

ANDHRA PRADESH STATE COUNCIL OF HIGHER EDUCATION

(A Statutory body of the Government of Andhra Pradesh)

PROGRAMME: THREE-YEAR B.Sc.

(With Zoology, Sericulture and Chemistry Disciplines)

DOMAIN SUBJECT

SERICULTURE

(With Learning Outcomes, Unit-wise Syllabus, References, Co-curricular Activities & Model Q.P

for Five Courses of 1, 2, 3 & 4 Semesters)

(To Be Implemented From 2020-21 Academic Year)

SUBJECT EXPERTS

Prof. S. Smitha

Principal,

Department of Sericulture

Sri Tayi Surya Narayana Govt.Degree College,Kadiri

Ananthapuramu.Dt

Affiliated to

Sri Krishna Devaraya University

Ananthapuramu.Dt

ANDHRA PRADESH STATE COUNCIL OF HIGHER EDUCATION

(A Statutory body of the Government of Andhra Pradesh)

CBCS – UG SYLLABUS SUBJECT REVIEW COMMITTEE

(To Be Implemented From 2020-21 Academic Year)

PROGRAMME: THREE-YEAR B.Sc. (With Zoology, Sericulture and Chemistry Disciplines)

Domain Subject: Sericulture

(With Learning Outcomes, Unit-wise Syllabus, References, Co-curricular Activities & Model Q.P for Five Courses of 1, 2, 3 & 4 Semesters)

Structure of SERICULTURE Syllabus under CBCS for 3-year B.Sc. Programme (with domain subject covered during the first 4 Semesters with 5 Courses)

Sl. No	Code	Sem	Courses 1, II, III, IV & 'O'	Name of Course (Each Course consists 5 Units with each Unit having 12 hours of class-work)	Hours/Week	Credits	Marks	
							Mid Sem	Sem End
1		I	I	Biology of mulberry & production technology	5	4	25	75
2		II	II	Cytogenetics and breeding of mulberry	5	4	25	75
3		III	III	Biology & rearing technology of silkworm	5	4	25	75
4		IV	IV	Silkworm seed organization, technology & pathology	5	4	25	75
5		Open (either 2/3/4)	'O'	Silkworm Cytogenetics and Breeding	5	4	25	75
Total						20	125	375

Approved
S. S. S. S.
20/1/21
Principal,
Chairperson
BOS, SERICULTURE
GOU K. J. Somayajulu

PROGRAMME: THREE-YEAR B.Sc.

(With Zoology, Sericulture and Chemistry Disciplines)

Course Code:

Domain Subject: Sericulture

Semester-wise Syllabus under CBCS I

Year B. Sc. –Semester – I

Course1: BIOLOGY OF MULBERRY & PRODUCTION TECHNOLOGY

Learning Outcomes:

After successful completion of this course, the student will be able to:

- Classification of plant kingdom
- Anatomy- root, stem and leaf of mulberry
- Income generation and economics
- Nursery Management - Kissan Nursery&Economics
- Cultivation package practices
- Growth Parameters

Syllabus:

Unit - 1	<u>TAXONOMY & ANATOMY OF MULBERRY</u> Botanical Description and taxonomical characters of Mulberry Varieties and Species- Anatomy of Root (Primary & Secondary), Stem (Primary & Secondary), Petiole and leaf- Influence of Environment on Mulberry growth and development- Soil- Physical and Chemical Properties of soils, soil texture, soil structure and their classification in relation to mulberry growth red loamy soils, clay soils, sandy soils and black soils.
Unit - II	<u>MULBERRY PROPAGATION</u> Asexual Propagation or Vegetative Propagation-Propagation by cuttings-Grafting- Stem, Bud and root grafting-Layering- Simple, Air, Trench-Sexual Propagation through seeds and seedlings preparation-Nursery Technology
Unit - III	<u>MULBERRY PRODUCTION & MANAGEMENT</u> -I:Factors of soil for mulberry growth -Mulberry cultivation. Selection of the Land-Preparation of the Land-Planting material-Methods of Planting-a) Pit system, b) Row system-Irrigation methods- Flatbed method, basin method, furrow method, sprinkler or over head method, drip irrigation- Manuring



Unit - IV

MULBERRY PRODUCTION & MANAGEMENT - II

Inter Cultivation and Weeding, Systematic position of Common weeds of mulberry garden, Preventive & Control measures. Integrated Weed Control.-2. Methods of pruning- low cut, high cut, and middle cut, Head and non-head type of pruning-3. Methods of leaf harvest- leaf picking, branch harvest and whole shoot harvest- Preservation.

