FIRST SEMESTER

PAPER – 1: GENERAL SERICULTURE AND MORICULTURE

60 hrs

Credits 4

Objectives:

(i) To introduce the concepts of origin, growth and study of Sericulture as science.

(ii) To acquaint the general aspects of Sericulture industry.

(iii)To understand the scientific approach of mulberry.

UNIT - I

1. Introduction to Sericulture – Definition, origin and history, spread of sericulture – distribution of Sericulture in the world.Components of sericulture – Mulberry cultivation – Silkworm rearing – Silkworm egg production – Silk reeling and Weaving – end products of each component and their economic importance. 03 hrs

2. Importance of Sericulture in rural development and Indian economy – employment generation in different components - role of women in Sericulture. 03 hrs

3. Global Silk Scenario: Silk production in India, China and Japan – past and present. Tropical and Temperate sericulture – advantages and disadvantages. 03 hrs

4. Sericultural practices in India: Concepts of traditional and non-traditional – meaning, traditional practices and areas – merits and demerits.Types of silks produced in India: Mulberry and non–mulberry silkworms – their food plants - distribution in Karnataka. 04 hrs

UNIT – II

1. Study of soils: Definition - process of soil formation - types of soils - classification of soils in brief. Suitable soil for moriculture. 03 hrs

2. Soil properties: Soil profile – texture – structure - permeability – soil air - soil temperature - soil water and soil micro organisms. 02 hrs

3. Soil reaction: Soil P^H – alkalinity – acidity – characters of alkaline soils and saline soils – remedial measures. 02 hrs

4. Taxonomy of mulberry – popular cultivars in Karnataka and in India. 01 hr

UNIT - III

1. Anatomy of mulberry: Internal structure of primary root and secondary root - stem (primary and secondary) – lamina and petiole of mulberry. 06 hrs

2. Establishment of mulberry garden: Selection of land and preparation of land – digging, ploughing, tilling – levelling. Formation of pits and rows. 02 hrs

3. Planting materials: Procurement of planting materials – preparation of planting materials – cuttings – saplings – Nursery bed preparation and maintainance – raising of saplings. 04 hrs

4. Propogation of mulberry by grafting and layering – methods. 02 hrs

5. Planting systems: Row system – pit system – tree planting – strip / block system –recommended spacing under improved methods of mulberry cultivation – advantages and disadvantages. 04 hrs

UNIT – IV

1. Brief account of essential micro and macronutrients – Organic manures – types and methods of application – vermicomposting. 04 hrs

2. Fertilizers – types – dosage – schedule of application forrainfed and irrigated moriculture. Foliar nutrition – Biofertilizers – Methods of application and significance. 05 hrs

3. Irrigation: Methods of irrigation – sources – periodicity and quantity of irrigation – impact of over irrigation and under irrigation. 02 hrs

4. Package of practices for irrigated and rainfed mulberry gardens: planting systems – manurial and fertilizer schedule – recommended dosage, Irrigation – types and frequency – mulching practices – methods and significance – intercultivation and weeding, pruning – methods and significance. Leaf harvesting methods – time and frequency. 08 hrs

5. Pruning methods in India with special reference to Karnataka.. 02 hrs

FIRST SEMESTER

PRACTICAL – 1: GENERAL SERICULTURE AND MORICULTURE

1. Sericulture maps: Indicating mulberry and non – mulberry belts in India. 01
2. Identification of different types of silks. 01
3. Preparation of pie charts: Different types of silk production in India. 01
4. Land area measurement – Conversion and calculations. 01
5. Soil analysis: For p^H and electrical conductivity. 01
6. Determination of water holding capacity of soils. 01
7. Farm implements. 01
8. Technical description of mulberry. 01
9. Anatomy of root, stem and leaf of mulberry. 03
10. Mulberry propagation: Preparation of cuttings – grafting and layering. 02
11. Mulberry cultivation: All aspects in detail (field work). 02
12. Visit to Government Silk Farm. 01

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Tumkur University

I B.Sc., I SEMESTER

PRACTICAL PAPER - I – SCHEME

GENERAL SERICULTURE AND MORICULTURE

Time: 3 Hours Maximum Marks: 50

Q. 1. Prepare a Pie chart with index for the given data 'A'. 07

Q. 2. Describe 'B' in technical terms with its sericultural importance. 07

Q. 3. Prepare a temporary mount of T.S of 'C'. Identify and leave the preparation for evaluation. 07

Q. 4. Determine the water holding capacity of the given soil. Write the procedure.

Or

Determine the P^H of the given soil sample. Write the procedure. 05

Q. 5. Comment on 'D' and 'E'. (3x2=6)

Q. 6. Identify F, G, H and I with reasons. (4x2=8)

Q. 7. Class records + Farm visit report. 05+05

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KEY

Q. 1. A: Area under mulberry cultivation in Tumkur district / Karnataka.

Or

Cocoon production / unit area in Tumkur district / Karnataka.

Or

Production of different types of silks in India.

Q. 2. B: Mulberry plant (Mysore local, M^5, M^1, S^{36}).

Q. 3. C: Primary root / primary stem / leaf of mulberry (Morus sps.).

Q. 4. : Red loamy soil, Clayey soil, Sandy soil.

Q. 5. 'D' – Farm implements.

'E' – Grafting and layering.

