

Dr. A. N. Sundar

Asst. professor

dept of Botany

2020-2021 - Even Semester

Mushroom Technology - U4BOSBE1

Plant Biotechnology - U6RBOMB2

Ethno Botany and pharmacognosy - P2RIBOEC2

| H/Do | 1 | 2 | 3 | 4 | 5 |
|------|----------|----------|----------|---------|----------|
| I | III B.sc | | II B.sc | | IM.sc |
| II | IM.sc | IM.sc | III B.sc | II B.sc | |
| III | | I.M.sc | | IM.sc | III B.sc |
| IV | II B.sc | | II B.sc. | | |
| V | | | | IM.sc | IM.sc |
| VI | | III B.sc | | | |

SEMESTER IV

MUSHROOM TECHNOLOGY

Course Code : U4RBOSBE1

Course: Skill-based Elective

Hours/Week : 2

Credit : 2

Objectives

- To learn basic knowledge on mushroom.
- To develop the skills to differentiate the edible and poisonous mushrooms.
- To understand the values and value added products of mushroom.
- To know the various steps in mushroom cultivation.

UNIT I

Introduction – History of mushroom cultivation; Classification and distribution of mushroom; life cycle of mushroom. Identification of poisonous mushrooms – Layout for mushroom cultivation

UNIT II

Spawn preparation - Isolation of pure culture; Nutrient media for pure culture; raw material of spawn; sterilization; preparation of mother spawn and multiplication.

UNIT III

Cultivation of mushroom - small scale and large scale production unit. Types of raw material – preparation and sterilization; Mushroom bed preparation – maintenance of mushroom shed; harvesting method and preservation of mushrooms.

UNIT IV

Nutrient values of mushroom: protein, carbohydrate, fat, fibre, vitamins and amino acids; short and long term storage of mushroom; preparation of various dishes from mushroom. Medicinal value of mushroom – cultivation, extraction, isolation and identification of active principle from mushroom. Pharmacological and economic values of mushroom.

UNIT V

Cultivation of following types of mushroom – milky mushroom; oyster mushroom, button mushroom and any one medically valuable mushroom.

Course outcome:

- The students will acquire sufficient academic and practical experience in the field of mushroom cultivation.
- The students can become self-employed in the mushroom.
- The students can be empowered with entrepreneurial skill in production and disease management of mushrooms.

Mushroom Technology U4RBOSBE1

Introduction.

6.1.24
III 3hr

A mushroom is the fleshy, spore bearing fruiting body of a fungus, produced above the ground on soil (or on its food source). These are rich in protein, carbohydrate and vitamins. Mushrooms are low in caloric value and hence are recommended for heart and diabetic patients. They contain all the essential nine amino acids required for human growth. Mushrooms are excellent source of thiamine, niacin and folic acid.

Mushrooms have low caloric value, high protein, high fiber content and K^+ , Na ratio. They are ideally suited for diabetic, B.P. patients. They are also reported anticancer activities.

8.1.24
I-2hr

History of Mushroom Cultivation-

First mushroom was cultivated around 600 AD. This was *Auricularia auricula*. 9000 AD. *Lentinula edodes* is estimated by us to have been cultivated for the first time between 100-1100 AD.

Cultivation of edible mushrooms in India is of recent origin.

11-1-21

Q. 1hr

Classification of Mushroom.

Mushroom is a fleshy fruiting body of some fungi arising from a group of mycelium found in substratum. Most of the mushrooms belong to the sub division - Basidiomycotina - a few belong to Ascomycotina of Kingdom Fungi.

50,000 known species of fungi and about 10,000 are considered as edible ones. One hundred and eighty mushrooms can be tried for artificial cultivation.

Paddy straw mushroom - *Volvarella* sp.

Oyster mushroom - *Pleurotus*

Button mushroom - *Agaricus*

Mulley mushroom - *Calocybe* sp.

Shiitake mushroom - *Lentinula* sp.

Jew's ear mushroom - *Auricularia* sp.

19-1-21

III - 3hr

Distribution of mushroom.

The tropics are the richest overall fungi and the northern temperate climate is richest in mushrooms. Mushrooms cannot synthesize their own food from the Sun's energy. Mushrooms are symbiosis, saprophytes and parasitism.

Symbiosis:

Most of the mushrooms growing on the forest floor intimately linked to trees by symbiosis.

Saprophytes.

Saprophytism is another important living method for mushrooms, which grow on lawns, rotting wood. They digest the organic matter and at the same time return nutrients to the soil.

