लोक सेवा आयोग

नेपाल कृषि सेवा, बाली संरक्षण समूह, रा. प. द्वितीय श्रेणी, खुला र आन्तरिक प्रतियोगितात्मक लिखित परीक्षाको पाठ्यक्रम

द्वितीय पत्र : सेवा सम्बन्धी प्राविधिक बिषय अङ्क १००

1. Policy, Strategy Rules and Regulation

1.1 National Policy on Pesticide Management.

1.2 Government Policy and Strategy on Post Harvest Programs including value addition and privatization

1.3 Government Policy on Sericulture and Apiculture.

1.4 Pesticide Act, 2048 and Rules, 2050.

1.5 International Plant Protection Convention (IPPC) and Asia Pacific Plant Protection Commission (APPPC)

1.6 International Code of Conduct on the Distribution and Uses of Pesticides.

2. Introductory Entomology

2.1 Importance of insects to man.

2.2 Importance of pest survey and surveillance in development of early warning system

2.3 Forecasting the pest problem in agriculture.

3. Insect ecology

3.1 Environmental Factors

3.2 Habitats

3.3 Insect populations

4. Agricultural Insect Pests of National Importance and Their Management:

4.1 Cereals

4.1.1 Stem borers *(Chilo partellus; Chilo suppressalis; Sesamia inferens; Scirpophaga incertulas*)

4.1.2 Green leafhopper (*Nephottetix nigropictus*)

4.1.3 Brown planthopper (*Nilaparvata lugens*)

4.1.4 Gandhi bug (*Leptocorisa chinensis*)

4.1.5 White grubs (*Melolontha* sp.; *Phyllophaga* sp.; *Holotrichia* sp.)

4.1.6 Grasshoppers (*Hieroglyphus banian, H. nigrorepletus)*

4.2 Vegetables

4.2.1 Cutworm (*Agrotis ipsilon; A. segetum*)

4.2.2 Pumpkin fruitfly (*Bactrocera cucurbitae*)

4.2.3 Aphids (*Myzus persicae; Aphis fabae; A. gossypii; A. craccivora; Brevicoryne brassicae*)

4.2.4 Red ants (*Dorylus orientalis*)

4.2.5 Pod borer (*Lampides boeticus*)

4.2.6 Shoot and fruit borer (*Leucinodes orobonalis*)

4.2.7 Large white butterfly (*Pieris brassicae nepalensis*)

4.2.8 Tomato fruit worm (*Helicoverpa armigera*)

4.2.9 Tobaco Caterpillar (*Spodoptera litura)*

4.2.10 Potato Tuber Moth (*Phthorimaea operculella)*

4.2.11 Diamondback Moth (*plutella xylostella)*

4.2.12 White Fly (*Bemisia tabaci)*

4.3 Oil Seed Crops

4.3.1 Cabbage Butterflies (*Pieres brassica, nepalensis)*

4.3.2 Sesamum Gall Midge (*Asphondylia sesami)*

4.3.3 Groundnut Leaf-miner (*Stomopteryx subsecivella)*

4.3.4 Mustard Aphid (*Lipaphis erysimi)*

4.4 Cash Crops:

4.4.1 Sugarcane White Fly (*Aleuro lobus barodensis)*

4.4.2 Early Shoot Borer (*Chilo infuscatellus)*
4.4.3 Sugarcane top borer *(Scirpophaga excerptalis)*
4.4.4 Sugarcane stalk borer (*Chilo aurecilus*)
4.4.5 Sugarcane internode borer (*Chilo sacchariphagus*)
4.4.6 Spotted Bollworms (*Earias vittella, E. insulana)*
4.4.7 Pink Bollworms (*Pectinophora gossypiella)*

4.5 Fruits

Sub- tropical fruits

4.5.1 Oriental fruitfly (*Bactrocera dorsalis), B. dorsalis, B. scuteralis, B. tau, B. zonatus,; B. yoshimotoi*
4.5.2 Leafhopper (*Amritodus atkinsoni*)
4.5.3 Gall midge (*Apsylla cistellata*)
4.5.4 Citrus psylla (*Diaphorina citri*)
4.5.5 Green stink bug (*Rhynchocoris humeralis*)
4.5.6 Citrus red scale (*Aonidiella aurantii*)
4.5.7 Banana weevil (*Cosmopolites sordidus; Odoiporus longicolis*)
4.5.8 Pomegranate butterfly (*Deudoryx epijarbas*; *Virachola isocrates*)

4.6 Temperate fruits

4.6.1 Apple wooly aphid (*Eriosoma lanigerum*)
4.6.2 San Jose scale (*Quadraspidiotus perniciosus*)

5. PATHOLOGY

5.1 Importance of Plant Diseases
5.2 Causes of plant diseases
5.2.1 Biotic- Fungi, Bacteria and Bacteria like organisms, Nematodes, Viruses and Virus like agents.
5.2.2 Taxonomy, classification and nomenclature of above pathogens
5.2.3 A biotic- Deficiency and environment related diseases
5.2.4 General characteristics of infectious and non-infectious diseases
5.3 History of Plant Pathology in Nepal.