Q. 6. F: Types of asilk.

G: Mulberry cutting / sapling.

H: Types of manures / fertilizers.

I: Permanent slide of mulberry anatomy.

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SECOND SEMESTER

PAPER – II: SILKWORM BIOLOGY AND REARING TECHNOLOGY

60 hrs

Credits 4

OBJECTIVES:

(i) To understand the classification of biology of silkworm *Bombyx mori*.

(ii) To acquaint with ecology and ethology of silkworm rearing.

(iii) To familiarize the improved technologies in silkworm rearing and its impact on cocoon productivity.

UNIT – I

1. Salient features of class Insecta – detailed classification of sericigenous insects – characteristics features Of order Lepidoptera, families *Bombycidae* and *Saturnidae* – economic importance of insects. 04 hrs

2. Classification of silkworms: Based on origin and geographical distribution – based on voltinism and moultinism – popular mulberry silkworm varieties of Karnataka and India. 04 hrs

3. Biology of silkworm *Bombyx mori* - Life cycle of *Bombyx mori.* 02 hrs

UNIT – II

1. Morphology of *Bombyx mori*: Egg, larva (Newly hatched and V^{th} instar), pupa and moth. Metamorphosis – Definition – types – significance. 05 hrs

2. Anatomy and physiology: Anatomy and physiology of digestive system - circulatory system - excretory system - respiratory system - nervous system, male and female reproductive system of silkworm *Bombyx mori*. Structure and function of silk glands. 10 hrs

UNIT – III

1. Mulberry silkworm rearing: Rearing house – location, plan, orientation – types of rearing house – model rearing house - ground plan – salient features and advantages. Rearing appliances – uses. 05 hrs
2. Disinfection: Concept - definition and objectives - methods of disinfecting rearing house and rearing appliances – time and frequency. 03 hrs
3. Disinfectants: Definition – types – popular disinfectants - formalin, bleaching powder - chlorine dioxide - slaked lime and iodine compounds. 03 hrs
4. Selection of race of silkworm – procurement of dfls – transportation procedures. 02 hrs
5. Incubation: Definition – method – environmental conditions – black boxing and its importance. 02 hrs

UNIT – IV

1. Chawki rearing: Preparation and methods of brushing – advantages and disadvantages. Methods of chawki rearing – Optimum environmental conditions – selection of leaves – Methods and frequency of feeding, bed cleaning and spacing – care during moulting. 07 hrs
2. Late age silkworm rearing: Methods – Optimum environmental conditions – selection of leaves – methods and frequency of feeding – merits and demerits – methods and frequency of bed cleaning – spacing - care during moulting. 07 hrs
3. Spinning and Mounting: Spinning behaviour of silkworm – Identification of spinning larva – Environmental requirements during spinning – Types of mountages – reasons for defective cocoons formation. 03 hrs
4. Harvesting of cocoons: Time of harvest, sorting and transportation procedure – time of transportation – significance. 03 hrs

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SECOND SEMESTER

PRACTICAL – II: SILKWORM BIOLOGY AND REARING TECHNOLOGY

1. Life cycle of *Bombyx Mori*, morphology of egg, larva, pupa and adult.	02
2. Dissection of digestive system, nervous system and silk glands of silkworm larva.	03
3. Dissection of male and female reproductive system of silk moth.	02
4. Model rearing house – Ground plan and recommendations.	01
5. Rearing appliances for chawki rearing and late age rearing.	01
6. Disinfectants – types – formulations – calculation – methods of application.	01
7. Silkworm races – Morphological study of BV and MV cocoons.	01
8. *** Silkworm rearing – brushing – methods – chawki rearing – late age rearing, feeding of bed cleaning, spacing, moulting.	03
9. Mounting and spinning – types of mountages.	01
10. Calculation of fecundity and percentage of hatching.	01

Note: *** Silkworm rearing (22 to 24 days) and submission of report.

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Tumkur University

I B.Sc., II SEMESTER

PRACTICAL PAPER - II – SCHEME

SILKWORM BIOLOGY AND REARING TECHNOLOGY

Time: 3 Hours Maximum marks: 50

Q. 1. Dissect and display ------- system of silkworm larva / moth.	10
Q. 2. Brush the given hatched larvae and write the procedure.	10
Q. 3. Comment on 'A' and 'B'.	(2x4=8)
Q. 4. Identify 'C', 'D', 'E', 'F' and 'G' with reasons.	(5x2=10)
Q. 5. Calculate the ---------- on given egg card.	10
Q. 6. Class records + Rearing report.	5+7

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KEY

Q. 1: Digestive system / Nervous system / Silk glands of larva.

Male / female reproductive system of silkmoth.

Q. 2: Egg cards with hatched larvae.

Q. 3: A: Multivoltine / Bivoltine cocoons.

B: Disinfectants.

Q. 4: C, D, E, F and G:

Pupa of *Bombyx mori*.

- Rearing appliances, Diapause and Non-diapause eggs.

Q. 5: Hatched egg cards / Fertile egg cards.

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THIRD SEMESTER

PAPER – III: MULBERRY AND SILKWORM CROP PROTECTION

60 hrs

Credits 4

OBJECTIVES:

(i) To study the incidence, symptoms and damage caused by different pests and diseases of mulberry and silkworm.

(ii) To acquaint with the management of pests and diseases through different methods to prevent crop loss (leaf yield and cocoon yield).