Unit - V

PHYSIOLOGY & GROWTH OF MULBERRY:

Brief Account of Photosynthesis; Carbon Fixation and their relation to leaf quality and productivity-Chemical Composition of Mulberry leaf. In relation to environmental conditions, soil conditions, cultural practices-Plant Nutrition- A. Macronutrients; Micronutrients their role in growth and respective deficiency syndromes-Growth regulating substances and their application in improvement of mulberry.

Practical components-Sem.1

1. **Taxonomy:** moraceae.
2. **Anatomy:**
 1. T.s. primary and secondary roots and stems of mulberry.
 2. Leaf and petiole.
3. **Mulberry propagation:**
 1. Stem cutting
 2. Nursery preparation.
 3. Bud grafting– root grafting - layering
4. Collection of mulberry seeds for germplasm development
5. Land preparation and mulberry plantation
6. Inter cultivation of mulberry
7. Morphology and systematic position of common weeds of mulberry.

References:

1. Bongale, U.D (1995) Fertilizers in mulberry cultivation. Pushpa Sree Publications, Thalaghattapura, Bangalore.
2. Dokuhon, Z.S (1998). Illustrated Textbook on Sericulture. Oxford & IBH publishing Co, Pvt. Ltd, New Delhi, Calcutta.
3. Gupta, R.K & Mittal, R.K (1983) Bibliography of Indian Weeds. Associated Pub. Co. New Dehli.
4. Hasao Aruga (1994) Principles of Sericulture (Translated from Japanese) Oxford & IBH publishing Co, Pvt. Ltd, New Delhi.
5. Hortmann and Kesler (1993) Plant Propagation, principles and practices. Prentice Hall, Hemel Nemstead.
6. Krishnamurthy, N. (1981) Plant growth substances including application in Agriculture. Tata McGraw Hill Pub. Co. Ltd. New Delhi.
7. Shankar, M.A (1998) Handbook on mulberry Nutrition, Multiplex, Bangalore.
8. Subba Rao, N.S (1998) Biofertilisers in Agriculture. Oxford & IBH Pub. Co, Pvt. Ltd, New Delhi.
9. A text Book on Mulberry Crop Protection. Govindaiah, V.P Gupta, D.D Sharma, S. Rajadurai and V. Nishitha Naik, Published by Central Silk Board, Bangalore-68, India. 2005.
10. Rajanna L, Das P.K, Ravindra S, Bhogesh K, Mishra R.K, Singhvi N.R, Katigar R.S and Jayaram H. Mulberry Cultivation and Physiology.2005

11. Sericulture Manual – 1 (Mulberry cultivation) (1972) Food and Agriculture Organization of the United Nations, Rome.
12. Lecturers on Sericulture-Edited by G.Boraiah, SBS Publishers Distributors, BANGALORE
13. Comprehensive Sericulture Manual-M.Madan Mohan Rao, B.S.Publications, HYDERABAD.
14. Patti sankethika vignana sasthanam-Developed by APSSRDI, Kirikera
15. Pattu parisrama-Telugu academy
16. Photosynthesis and plant physiology

Mandatory Co-Curricular Activity:

Mulberry Cultivation should be a compulsory activity as it helps student to understand vividly and clearly than the text and **should be made part of Internal Examination by allotting 10 marks out of 25 marks for this skill-based activity.**