6. Plant Diseases of National Importance and Their Management

6.1 Cereals (Rice, wheat, maize, fingermillet)
6.1.1 Rice: Blast (*Pyricularia grisea*), Bacterial leaf blight (*Xanthomonas campestris* p.v. oryzae) , Sheath blight (*Rhizoctonia solani*), Foot rot (*Fusarium moniliforme*), Brown spot (*Helminthosporium oryzae*). False smut (*Ustilaginoides virens)*
6.1.2 Wheat: Rusts *(Puccinia graminis tritici*, *P. recondite* and *P. striiformis*), Loose smut (*Ustilago tritici*), Foliar blight (*Bipolaris sorokiniana* and *Drechslera tritici-repentis*), Powdery mildew (*Erysiphe graminis tritici*), Bunt (*Tilletia caries and T. foetida*)
6.1.3 Maize: Stalk rot (*Erwinia carotovora*), Northern Leaf blights (*Exserohilum turcicum),* Southern leaf blight (*Bipolaris maydis*), Banded leaf and sheath blight (*Rhozoctonia solani*), Ear rot (*Fusarium vertilloides.)*
6.1.4 Fingermillet: Blast (*Pyricularia greasea*) and Cercospora leaf spot (*Cercospora eleusine*).
6.2 Vegetables (Potato, tomato, cruciferae, cucurbitaceae)
6.2.1 Potato: Blights (*Pytopthora infestans* and *Alternaria spp.)),* Bacterial wilt (*Ralstonia solanacearum*), Rhizoctonia rot (*Rhizoctonia solani*), Wart (*Synchytrium endobioticum*), Viral diseases

6.2.2 Tomato: Wilts (*Ralstonia solanacearum*), Blight(*Phytophthora infestans* and *Alternaria* spp.)), Rootknots (*Meloidogyne* spp.*),* camping-off (*Pythium* spp., *Fusarium* spp. and others).

6.2.3 Cruciferae: Clubroot (*Plasmodiophora brassicae*), Alternaria leaf spot (*Alternaria brassicola* and *A. brassicae*), Camping-off (*Pythium* spp. and others), Stalk rot (*Scleritinia sclerotiorum*). White rust (*Albugo* spp.)

6.2.4 Cucurbitaceae: Powdery mildew (*Erysiphe* spp.), Downey mildew (*Peronospora cubensis*), viral diseases.

6.3 Fruits/Plantation crops (Citrus, mango, apple, pear, banana, papaya, tea)

6.3.1 Citrus: Gummosis, Foot and root rots (*Phytophthora* spp.), Greening /Huanglungbin (*Liberibacter asiaticum*), Powdery *mildew (Odium spp.),* Tristeza *(Virus),* Pink disease *(Pellicularia salmonicolor),* Anthracnose (*Colletotrichum gloesporioides*), Scab (*Elsinoe fawcetti*), Citrus decline (disease complex)

6.3.2 Apple and temperate fruits: Scab (*Venturia inaequalis*), Pink (*Pellicularia salmonicolor*) and root rot (complex), Powdery mildew (*Odium* spp.)

6.3.3 Mango: Black tip (S-pollution), Mango malformation, Anthracnose (*Colletotrichum gloesporioides*)

6.3.4 Banana: Wilt (*Fusarium* spp.), Sigatoka or leaf spot (*Mycosphaerella),* Bunchy top (viral)

6.3.5 Papaya: Ring spot (Virus), Leaf curl (Virus), Collar and root rot (complex).

6.3.6 Tea: Black rot (*Corticium* spp.)

6.4 Commercial crops

6.4.1 Rhizome rots of ginger (complex)

6.4.2 Red rot of sugarcane (*Colletotrichum gleosporioides*)

6.4.3 Charcoal rot of Jute (*Macrophomina* spp.)

6.4.4 Mustard: white rot (*Sclerotinia sclerotiorum*), Alternaria leaf spot (*Alternaria* spp), Witch weed (*Striga* spp.)

