

HORTICULTURE
(P.G. DEGREE STANDARD)

SUBJECT CODE: 279

UNIT- I: PRINCIPLES OF HORTICULTURE

Scope and importance of horticulture - Scenario of horticulture industry in the regional, National and global economy - Area and production - Export and import - Nutritive value of horticultural crops - Horticultural therapy - Role of soil and climate on crop production – Planting system – HDP, UHDP and meadow orchard - Importance and methods of Irrigation - Water stress management - Essential and beneficial nutrients – Classification - Functions and deficiency symptoms of primary, secondary and micronutrients in horticulture crops – Fertigation - Weed management – Training and pruning – Cropping systems – Mulching - Role of growth regulators – Off season production – Physiological disorders and its remedies – Pests and diseases management strategies - Maturity indices – Harvest – Grading – Post harvest handling - Importance of protected cultivation in horticultural crops – Vegetable forcing - Hydroponics – Nutrient Film Technique - Aeroponics - Precision horticulture – Commercial horticulture – GAP – GMP - Organic horticulture and certification – Horticulture developmental agencies, programmes and commodity boards.

UNIT - II: PROPAGATION AND NURSERY TECHNIQUES OF HORTICULTURAL CROPS

Sexual propagation, principles, advantages and disadvantages – Apomixis, polyembryony, seed dormancy and methods to overcome the dormancy - Factors influencing seed germination - Protrays - Containers - Media - Growing structures – Management of fruit nursery - Asexual propagation – Principles, advantages and disadvantages – Mist chamber - Rooting of vegetatively propagated plants - Physiological, anatomical and bio chemical basis of root induction - Layering, Grafting and budding principles – Methods - Problems and measures to overcome - Stock and scion relationship – Incompatibility - Propagation through specialized plant parts, rejuvenation of senile orchards through top working, progeny orchard and bud wood bank - Hardening - Nutrient management, pest and disease management in nursery. Nursery certification-micro propagation - principles and concepts – *in vitro*

clonal propagation techniques – Media - Growth hormones - Callus induction - Direct and indirect organogenesis – Synthetic seeds - Meristem culture - Embryogenesis - Micro-grafting - Callus induction and sub culturing - Hardening - Packing and transport of micro propagated plants.

UNIT - III: GROWTH AND DEVELOPMENT OF HORTICULTURAL CROPS

Important phases of growth and development – Definitions, photosynthetic productivity, leaf area index (LAI) – optimum LAI in horticultural crops. Canopy development: Different stages of growth, growth curves, growth analysis in horticultural crops. Plant bio-regulators – Auxin, gibberellin, cytokinin, ethylene, inhibitors and retardants, basic functions, biosynthesis, role in crop growth and development, propagation, flowering, fruit setting, fruit thinning, fruit development, fruit drop and fruit ripening. physiological basis of training and pruning, source and sink relationship. Seed development and maturation, seed dormancy and bud dormancy, causes and breaking methods in horticultural crops. factors affecting flowering, physiology of flowering, photoperiodism in horticultural crops. Physiology of fruit growth and development, fruit setting, ripening- study of chemical manipulations on growth and development, understanding stress impact on growth and development.

UNIT - IV: BREEDING OF HORTICULTURAL CROPS

Scope and importance of plant breeding in horticultural crops – Breeding systems and objectives – Plant genetic resources - Modes of reproduction - Mechanisms of pollination control, sterility and incompatibility – Effect of mating systems. Methods of breeding in annual vegetable crops(cross and self pollinated crops) – Approaches for crop improvement – Introduction, selection, hybridization – Pedigree breeding, bulk, single seed descent method, mass selection, recurrent and reciprocal recurrent selection, back cross breeding – Heterosis breeding – Development of F1 hybrids, synthetics, composites, mutation breeding, polyploidy breeding, breeding for quality traits – Resistance breeding for biotic and abiotic stress. Methods of breeding in fruit crops - Objectives– modes of reproduction – Approaches for crop improvement – Introduction, selection, hybridization, mutation breeding , polyploidy breeding, breeding for quality traits – Resistance breeding for biotic and abiotic stresses - Biotechnological interventions. In vitro and molecular approaches - Molecular tools

for breeding – Molecular markers – Protein based and PCR based detection for genetic confirmation – *in vitro* mutation breeding - Genetic transformation methods – Vector transformation and particle bombardment – RNAi technology – Emerging concepts and applications in horticultural crops.