Parasites:

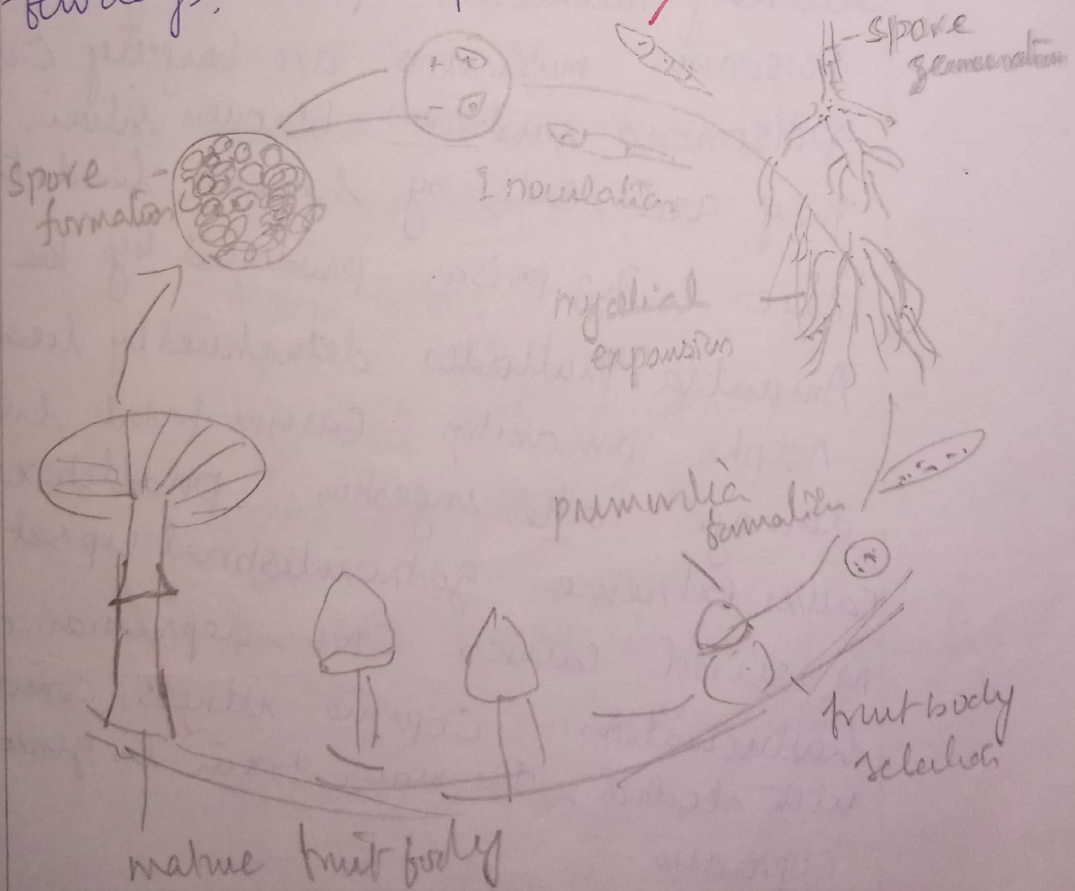
several kinds of parasitism, ranging from species which attacks healthy host. The parasitic species are generally microscopic mushrooms.

20-1-20

IV - 2hr

Life cycle of mushroom.

The mushroom cultivator follows the path of mushroom life cycle. Fruit bodies form only at the completion of the mushroom life cycle and for most species occur but for a few days, then disappear.



Inoculation

↓
spore germination

↓
mycelial expansion.

↓
hyphal knot

↓
Primordia formation

↓
fruitbody selection

↓
mature fruitbody

22-1-21

VII - 1hr

Identify Poisonous mushroom.

Mushroom poisoning refers to harmful effects from ingestion of toxic substances present in a mushroom. These symptoms vary from slight gastro intestinal discomfort to death. The toxins present are secondary metabolites produced by the fungus. Poisonous mushrooms are brightly colored. Poisonous mushroom blacken silver. They are eaten by human leads to toxic. The poison produced by the deathcap Amanita phalloides destroyed by heat. Alpha amanitin causes fatal liver damage after ingestion. Phallotoxin causes extreme gastrointestinal upset. Muscimol causes CNS-depression and hallucinations. Coprine illness, consumed with alcohol, The main toxin in genus Coprinus.

6-3-21
Q. 3hr

Cultivation of milky mushroom.

1. substrate preparation.
 - a. steam pasteurization
 - b. sterilization
2. Spawning and spawn running.
 - a. casing
 - b. cupping
 - c. yield.

8-3-21
Q. 2hr

Cultivation of oyster mushroom (Pleurotus)

The genus pleurotus sajor caju process of cultivation are

1. Requirement
2. Preparation of spawn.
3. Cultivation procedure
4. Harvesting fruit bodies
5. preservation of fruit bodies

9-3-21
Q. 1hr

Cultivation of Agaricus bisporus (Button mushroom)

The cultivation procedure is

1. Production of spawn.
2. Preparation of compost

Filling of trays with Compost.