UNIT – I

1. Introduction to plant diseases – importance of crop protection, classification of mulberry diseases. — 02 hrs
2. Fungal diseases of mulberry: Leaf spot, leaf rust, powdery mildew, stem canker, root rot – Incidence, symptoms, casual organism, life cycle of pathogen – integrated control measures. — 05 hrs
3. Root knot disease of mulberry: Occurrence, symptoms, casual organism, preventive and control measures. — 01 hr
4. Viral, bacterial and mycoplasmal diseases of mulberry - occurrence, symptoms, casual organism, preventive and control measures. — 05 hrs
5. Nutritional disorders in mulberry – symptoms and remedial measures. — 03 hrs

UNIT – II

1. Pests of mulberry: Definition of pest - parasitoid and predator – classification of mulberry pests. — 02 hrs
2. Insect pests of mulberry: Types – Leaf eating caterpillars, mealy bugs, leaf rollers, Jassids, thrips, scale insects, beetles, grass-hoppers, spiralling whitefly – occurrence, life cycle, alternate host plants, nature of damage and integrated control measures. — 10 hrs

3. Fungicides and pesticides: Classification - mode of action – forms - formulations and application. 04 hrs

UNIT – III

1. Diseases of silkworm *Bombyx mori*: Introduction – mode of infection – disease development and spread - classification of silkworm diseases 03 hrs
2. Fungal diseases of silkworm - occurrence, symptoms, casual organism, predisposing factors, mode of infection – prevention and control measures. 05 hrs
3. Bacterial diseases of silkworm – Types - occurrence, symptoms, casual organism, predisposing factors, mode of infection – prevention and control measures. 05 hrs
4. Viral diseases of silkworm: Types - occurrence, symptoms, casual organism, predisposing factors, mode of infection – prevention and control measures. 05 hrs
5. Protozoan disease of silkworm: Occurrence, symptoms, casual organism, life-cycle, mode of infection – prevention and control measures. 02 hrs

UNIT – IV

1. Pests and predators of silkworm – Definition – distribution - systematic position and methods of protection. 02 hrs
2. Pests of Silkworm: Indian Uzi fly and Dermestid beetle – Life-cycle - nature of damage - Prevention and control measures. 04 hrs
3. Predators of silkworm: Cockroach, ant, lizard, rodents and birds – systematic position, nature of damage and control measures. 02 hrs

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THIRD SEMESTER

PRACTICAL – III: MULBERRY AND SILKWORM CROP PROTECTION

1. Studies of fungal diseases of mulberry – leaf spot, leaf rust and powdery mildew (free hand sectioning, staining and temporary mounting).	03
2. Study of symptoms of Root knot disease in mulberry.	01
3. Collection of diseased samples of mulberry leaf / root and their preservation, identification of fungal and bacterial pathogens.	02
4. Identification of mineral deficiency symptoms in mulberry and their remedial measures.	01
5. Pests of mulberry – collection, identification and preservation / mounting.	01
6. Studies on common insect pests of mulberry – leaf eating caterpillars, scale insect, mealy bug, thrips, jassid, leaf roller and grasshopper.	01
7. Staining and Study of symptoms of bacterial diseases of silkworm – microscopic examination and identification of pathogen.	01
8. Identification / visual examination of silkworm larvae infected with NPV, CPV and Kenchu – collection and microscopic examination of polyhedral bodies – staining of polyhedra.	01
9. Study of silkworm larva, pupa and moth infected by fungal diseases – collection, staining and microscopic examination.	01
10. Fungicides / pesticides – forms, formulation and application.	01
11. Studies on India Uzi Fly and Dermestid beetle - identification of maggot, pupa, adult and silkworm larva infested by Uzi fly.	02
12. Morphological features of Pebrine infected silkworm eggs, pupa and moth – isolation and microscopic examination. Staining of spores (Giemsa staining).	01

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Tumkur University

II B.Sc., III SEMESTER

PRACTICAL PAPER - III – SCHEME

MULBERRY AND SILKWORM CROP PROTECTION

Time: 3 Hours Maximum marks: 50

Q. 1. Prepare temporary mount of 'A' and identify the pathogen. 07

Q. 2. Prepare a smear of 'B' and identify the pathogen. 07

Q. 3. Comment on 'C' and 'D'. (2x4=8)

Q. 4. Identify and write the significance of 'E' and 'F'. (2x4=8)

Q. 5. Identify G, H, I, J and K with reasons. (2x5=10)

Q. 6. Class record. 05

Submissions:

- Herbarium (01 number) 02
- Pest of mulberry (01 number) 1.5
- Diseased silkworm / Pest of silkworm (01 number) 1.5

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KEY

Q. 1. A: Leaf spot / leaf rust / powdery mildew diseased mulberry leaf.

Q. 2. B: Grasserie / Muscardine / Flacherie infected silkworm larva.

Q. 3. C: Plant protection appliance.

D: Fungicide / Pesticide used for mulberry crop protection.

Q. 4. E: Silkworm crop protection fungicide / Antibiotics.

F: Uzicide / RKO / Similar pesticide.

Q. 5. G, H, I, J, K:

(i) Root knot infected mulberry root.

(ii) Pests of mulberry.

(iii) Pathology permanent slides of mulberry / silkworm.

(iv) Stages of Uzi life cycle.

