

NORTH MAHARASHTRA UNIVERSITY, JALGAON

**Syllabus For S.Y.B.Sc. Botany
(w.e.f. June2008)**

SEM- I

**PAPER-I BOT. 211: Morphology of Angiosperms
PAPER-II BOT. 212: Plant Physiology**

SEM- II

**PAPER- I BOT. 221: Diversity of Angiosperms
PAPER-II BOT. 222: Horticulture**

**BOT. 203 Practicals Based on Theory Papers BOT. 211, 212,
221 & 222)**

SEM- I
PAPER-I BOT. 211 : MORPHOLOGY OF ANGIOSPERMS
(Total Periods:52)

Objectives:

1. *To study ground plan of angiospermic plants.*
2. *To study fundamental vegetative and floral plant parts.*
3. *To study plant parts, their modifications and functions.*

Marks

Chapter I: Introduction: (3 Periods) (2)

- 1.1 Ground plan of a plant body, functions of different organs
- 1.2 Seedling morphology: structure of dicotyledonous and monocotyledonous seeds, Epigeal and hypogeal germination

Chapter II: Root: (4 Periods) (4)

- 2.1 Definition, characteristics, functions of root, types of root
- 2.2 Types of modifications for storage, support and breathing:
 - a) Storage: Conical, Fusiform, Napiform, Tuber.
 - b) Support: Prop, Floating, Epiphytic, Parasitic.
 - c) Breathing roots: Pneumatophores.

Chapter III: Stem: (6 Periods) (5)

- 3.1 Definition, characteristics and functions of stem.
- 3.2 Types: Creepers, Climbers, Lianas, Erect.
- 3.3 Modifications:
 - a) Underground: Rhizome, Tuber, Bulbs (Tunicated and Scaly), Corm
 - b) Subaerial: Runner, Sucker, Offset, Stolon
 - c) Aerial: Phylloclade, Cladode, Thorn, Stem-tendrils, Bulbil.

Chapter IV: Leaf: (9 Periods) (7)

- 4.1 Definition, parts of a typical leaf, functions of leaf
- 4.2 Phyllotaxy: a) Alternate b) Opposite c) Whorled
- 4.3 Stipules: Free-lateral, adnate, interpetiolar, intrapetiolar, orchreate, foliaceous, spiny, tendrillar.
- 4.4 Types of Leaf: simple and compound leaf
- 4.5 Venation: Types of venation
- 4.6 Modifications of lamina: Leaf spines, leaf tendrils, fleshy leaf, insectivorous plant- pitcher, bladder-wort, venus fly-trap.

Chapter V: Inflorescence: (6 Periods) (5)

- 5.1 Definition
- 5.2 a) Racemose and their types, b) Cymose and their types, c) Special types: Cyathium, Hypanthodium, Verticillaster
- 5.3 Significance of inflorescence

Chapter VI: Flower: (15 Periods) (10)

- 6.1 Definition
- 6.2 Parts of typical flower
- 6.3 Hypogyny, Epigyny, Perigyny
- 6.4 Bract, Bracteole, Modifications

- 6.5 Calyx: Modifications of calyx- acresent, macrescent, petalloid calyx, pappus, leafy (foliaceous) calyx
- 6.6 Corolla: Polypetalous and gamopetalous types
- 6.7 Perianth
- 6.8 Aestivation: Types of aestivation
- 6.9 Androecium: Cohesion and Adhesion
- 6.10 Gynoecium: Placentation types.

