

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.