(v) Silkworm larva infested by Uzi.

(vi) Diseases silkworms.

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FOURTH SEMESTER

PAPER–IV: SILKWORM SEED TECHNOLOGY AND EXTENSION OF SERICULTURE

60 hrs

Credits 4

OBJECTIVES:

i. To introduce the concept of seed cocoon and understand the principle of seed technology.

ii. To acquaint with silkworm seed organization and its importance.

iii. To understand the importance of extension education in community development.

iv. To get introduced to different extension methods for effective diffusion of innovations in sericulture.

UNIT – I

1. Introduction to seed technology – Concept and general account of silkworm seeds and grainages. 02 hrs

2. Seed Organization – Concept and significance, maintenance of parental stock and multiplication. Norms for P^4, P^3, P^2 and P^1 centres. 05 hrs

3. Seed areas and seed cocoon rearers – Seed legislation act – rules and regulations. Seed cocoon markets – transaction procedure – significance. 04 hrs

4. Model grainage – ground plan – grainage equipments – uses and maintenance – significance of environmental factors in a grainage. 04 hrs

UNIT – II

1. Grainage activities: Programme for hybrid egg production – sorting of cocoons – preservation – pupal testing – sex separation at cocoon stage. Moth emergence and synchronization – sex separation in moth stage – coupling and decoupling – oviposition - egg preparation (sheets and loose) – surface sterilization of eggs – refrigeration of 09 hrs

male moths – moth examination – importance – types of moth examination (individual, mass and random).

2. Embryology of *Bombyx mori*: Spermatogenesis and Oogenesis – Fertilization – Embryogenesis – blastoderm and germband formation – blastokinesis, eyespot and blue egg stage embryos. 05 hrs

3. Artificial hatching: Cold and hot acid treatment – postponement of hatching – refrigeration – short term and long term chilling methods – Hibernating and non-hibernating eggs. Hibernation schedule for 3, 4, 6 and 10 months duration. 05 hrs

UNIT – III

1. Extension education: Concept, importance, principle and philosophy – meaning and definition, objectives – need for extension education. 03 hrs

2. Extension methods:

   - Individual contact methods – farm and home visits, farmer calls, personal letter, field flag method – Agri-clinic and Agri–business centres. 02 hrs
   - Group contact methods: Method demonstration. Result demonstration, General meetings, Workshop, Field day, field visits, Group training. 02 hrs
   - Mass contact methods: Mass meetings, publications, Television, Campaign, Exhibitions, Radio. 02 hrs

3. Adoption and diffusion of innovations: - Concepts – attributes of innovation – Adoption process – Diffusion of innovations – stages involved. 04 hrs

UNIT – IV

1. First line extension system –Community Development Programme (CDP) – Integrated Rural Development Programme (IRDP) – Voluntary Organizations. 04 hrs

2. Extension organization in sericulture – Central and state level organization. 02 hrs

3. Extension services: Technical Service Centres, Chawki Rearing Centres, Basic seed farms, Grainages, Cocoon markets, Silk exchange, Central Silk Board, KSMB. 04 hrs

4. Credit flow in Sericulture: Types of credits – Commercial Banks – Co-operatives – DCCB, PLD bank – NABARD. 03 hrs

FOURTH SEMESTER

PRACTICAL – IV: SILKWORM SEED TECHNOLOGY AND EXTENSION OF SERICULTURE.

1. Ground plan of model grainage and grainage equipments.	02
2. Selection of seed cocoons, sorting and preservation.	01
3. Sex separation at cocoon stage, pupal stage and moth stage.	01
4. Moth emergence – pairing, depairing, ovi position – preparation of egg cards / loose eggs – surface sterilization of eggs.	01
5. Moth examination for pebrine spores.	01
6. Identification of different types of eggs: Diapause and non-diapause eggs, fertilized and unfertilized eggs, dead, hatched and unhatched eggs.	01
7. Study of eye spot and blue egg stage embryos of silkworm.	02
8. Acid treatment – cold and hot acid treatment – preparation of acids of required specific gravity.	01
9. Disinfection: Disinfectants, types, formulations and calculations.	01
10. Preparation of organizational charts: Extension network system in Karnataka and India.	01
11. Preparation of leaflets, pamphlets and bulletins.	02
12. Study of functioning of TSCs and interaction with trained farmers with a structured questionnaire through field visits.	01
13. Visit to Government model grainage.	01

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Tumkur University

II B.Sc., IV SEMESTER

PRACTICAL PAPER - IV – SCHEME

SILKWORM SEED TECHNOLOGY AND EXTENSION OF SERICULTURE

Time: 3 Hours Maximum marks: 50

Q. 1. Conduct mother moth examination, identify the spores and leave the smear preparation for evaluation. Write the procedure.

Or

Calculate the sex ratio of given pupae. Write the procedure. 08

Q. 2. Mount the given embryo and identify the stage. Leave the preparation for evaluation. Write the procedure. 10

Q. 3. Comment on 'A' and 'B'. (2x3=6)

Q. 4. Identify C, D, E, F with reasons. (4x2=8)

Q. 5. Prepare a pamphlet / bulletin on ---------- 07

Q. 6. Class records. 05

Submission: Grainage training report. 03

Extension study tour report. 03

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KEY

Q. 3: Eye spot stage / Blue egg stage.

Q. 4: A and B

(i) Seed cocoon preservation – in single layer / in heaped / mixed/ multilayered condition.