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Assistant Professor,

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HOURLY

| Sl. No. | Day | Time | Subject |
|---------|-----------|---------------------|---------|
| 1 | Monday | 11:00 AM - 12:00 PM | English |
| 2 | Tuesday | 11:00 AM - 12:00 PM | English |
| 3 | Wednesday | 11:00 AM - 12:00 PM | English |
| 4 | Thursday | 11:00 AM - 12:00 PM | English |
| 5 | Friday | 11:00 AM - 12:00 PM | English |
| 6 | Saturday | 11:00 AM - 12:00 PM | English |
| 7 | Sunday | 11:00 AM - 12:00 PM | English |

| DAY ORDER | HOURS | | | | |
|------------|-----------------------------|----------------|-----------------|----------------|----------------|
| | 1 | 2 | 3 | 4 | 5 |
| <u>I</u> | <u>II M.Sc</u> | | <u>III B.Sc</u> | | |
| <u>II</u> | <u>IV B.Sc</u> | | <u>II B.Sc</u> | | |
| <u>III</u> | <u>II B.Sc</u> | | <u>II M.Sc</u> | | <u>IV B.Sc</u> |
| <u>IV</u> | | <u>II B.Sc</u> | | <u>II M.Sc</u> | |
| <u>V</u> | | | | | <u>II M.Sc</u> |
| <u>VI</u> | <u>II B.Sc</u> practical | | <u>IV B.Sc</u> | | <u>II M.Sc</u> |

SEMESTER III
Allied course IV (Zoology I)
Principles of Zoology

Course code: UIRBOAC4

Hours / week: 5

Course: Core course

Credits: 5

Objectives

- To learn about the lower and primitive groups of animals
- To understand the plant diversity and its economic uses

UNIT: I

Classification of Invertebrates and their Characteristic, diagnostic features with suitable examples, specialized organs of invertebrate's phylum wise Book lungs, water vascular system, parapodia, cnidocyte, connecting links peripatus limulus (king crab)

UNIT: II

General characters of chordates - classification of vertebrata upto classes, characteristic features of connecting links reptiles and birds.

UNIT: III

Digestive system- Circulatory system in humans – Structure of heart.

UNIT: IV

Structure, composition and functions of blood of man. Muscular, Nervous system, structure of brain.

UNIT: V

Excretory system and human reproductive systems.

Reference:

1. Ekambaranatha Ayyar, (1993). Outlines of Zoology. Vo. I S.Viswanathan (Printers & Publishers) Pvt. Ltd., Chennai
2. Verma Tyagi and Agarwal (1997). Animal Physiology. S.Chand and Co. Delhi.
3. Leelavathy. S. Nair, Revised enlarged edition (2001). A Text book of Invertebrates, Saras Publications.
4. Jordan and Verma (2014), Invertebrates zoology, S. Chand publications