Chapter VII: Fruit:

(9 Periods) (7)

7.1 Definition

7.2 Types:

- A) Simple: (a) Dehiscent
 - (b) Indehiscent i) Fleshy ii) Dry
 - (c) Schizocarpic
- B) Aggregate fruits
- C) Composite fruits: (a) Sorosis (b) Syconus

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SEM- I
PAPER-II BOT. 212 : PLANT PHYSIOLOGY

(Total Periods: 52)

Objectives:

1. *To know importance and scope of the discipline.*
2. *To study plants and plant cells in relation to water.*
3. *To study the process of photosynthesis in higher plants with particular emphasis on light and dark reactions, C₃ and C₄ pathways, limiting factors etc.*
4. *To study process of respiration in higher plants with particular emphasis on aerobic and anaerobic respiration.*
5. *To study plant metabolism in higher plants, primary and secondary metabolites*

Marks

Chapter I: Introduction, Scope and importance of plant physiology. (2 Periods) (2)

Chapter II: Plant cells and water: (10 Periods) (8)

- 2.1 Physical and chemical properties of water: hydrogen bonds- water as Solvent, cohesion and adhesion forces
- 2.2 Movement of water in and out of plant cells and tissues
 - i) Diffusion: Definition, process with example, Diffusion pressure, factors affecting diffusion.
 - ii) Osmosis: Definition, osmometer, osmotic pressure and osmotic potential, Turgor pressure, Wall pressure, Diffusion pressure deficit (DPD), their relationship and importance in water absorption by plant cells, The concept of water potential
 - iii) Types of solutions: Isotonic, hypotonic and hypertonic solutions
Exosmosis, Endosmosis; Plasmolysis and deplasmolysis
 - vi) Imbibition: Mechanism, imbibition pressure or metric potential, significance.

Chapter III: Plant and water relations: (15 periods) (10)

- 3.1 Water absorption by roots, surface area of absorption: Root hairs, Active and passive absorption, Osmotic and non osmotic theories of water absorption.
- 3.2 Ascent of xylem sap. Theories of ascent of xylem sap: Root pressure theory, Cohesion theory with anatomy of water conduction (structure of xylem vessels including bordered pits, pit cavity and torus)
- 3.3 Transpiration- Magnitude, types, structure and mechanism of stomatal opening and closing, Stewards theory, K⁺ pump theory, factor affecting the process, significance of transpiration.

Chapter IV: Photosynthesis: (08 periods) (7)

- 4.1 Introduction and definition:
- 4.2 Structure of chloroplast and compartmentation of the process: light reaction and dark reaction
- 4.3 Light reaction: Types, and functions of photosynthetic pigments in plant

kingdom. Arnon reaction, Cyclic photophosphorylation, Hill reaction, Non-cyclic photophosphorylation.

4.4 Dark reaction: Calvin cycle

4.5 C₄ pathway

4.6 Differences between C₃ and C₄ pathways with examples of plants.

4.7 Law of limiting factors; effect of light, O₂ and CO₂ on photosynthesis including Warberg effect

Chapter V: Respiration: (7 Periods) (5)

5.1 Introduction, definition and types.

5.2 Ultra structure of mitochondria

5.3 Steps in aerobic respiration- glycolysis, oxidation of pyruvate, Krebs' cycle, electron transport system (ETS), cyanide resistant respiration

5.4 Anaerobic respiration in plants- Alcohol fermentation

5.5 Factors influencing rate of respiration.

Chapter VI: Introduction to Plant metabolism: (10 Periods) (8)

6.1 Plants as organic laboratories

6.2 Primary metabolism and secondary metabolism

6.3 Chemical nature, types, distribution and functions of primary metabolites: Carbohydrates, proteins and fats

6.4 Chemical nature, distribution and functions of secondary metabolites: phenolics, terpenoids, glycosides and alkaloids

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- Varma, V. (1995). A Text Book of Plant Physiology and Biochemistry. S.Chand & Company. New Delhi, India.

SEM- II
PAPER-I BOT. 221 : DIVERSITY OF ANGIOSPERMS

(Total Periods: 52)

Objectives:

1. To expose diversity amongst agiospermic plants.
2. To know evolutionary status of angiosperms in the plant kingdom.
3. To understand taxonomy and its functions.
4. To study system of plant classification with particular emphasis on Bentham & Hooker's system.
5. To study angiospermic families from morphological, taxonomical and economic point of view.
6. To know importance of herbarium and their techniques.