(ii) Chipped cocoons.

(iii) Pairing / Oviposition under bright light / normal conditions.

Q. 5: C, D, E and F:

(i) Silk moth (male / female), pupa (male / female) of *Bombyx mori.*

(ii) Types of eggs.

(iii) Grainage equipments.

(iv) Disinfectants used in grainage.

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FIFTH SEMESTER

PAPER – V: CYTOGENETICS AND BREEDING OF MULBERRY

45 hrs

Credits 3

OBJECTIVES:

(i) To familiarise with the basic principles and recent approaches in mulberry genetics and breeding.

(ii) To introduce the fundamentals of cytology and embryology of mulberry.

(iii) To acquaint with application of tissue culture techniques and their practical usefulness.

UNIT – I

1. Mendel's laws of heredity – Monohybrid inheritance and principle of segregation – Dihybrid inheritance and principle of independent assortment – test cross. 03 hrs

2. Chromosomes – Number and structure – mitotic and meiotic studies in mulberry. 02 hrs

3. Microsporogenesis and Megasporogenesis – development of male and female gametophyte - pollination – fertilization – Endosperm – Embryogenesis – polyembryony – parthenocarpy with special reference to mulberry. 07 hrs

UNIT – II

1. Genetic resources of mulberry – Germplasm bank – objectives – collection – characterization – evaluation – conservation and utilization. 02 hrs

2. Aims and objectives of plant breeding - Mode of reproduction in relation to breeding methods – Parameters associated with yield and quality of mulberry leaves - Genetic variability and heterozygosity. 04 hrs

3. Selection methods – Mass selection, pureline selection and clonal selection – Merits and demerits. 04 hrs

UNIT – III

1. Hybridization – Definition - types – objectives – Hybridization techniques – Pedigree method - Back cross method – Bulk method - Synthetic cross method – Advantages and disadvantages. 04 hrs
2. Plant introduction and acclimatization – Definition – procedure – uses, advantages and disadvantages - Quarantine measures – NBPGR. 04 hrs
3. Mutation breeding – Artificial induction of mutation – mutagens - procedure of mutation breeding – application – limitations. 04 hrs

UNIT – IV

1. Polyploidy breeding - Types – induction - its significance in mulberry. 03 hrs
2. Breeding for disease and drought resistance – a brief account - its significance in mulberry breeding. 03 hrs
3. Tissue culture – a brief account of techniques of Tissue culture – culture media – micropropagation – somaclonal variations – protoplast fusion – transgenic plants. 05 hrs

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FIFTH SEMESTER

PRACTICAL – V: CYTOGENETICS AND BREEDING OF MULBERRY.

1. Identification of different stages of megasporogenesis and microsporogenesis – Nuclear endosperm – Dicot embryo. 02
2. Mulberry germplasm bank – Study of leaf yield and quality parameters of mulberry accessions by referring to CSGRC catalogue. 02
3. Mitotic and meiotic chromosomes of onions in comparison with mulberry chromosomes. 02
4. Study of pollen structure in mulberry. 01
5. Hybridisation technique: demonstration of emasculation, bagging and crossing (field work). 02
6. Colchicine treatment of mulberry buds for induction of tetraploidy and mutagenic treatment for mulberry seeds and cuttings. 01
7. Study of stomatal index and frequency in mulberry. 01
8. Separation of chlorophyll by paper chromatography method. 01
9. Estimation of protein content in mulberry leaf. 01
10. Estimation of carbohydrate content in mulberry leaf. 01
11. Determination of moisture percentage and moisture retention capacity of mulberry leaf. 01
12. Tissue culture and Biotechnology (demonstration) – Visit to a research institute. 01

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Tumkur University

III B.Sc., V SEMESTER

PRACTICAL PAPER - V – SCHEME

CYTOGENETICS AND BREEDING OF MULBERRY

Time: 3 Hours Maximum marks: 50

Q. 1. Prepare a temporary squash of given material 'A'. Write the procedure and comment on the cytological stages observed. 10

Q. 2. Conduct the given experiment 'B'. Write the procedure and comment. 10

Q. 3. Evaluate the given mulberry variety 'C' for its morphological features. 06

Q. 4. Comment on 'D' and 'E'. (2x3=6)

Q. 5. Identify F, G, H and I with reasons. (4x2=8)

Q. 6. Class record. 05

Submission: Study tour report. 05

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KEY

Q. 1. A: mulberry root.

Q. 2. B: Estimation of moisture content / protein / carbohydrate content in mulberry leaf.

Or

Extraction of chlorophyll by paper chromatography method.

Q. 3. C: Mutant varieties of Mulberry – S_{35}, S_{54}.

Q. 4. D and E: (i) Stages of Hybridisation techniques and appliances.

(ii) Tissue cultire stages (Photographs).

(iii) Culture media.

(iv) Equipments used in tissue culture.

Q. 5. F, G, H, I:

- Slides of different stages of Microsporogenesis and Megasporogenesis.
- Mutagens.
- Permanent slides of stages of mitosis.
- Pollen grains of mulberry.
- Male / Female inflorescence of Morus.
- V_1, M_5 varieties of mulberry.
- Mutagen treated mulberry seeds / cuttings.