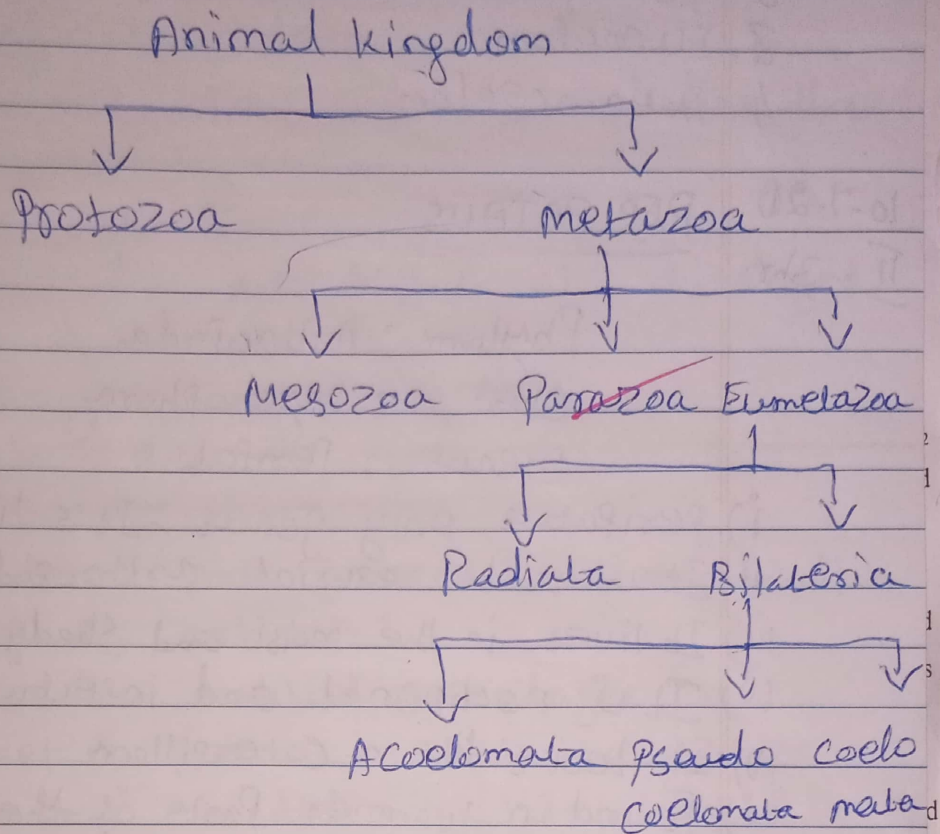
ALLIED

ZOOLOGY

1-7-20 INVERTEBRATES

II-3hr

Classification of invertebrates



3-7-20 Levels of organization

III-1hr

Five types of grade of organization in animals.

- ① A cellular grade of organization
- ② cellular grade of organization
- ③ Tissue grade of organization
- ④ Organ grade of organization
- ⑤ Organ-system grade of organization.

5-7-21 Symmetry

IV-2hr

1. Asymmetry
2. Radial Symmetry
3. Bilateral Symmetry
4. Biradial Symmetry

7-7-20

I - 2hr

Body Cavity

1. Acoelom
2. Pseudocoelom
3. Eucoelom
4. Haemocoelom

10-7-20

II - 3hr

PERIPATAUS

Phylum : Arthropoda

Class : Onychophora

Genus : Peripatus

- i) Peripatus only genus - It's living fossil
- ii) It is a terrestrial arthropod
- iii) It lives in the moist and shady places
- iv) It is nocturnal and insectivorous in habit
- v) It looks like a caterpillar
- vi) Found in warmer parts of the world namely Africa, Australia, New Zealand, Central Africa, West Indies, India and Malaya.
- vii) The body is unsegmented
- viii) The body consists of head and trunk
- ix) The trunk bears paired legs which are unsegmented and each leg bears 5 pairs of claws
- x) The body is soft and wrinkled
- xi) The body cavity is haemocoel
- xii) The nervous system is ladder-like
- xiii) Excretion carried out by segmentally arranged "metanephridia".
- xiv) It forms the connective link between "Annelida" and "Arthropoda".

15-7-20 I. Annelidan characters

III-1hr

1. The segmentation is more (or) less homonomous
2. The body is vermiform
3. The body wall is dermomuscular
4. The legs are hollow and unjointed like those of Parapodia.
5. The eyes are simple
6. The nephridia are segmentally arranged
7. Genital ducts are ciliated
8. Alimentary canal is straight.

2. Arthropodan characters

20-7-20

IV-2hrs

1. The antennae are jointed and are similar to those of arthropoda.
2. The jaws are modified appendages.
3. Homocoel is present in both the groups.
4. The heart is provided with lateral ostia.
5. Respiration is carried out by the tracheal system.
6. Salivary glands are connected with the digestive system.
7. The body is covered with a chitinous cuticle.
8. The appendages are provided with claws.
9. The development is like that of arthropods.

24-7-20 3. Unique features of Peripatus

V-2hrs

Peripatus differs from all other animals in the following features.

1. Segmentation is not distinct
2. The Sigmata are arranged in a scattered pattern.
3. The nervous system is ladder-like and without segmental ganglia.

Connecting link

- i) The origin of birds from reptiles is evidenced by a connecting link called Archaeopteryx
- ii) It is a fossil animal
- iii) It is a bird, it retains many reptilian characters. Hence it is intermediate between reptiles and birds.

a) REPTILIAN characters

1. Jaws are provided with homodont-teeth.
2. Bones are not pneumatic
3. Scales are present
4. Sternum is weak (or) absent
5. Cervical vertebrae are fewer 9 or 19
6. The tail is long, lizard-like and with 20 free caudal vertebrae.

13-7-20

V-2hrs

b) Avian [birds] characters

1. Presence of feathers
2. Rounded brain case
3. Beaks are present
4. Fore limbs the two rows of feathers
5. Tail bears two rows of feathers
6. Flight muscles are well developed
7. Bones are pneumatic
8. The fore limbs are modified in to wings
9. Parental care is well developed.
10. The best example of Archaeopteryx connecting link between reptiles and birds.