6.4.5 Lentil: Grey mould (*Botrytis* cinerea.), Leaf blight (*Stemphyllium sarciniformae.*) and wilt complex (*Fusarium, Rhizoctonia and* others)

7. Mechanism of Infection by Plant Pathogen and Stages in the development of diseases

7.1 Penetration
7.2 Infection
7.3 Incubation
7.4 Reproduction
7.5 Dissemination
7.6 Off-season survival of pathogens

8. Defense Mechanisms of Host Plants

8.1 Structural defense
8.2 Biochemical defense

9. Effects of Plant Pathogens on Host and Host Physiology

9.1 Structure, growth and reproduction of the host.
9.2 Host photosynthesis
9.3 Host respiration and
9.4 Translocation of water and nutrients in the host plant.
9.5 Effect on transpiration

10. Effects of Environment on Plant Disease Development

10.1 Effect of temperature
10.2 Effect of moisture or humidity

10.3 Effect of light
10.4 Effects of pH (Soil or substrate/host)
10.5 Effect of host plant nutrition

11. Genetics and Disease Resistance in Plants
11.1 Host-pathogen interfaces
11.2 Gene for gene concepts
11.3 Types of resistance: Horizontal, vertical, field, tolerance genetics of host resistance, tolerance. nature of resistance, genetics of host resistance, tolerance

12. Plant Disease Epidemiology and Forecasting
12.1 Measurement of disease and loss assessment
12.2 Plant disease epidemics
12.2.1 Pattern and types of epidemics.
12.2.2 Factors affecting development of epidemics
12.3 Forecasting of epidemics based on weather and inoculums

13. Plant diseases of special environment
13.1 Seed-borne diseases, their significance and their management
13.2 Seed health-testing techniques
13.3 Soil-borne diseases and their management

14. Post-harvest Insect & diseases and management
14.1 Post-harvest diseases of perishables- molds and rots
14.2 Fungal diseases and mycotoxin in the storage
14.3 Appropriate Technology in Post harvest Loss management
14.4 Prevention of post harvest food loss in perishable and durable commodities
14.5 Post harvest technology for market oriented vegetable and fruit crops.
14.6 Alternatives of Pesticides in Storage.

15. Toxicology of Pesticide
15.1 Type of Pesticide formulation
15.2 WHO classification of pesticide by hazard
15.3 Lethal Dose$_{50}$ (LD$_{50}$) of a pesticide
15.4 Pesticide residues in implication:
15.4.1 Maximum Residue Limit (MRL),
15.4.2 Average Daily Intake (ADI) and
15.4.3 With holding Periods (WP).
15.5 Metabolism of Insecticides and Herbicides and types of metabolic reaction
15.6 Recommendations for safe use of pesticides.
15.7 Status of Pesticide use in Nepal.
15.8 Symptoms and Treatment of pesticide poisoning.

16. Laboratory Techniques
16.1 Insect Rearing and Disease culture technique.
16.2 Insect and disease Preservation
16.3 Slide Preparation
16.4 Dispatching insects and disease for Experts for authentic identification
16.5 Koch's postulates and Disease diagnosis technique
16.6 Isolation, preservation and multiplication of pathogens
16.7 Function and maintenance of laboratory equipments
16.8. Tissue culture and spawn production techniques

17. Pesticide Sprayer
17.1 Types of sprayers
17.2 Maintenance of sprayers

17.3 Calibration of sprayers

18. Integrated Pest Management (IPM)

18.1 Concepts, tactics and strategy.
18.2 Components of IPM.
18.3 Need of IPM in Nepal
18.4 Typical example of IPM to control insect-pests of rice and vegetables.

19. Biological Control of Insect-pests and Diseases

19.1 Classical biological control.
19.2 Important agents of biological control
19.2.1 Insect origin
19.2.2 Microbial
19.2.3 Botanicals
19.3 Techniques in biological control

20. Plant Quarantine

20.1 Importance, issues, challenges and role of plant quarantine in Nepalese agriculture system.

21. Insects and Microorganism of Industrial use

21.1 Sericulture
21.1.1 Prospect of sericulture and silk industry in Nepal
21.1.2 Mulberry cultivation practices & management in Nepal
21.1.3 Silkworm rearing techniques, diseases and their management
21.2 Bee-keeping
21.2.1 Promotion of bee products, marketing and trade in the context of WTO
21.2.2 Major concerns on legal basis and controls, quality and control of Pesticides.
21.2.3 Bee poisoning and avoiding honey bee losses when using pesticides
21.2.4 Pesticide residue management in honey
21.2.5 Scope of commercial apiculture in Nepal
21.2.6 Biology and reproduction of honey bees in Nepal
21.2.7 Bees, crop pollination and bee-forage
21.2.8 Seasonal management of honey bees colonies
21.3 Mushroom
21.3.1. Types of mushrooms- edible, poisonous and medicinal
21.3.2. Cultivation methods of Button, Oyster and Shitake mushrooms
21.3.3. Diseases and insect pests of cultivated mushrooms and their management
21.4 Lac culture
21.4.1 Lac insect, its importance and scope

22. Weed Science

22.1 Herbicide, environmental impact and management practices of weed.
22.2 Biology of weeds and weed seeds
22.3 Importance of weeds and emerging weeds problem in agricultural crops and their management
22.4 Herbicides and the plant

23. Statistics in Plant Protection

23.1 General knowledge of statistics including Chi-square, sampling, statistical designs of experiment layout in field and in laboratory, data transformations, analysis of variance mean separation, and result interpretation and research presentation.

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