Suggested Co-Curricular Activities

A. Measurable

- Assignments/Team Projects –Textual form/garden establishment/Gene Banks/Vermicompost units/panchagavya/jeevamrytham/organic pesticide preparations/
- Student seminars& Debates – Why Sericulture/impact on Economy & Economics/ Field constrains/Govt subsidiary schemes/Sericulture extension & Scope/Research inventions/State and Central depts. of Sericulture-
- Quiz Programmes –ICT based/Kahooth/h5P/Google forms/plickers
- Individual Field Studies –Institute- Village Linked programmes/Data Collection/Paper presentation/Molakala cheruvu-a model village
- Study Tour-CSR&TI, Mysore, CST&RI,B'lore
- Students can be asked to create a chart of SILK ROAD charting the dates of key events. This can be applied to an historical event or the sequence of events.
- Students should be asked to maintain a SILK MUSEUM with inventory items cocoon handicrafts, silk fabrics, bouquets etc

B GENERAL :

- Collection of news reports and maintaining a record of paper-cuttings relating to topics covered in syllabus
- Discussion Forums-Participation by joining ONLINE Sericulture Technology
- Designing of online course/Moodle -Any similar activities with imaginative thinking.

CONTINUOUS COMPREHENSIVE ASSESSMENT METHODS

- The oral and written examinations (Scheduled and surprise tests),
- Closed-book and open-book tests/Concept paper writing,
- Problem-solving exercises,
- Practical assignments and survey reports,
- Observation of practical skills,
- Individual and group project reports,
- Efficient delivery using seminar presentations, Viva voce interviews.
- Computerized adaptive testing, literature surveys and evaluations,
- Peers and self-assessment, outputs form individual and collaborative work

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Study Tour:

- Mulberry Farms, Mulberry Nursery, Gene Banks, RSRS, Rappthadu
- AP State Sericulture Department, Kadiri; AP Agriculture Research Station, Kadiri;
- AP State Sericulture Research and Development Institute, Hindupur;
- Regional Sericulture Research Station, Rappthadu; Department of Sericulture, Sri Padmavathi Mahila University, Tirupati;
- Sericulture Department, SK University; GKVK, Hebbal, Bangalore.

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PROGRAMME: THREE-YEAR B.Sc.

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Course Code:

Domain Subject: Sericulture

Semester-wise Syllabus under CBCS I Year B. Sc. –Semester –II
Course2: CYTOGENETICS AND BREEDING OF MULBERRY

Learning Outcomes:

After successful completion of this course, the student will be able to:

- Germplasm resources of host plants of silkworms and their exploration
- Conservation of germplasm of host plants of silkworm

- Role of germplasm in crop improvement

- Inheritance of economic characters

- Breeding methods
- Back cross method of breeding and Application of tissue culture technique in mulberry its importance

Syllabus:

- Unit - 1 **EMBRYOLOGY:-** Sporogenesis-. Microsporogenesis- Development of microspores; Megaspores -Development of megaspores-Fertilization- Embryo Development-Polyembryony; Parthenogenesis; Parthenocarpy
- Unit - II **CYTOLOGY, GENETICS, BREEDING OF MULBERRY**
Cytological aspects of Mulberry-Brief account of Mendelian genetics, selection, scope and methods. Collection and maintenance of Germplasm Bank. Breeding of Mulberry-Plant introduction and acclimatization. Hybridization-Scope, application and limitations Polyploidy- Euploidy, Aneuploidy, Introduction of Polyploidy and their significance. Mutations-Natural, Induced-Techniques, applications, Limitations.
- Unit - III **BIOTECHNOLOGY IN MULBERRY:**
Introduction and Scope of biotechnology in mulberry improvement
Biofertilizers –Bio-fertilizers and their application in mulberry cultivation, methods of application, scope and limitation.
VermiTechnology. Mulching: Mulches and their significance in soil conservation
-Tissue Culture – Tissue culture techniques in mulberry anther/ pollen culture, callus culture, somoclonal variants, somatic, hybrid in *vitro* screening cryopreservation.
- Unit - IV **DISEASES & PESTS OF MULBERRY, INTEGRATED PEST MANAGEMENT (IPM):**
Introduction to Plant diseases
Foliar Diseases- Powdery mildew- Rust- Leaf Spot; D. Tukra.
Stem Diseases- Trunk rot-. Dogare blight-

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Root Diseases- White root-rot. Violet root-rot Root-Knot.
Prevention and Control of Mulberry Diseases

Pest Attack on Mulberry:

Identification of different types of leaf eating caterpillars, Jassids, Mealy Bugs, Thrips, Scale Insects, Beetles, Nature of damage, Preventive and control measures. Common Pesticides, Chemical nature, Mode of action. Integrated Pest Management methods.

