
2. DNA isolation from animal source
3. DNA isolation from Bacterial source.
4. Agarose gel electrophoresis.

(B). MICROBIOLOGY

5. Isolation of Microbes:
 - ✦ By pour plate technique
 - ✦ By spread plate technique
6. Purification of Microorganisms by Different streaking techniques.
7. Preservation of purified cultures
8. Grams Staining for Bacteria
9. Lacto phenol Cotton blue staining for fungi
10. Study of bacterial growth curve
11. Antibiotic sensitivity test.

(C) ENZYMOLOGY

12. Isolation of microbes from suspected sources for production of particular enzyme
13. Screening of cultures for enzyme production
14. Production /Fermentation for enzyme production
15. Preparation of crude enzyme
16. Protein estimation by Lowry's method
17. Salt precipitation
18. Dialysis
19. Ion exchange chromatography
20. Enzyme assay

(D) PLANT TISSUE CULTURE

21. Introduction of plant tissue culture
22. Initiation of explants
23. Embryo Culture
24. Anther culture
25. Meristem Culture
26. Callus culture
27. Synthetic seed formation

PLANT TISSUE CULTURE

Training Module

1. Introduction to Plant Biotechnology
2. History of plant tissue culture
3. Application of plant tissue culture
4. Sterilization
5. Types of sterilization
6. Washing of glassware
7. Process of contaminated media discardation
8. Embryo culture.
9. Media preparation for initiation explants.
10. Media preparation for multiplication of culture.
11. Media preparation for shooting of culture.
12. Media preparation for rooting of culture.
13. Checking of culture media.
14. Selection of mother plant.
15. Isolation of meristem.
16. Sterilization of explant
17. Initiation of banana meristematic tissue.
18. Multiplication of culture.
19. Shooting of culture.
20. Rooting of culture.
21. Checking of cultures.
22. Primary hardening of cultured plants.
23. Secondary hardening of plants.
24. Submission of report.

Microbial Fermentation Technology

Training Module

- 1 General and Safety Instructions.
- 2 Good Laboratory Practices.
- 3 Principle, Working and Proper Handling of Laboratory Equipments.
- 4 Concepts of Calculations, Weighing and Measurements.
- 5 Reagents and Stock Solutions Preparation, Labelling and Storage.
- 6 Methods/protocols of Sterilization and Decontamination.
- 7 Isolation and Purification of Bacteria from Soil.
- 8 Screening of Purified Cultures for Amylase Production:
 - Primary Screening
 - Secondary Screening
- 9 Optimization of Physiochemical Factors for Maximum Production of Amylases.
 - pH
 - Temperature
 - Incubation Time
 - Substrate Concentration
 - Carbon Source
 - Nitrogen source
- 10 Introduction to Fermentation Processes.
11. Design of Fermenter & Types.
- 12 Inoculum Development. 13
Production of Amylase
 - Submerged fermentation (Batch/ Shake flask)
 - Solid state fermentation 14 Downstream Processes.
 - Preparation of Cell Free Extract.
 - Precipitation of Enzyme.
 - Dialysis.

15 Determination of Specific activity.

- Total activity calculation by DNS Method
- Total Protein estimation by Lowry Method

16 Characterization of Purified Enzyme.

- pH
- Temperature
- Activators
- Inhibitors

17 Determination of Molecular Weight of Purified Enzyme by SDS PAGE



FOOD MICROBIOLOGY MODULE

A. Introduction

B. Microorganisms Morphology and Staining

1. Microscopy
2. Stained preparations
3. Making a smear
4. A simple stain
5. A differential stain: Gram's staining method
6. Bacterial motility
7. Endospore staining (Schaeffer–Fulton or Wirtz–Conklin)
8. Flagella staining: West and Difco's Spot test Methods

C. Basic laboratory procedures and culture Techniques

1. Preparation of culture media
2. Pouring a plate
3. Storage of media
4. Sterilization vs. Disinfection
5. Sterilization of equipment and materials
6. Disinfectants
7. Inoculation and other aseptic procedures
8. Essential points
9. Streak plate
10. Pour plate
11. Spread plate
12. Incubation
13. Clearing up
14. Pure cultures
15. Maintaining stock cultures
16. Cotton wool plugs
17. Aseptic transfer of cultures and sterile solutions
18. Testing sensitivity to antibacterial substance

D. Common Biochemical Tests

1. Indole test
2. H₂S production test
3. Nitrate reduction test
4. Methyl red test
5. Vogus- Proskauer's test
6. Utilization of citrate as the sole source of carbon
7. Fermentation of sugar
8. Gelatine liquification
9. Action on litmus milk



FOOD BIOCHEMISTRY MODULE

1. Qualitative tests for carbohydrates
2. Hydrolysis of starch by dil acid and amylases.
3. Qualitative tests for lipids
4. Qualitative tests for amino acids and proteins.
5. .Demonstration of Lambert - Beer's law.
6. Quantitative tests for reducing sugars.
7. Quantitative tests for total sugars.
8. Estimation of soluble proteins by Lowry's method.
9. Estimation of soluble proteins by Biuret method.
10. Determination of saponification number of an oil / fat
11. Determination of iodine number of an oil / fat.
12. Determination of acid number of an oil / fat.
13. Determination of acetyl number of an oil / fat.
14. Estimation of Ascorbic acid by titrimetry.
15. Determination of organic acid content by titrimetry



THANK YOU



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For more information

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