UNIT – V: PRODUCTION TECHNOLOGY OF FRUIT CROPS

Scope and importance - Current scenario on national and international level production and trade of fruit crops – Field gene bank and cryopreservation of fruit crops - Species - Varieties / hybrids – Climate and soil requirements and its influence on crop growth - propagation methods and nursery technologies – Rootstocks influence-planting systems including high density planting(HDP) and ultra high density planting(UHDP) – Canopy management and crop regulation - Water management – Nutrient management – Fertigation - Cropping systems – Training and pruning - Mulching – Weed management – Use of plant growth regulators - Special horticultural practices - Role of biotic and abiotic factors, limits of fruit production and their management – Nutrient deficiency and physiological disorder and its corrective measures - Maturity indices – Harvesting - Ripening – Post harvest management – Supply chain management of important fruit crops : Mango, Banana, Acidlime, Sweet Orange, Grapes, Papaya, Guava, Sapota, Pineapple, Jackfruit, Pomegranate, Annona, Ber, Aonla, Apple, Pear, Plum, Peach, Strawberry, Litchi, Avocado, Walnut and Almond and minor fruit crops.

UNIT - VI: PRODUCTION TECHNOLOGY OF VEGETABLE CROPS

Scope and importance of warm, cool and under exploited vegetable crops -Current scenario on national and international level of production and trade of vegetable crops - Types of vegetable farming - Commercial varieties / hybrids - Climatic and soil requirements – Seasons - Seed rate and seed treatment - Nursery management - Protray nursery - Sowing/planting - Cropping systems – Nutrient management – Fertigation - Irrigation management – Plant growth regulators - Intercultural operations, weed management – Mulching - Biotic and abiotic stresses and their management - Nutrient deficiency and physiological disorder and its corrective measures - Maturity standards – Harvesting - Post harvest management -Protected cultivation – Precision farming - Seed production techniques of vegetable crops: Tomato, Brinjal, Chilli and Capsicum (Sweet pepper), Bhendi, Leguminous

Vegetables (Beans, Peas, Cluster beans - Cowpea - Dolichos bean); Bulbous vegetables (onion); Tuber crops - (Potato, Tapioca, Sweet potato, Elephant footyam, Colacassia); Cucurbitaceous Vegetables (Cucumber, Bittergourd, Snakegourd, Ridgegourd, Ashgourd, Musk melon, Watermelon, Pumpkin) - Cruciferous vegetables (Cabbage, Cauliflower and Knolkhol); Root vegetables (Carrot, Radish, Beetroot, Turnip) - Leafy vegetables (Spinach, Lettuce, Palak, Amaranthus) – Perennial vegetables (Drumstick, Coccinea) – Underexploited vegetables.

UNIT - VII: PRODUCTION TECHNOLOGY OF COMMERCIAL FLOWER CROPS AND LANDSCAPING

Scope and importance of floriculture industry - Loose flower production and trade - National and international status – Commercial varieties/ hybrids - Climatic and soil requirements - Field preparation – Season - Systems of planting, transplanting techniques - Precision farming techniques - Water and nutrient management, Weed management - Training and pruning, Special horticultural practices - Pinching, disbudding, use of growth regulators - Physiological disorders and remedies – Biotic and abiotic stress management - Harvest indices, harvesting techniques - Post - harvest handling and grading, pre-cooling, packing and storage, transportation and marketing. value addition - Dry flowers - Pigment extraction - Concrete and essential oil extraction of important loose flower crops – Jasmine, Scented Rose, Chrysanthemum, Tuberose, Marigold, Crossandra, Celosia, Gomphrena, Nerium.

Scope and importance of cut flowers - Production and trade - Global and National scenario - Special nursery practices, growing environment, open cultivation, protected cultivation, soil requirements, soil decontamination techniques, planting methods, influence of environmental parameters, light, temperature, moisture, humidity and CO₂ on growth and flowering - Water and nutrient management, Fertigation, weed management, ratooning, training and pruning, special horticultural practices - Use of growth regulators, flower forcing and year round flowering through physiological interventions, chemical regulation, physiological disorders and remedies, environmental manipulation – Biotic and abiotic stress management - Cut flower standards and grades, harvest indices, harvesting techniques, post-harvest

handling of cut Rose, cut Chrysanthemum, carnation, gerbera, anthurium, orchids, gladiolus, cut foliage and fillers.

