

## Syllabus for written examination for the post of Horticulture Development Officer

### 1. Introduction to Horticulture Crops

Background, scope and importance of Horticulture, origin and distribution of fruit crops, classification of horticultural crops and their nutritive values, area and production under different fruit crops. Major species, rootstocks and commercial varieties of regional, national and international importance of different temperate and sub-tropical fruit crops such as apple, pear, peach, apricot, plum, cherry, persimmon, strawberry, kiwi, almond, walnut, pecan nut, hazel nut, chest nut, olive, mango, banana, grapes, citrus, papaya, sapota, guava, pomegranate, bael, ber, amla, fig, jackfruit, litchi, dragon fruit and loquat.

### 2. Soil requirements for different Horticulture Crop

Types of soil, Soil components, Soil Structure and Texture, Particle size classes (sand clay silt stones and gravel), soil pH and its management, soil profile, soil testing, soil fertility evaluation, soil microbiology. Soil characteristics influencing growth activity of micro flora, humus formation, cycles of important organic nutrients. Biodegradation of pesticides, organic wastes in soil.

### 3. Nursery management, propagation & planting

Sexual, asexual and vegetative methods of propagation of Horticultural crops. Nursery Management Techniques and regulations. Factors for successful graftage and incompatibility. Progeny trees/mother block. Different types of commercial rootstocks of fruit crops, their characteristics, uses and multiplication. Micro propagation; use of plant growth regulators in propagation.

Propagation structures: Mist chamber, humidifiers, greenhouses, glasshouses, cold frames, hot beds, poly-houses, phytotrons, nursery (tools and implements) standards for seed and quality planting material. J&K Fruit Nurseries (Licensing) Act, 1987.

**Green house technology:** Types of greenhouses; Plant response to greenhouse environment. Planning and design of greenhouses. Design criteria of greenhouse for cooling and heating purposes. Green house equipment, materials of construction for traditional and low cost green houses.

Irrigation systems used in greenhouses. Choice of crops for cultivation under greenhouses. Constraints of greenhouse cultivation. Growing media, soil culture, type of soil required, drainage, flooding and leaching, soil pasteurization in peat moss and mixtures, rock wool and other inert media, nutrient film technique (NFT)/hydroponics.

### 4. Plant physiology, plant growth & development of Horticulture crops

Physiology of flowering, pollination, pollinisers & pollinators, phenological stages and their duration in important temperate and subtropical fruit crops, fruit set and seed development; bearing habit of fruits, factors influencing the fruitfulness and unfruitfulness of fruit crops, irregular/alternate bearing, fruit drop and its management; causes, symptoms and remedies of physiological disorders of important temperate and sub-tropical fruits; Transportation and translocation of mineral nutrients and water in fruit plants, role of plant growth regulators (natural/synthetic); fruit size, shape, fruit density and thinning. Concept of source-sink and their manipulation; phytohormones and their commercial applications.

## 5. Production technology of Horticulture crops

Agro-climatic requirements of fruit crops, laser levelling, Principles, planning, layout and management of orchards, planting systems, planting densities, Production practices of fruit crops, Precision farming, Canopy management of fruit crops (Pruning and training with special reference to High Density plantation), Water management: irrigation methods, merits and demerits, micro-irrigation systems, concept of deficit irrigation; weed management, fertility management in horticultural crops, Fertigation, Re-plant problem, rejuvenation of old and senile orchards and top working; special production problems like pre-mature fruit and leaf fall. Principles of organic farming, components and importance.

## 6. Nutritional management and physiological disorders of horticulture crops, causes and remedies

Essential micro and macro nutrients for fruit crops and the factors affecting their availability and uptake; Bio fertilizers, definition & classification, role in crop production. Fertilizer requirement of different fruit crops. Integrated nutrient management, deficiency symptoms of essential elements and their replenishment and correction, physiological disorders their causes and control measures. Manures & fertilizers: manufacture of different chemical and bio fertilizers, their composition, use and time of application Quality control of fertilizers.

## 7. Harvesting & maturity indices of different Horticulture crops

Physiology of fruit ripening and senescence. Maturity indicators of important temperate and subtropical fruit crops, types of maturity indicators, factors affecting fruit maturity and quality. pre-harvest treatments, methods of fruit harvest, precautions during harvesting of different fruit crops.

## 8. Post-Harvest Management and marketing of Horticulture crops

Importance of postharvest technology in horticultural crops. Grading of fruits, vegetables, cut flowers. Pre-harvest factors affecting quality, factors responsible for deterioration of horticultural produce, physiological and bio-chemical changes, hardening and delaying ripening process.

Quality parameters and specifications. Structure of fruits related to physiological changes after harvest. Methods of storage for local market and export. Post-harvest treatment, pre-cooling, pre-storage treatments. Different systems of storage, packaging methods and types of packages, recent advances in packaging. Types of containers and cushioning materials, vacuum packaging, cold storage, poly shrink packaging, grape guard packing treatments. Modes of transport.