Unit - V

RESOURCE MANAGEMENT & ECONOMICS OF MULBERRY

Water management and Watershed management concept – significance of recharging technologies-Intercropping and uses for soil management- Economics of mulberry cultivation – Bye – products of mulberry and their indu use

PRACTICALS-Sem II

1. Identification of different mulberry genotypes
2. Bio – Fertilizers – Identification, Preparation of panchagavya & Jeevamrutha.
3. Vermin Technology
4. By – Products of Mulberry and their utilization – Fruit jam preparation
5. Identification of mulberry diseases and pests Identification,

REFERENCES

1. Chopra, V.L (1985). Plant Breeding: Theory and Practice. Oxford &IBH Publishing Co, Pvt. Ltd. New Delhi.
2. Darlington, C.D. and Wylie, A.P (1970). Handling of chrosomes. George Allen and Unwin Ltd, London.
3. Gupta, P.K (1995). Cytogenesis. Rastogi Publication, Meerut.
4. Kuckuch, H., Kobabe, G. Wenzel, G (1993) Fundaments of plant Breeding. Narasa Publishing House, New Delhi, Bombay, Calcutta.
5. A.Bayly, Indian Society and the Making of the British Empire History of India, 2nd Part, Telugu Academy

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Mandatory Co-Curricular Activity:

Establishment of Gene Bank of Mulberry genotypes should be a compulsory activity as it helps student to understand the varied genetic resources vividly and clearly than the text and should be made part of Internal Examination by allotting marks for this skill-based activity.

Suggested Co-Curricular Activities

A. Measurable

- Assignments/Team Projects –Textual form/Tissue culture/Biofertilizer preparations/Vermin compost/INM/IPM/Herbarium/Disease management/Byproduct preparation
- Student seminars& Debates – Resource management/Breeding strategies/Seribiotechnology
- Quiz Programmes –ICT based/Kahooth/h5P/Google forms/plickers
- Individual Field Studies –Institute- Village Linked programmes/Data Collection/Paper presentation/ Study Tour-CSR&TI, Mysore, CST&RI,B'lore
- Students can be asked to create a chart of SILK ROAD charting the dates of key events. This can be applied to an historical event or the sequence of events.
- Students should be asked to maintain a SILK MUSEUM with inventory items cocoon handicrafts, silk fabrics, bouquets etc

B General

- Collection of news reports and maintaining a record of paper-cuttings relating to topics covered in syllabus
- Discussion Forums-Participation by joining ONLINE Sericulture Technology
- Designing of online course/Moodle -Any similar activities with imaginative thinking.

CONTINUOUS COMPREHENSIVE ASSESSMENT METHODS

- The oral and written examinations (Scheduled and surprise tests),
- Closed-book and open-book tests/Concept paper writing,
- Problem-solving exercises,
- Practical assignments and survey reports,
- Observation of practical skills,
- Individual and group project reports,
- Efficient delivery using seminar presentations,
- Viva voce interviews.
- Computerized adaptive testing, literature surveys and evaluations,
- Peers and self-assessment, outputs form individual and collaborative work

Study Tour:

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- Sericulture Department, SK University;
- GKVK, Hebbal, Bangalore.

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Course Code:

Domain Subject: Sericulture

Semester-wise Syllabus under CBCS

I Year B. Sc. – Semester – III

Course 3: BIOLOGY & REARING TECHNOLOGY OF SILKWORM

Learning Outcomes:

After successful completion of this course, the student will be able to:

- Biodiversity of silkworms in India and World wide
- Authorized Silkworm Races suitable for different regions
- Differences between rearing of crossbreed and bivoltine silkworm
- Rearing houses, plan and maintenance. Rearing of chawki worms and methods appliances.
- Record maintenance and logistics at Chawki Rearing Centres
- Calculation of Effective Rate of Rearing

Syllabus:

- Unit - I **SYSTEMATICS & SILKWORM BIODIVERSITY:**
Systematic position of Mulberry and Non mulberry silkworms in the animal kingdom (Taxonomic Classification)-Kinds of Silkworms & geographical distribution (Mulberry and Non Mulberry Silkworms) -Life cycle (Holometabola) of silkworm – egg stage, larva stage, pupa stage and adult stage
- Unit - II **SILKWORM ANATOMY AND PHYSIOLOGY:**
Morphology of Silkworm Egg, Larva, Pupa & Moth.
Anatomy of Silkworm larva-Digestive System, Excretory System , Respiratory, Circulatory and Central Nervous System and Silk glands Male and Female reproductive system. - Introduction, Structure and functions of Endocrine Glands (Brain, Corpora allatum, Prothoracic gland, Corpora cardiaca & Sub oesophageal ganglion).
- Unit - III **THE SILKWORM AND THE ENVIRONMENT:**
Introduction of silkworm rearing
Rearing Equipment - rearing stand, rearing trays, ant wells, paraffin papers, foam rubber pads, chopsticks, feathers, chopping boards, leaf chambers, cleaning nets, mountages -Disinfection of rearing house - methods, eco-friendly disinfectants-Precautions during disinfection - Rearing and Impact of Environmental factors.
- Unit - IV **INCUBATION AND PRESERVATION OF SILKWORM EGGS:**
Preparatory Work for Incubation of Silkworm Egg
Development of Silkworm Embryo-Environmental conditions for Incubation-Technical Management in Incubation-Preservation of eggs for

initiation of rearing.

- Unit - V **PRINCIPLES AND BV&MV SILKWORM REARING MANAGEMENT**
Rearing of Chawki Silkworms: Paraffin Paper method-Box rearing
Cooperative Rearing-Scientific Rearing Technology - Brushing, feeding, bed cleaning, spacing-Moulting and care during moulting-Adult Silkworm Rearing Methods - Mounting-Methods-Various Mountages, Spinning and Harvesting

PRACTICALS-Sem-3

1. Biology of silkworms:

1. Morphology and life cycle of silkworms.
2. Comparative stages of egg, larva.
3. Male pupa, Female pupa, Male moth and Female moth.
4. Digestive system and silk glands of silkworm.
5. Female Reproductive system and Nervous system.

2. Silkworm Rearing:

1. Model rearing house.
2. Chopping Boards, Chopping Knives, Leaf Chambers, Ant wells.
3. Basin Stand, Cleaning Nets.
4. Feeding Stand, Chopsticks and feathers.
5. Hygrometer, Thermometer.
6. Rearing Stands, Chandrikae, Wooden tray.

Study Tour:

Grainages- APSSericulture dept, Kutagulla
Chawki Rearing Centers, - APSSericulture dept CRC
Seed Farms (P2) station , Horsely Hills, Madanapalli,

References

1. Charsley, S.R. (1982). Culture and Sericulture. Academic Press Inc., New York, U.S.A
2. Chowdhury, S.N. (1998) Muga Culture. Central Silk Board, Bangalore, India
3. Dokuhon, Z.S. (1998). Illustrated Textbook on Sericulture. Oxford & IBH publishing Co., Pvt. Ltd. Calcutta.
4. Hamamura, Y. (2001). Silkworm rearing on Artificial Diet. Oxford & IBH publishing Co., Pvt. Ltd. New Delhi.
5. Hasao Aruga (1994). Principles of Sericulture (Translated from Japanese) Oxford & IBH publishing Co., Pvt. Ltd. New Delhi.
6. Jolly, M.S. Chowdhuty, S.N and Sen. (1975). Non-Mulberry Sericulture in India. Central Silk Board, Bombay, India.
7. Jolly, M.S (1998). Tasar Culture. Central Silk Board, Bangalore, India.
8. Sarkar, D.C. (1998) Eri Culture. Central Silk Board, Bangalore
9. Techniques of Silkworm rearing in the tropics. Economic and Social commission of Asia and the Pacific. United Nations, New York. 1993.
10. Veda, K. Nagai, I., Horikomi, M (1997) Silkworm Rearing (Translated from Japanese. Oxford & IBH publishing co., Co., Pvt. Ltd. New Delhi.
11. Wu Pang-Chuan and Chen Da-Chuang. (1994) Silkworm rearing. Oxford & IBH publishing Co., Pvt. Ltd. New Delhi.
12. Proceedings of the 20th Congress of the International Sericulture Commission-2005. Volume-2. Published by Central Silk Board, Bangalore-68, India.
13. Rajan, R.K. Hemanth Raju 2005, Text Book on silkworm rearing, Central Silk Board, Bangalore.