Marks

Chapter I: Introduction:

(3 Periods) (3)

- 1.1 Diversity of Angiosperm w.r.t. form, structure and function.
- 1.2 Distinguishing features of the group
- 1.3 Evolutionary status of Angiosperms
- 1.4 Alternation of generations

Chapter II: Taxonomy:

(3 Periods) (3)

- 2.1 Definition and aims of Taxonomy
- 2.2 Taxonomy and systematics
- 2.3 Functions of Taxonomy
 - i) Identification
 - ii) Nomenclature
 - iii) Classification

Chapter III: Classification of Angiosperms:

(5 Periods) (5)

- 3.1 Ranks of Classification
- 3.2 Binomial Nomenclature
- 3.3 Systems of Classification:
 - i) Artificial
 - ii) Natural
 - iii) Phylogenetic
- 3.4 Bentham & Hooker's system of classification upto series
 - i) History,
 - ii) Outline upto series giving reasons
 - iii) Merits
 - iv) Demerits

Chapter IV: Study of families of Angiosperms:

(35 Periods) (25)

(w.r.t Systematic position, general morphological characters, salient features and economic importance)

- | | | | |
|-----------------|----------------------------|-------------------------------|-----------------|
| i) Annonaceae | ii) Malvaceae | iii) Rutaceae | iv) Meliaceae |
| v) Mimosaceae | vi) Caesalpiniaceae | vii) Papilionaceae (Fabaceae) | |
| viii) Myrtaceae | ix) Rubiaceae | x) Sapotaceae | xi) Apocynaceae |
| xii) Solanaceae | xiii) Labiatae (Lamiaceae) | xiv) Euphorbiaceae | |
| xv) Liliaceae | xvi) Commelinaceae | | |

SEM- II
PAPER-II BOT. 222 : HORTICULTURE

(Total Periods: 52)

Objectives:

1. *To know horticulture, its scope, importance and its disciplines.*
2. *To understand different horticultural practices and their methods.*
3. *To study importance, principles and types of Bahar treatment.*
4. *To study role played by green and poly-houses in horticulture.*
5. *To study production technology, harvesting and marketing of crops grown especially in Khandesh region of Maharashtra.*
6. *To understand methods of preservation and preparation of preserved products prevailing especially in this part of the state.*

Marks

Chapter I: Introduction: (3 Periods) (2)

- 1.1 Historical background
- 1.2 Definition, scope and importance
- 1.3 Export and import potential of horticultural crops.
- 1.4 Different disciplines of horticulture

Chapter II: Propagation of Horticultural Plants: (3 Periods) (2)

- 2.1 Sexual propagation: Advantages and disadvantages
- 2.2 Asexual propagation:
 - i) Methods in brief
 - ii) Advantages and disadvantages

Chapter III: Cutting: (3 Periods) (3)

- 3.1 Definition
- 3.2 Methods of cutting:
 - i) Stem cutting: Softwood cutting, Hardwood cutting
 - ii) Leaf cutting
 - iii) Root cutting

Chapter IV: Layering: (3 Periods) (3)

- 4.1 Definition
- 4.2 Methods of layering:
 - i) Simple layering
 - ii) Compound layering
 - iii) Serpentine layering
 - iv) Air-layering or Gootee

Chapter V: Grafting: (3 Periods) (3)

- 5.1 Definition
- 5.2 Methods of grafting:
 - i) Whip grafting
 - ii) Wedge grafting
 - iii) Tongue grafting

