

SYLLABUS FOR ENTRANCE EXAMINATION TO PhD PROGRAMME IN
POST-HARVEST MANAGEMENT

Introduction, Importance & scope of postharvest management of fruits and vegetables in Indian economy. Maturity indices and standards for selected fruits and vegetables; methods of maturity determinations.

Harvesting- Time of harvest Harvesting methods; Harvesting aids; Harvesting tools and their design aspects; Field containers, transport from field and temperature protection. Packing house operation viz., delivery, precooling, grading, sizing, pre-treatments including chlorination, waxing, chemicals, bio control agents and natural plant products, de-greening, vapour heat treatments, packaging: individual packaging, unitization, cooling and loading, shipment, storage and ripening techniques. Distribution-Marketing channels, wholesaling, retailing, merchandizing and integration. Standards and specifications for fresh fruits and vegetable.

Introduction, structure and composition of fruits and vegetables. Preharvest and postharvest factors affecting shelf-life and quality of fruits and vegetables. Determining Maturity and maturity indices. Biochemical changes associated with fruit development maturation and ripening carbohydrate metabolism, lipid metabolism, proteolysis and structural breakdown of chloroplast, isoprenoid and anthocyanin biosynthesis. Programmed cell death during senescence. Structural Deterioration of the Produce-cell wall degradation, change in

Membrane lipid. Ripening processes: events of ripening and factors affecting them. Respiration: respiratory climacteric, significance. Transpiration and water stress during post-harvest. Ethylene biogenesis: biochemical pathways, significance in ripening process, its perception-action and regulation.

Introduction, Historical development in food processing, type of food and causes for food spoilage. Basic principles of fruits and vegetables processing. Thermal processing, pH classification of foods, heat resistance of microorganism; Heat resistance of enzymes in foods, Spoilage of thermal processed food; Containers - canning, rigid tin plates and cans, aluminium cans, glass containers – types; flexible packaging materials, Composite can, specification, corrosion of cans, heat penetration into containers and methods for determination of process time. Effects of low temperature on fresh commodities and prepared product. Freezing preservation, freezing points of foods, slow and quick freezing, Cryogenic freezing and frozen food storage. Drying and dehydration, sun drying solar dehydration, mechanical drying types of driers, osmotic dehydration. Food fermentation – alcoholic, acetic and lactic fermentation. Pickling and curing; Effect of salt on food preservation, types of salt cured products. Traditional and new products; chemical preservation, SO₂, benzoic acid, asorbic acid, antioxidants and antibiotics, newer preservatives. Preservation by controlling water activity – high sugar products, intermediate moisture food, food concentration. Food irradiation, principles, types and sources of radiation, mode of action of Ionizing radiation; radiation effect on food constituents and regulation.

Importance of storage of Horticultural produce, present status and future scope. Goals of storage, Storage consideration: Temperature, relative humidity, gaseous composition etc. Principles and methods of storage. Low cost storage structure: Clamps, Cellars, Ventilated storage structures, Evaporative cool chambers. Bulk storage of vegetables like onion, potato etc. Refrigerated storage-principles of refrigeration, types of refrigerants, refrigeration equipments, Design consideration, Calculation of refrigeration requirement. Controlled or modified atmosphere (CA/MA) storages – principles, uses, structure and equipments,

methods and requirements. Hypobaric storage – principles, uses, methods, structures and equipments and requirements. Important storage disease and disorders: chilling injury, low O₂ and elevated CO₂ disorder etc. Ideal storage requirements of horticultural crops.

Introduction to packaging: functions of packaging and package environments. Type of package: Harvest container, Consumer /Individual/Unit package, Transport/Distribution Package and Unit load packaging/palletization, and unitization. Different forms of Packaging Rigid, Semi-rigid and flexible. Rigid container: tin and aluminium cans, glass, wooden boxes, crates, plywood and wire bound boxes, corrugated fibre board boxes, woven baskets, field containers etc. Semi-rigid package: textile and paper sacks, bags, tetrapack etc. Flexible packaging materials and their properties; their structural qualities and performance including moisture and gas transmission; selection of packaging materials for various food products. Modified Atmosphere Packaging (MAP): Principles, gases used in MAP and methods for creating MA conditions. Packaging of fresh fruits and vegetables: factors affecting MAP and design of MAP. Modified Atmosphere Packaging (MAP) for fresh cut produce. Controlled atmosphere storage (CAS). Active and intelligent packaging: Ethylene and moisture regulation in packaging of fresh fruits and vegetables. Edible and Biodegradable packaging. Antimicrobial food packaging: introduction, antimicrobial agents and factors affecting its effectiveness. Non-Migratory Bioactive Polymers (NMBP) in food packaging: introduction, advantages and limitations. Retort packaging foods, Tetra packaging pillow pouch packaging, shrink wrapping Packaging, aseptic packaging of foods.

Processing of major spices – chillies, cardamom, ginger, black pepper and turmeric. Minor spices – coriander, clove, nutmeg, and other leaf and seeds spices. Harvesting, handling, processing, grading and packaging of fresh and processed product of cashewnut, arecanut, coconut, betelvine, coffee, tea and cocoa.

Introduction, Historical perspective and scope of microbiology in relation to fruits and vegetables. Principles and causes of spoilage of fresh and processed products. Type of spoilage. Microbial spoilage – general morphology, cytology and reproduction, Growth of microorganism – factors affecting growth; Food substrate – type of food – pH classification of food, Growth curve methods of measuring microbial growth, Destruction of microorganism. Physical, chemical and biological factors influencing the destruction of microorganism including the concept of Z, F and D values. Role of enzymes in food spoilage; Spoilage causing agents. Sources and prevention of contamination, food hygiene and sanitation, food poisoning – food borne infection and intoxication, mycotoxin. Food safety – preventive measure – HACCP- Preventive measure for spoilage. Spoilage of canned product, juice, squashes, jellies, pickles, dehydrated and alcoholic product. Postharvest pathology (biology and control of postharvest diseases of important fruits, vegetable and flowers); insect, pest infestation and control, quarantine requirements, physiological disorder and management.

Importance of drying, principles of drying, moisture determination, equilibrium moisture content, determination of EMC, water activity and food stability, methods and isotherm models, psychrometry, psychrometric terms, construction and use of psychrometric charts. Drying rate, factors affecting drying rate. Commercial drying of fruits and vegetables, fruit juice concentration and fruit powders. Methods of drying and equipments. Foam mat, heat pump drying, osmotic drying, freeze drying, novel drying techniques, machinery required. Effect of drying on product quality and storability, FPO and ISI specification for dry product.