Mandatory Co-Curricular Activity:

Silkworm Rearing should be a compulsory activity as it helps student to understand vividly and clearly than the text and should be made part of Internal Examination by allotting 10 marks for this skill-based activity.

Suggested Co-Curricular Activities

Students should be asked to maintain a SILK MUSEUM with inventory items cocoon handicrafts, silk fabrics, bouquets etc

A.MEASURABLE

- Assignments/Team Projects –Textual form/Silkworm Rearing/Cocoon production/Marketing/Income generation/Economics-analysis
- Student seminars& Debates – Why Sericulture/impact on Economy & Economics/ Field constrains/Govt subsidiary schemes/Sericulture extension & Scope/Research inventions/State and Central depts. of Sericulture-
- Quiz Programmes –ICT based/Kahooth/h5P/Google forms/plickers
- Individual Field Studies –Institute- Village Linked programmes/Data Collection/Paper presentation/Molakala cheruvu-a model village
- Study Tour-CSR&TI, Mysore, CST&RI,B'lore
- Students can be asked to create a chart of SILK ROAD charting the dates of key events. This can be applied to an historical event or the sequence of events.

B.GENERAL

- Collection of news reports and maintaining a record of paper-cuttings relating to topics covered in syllabus
- Discussion Forums-Participation by joining ONLINE Sericulture Technology-Designing of online course/Moodle -Any similar activities with imaginative thinking

CONTINUOUS COMPREHENSIVE ASSESSMENT METHODS

- The oral and written examinations (Scheduled and surprise tests),
- Closed-book and open-book tests/Concept paper writing,
- Problem-solving exercises,
- Practical assignments and survey reports,
- Observation of practical skills,Individual and group project reports,
- Efficient delivery using seminar presentations,
- Viva voce interviews.
- Computerized adaptive testing, literature surveys and evaluations,
- Peers and self-assessment, outputs form individual and collaborative work



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Course Code:

Domain Subject: Sericulture

Semester-wise Syllabus under CBCS

II Year B. Sc. – Semester – IV

Course.4:SILKWORM SEED ORGANIZATION, TECHNOLOGY& PATHOLOGY

Learning Outcomes:

After successful completion of this course, the student will be able to:

- Indian sericulture scenario in egg production
- Seed Multiplication
- Preparation for Egg Production
- Bivoltine seed production, importance and characteristic features
- Economics and self Employability
- Indian sericulture scenario in egg production
- Seed Multiplication
- Preparation for Egg Production

Syllabus:

- Unit - 1 **SILKWORM SEED TECHNOLOGY**
Grainage introduction:
Indian sericulture scenario in egg production - Grainage system in A.P -
Model Grainage - Grainage Equipment - Economics of Egg -
Production
- Unit - II **SILKWORM SEED COCOON PROCESSING**
Grainage activities(Hybrid Disease free egg laying):
Disinfection of grainage - P1 Seed cocoon procurement and
transportation of seed cocoons - Cocoon Sorting and Cocoon
arrangements - Sex Separation, Moth Emergence & Synchronization of
moth emergence, Pairing & De - pairing Oviposition, Refrigeration of
Male moths- Pupal gut examination - Moth Examination: (Individual,
Sampling and Mass Moth examination Artificial hatching - Hot and
Cold Acid Treatment - Postponement of hatching by Chilling -
Hibernation and Incubation of Eggs.
- Unit –III **SEED ORGANIZATION:**
Objectives of seed organization - Types of cocoon production areas -
Industrial cocoon production areas - seed cocoon production areas -
P4 Stations (Evolution of new silkworm breeds) - P3 Stations (Basic
Seed Farms) - P2 Stations (Seed Multiplication Farms) and
P1 centers (Parent Seed Cocoon Production Centers)
- Unit - IV **SILKWORM PATHOLOGY:**
Introduction of Parasitism, Commensalism, Symbiosis and Parasite
relationship - Mulberry Silkworm Diseases: Introduction, types,
Pebrine, Grasserie, Muscardine, Flacherie, Symptoms and Pathogens,
Mode of Infection, Prevention and Control -Non – mulberry silkworm

diseases: Pebrine, Bacterial and viral diseases.