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FIFTH SEMESTER

PAPER – VI: CYTOGENETICS AND BREEDING OF SILKWORM

45 hours

Credits 3

OBJECTIVES:

(i) To know the basic concept and recent approaches in genetics and breeding of silkworm.

(ii) To understand the developmental biology of silkworm.

(iii) To acquaint with the importance of silkworm breeding.

(iv) To familiarise with the breeding techniques of silkworm.

UNIT – I

1. Chromosomes – Structure and number of chromosomes in mulberry and non-mulberry silkworms. — 01 hr
2. Spermatogenesis and Oogenesis – Fertilization – Cleavage of Zygote – blastoderm and germband formation – blastokinesis – eye spot and blue egg stage embryo in silkworm *Bombyx mori.* — 05 hrs
3. Sex determination – Theories - Sex chromosomes - Role of 'Z' and 'W' chromosomes in determination of sex in *Bombyx mori*. — 04 hrs
4. Linkage and crossing over: Definition – significance - linkage groups and linkage maps with special reference to *Bombyx mori*. — 03 hrs

UNIT – II

1. Parthenogenesis and polyploidy – Definition – types - induction in *Bombyx mori* – mosaicism in silkworm. — 03 hrs
2. Mutation – Definition - types – radiation and chemical mutagens. Radiation sensitivity in different developmental stages – Economic utility of induced mutants. — 03 hrs
3. Inheritance of voltinism and moultinism. — 02 hrs

4. Inheritance of voltinism of cocoon colour – pleiotropism - E-alleles and multiple alleles. 04 hrs

UNIT – III

1. Hereditary traits of silkworm – Egg – larva - pupa and adult characteristics. 04 hrs
2. Germplasm bank – Aims - scope and maintenance of silkworm races. 02 hrs
3. Sex limited characters in silkworm – egg colour - larval marking - cocoon colour. 03 hrs
4. Present status of silkworm breeding in India – problems and priorities. Tropical races versus temperate races – advantages and disadvantages. 03 hrs

UNIT – IV

1. Breeding of silkworm - Pre-requisites and objectives – Methods of silkworm breeding – selection – inbreeding - outbreeding and mutation breeding – advantages and disadvantages. New silkworm breeds. 04 hrs
2. Heterosis - Theoretical basis of heterosis. Hybrid vigour in different crossing systems. Hybrid vigour and environment – Utilization of heterosis in sericulture. 04 hrs

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FIFTH SEMESTER

PRACTICAL – VI: CYTOGENETICS AND BREEDING OF SILKWORM

1. Cytological techniques – pre-treatment – fixation – staining – squashes and smears.	03
2. Study of mitosis and meiosis in silkworm *Bombyx mori*.	02
3. Identification of mutants of silkworm varieties.	01
4. Mendelian's mono and dihybrid ratios – exercise.	01
5. Racial characters of bivoltine and multivoltine breeds.	01
6. Selection of cocoons for breeding based on racial characters.	01
7. Calculation of inbreeding depression value.	01
8. Calculation of heterosis.	01
9. Analysis of quantitative traits (cocoon weight and shell weight).	01
10. Study of sex limited larval markings in silkworm breeds.	01
11. Chi-square test and t-test.	01
12. Visit to silkworm germplasm bank (CSGRC).	01
13. Visit to RSRS.	01

Tumkur University

III B.Sc., V SEMESTER

PRACTICAL PAPER - VI – SCHEME

CYTOGENETICS AND BREEDING OF MULBERRY

Time: 3 Hours Maximum marks: 50

Q. 1. Prepare a temporary squash of the given material 'A'. Write the procedure and comment on the cytological stages observed. 10

Q. 2. Calculate 'B' and 'C'. 12

Q. 3. Evaluate the racial characters of 'D' and 'E'. (2x4=8)

Q. 4. Identify F, G, H with reasons. (3x3=9)

Q. 5. Class records. 05

Submission: Study tour report. 3+3

- CSGRC and RSRS.

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KEY

Q. 1. A: Silkworm testes.

Q. 2. B and C: (a) Mendelian mono and dihybrid ratios.

(b) Inbreeding depression.

(c) Heterosis.

(d) Quantitative traits.

(e) Chi-square test and t-test.

Q. 3. D: MV pure race (PM, Nistari).

E: BV cocoons (CSR_2, CSR_4)

Q. 4. F, G, H: (i) Larval mutants.

(ii) Stages of meiosis (slides)

(iii) Silkworm breeds (with sex limited larval markings)

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SIXTH SEMESTER

PAPER – VII: SILK TECHNOLOGY

45 hours

Credits 3

OBJECTIVES:

1. To introduce the concept of cocoon as raw material and its significance in reeling technology.
2. To acquaint with the technologies of silk reeling and importance in reeling devices.
3. To understand the significance of raw silk production and processing of yarn.

