

### **Unit 1: Mulberry Crop Production**

Mulberry genetic variability and distribution–varieties–Soil suitability–Climatic requirements and constraints – Propagation methods – Planting methods – inter cropping - population geometry – growth analysis - Soil fertility – fertilizer recommendation – integrated nutrient management – organic farming - Water management – Weed management -Problem soils and management – Rain fed mulberry - *Chawki* garden maintenance – Training and pruning –Leaf quality-concept and assessment–preservation–Sericulture in integrated farming system–Resource management in mulberry crop production–Mechanization-machineries in sericulture–Pests, diseases and nematodes of mulberry and their management.

### **Unit 2: Mulberry and Silkworm Breeding**

Germplasm-collection-conservation-evaluation and utilization-choice of parental genotypes for selection and hybridization –inter varietal and interspecific hybridization and polycross-clones-clonal Selection-Breeding for quality-genetic relationship between mulberry and silk worm genotypes-environmental interactions. Biotic and abiotic stresses- selection of suitable host genotypes for stability and responsiveness across the environments – selection for different situations like drought and salinity-breeding for tree types-selection of genotypes-responsive to pruning - innovative breeding approaches - tissue culture/micro propagation of mulberry plants-contribution of National and International Institutes - Distinguishing characters of released varieties- production of nucleus and breeders planting materials. Silkworm - present status of silkworm breeding - establishing a silkworm breeding programme - introduction of exotic gene source. In breeding techniques-crossbreeding techniques for hybridization-different methods-mutation- convergent crossing-diallel selection-selection of good inbred combiners. Selection for single trait and multi traits-breeding for tolerance to pathogens, early maturity, high temperature, post cocoon characters–breeding for biochemical parameters and sex-limited characters–recent advances in silkworm breeding.

### **Unit 3: Silkworm Biology**

Position of sericigenous insects in class insecta-silkworm integument-moulting process–exoskeleton–structure and Function-Body regions-head and its appendages in silkworm-mouth Parts-Types of antenna and mouth parts in silkworm and other insects–Cephalic glands. Thorax and its appendages-modification of legs in silkworm and in other insects-type of wings and venation in *Bombycidae* and *Saturnidae* - Abdomen and its appendages - male and female genitalia in silk moths–male–female reproductive system–spermatogenesis–oogenesis– unusual types of development. Morphology and anatomy of eggs of silkworm–Diapause–physiology of diapause–biochemical changes - stages of development in diapausing and non-diapausing eggs - principles underlying breaking diapause and cold storage. Structure and function of silk gland-protein requirement in silkworm–composition of amino acids in silk gland-transamination-chemistry of fibroin, sericin and P25-biosynthesis of silk-role of food supplementation on silk yield. Structure and function of digestive system–circulatory system-respiratory system–

excretory system – endocrine system - role of JH and anti JH analogues/ phytohormones in cocoon production.

#### **Unit 4: Silkworm Protection**

Insect pathology–history–Concepts–Silkworm diseases–pathogenicity–kinds of infection–symptoms and pathologies associated with various diseases–classification of non-infectious and infectious diseases–poisoning due to gases–tobacco poisoning–nutritional and genetic diseases. Silkworm viruses–resistance of silkworm breeds against viral infection–role of antiviral and viral inhibitory factors– non-inclusion viruses. Miscellaneous flacherie diseases - Bacterial diseases – etiology – epizootology – bacterial toxicosis- symptoms - management of bacterial diseases. Protozoan diseases–biodiversity–symptoms–detection–monitoring and management–silkworm mycoses – types of fungal diseases – symptoms and management - disinfection and hygiene – disinfectants – mode of action. Pests of silkworm–uzifly–external morphology, biology, symptoms and management practices– pests of grainage–non-insect pests–mite–nematode–rodents’ symptoms and management practices.

#### **Unit 5: Silkworm Nutrition**

Insect nutrition–nutritional requirements of silkworm larva–nutritional composition of mulberry leaves–feeding physiology of silkworm. Carbohydrate requirement - carbohydrate metabolism - lipid metabolism - synthesis of fatty acid in *Bombyx mori* – Amino acid requirement. Transamination – silk proteins physio-chemical properties - fibroin and sericin synthesis–supplementation of nutrients for high silk yield. Role of water soluble and lipid soluble vitamins–growth factor–role and requirement of minerals- larval excretion. Dry matter economy–intestinal flora of silkworm–Artificial diet–nutrient management through food supplementation.

#### **Unit 6: Non-Mulberry Sericulture**

Status of vanya silk industry in India–History–Types of non-mulberry silkworms–Distribution and eco races of non-mulberry silkworms- Maintenance of germplasm of non-mulberry silkworms – *Eri* silkworm–morphology and voltinism–and their host Plants–Castor for dual purpose. Tasar silkworm–food plants and cultivation practices–large scale Plantations–*Terminalia arjuna* and *Terminalia tomentosa*–Pests and diseases on food plants and their Management–Rearing of different non-mulberry Silkworms–Pests and diseases of non-mulberry silkworms–Management practices. Muga silkworm–food plants and cultivation practices–Pests and diseases on food plants and their management - Rearing technology – Economics of rearing–Marketing System–Silk reeling techniques–Recent advances in non-mulberry silk industry–Biotechnological approaches.

#### **Unit 7: Silk Reeling Technology**

Cocoon marketing–price fixation–sorting, mixing, drying and stifling–Cocoon cooking–principle and methods. Types of reeling machines. Comparative output of each device – advantages and disadvantages of different reeling devices. Reeling water quality. Silk throwing and weaving–processes involved in winding, doubling, twisting, rewinding for warp and weft-

hank Making-Wet processing–degumming and bleaching by alkali and enzyme methods-dyeing-different dyes - warping and weaving - printing - block, hand screen tables Grading of silk–standards–silk exchange- by products and its uses.

### **Unit 8: Silkworm Seed Cocoon and Egg Production**

Status and strategies of silkworm egg production - Morphology - Embryology – Biochemical changes in Eggs-Seed cocoon-preservation-selection-sorting-sex separation-cocoon melting. Moth emergence-sexing-pairing and depairing-egg Laying-Handling of eggs-embryological tools- diapausing and non-diapausing eggs - Acid treatment -preservation schedule - incubation/Black boxing technique- bivoltine seed production. Seed crop monitoring-agencies-seed Organization-Seed Acts-licensing procedures-pests of grainage – pebrine diagnosis and management- cocoon melting – seed acts.