Unit - V

SILKWORM PESTS AND PREDATORS:

Introduction, types of pests – Indian and Japan Uzi fly Life Cycle - Nature of Damage, Preventive and control measure and other pests Demisted beetles - Brief Account of Predators of Silkworms, Cockroaches, Ants, Beetles, Lizards, and Rodents - Nature of damage and control measures.

PRACTICALS

Seed Technology & Pathology

1. Model grainage equipment: Wooden Stand, Bamboo tray, Ant wells, Thermometer, Hygro meter, cellulose, Moth crushing set, Microscope, Acid treatment equipment.
2. Sexing of pupae and moth, Moth emergence, Preparation of loose eggs, Preparation of disease free layings.
3. Moth examination for Pebrine, acid treatment (Hot acid and cold acid treatment).
4. Identification of different types of eggs: Hybernative and Non-hybernative eggs, fertilized and unfertilized and dead eggs. Counting of eggs and hatching percentage.
5. Identification of diseased silkworm larvae:
 1. Muscardine
 2. Grasserie
 3. Flacherie
6. Collection and identification of Pests of Mulberry silkworms: Uzi fly, its life cycle.
7. Morphology of predators of silkworm (Beetles, ants and Rats).

References:

1. Anon. (1972). Manual on Sericulture.. Vol. II Silkworm Rearing FAO, Agriculture Services. Bulletin No. 72/2, Rome, Italy.
2. Narasimhanna and Ullal (1978). Handbook of silkworm egg production, CSB Publications,
3. Ullal and Narasimhanna (1978). Handbook of practical sericulture, CSB Publications, Bangalore.
4. Wang San-Wing (1994). Silkworm seed production Vol. III Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi.
5. Narasimhanna. M.N. (1998). Manual on Silkworm egg Production. CSB., Govt. of India, Bangalore
6. Silkworm egg production, (Translated from Japanese), (1997), Oxford & IBH Publishing Co. New Delhi.

Mandatory Co-Curricular Activity:

Silkworm egg Production and processing should be a compulsory activity as it helps student to understand vividly and clearly than the text and should be made part of Internal Examination by allotting 10 marks for this skill-based activity.

Suggested Co-Curricular Activities

A.MEASURABLE

- Assignments/Team Projects –Textual form/silkworm seed production
- Student seminars& Debates – Grainage system in AP, Karnataka and neighbouring states
- Quiz Programmes –ICT based/Kahooth/h5P/Google forms/plickers
- Individual Field Studies –Grainages in Dharmavaram, HDP, Demand and Status
- Study Tour-CSR&TI, Mysore, CST&RI,B'lore
- Students can be asked to create a chart of capacity of Grainages and Seed Cocoon prices

B GENERAL :

- Collection of news reports and maintaining a record of paper-cuttings relating to topics covered in syllabus
- Discussion Forums-Participation by joining ONLINE Sericulture Technology
- Designing of online course/Moodle -Any similar activities with imaginative thinking.