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| DAY ORDER | HOURS | | | | |
|--------------|----------|----------------------|----------|----------|----------|
| | 1 | 2 | 3 | 4 | 5 |
| I | | II B.Sc | | | II M.Sc |
| II | | | IV B.Sc | | II M.Sc |
| III | III B.Sc | | III B.Sc | | II B.Sc |
| IV | | II B.Sc Practical | | | II M.Sc |
| V | II B.Sc | | | III B.Sc | |
| VI | II M.Sc | | III B.Sc | | III B.Sc |

Revised

UFRZOAC6
Course code: URBOAE6
Hours / week: 5

SEMESTER IV
Allied course (Zoology II)
Applied Biology

Zoology

Course: Core course
Credits: 5

Objectives

- To learn about the Economic Importance of animals
- To enlighten the students about the Earthworm Species, honey bees and social behavior. The Vermiculture and silkworm and its self-employment opportunities.
- Students may be benefitted by the culture practices
- To make them aware of commercially important animals.

UNIT: I

Vermiculture: Species of earthworms. Biology of *Lampito maritii*. Preparation of Vermicompost and Methods. Nutrient composition of vermicompost and Advantages of vermicompost, Application of vermicomposting in Agriculture and Horticultural practices. Economic importance of vermiculture.

UNIT: II

Apiculture - Species of honey bees, Formation and Extraction of honey. Chemical composition of Honey. Nutritive and medicinal value of honey. Economic importance of honey. Importance and uses of beeswax. Lac culture: Life cycle of Lac insect - extraction of Lac - Economic importance of Lac.

UNIT: III

Sericulture : Biology of silk worm larva-*Bombyx mori*. Types of silk worms -Tasar, Muga, and Eri. Rearing techniques and Reeling appliances. Re-reeling -Silk examination and grading of silk. Moriculture: Optimum conditions for mulberry growth; planting for mulberry cultivation. Economic importance of silk worm and silk.

UNIT: IV

Aquaculture : Definition - cultivable organisms - classification - various culture systems - type of culture. Fabrication of Aquarium, Economically important of freshwater fishes -Indian Major Carps. Pearl Oyster Culture -methods, types of pearls, composition and formation of pearls.

UNIT: V

Poultry farming - Introduction to poultry keeping. Important breeds of Poultry - Desi, Chittagong and Leghorn. Essential nutrients - Ration for Chick and Broiler. Hatchery, Nutritional value of egg. Marketing of egg and By products of poultry.

4-1-21

I:shr ✓

BIOLOGY OF LAMPITO MAURITII

Phylum : Annelida

Class : Oligochaeta

Order : Neo-oligochaeta

Genus : Lampito

Species : mauritii

1. Bilaterally Symmetrical, worm like animal.
2. They are included in the Phylum Annelida.
3. The skin of the earthworm contains setae. So it comes under the Class Oligochaeta.

BIOLOGY OF LAMPITO MAURITII :-

- i) Lampito mauritii is commonly found in Tamilnadu.
- ii) It has a long and cylindrical narrow body.
- iii) Bilaterally Symmetrical.
- iv) Lampito mauritii is 80 to 120 mm in length with a diameter of 3.5 - 5 mm, and is light brown in colour.
- v) A worm has no arms, legs and eyes.
- vi) worms live where there is food, moisture, oxygen and a favourable temperature.