Principles of landscape designing – Styles of gardening - Types of gardening viz., Mughal, Japanese, English, Persian, Italian, French gardening - Garden components – Plants for container growing – Indoor plants - Plants for instant gardens – Plants for spring, summer, winter and autumn - Ornamental trees and burlapping - Shrub, annuals, climbers and creepers, hedge and edge plants (foliage and flowering) - Cactus and succulent, xeriscapping - Interior scaping – Garden adornments - Principles and styles of flower arrangements – Bonsai styles and culture – Different gardening: industrial, institutional, public and private landscaping – Vertical garden – Roof garden – Terrace garden – Sky rise garden – Scenic gardens - Landscaping for roadways and traffic islands – Garden with water features and water conservation – Speciality garden – Dish, terrarium, bottle, miniature, bog and rock garden. Lawn – Classification of turf grasses - Conditions for healthy turf - Soil properties, micro irrigation, nutrient management – Turf grass establishment and maintenance – Astroturf and maintenance - Overview of software for Computer Aided Design and Drafting (CADD) - AUTOCAD plants and design - AUTOCAD - File handling.

UNIT - VIII: PRODUCTION TECHNOLOGY OF SPICES AND PLANTATION CROPS

Scope and importance of spices and plantation crops - Present status - National and International trade - Climatic and soil requirements - Commercial varieties/hybrids - Season – Propagation - Sowing/planting - Seed rate and seed treatment - Nutrient and water management – Intercropping - Mixed cropping - Multitier cropping - Weed management – Mulching - Shade and canopy regulation – Nutrient deficiencies – Biotic and abiotic stress management - Harvest and post-harvest management and processing - Organic farming and certification of major spices and plantation crops - Spice crops : Black pepper, Cardamom, Turmeric, Ginger, Coriander, Fenugreek, Fennel, Cumin and Ajowan, Nutmeg, Clove, Cinnamon, Allspice, Tamarind, Garcinia, Garlic, Vanilla, Curry Leaf and Paprika. Plantation crops: Coffee, Tea, Rubber, Cashew, Coconut, Oilpalm, Palmyrah, Arecanut, Cocoa and Betelvine

UNIT - IX: PRODUCTION TECHNOLOGY OF MEDICINAL AND AROMATIC CROPS

Scope and importance of medicinal and aromatic plants. - Production and trade - National and International scenario of herbal and perfumery industry, WTO - Export and import status, Indian system of medicine, *in situ* and *ex situ* conservation. Classification of medicinal and aromatic crops - Organic production and certification - Climatic and soil requirements - Varieties and species - Propagation - Sowing/planting - Nutrient and water management, Weed management - Biotic and abiotic stress management - Harvest index-harvesting, Post harvest handling - Drying, processing, grading, packing and storage, processing and value addition; Quality standards in herbal products. Production of secondary metabolites - Distillation of essential oils and quality analysis. GAP - GCP - GMP. Medicinal crops: Senna, Periwinkle, Coleus, Aswagandha, Glory Lily and Sarpagandha. *Dioscorea sp.*, *Aloe vera*, *Phyllanthus amarus*, *Andrographis paniculata* and Medicinal solanum, Isabgol, Poppy, Safed Musli, *Stevia rebaudiana* and *Mucuna pruriens*, Aromatic crops: Palmarosa, Lemongrass, Citronella, Vettiver, Geranium, *Artemisia*, *Mentha*, *Ocimum*, Eucalyptus, Rosemary, Thyme, Patchouli, Lavender, Marjoram, Oreganum.

UNIT - X: POST- HARVEST TECHNOLOGY OF HORTICULTURAL CROPS

Scope and importance - National and Global scenario of post-harvest technology in horticultural crops - Harvest indices, harvesting methods in horticultural crops - Harvesting practices for specific market requirements - Influence of pre harvest factors on post harvest quality and shelf life of horticultural crops - Factors leading to post harvest losses. Ethylene action on ripening of fruits and ethylene management - Pre-cooling - Treatments prior to transport - Chlorination, waxing, chemicals, bio-control agents and natural plant products. Storage methods viz., ventilated, refrigerated, MAS, CAS - Physical injuries and disorders during storage - Post-harvest disease and insect management. Packaging technologies - Packaging materials and transport - Principles and methods of preservation - Minimal processing of fruits and vegetables - Pre-treatment - Blanching, canning and irradiation - Value added including, encapsulated fruit flavours, nutritionally enriched / fortified products in horticultural crops - Food safety standards.