CONTINUOUS COMPREHENSIVE ASSESSMENT METHODS

- The oral and written examinations (Scheduled and surprise tests),
- Closed-book and open-book tests/Concept paper writing,
- Problem-solving exercises,
- Practical assignments and survey reports,
- Observation of practical skills,
- Individual and group project reports,
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PROGRAMME: THREE-YEAR B.Sc
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Course Code:

Domain Subject: Sericulture

Semester-wise Syllabus under CBCS

I/II Year B. Sc. – Semester 2/3/4

Course 'O': SILKWORM CYTO GENETICS AND BREEDING

Learning Outcomes:

After successful completion of this course, the student will be able to:

- History of silkworm breeding Japan, China, India
- Silkworm gene bank and maintaining germplasm
- Hybridization programme & Heterosis in different crossing systems
- Authorization of parental breeds, hybrids and Authorization committee – role
- Phases of silkworm breeds developed, prospects and its applications
- Molecular markers in silkworm breedings

Syllabus:

- Unit - 1 **CYTOLOGY:**
Mitosis, Meiosis, Chromosome number in Mulberry and Non-Mulberry
Silkworms - Gametogenesis, Oogenesis and Spermatogenesis
- Unit - II **DEVELOPMENTAL BIOLOGY**
Embryonic development-Cleavage-Blastoderm-germ band formation –
Blastokinesis-Appendage formation-Organogenesis - Sex determination in
silkworms.
- Unit - III **GENETICS**
Linkage and Crossing Over, Linkage Maps, factors influencing crossing over,
Linkage groups - Parthenogenesis with reference to silkworm-types and methods,
induction of parthenogenesis. Merits and limitations - Multiple alleles. Genetic
control of Voltinism and Moultnism, relation between genes and hormones.
- Unit - IV **Genetics of cocoon colours**
Mutations- Mutation - radiation and chemical mutagenesis – radiation sensitivity -
types of chemical mutagens, importance of mutagens in induction of mutations.
- Unit - V **BREEDING:**
Aim of Breeding, inbreeding, Inbreeding depression, out breeding, consequence
of homozygosity - Selection-Hybridization- Heterosis-theories-manifestation of
hybrid vigor. Evolution of new breeds, Sex Limited races - Genetic Engineering-
rDNA technology-Transgenic Silkworms-Restriction Enzymes-Vectors Plasmids



REFERENCES:

1. CHRISTOPHER Howe. (1995). Gene Cloning and Manipulation Cambridge Univ. Press.
2. Goldsmith, M and Wilkinson, A.S. (1996) Molecular model system in Lepidopterons. Cambridge Press, London.
3. Hiratsuka. (1999) Silkworm Breeding Oxford & IBH publishing Co, Pvt. Ltd. New Delhi. Calcutta.
4. Morohoshi, S (2000) Development, and Physiology of Silkworm. Oxford & IBH Publishing Co, Pvt. Ltd., New Delhi.
5. Sreeramreddy (ed), G. (1998). Silkworm Breeding. IBM Publishers, New Delhi.
6. Strickberger, M.W.(1996). GENETICS. Prentice-Hall of India, New Delhi.

Mandatory Co-Curricular Activity:

Collection of Silkworm varieties and maintenance should be a compulsory activity as it helps student to understand vividly and clearly than the text and should be made part of Internal Examination by allotting marks for this skill-based activity.

Suggested Co-Curricular Activities

A.MEASURABLE

- Assignments/Team Projects –Textual form/Incubation of eggs/induction of Parthenogenesis
- Student seminars& Debates – Transgenics and Breeding,Role played by Research Institutess
- Quiz Programmes –ICT based/Kahooth/h5P/Google forms/plickers
- Individual Field Studies –Grainages in Dharmavaram, HDP, Demand and Status
- Study Tour-CSR&TI, Mysore, CST&RI,B'lore
- Students can be asked to create a chart of capacity of Grainages and Seed Cocoon prices

B.GENERAL :

- Collection of news reports and maintaining a record of paper-cuttings relating to topics covered in syllabus
- Discussion Forums-Participation by joining ONLINE Sericulture Technology
- Designing of online course/Moodle -Any similar activities with imaginative thinking.

CONTINUOUS COMPREHENSIVE ASSESSMENT METHODS

- The oral and written examinations (Scheduled and surprise tests),
- Closed-book and open-book tests/Concept paper writing,
- Problem-solving exercises,
- Practical assignments and survey reports,
- Observation of practical skills,
- Individual and group project reports,
- Efficient delivery using seminar presentations,Viva voce interviews.
- Computerized adaptive testing, literature surveys and evaluations,
- Peers and self-assessment, outputs form individual and collaborative work