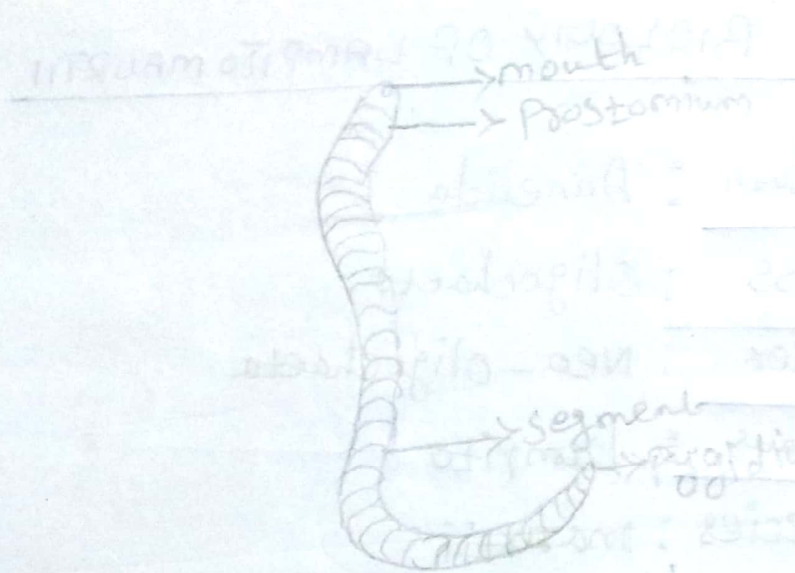
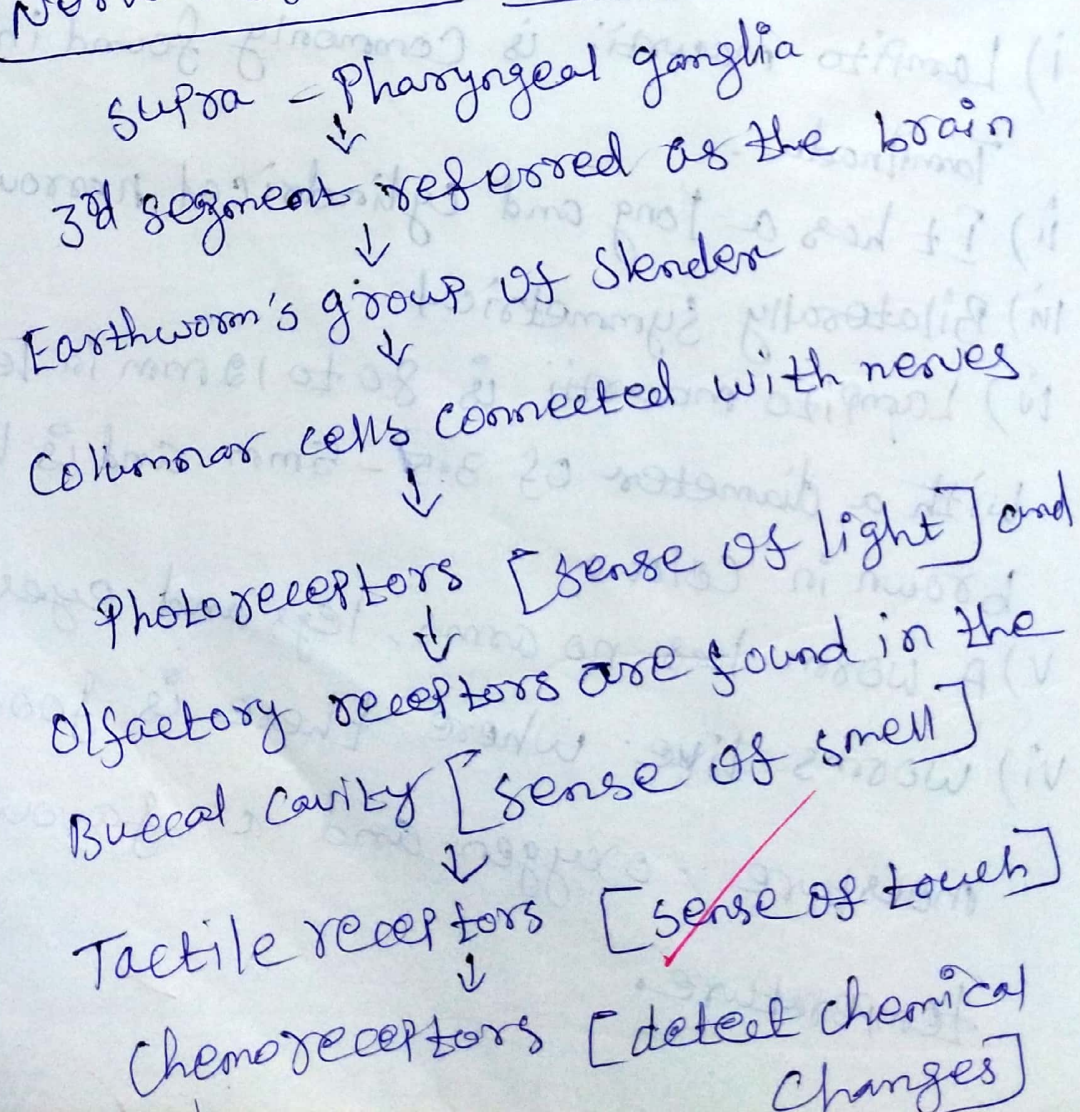


Fig. - *Lampito mauritii*

- i) Lateral hearts lying in the 6th to 13th segments.
- ii) Alimentary canal and pump blood from dorsal vessel to the ventral vessel.

5-1-21 Nervous system - *Lampito mauritii*
 11-3hr



Thermoreceptors [Changes in temperature]
are present in prostomium and the
body wall.

6-1-21
III-5hr Excretory System of Lampito mauritii

Number of coiled tubes



Nephridia



yellow colour chloragogenous cells



Funnel-shaped nephrostomes

Reproductive System - Lampito mauritii

Female gonopore



It receives ova and sperms



Development is direct



There is no larval stage



Embryo - hatches out of each cocoon stage



Cocoon - light yellow colour



Nourishes the developing embryo

7-1-21
V-1hr Lifecycle - Lampito mauritii

Cocoon - 14 to 18 days



Juveniles - after 15 days

(x) It should contain less protein source
(x) Excess protein will produce more heat and ammonia which will kill the worm.