UNIT – I

1. Cocoon – Definition - spinning behaviour of silkworm and cocoon formation. Mechanism of silk extrusion – impact of biotic and abiotic factors on cocoon formation. 02 hrs
2. Characteristic features of cocoon - Structure and nature of cocoon – physical and commercial characters – factors influencing cocoon characters. 02 hrs
3. Scientific method of cocoon testing - Objectives and principles - System followed in China, Japan and India. 02 hrs
4. Sorting of cocoons – Objectives and principles – Types of defective cocoons - procedure – estimation of good and defective cocoons in terms of percentage. 03 hrs

UNIT – II

1. Cocoon processing - Stifling and conditioning – Definition and objectives – methods – conventional and advanced – advantages and limitations – significance of conditioning. Determination of standard drying percentage – degree of optimum drying. 05 hrs
2. Cocoon cooking - Definition and objectives – cooking methods – Conventional – monopan, two pan, three pan methods – advantages and disadvantages. Advanced – pressurised and conveyor system – merits and demerits. 05 hrs

3. Brushing – Meaning – objectives – methods – advantages and limitations. 02 hrs

UNIT – III

1. Silk Reeling - Definition and objectives – methods – charaka - cottage basin - multiend – semi-automatic and automatic – advantages and disadvantages. 05 hrs
2. Components of reeling: Croissure – definition - objectives and types – functions – factors influencing efficiency – Thread guide – tharapatti, button – Jettebout – function, types of reels – charaka, standard and small reel. 03 hrs
3. Reeling water: Sources - properties – P^H - Hardness, conductivity – alkalinity - reeling water standards – corrective measures. 02 hrs
4. Re-reeling: Definition – objectives and process. Machineries – conventional and modern – grant reeling. 02 hrs

UNIT – IV

1. Silk lacing – skeining – objectives, process – book making - bundling and bale making. 01 hrs
2. Raw silk testing and grading - Objectives – methods – visual and mechanical tests – standard conditions for silk testing and grading. 04 hrs
3. Silk throwing: Definition and objectives, winding – doubling – twisting – rewinding. 02 hrs
4. Chemical processing of silk: Degumming – definition, objectives and methods – Bleaching and Dyeing of silk – Definition, objectives and methods. 03 hrs
5. Types of silk wastes – Utilization – spun silk production. 02 hrs

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SIXTH SEMESTER

PRACTICAL – VII: SILK TECHNOLOGY

1. Classification and sorting of cocoon – percentage calculation of good and different types of defective cocoons — 01
2. Cocoon drying and estimation of drying percentage for different durations. — 01
3. Determination of commercial characters of cocoon:
    a) Cocoon weight, shell weight, floss weight, pupal weight. Estimation of shell weight percentage, floss weight percentage and pupal weight percentage. — 02
    b) Determination of average filament length and non-breakable filament length, denier and renditta, raw silk percentage and silk recovery. — 01
4. Cooking methods – demonstration. — 01
5. Reeling machineries – visit to a reeling centre.
6. Reeling water analysis – Determination of p^H, conductivity, alkalinity, total hardness and permanent hardness of water. — 02
7. Identification by physical and flame tests for cotton, wool and silk fibres. — 02
8. Estimation of fibroin and sericin percentage. — 01
9. Wet processing of raw silk: — 03
    a) Degumming
    b) Bleaching
    c) Dyeing – acid, basic.
10. Identification of different types of silk wastes – charaka, cottage basin, filature waste, basin refusal, reeler's waste. — 01
11. Identification of parts of reeling devices. — 01

Tumkur University

III B.Sc., VI SEMESTER

PRACTICAL PAPER - VII – SCHEME

SILK TECHNOLOGY

Time: 3 Hours Maximum marks: 50

Q. 1. Sort out the given lot of cocoons into different defective types and good cocoons. Write their salient features and calculate the percentage of each type.

Or

- Estimate the sericin and fibroin percentage in given cocoon. 10

Or

- Calculate the commercial characters of given cocoons. Write the procedure.

Q. 2. Reel the given lot cocoons and determine the average filament length and renditta.

Or

Determine the hardness of reeling water sample given. Write the procedure. 10

Or

Reel the given lot of cocoons and calculate the non-breakable filament length and denier.

Q. 3. Find out the degumming loss of the given silk sample.

Or

Dye the given silk hank, write the procedure. 10

Q. 4. Identify the given sample fibre by physical and burning test. 04

Q. 5. Identify A, B, C with reasons. 06

Q. 6. A) Class record. 05

B) Study tour report. 05

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KEY

Q. 1: (i) Calculation of percentage of defective cocoons and good cocoons.

(ii) Calculation of Shell weight percentage, floss weight percentage, silk recovery, pupal weight percentage etc.

Q. 4: Silk fibre / Cotton fibre / Wool.

Q. 5: A, B, C: Parts of reeling / Weaving machines.

Types of Silk wastes.

Defective cocoons.

Skein, Hank etc.

Skeining machine, Denier scale.

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SIXTH SEMESTER

PAPER – VIII: NON-MULBERRY SERICULTURE AND ECONOMICS OF SERICULTURE

45 hours

Credits 3

OBJECTIVES:

1. To study the vanya silkworms and their food plants.
2. To understand the biology and rearing of non-mulberry silkworms.
3. To know the diseases and pests of non-mulberry silkworms.
4. To acquaint the economic aspects of Sericulture.