Importance and scope of fruit and vegetable preservation industry in India, food pipe line, losses in post-harvest operations, unit operations in food processing Principles and guidelines for the establishment of processing units. Principles and methods of preservation by heat-pasteurization, canning, bottling. Methods of preparation of juices, squashes, syrups, cordials and fermented beverages. Methods of preparation of Jam, jelly and marmalade. Preservation by sugar- candies, crystallized fruits, preserve etc. Preservation by chemical preservatives, preservation with salt and vinegar- pickling, chutneys and sauces, tomato and mushrooms products. Drying and dehydration, freezing preservation, quality control of processed products. Govt. policy on import and export of processed fruits. Food safety standards act 2006.

hygiene and sanitary practices, licensing, packaging and labelling. Food products standards for fruits and vegetables based products.

Marketing concept and strategies for horticultural produce with emphasis on digital Marketing. Brand building and STP frame work. Scale economics and export promotion, value chain concept and market intelligence system.

#### **9. Plant Protection (Pest and Disease management) of horticulture crops**

Etiology, symptoms, mode of spread, epidemiology and integrated management of the fungal, viral, bacterial, mycoplasma diseases of fruits, crops viz mango, banana, grape, citrus, guava, dragon fruit, Kiwi fruit, pomegranate, apple, pear, cherry, peach, plum, apricot, almond, walnut, strawberry, chestnut, pecan nut, hazel nut, olive, papaya, sapota, amla, fig, litchi, jackfruit, loquat, ber. Important post-harvest diseases of fruit crops and their management. Non-parasitic causes of plant diseases, principle and methods of integrated disease management. Fungicide classification. Fungicidal formulations. Importance of micro-organisms in plant diseases management.

Etiology, symptoms, mode of spread, epidemiology and integrated management of the insect pests of fruit crops viz. mango, banana, grape, citrus, guava, dragon fruit, Kiwi fruit, pomegranate, apple, pear, cherry, peach, plum, apricot, almond, walnut, strawberry, chestnut, pecan nut, hazel nut, olive, papaya, sapota, amla, fig, litchi, jackfruit, loquat, ber. Rodents damaging fruit crops and their control. Pests in polyhouses/protected cultivation.

Principles of classical biological control- importation, augmentation and conservation. Role of insect pathogenic nematodes, viruses, bacteria, fungi, protozoa etc., their mode of action. Mass production of bio-control agents- techniques, formulations, field release/application and evaluation. Semiochemicals in biological control.

Categorization of insecticides on the basis of toxicity, mode of action of organochlorines, organophosphates, carbamates, pyrethroids, neonicotinoids, oxadiazines, phenyl pyrozoles, insect growth regulators, microbials, botanicals, new promising compounds/ new insecticide molecules; Nano pesticides Tools of pest management and their integration- legislative, quarantine regulations, cultural, physical and mechanical methods; Pest survey and surveillance, forecasting, types of surveys including remote sensing methods. Insecticides Act 1968, Rules 1971.

#### **10. Extension Methods and Skills**

Concepts and principles in Extension Education, Extension Teaching Methods, Extension Teaching Aids, Duties of Extension Workers; Communication and adoption of innovations, Extension Programme Planning, Community Development, Leadership and Extension worker; Developing, course objectives and lesson plans for training of extension workers and farmers; Emotional intelligence, motivation and psychology of learning; Farmers groups and cooperatives, FPO's (Farmer Producer Organisations) and their mobilisation; Concept of welfare state.

#### **11. Dryland/Rainfed Horticulture**

Importance and limitation of dry land/Rainfed horticulture, present status and future scope. Soil and water conservation methods. Selection of plants having drought resistance. Special techniques for raising dry land fruit crops. Characters and special adaptation of fruit crops for dry land/rainfed horticulture.

## 12. Miscellaneous

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### i. Vegetable Science

Importance of Vegetables (nutritional and medicinal). General principles of vegetable production. Area, production export and import of vegetable crops in India and J&K. Climatic and soil requirements, commercial varieties/ hybrids, sowing/planting times and cultivation practices, seed rate and seed treatments, nutritional and irrigation requirements, intercultural operations, weed control, mulching, physiological disorders, harvesting, post-harvest management.

### ii. Floriculture

Production Technology of commercially and aesthetically important flowers. Introduction to flowers production, Scope and significance in global trade, Global cut flower production and varietal diversity, IPR issues affecting trade. Post-harvest requirements of flower crops: Quality standards, harvest indices packaging, storage and transport. Physiological disorders symptoms and management in flowers.

### iii. Plantation, Medicinal & Aromatic Plants

Role of plantation crops in the national economy, Export potential of plantation crops. Specific plantation crops and their cultivation: Coffee and tea, Cashew, Rubber, oil palm and Coconut. Scope and opportunities in the cultivation of medicinal and aromatic plants. Importance, distribution, area, production, climatic and soil requirements, propagation and nursery techniques and harvesting of below mentioned important medicinal and aromatic plants. Medicinal Plants: Withania, Rauwolfia, Dioscorea, Isabgol, Belladonna, Pyrethrum, Rheum and Podophyllum. Aromatic Plants: Citronella grass, Acorus (baje), Lavender and Geranium.

### iv. Spices & Condiments

Classification, soil and climate, propagation-seed, vegetative and micropropagation systems and methods of planting. Nutritional management, irrigation practices, weed control, mulching and cover cropping Training and pruning practices, role of growth regulators, shade crops and shade regulation. Harvesting, post-harvest technology, packaging, storage, value added products, methods of extraction of essential oil and oleoresins. Role of Spice Board. Crops: ginger, turmeric, clove, cinnamon, curry leaf, coriander, fenugreek, fennel, cumin, celery, saffron, and rosemary.