(xi) It should provide a good medium on which the worms must live and work.

Containers for vermicomposting

i) Plastic bucket

ii) Plastic basin

iii) wooden box

iv) concrete tank

v) well rings

vi) cardboard

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18-1-21

I-shr Preparation

i) The preparation of vermicomposting system is bedding for

ii) must be able to retain both moisture and air while providing a place for the worms to live.

iii) Shredded corrugated cardboard is an excellent bedding

4. Feed stock: -

i) Animal wastes

ii) Fruits and vegetable wastes



Dr. P. Raja

Anatomy and Embryology of
Angiosperms / Plant Diversity - I
Odd Semester - 2020-2021

Subject codes : U3R1B0CC5 ; P1R1B0CC1

| D/H | 1 | 2 | 3 | 4 | 5 |
|------------|----------------|----------------|----------------|----------------|----------------|
| <u>I</u> | <u>II. MSc</u> | <u>II. BSc</u> | <u>II. BSc</u> | | |
| <u>II</u> | <u>II. MSc</u> | <u>II. BSc</u> | | <u>II. MSc</u> | <u>II. MSc</u> |
| <u>III</u> | | <u>II. BSc</u> | <u>II. MSc</u> | | <u>II. MSc</u> |
| <u>IV</u> | | <u>II. BSc</u> | | <u>II. BSc</u> | |
| <u>V</u> | <u>II. MSc</u> | <u>II. BSc</u> | | <u>II. MSc</u> | |
| <u>VI</u> | | <u>II. BSc</u> | | <u>II. MSc</u> | |

SEMESTER III

ANATOMY AND EMBRYOLOGY OF ANGIOSPERMS

Course Code : U3RBOCC5

Course : Core Course

Hours/Week : 6

Credit : 5

Objectives

- To inculcate the primary tissues and anatomical features of plants.
- To accrue knowledge about the embryology of Angiosperms.
- To understand the primary, secondary and anomalous, anatomical structure of plant parts.
- To know the various types of pollination mechanism.

UNIT I

General Account – classification and theories of Meristem. Concept of totipotency, differentiation, dedifferentiation and redifferentiation. Structure and Function of Simple tissue (Parenchyma, collenchyma, sclerenchyma; fibres and sclereids) and Complex tissues (xylem and phloem)

UNIT II

Primary and secondary structure of stem in dicotyledons and Monocotyledons. Nodal Anatomy - unilacunar, trilacunar and multilacunar. Leaf Anatomy of monocot and dicot. The root - primary and secondary structure of dicotyledonous and monocotyledonous roots. Anomalous secondary growth – *Boerhaavia*, *Dracaena*.

UNIT III

Wood anatomy - secondary xylem. Physical and chemical properties of wood. Classification of wood. General account an Commercial wood species of South India (teak wood, rose wood, sandal wood, red sandal wood and silver oak).

UNIT IV

Microsporangium, Microsporogenesis - Development of male gametophyte. Megasporangium, Megasporogenesis. Development of female gametophyte (Polygonum). Type and Structure of monosporic (Polygonum), bisporic (*Allium*) and tetrasporic (*Peperomia*) embryo sacs.

UNIT V

Fertilization - Double fertilization. Triple fusion. Development of dicot embryo – Polygonum: type, Development of monocot embryo – *Luzula*: type. Endosperm - Definition. Apomixis - types and significance, Polyembryony, Parthenogenesis and its significance.

Anatomy

7/9/2020

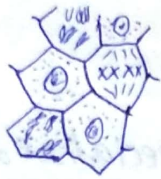
I-2,3 * Anatomy is the study of internal structure of humans, animals and other living organisms

* Greek anatome - Dissection.

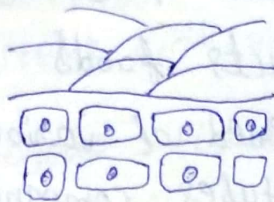
* Tissue - Tissues are groups of cells that have a similar structure and act together to perform a specific function.

* Different cells of plant tissue

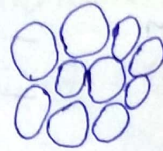
meristematic



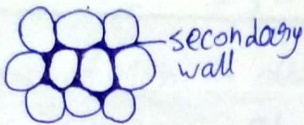
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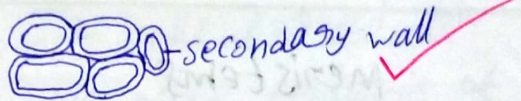
parenchyma



collenchyma



sclerenchyma



8/9/2020

xylem

phloem

II-2

meristematic

- These are small thinwalled cells. devoid of any central vacuole and ~~sited~~ situated at the growing points of root of shoot tip.