- Chapter VI: Budding:** (3 Periods) (2)
- 6.1 Definition
 - 6.2 Methods of budding
 - i) 'T' Shape budding
 - ii) Patch budding
- Chapter VII: Training and Pruning of Plants:** (5 Periods) (4)
- 7.1 Definition
 - 7.2 Difference between training and pruning
 - 7.3 Objectives of training and pruning
 - 7.4 Advantages of training and pruning
- Chapter VIII: Bahar Treatment:** (3 periods) (2)
- 8.1 Definition, importance and principles
 - 8.2 Types of Bahar (Methods not expected)
 - i) Ambe Bahar
 - ii) Mrig Bahar
 - iii) Hasth Bahar
- Chapter IX: Role of Green house and Poly-house in Horticulture:** (5 Periods) (4)
- 9.1 Definition, Scope and importance
 - 9.2 Green-house, Poly-house
- Chapter X: Production technology of some important horticultural** (9Periods) (6)
- Crops:** w.r.t. Commercial varieties, Climate, Soil, Cultivation practices, Pest and disease management, harvesting and methods of marketing: a) Brinjal b) Banana
- Chapter XI: Preservation of Fruits and Vegetables:** (12Periods) (9)
- 11.1 Introduction, scope, importance and principles
 - 11.2 Methods of preservation
 - a) Temporary preservation
 - i) Asepsis
 - ii) Exclusion of moisture
 - iii) Use of mild antiseptic
 - iv) Pasteurization
 - v) Low temperature
 - b) Permanent preservation
 - i) Sterilization and processing: use of sugar, salts, vinegar or chemicals
 - ii) Drying
 - iii) Ionizing radiation
 - 11.3 Preparation of preserved products:
 - a) Mix fruit jam
 - b) Wood apple or guava jelly
 - c) Lemon/ Orange squash
 - d) Tomato ketchup
 - e) Ready to serve (RTS)

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BOT. 203: Practicals Based on Theory Papers BOT. 211, 212, 221 & 222

(Total Practicals: 24)

Practical: 1) Study of Root and stem modifications as per syllabus

Practical: 2) Study of leaf morphology

- i) Parts of typical leaf
- ii) Types of leaf: Simple and compound
- iii) Phyllotaxy: A) Alternate
B) Opposite: a) Superposed b) Decussate
C) Whorled

Practical: 3) Study of inflorescence:

- i) Racemose types
- ii) Cymose types
- iii) Special types

Practical: 4 & 5) Study of flower morphology:

- i) Calyx: Modifications and aestivation
- ii) Corolla: Forms of corolla and aestivation
- iii) Androecium: Adhesion and cohesion
- iv) Gynoecium: Types of placentation (Permanent Slides)

Practical: 6) Study of fruit morphology:

- i) Simple
- ii) Aggregate
- iii) Composite

Practical: 7) To find concentration of isotonic solution by plasmolysis method.

Practical: 8) To find rate of photosynthesis under

- a) Light intensity b) Light quality

Practical: 9) To find rate of transpiration under

- a) Wind b) Light

Practical: 10) Demonstration:

- a) Imbibition pressure
- b) Osmosis- Thistle funnel
- c) Osmosis- Curling experiment
- d) Ringing experiment

Practical: 11) Demonstration:

- a) Relative transpiration
- b) Ganong's potometer
- c) Kuhne's tube
- d) CO₂ necessary for photosynthesis

Practical: 12) To identify following chemicals from plant material:

- a) Amino acids from legumes.
- b) Phenols in tea leaves and Supari (Areca-nut)
- c) Alkaloids in Tobacco/ Datura.

Practical: 13) To construct floral diagram and to write floral formula selecting different flower types.

Practical: 14 to 18) Study of ANY TEN families as per theory syllabus w.r.t. morphological characters, floral formula, floral diagram and systematic position (Sensu Bentham and Hooker) giving reasons, (Selecting families possibly from all plant groups viz., *Polypetalae*, *Gamopetalae*, *Monochlamydae* and *Monocotyledons*)

Practical: 19) Study of garden tools and equipments.

Practical: 20) Study of propagation- i) Media ii) Containers iii) Potting iv) Repotting

Practical: 21) Study of Propagation method by

- a) Cutting
- b) Layering

Practical: 22) Study of Propagation method by

- a) Budding
- b) Grafting

Practical: 23 & 24) Preparation of preserved food products

- a) Mix fruit jam
- b) wood apple or guava jelly
- c) Lemon/Orange squash
- d) Tomato ketchup
- e) Ready to serve-R.T.S./juices

N.B.

- 1) Submission of duly certified journal at the time of practical examination is compulsory.
- 2) Botanical excursion tour, tour report and submission of five duly identified herbarium specimens representing different families are compulsory.