UNIT – I

1. Scope of non-mulberry sericulture – Distribution of Vanya sericulture in Karnataka.	01 hr
2. Types of non-mulberry silkworms – their systematic position – global distribution.	01 hr
3. Primary and secondary food plants of Tasar. Muga, Eri silkworms and their distribution.	02 hrs
4. Taxonomy of non-mulberry food plants: Technical description of *Terminalia arjuna, Terminalia catappa, Litsaea polyantha, Machilus bombycina, Ricinus communis*.	05 hrs
5. Cultivation of primary food plants of Tasar, Muga and Eri silkworms – *Terminalia arjuna, Machilus bombycina* and *Ricinus communis*.	03 hrs
6. Brief account of important diseases and pests of primary non-mulberry food plants and their management.	03 hrs

UNIT – II

1. Life cycle of Tasar, Muga and Eri silkworms – Morphology of egg, larva, pupa cocoon and moth.	04 hrs
2. Rearing of Tasar, Muga and Eri silkworms – Influence of ecological conditions – Traditional and improved methods of young age and late age silkworm rearing.	04 hrs

3. Spinning and Mounting: Mounting methods – Types of mountages used for Tasar, Muga and Eri cocoon spinning. Spinning behaviour of non-mulberry silkworms. 02 hrs

4. Grainage activities: Procurement of seed cocoons – Storage of seed cocoons – moth emergence – coupling – production of egg layings. 02 hrs

UNIT – III

1. Diseases of non-mulberry silkworms: Mycosis, Bacteriosis, Virosis and Microsporidiosis diseases – Causitive agents – symptoms – preventive and control measures. 04 hrs

2. Pests and predators of non-mulberry silkworms – life-cycle – incidence - damage caused – control measures. 03 hrs

3. Vanya cocoon harvesting and reeling techniques – production and processing of Tasar silk, Muga silk and Eri silk. 03 hrs

UNIT – IV

1. Economics of mulberry cultivation: Cost and returns of Irrigated and rainfed mulberry garden (per hectare). 02 hrs

2. Economics of silkworm rearing: Cost and returns of silkworm rearing (for 100dfls). 01 hr

3. Cost and returns of silkworm egg production (for producing one lakh dfls). 01 hr

4. Economics of silk reeling: Cost and returns of raw silk production (per kg) on charaka, cottage basin and multiend reeling. 03 hrs

5. Comparative economics of sericulture versus paddy, ragi, sugarcane. 01 hr

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SIXTH SEMESTER

PRACTICAL – VIII: NON–MULBERRY SERICULTURE AND ECONOMICS OF SERICULTURE

1. Taxonomy of primary and secondary food plants of Tasar, Muga and Eri silkworms.	03
2. Life cycle of Tasar, Muga and Eri silkworms - Morphology of egg, larva, cocoon, pupa and moth.	03
3. Rearing appliances used in rearing of non-mulberry silkworms (Drawing / sketches).	03
4. Characteristics of Non-mulberry silks.	01
5. Graphical representation of data – Preparation of Pie charts – Bar diagrams.	01
6. Computation of economics of seed production under different scales of production.	01
7. Economics of Chawki rearing centres – with a capacity of 2500dfls / 5000dfls / 10,000dfls per batch.	01
8. Visit the CRC, TSC, CSB and KSMB.	03

Tumkur University

III B.Sc., VI SEMESTER

PRACTICAL PAPER - VIII – SCHEME

NON-MULBERRY SERICULTURE AND ECONOMICS OF SERICULTURE

Time: 3 Hours Maximum marks: 50

Q. 1. Describe 'A' in taxonomical term and write its sericultural importance. 10

Q. 2. Comment on 'B' and 'C'. (2x4=8)

Q. 3. Identify 'D', write its characteristic feature. 06

Q. 4. Give the graphical representation for 'E'.

Or

Prepare a pie chart for 'E'. 10

Q. 5. Identify 'F' and 'G' with reasons. (3x2=6)

Q. 6. Class records. 05

Submission: Study tour report. 05

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KEY

Q. 1. A: Primary and secondary food plants of non-mulberry.

Q. 2. B: Cocoons of Non-mulberry silkworms.

C: Locally available food plants of Eri silkworm / Tasar silkworm.

Q. 3. D: Tasar silk / Muag silk / Eri silk.

Q. 4. E: Data of

- Cocoon production / Silk production in Karnataka or India.
- Area under mulberry cultivation in Karnataka.

Q. 5. F and G:

- Egg, larva, pupa and moths of Non-mulberry silkworms.
- Rearing appliances of non-mulberry silkworm rearing.

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Question Paper Format

For

B.Sc., Course (CBCS) in Sericulture of Tumkur University, Tumakuru

B.Sc., I-VI Semester Internal Test in Sericulture

Time Duration: 01 Hours. **Total Marks: 45 marks.**

(Draw neat labelled diagram wherever necessary)

I. Answer any Five from the following: (05x2=10 marks)

1.

2.

3.

4.

5.

6.

7.

II. Answer any Three from the following: (03x05=15 marks)

1.

2.

3.

4.

5.

III. Answer any Two from the following: (02x10=20 marks)

1.

2.

3.

4.

Question Paper Format

For

B.Sc., Course (CBCS) in Sericulture of Tumkur University, Tumakuru

B.Sc., I-VI Semester Examination in Sericulture

Time Duration: 03 Hours. **Total Marks: 90 marks.**

(Draw neat labelled diagram wherever necessary)

I. Answer any Ten from the following: (10x2=20 marks)

1.

2.

3.

4.

5.

6.

7.

8.

9.

10.

11.

12.

II. Answer any Six from the following: (06x05=30 marks)

1.

2.

3.

4.

5.

6.

7.

8.

III. Answer any Four from the following: (04x10=40 marks)

1.

2.

3.

4.

5.

6.

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