PhD Entrance Syllabus

VEGETABLE SCIENCE

Unit I

Production Technology of Cool Season Vegetable Crops

Introduction, climatic and soil requirement, commercial varieties/hybrids, sowing/planting times and methods, seed rate and seed treatment, nutritional and irrigation requirements, intercultural operations, weed control, mulching, physiological disorders, harvesting of potato, chow chow, cole crops: cabbage, cauliflower, knolkhol, sprouting broccoli, Brussels sprout, root crops: carrot, radish, turnip, and beetroot, bulb crops: onion and garlic, Peas and beans, leafy vegetables:palak

Unit II
Production Technology of Warm Season Vegetable Crops

Introduction, climatic and soil requirements, commercial varieties/hybrids, sowing/planting times and methods, seed rate and seed treatment, nutritional and irrigation requirements, intercultural operations, weed control, mulching, physiological disorders, harvesting of: Tomato, eggplant, hot and sweet pepper, Okra, vegetable cowpea, Dolichos lablab and cluster bean, Cucurbitaceous crops, and sweet potato, cassava,yams, coclocasia, moringa and amaranths.

Unit III
Breeding of Vegetable Crops

Cytogenetics, genetics, breeding objectives, breeding methods (introduction, selection, hybridization, mutation), varieties and varietal characterization, resistance breeding for biotic and abiotic stress, quality improvement, biotechnology and their use in breeding in vegetable crops - molecular marker, genomics, marker assisted selection and QTLs. Potato and tomato, Eggplant, hot pepper, sweet pepper and okra, Peas and beans, lettuce, gourds, melons, pumpkins and squashes, cabbage, cauliflower, carrot ,beetroot, radish, moringa, amaranthus, cassava, sweetpotato, lab lab, onion and garlic

Unit IV
Growth and Development

Cellular structures and their functions; definition of growth and development, growth analysis and its importance in vegetable production; Physiology of dormancy and germination of vegetable seeds, tubers and bulbs; Role of auxins, gibberellilns, cyktokinins and abscisic acid; Application of synthetic hormones, plant growth retardants and inhibitors for various purposes in vegetable crops; sex expression in cucurbits and checking flower and fruit drops and improving fruit set in Solanaceous vegetables Role and mode of action of antitranspirants, anti-auxin, ripening retardant and plant stimulants in vegetable crop production; Role of light, temperature and photoperiod on growth, development of underground parts, apical dominance; Physiology of fruit set, fruit development, fruit growth, flower and fruit drop; parthenocarpy in vegetable crops; phototropism, ethylene inhibitors, senescence and abscission; fruit ripening and physiological changes associated

with ripening; Plant growth regulators in relation to morphogenesis and tissue culture techniques in vegetable crops.

Unit V
Seed Production

Introduction, importance and present status of vegetable industry.; modes of propagation in vegetables; Seed morphology and development in vegetable seeds; Floral biology of these plant species; classification of vegetable crops based on seed dormancypollination and reproduction behavior; steps in quality seed production; identification of suitable areas/locations for seed production of these crops; methods of seed production; comparison between different methods e.g. pollination mechanisms; sex types, ratios and expression and modification of flowering pattern in cucurbits; nursery raising and transplanting stage; Seed production technology of vegetables viz. solanaceous, cucurbitaceous, leguminous, malvaceae, cole crops, leafy vegetables, root, tuber and bulb crops; harvesting/picking stage and seed extraction in fruit vegetables, grading, storage,seed quality testing and seed certification standards; clonal propagation and multiplication in tuber crops e.g. Potato and sweet potato, seed-plot technique in potato, TPS (True Potato Seed); hybrid seed production technology of vegetable crops;maintenance of parental lines; use of male sterility and self-incompatibility in hybrid seed production.

Unit VI
Systematics of Vegetable Crops

Principles of classification; different methods of classification; salient features of international code of nomenclature of vegetable crops; Origin, history, evolution and distribution of vegetable crops, taxonomy, botanical description of families, genera and species covering various tropical, subtropical and temperate vegetables; Floral biology, Cytological level of various vegetable crops; descriptive keys for important vegetables; Importance of molecular markers in evolution of vegetable crops; molecular markers as an aid in characterization and taxonomy of vegetable crops :Potato and tomato, Eggplant, hot pepper, sweet pepper and okra, Peas and beans, lettuce, gourds, melons, pumpkins and squashes, cabbage, cauliflower, carrot ,beetroot, radish, moringa, amaranthus, cassava, sweetpotato, lab lab, onion and garlic

Unit VII
Production Technology of Underexploited Vegetable Crops

Introduction, botany and taxonomy, climatic and soil requirements, commercial varieties/hybrids, planting time and method, seed rate and seed treatment, nutritional and irrigation requirements, intercultural operations, weed control, mulching, physiological disorders, harvesting of: Asparagus and leek; Chinese cabbage, Chinese potato, and kale; Amaranth, , parsnip, rhubarb, basella and bathu (chenopods); lima bean, winged bean, vegetable pigeon pea and sword bean; Sweet gourd, spine gourd, pointed gourd, Ivy gourd

Unit VIII
Post-Harvest Technology of Vegetable Crops

Importance and scope of post-harvest management of vegetables; Maturity indices and standards for different vegetables; methods of maturity determinations; biochemistry of maturity and ripening, enzymatic and textural changes, ethylene evolution and ethylene management, respiration, transpiration, regulation methods; Harvesting tools, harvesting practices for specific market requirements; grading,post-harvest physiological and biochemical changes, disorders-chilling injury in vegetables, influence of pre-harvest practices and other factors affecting post-harvest losses, packaging house operations, commodity pre-treatments- chemicals, wax coating, pre-packaging and irradiation; packaging of vegetables, post-harvest, diseases and prevention from infestation, principles of transport; Methods and practices of storage-ventilated, refrigerated, MA, CA storage, hypobaric storage, precooling and cold storage, zero energy cool chamber; HACCP, Codex ,FSSAI.

Unit IX
Organic Vegetable Production Technology

Importance, principles, prospective, concept and component of organic production of vegetable crops, managing soil fertility, pest, disease and weed problem in organic farming system, crop rotation in organic vegetable production. Method of enhancing soil fertility, mulching, raising green manure crops, indigenous methods of compost, panchgavya, biodynamics preparation, ITKs organic farming. Role of botanicals and bio-control agents. GAP and GMP, organic certification standards, opportunity and challenges in organic production of vegetables.

Unit X
Hi-tech Production Technology of Vegetable Crops

Importance and scope of protected cultivation of vegetable crops, principles used in protected cultivation and greenhouse technology, effect of temperature, carbon dioxide, humidity; energy management, low cost structures, training methods, engineering aspects,classification of protected structures including low cost poly-house/green houses and other structures in vegetable production, types of cladding material,types of media, Mulching, solarisation,fumigation, Drip and sprinkler irrigation, fertigation, ,special horticultural practices, hydroponics, vertical farming andsoilless culture for enhancing productivity and off-season of high value vegetable crops like tomato, capsicum and cucumber.