- chief function mitosis

protective

- surface of roots, stems and leaves
- flat cells are parallel irregularly arranged.

parenchyma

- large, thinwalled, living cells, having nucleus a central vacuole, intercellular spaces are present. specialized for the process of photosynthesis called chlorenchyma.

collenchyma

- Thick walled, well developed at their corners mechanical support

9/9/2020
II-2
sclerenchyma — very thick secondary layer around the entire margin of the cells. 11/9/2020

— After secondary formation protoplast are cell V-2

xylem — have several types xylem vessels.
xylem tracheitis.

- vessels absent in xylem of gymnosperm
- xylem develops into wood
- conducting tissue conducts water & mineral nutrients.

phloem — conducts foods

- composed of various specialized cells
- sieve tubes, companion cells, phloem fibres, phloem parenchyma cells.

Meristems

13/9/2020
IV-4

- A meristematic tissue consist of a group of cells which remain in continuous state of division. The term first coined by Nageli (1858)
- They retain their power of division.

Characters

- composed of immature cells, division ~~of~~ growth VI-2 12/9/2020
- ICS not found
- rounded, oval, polygonal, living & thin walled
- Abundant cytoplasm & 1 or more nuclei
- vacuoles in the cells may be quite small or altogether absent.
- Nucleus conspicuous
- cytoplasm dense
- vacuoles absent or very small
- rate of respiration is very high

11/9/2020

V-2

pro-meristem — part of apical meristem active & dividing cells and their most recent derivatives.

— one the basis of plane of division meristem are of three types ^{at} meristem.

— All the cells of the body are meristem and divide in different planes ex. early emb.

plate — A flat meristem cells divide anticlinally in two planes as during formation of leaves Rib or file meristem. meristems with only anticlinal division

promeristem — Histogens — tissue producing regions

— Dermatogen

— periblem & plesome

i) Dermatogen — outermost cells formed from AM

— It is give rise to epidermis of stem and other aerial parts.

— In root it gives rise to epiblemma and root cap or calyptrogen forms rootcap (calyptra covering, gennaein — to produce)

ii) Periblem

VI-2

It is middle histogen. forms cortex of stem and roots.

iii) Plesome

It is the central histogen forms stele or part of stem at root inner to endodermis part of it forms vascular tissue called procambium.

Haberlandt (1914) proposed different nomenclature protoderm, ground meristem & pro-cambium.

a) protoderm (protos — first derma — skin)

— outer layer of AM → Epidermis of epiblem & stem

* The process which leads to maturation of cell is called differentiation

* few or major changes happen in protoplasm and cell wall of the cells

Ex. tracheary element loss their protoplasm and develop a very strong, elastic, lignocellulosic secondary cell walls. These changes help the tracheary element to carry water to long distance and extreme tension.

22/9/2020 Dedicifferentiation

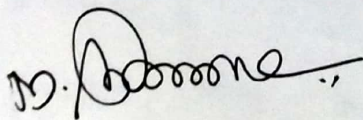
11-2

- A differentiated cell can regain its capacity for cell division under certain conditions.

- This phenomenon called as dedifferentiation formation of inter fascicular cambium and cork cambium from fully differentiated parenchyma cells.

Redifferentiation

A dedifferentiated plant cell once again loses its capacity to divide and become mature. This phenomenon is called redifferentiation



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- * close The windows and let The substrate heat itself up to 60°C .
- * Easily accessible ^{or available} Sugars and nitrogen in The form of ammonia will be used up.
- * This will be incorporated into microbial tissue when They die.
- * Maintain temperature at 60°C for 6 hours by controlling ventilation.
- * A Small mushroom house may not generate 60°C so steam source may be done.

20-9-21

1-1 Hour.

Conditioning:

- * Low temperature from $60-50^{\circ}\text{C}$ (by ventilation) should be used for a period of 12 hours.
- * During conditioning, ensure aeration to avoid anaerobic conditions.
- * Aeration should ^(2-3%) ensure that there is 1.5-2.5%.
- * Carbon dioxide tested by lighting a match stick, if it goes off immediately, carbon dioxide is too high.
- * Nitrogen in the form of ammonia and any simple carbohydrates can be ^(or simple) depleted from the substrate at 50°C for 5-7 days.
- * This will ensure that ammonium ions are below 10-ppm (parts per million)
- * Then cool The substrate suddenly to 25°C

for spawning
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