

29. SYLLABUS FOR COMPETITIVE EXAMINATION FOR THE POST OF TEACHING ASSOCIATE IN ENTOMOLOGY

Unit 1: Systematics-

History and development of Entomology, evolution of insects, position of insects in the animal world, insect dominance. Characteristics of phylum Arthropoda, structural features of important arthropod groups such as Trilobita, Chelicerata and Mandibulata, structural features of important classes of phylum Arthropod viz. Arachnida, Crustacea, Chilopoda, Diplopoda and Hexapoda. Classification of insects upto order level, habits, habitats and distinguishing features of different order and important families of economic importance.

Unit 2: Morphology-

Body wall, its structure. Head and head appendages, types of mouth parts, antennae, their structure and types. Thorax structure, thoracic appendages: legs and their modification. Wings, their modification and venation. Abdomen; structure, abdominal appendages. External genitalia, general structure and modification.

Unit 3: Embryology, Internal Anatomy and Physiology-

Embryonic and post embryonic development, physiology of ecdysis. Growth and metamorphosis, general features and types of larvae and pupae. Structure, function and physiology of digestive, circulatory, respiratory, reproductive, nervous and excretory systems. Sense organs; structure and types. Insect food and nutrition; minerals, carbohydrates, proteins and amino acids, lipids, vitamins and their role in growth and development, Extra and intra cellular microorganisms and their role in digestion, artificial diets.

Unit 4: Ecology-

Concept of ecology, Environment and its components- biotic and abiotic factors and their effects on growth, development, population dynamics, distribution migration and dispersal. Principle of biogeography and insects biodiversity. Biotic potential, carrying capacity and environmental resistance. Ecosystems, agroecosystems analysis, their characteristics and functioning. Intra and inter specific relationship; competition, predator-prey and host-parasite interactions, ecological niche and habitat. Life table studies, population models. Tropic level, food chain and food web. Food pyramids. Arthropod population monitoring, surveillance and pest forecasting. Diapause and causes of pest out breaks, pest risk analysis.

Unit 5: Arthropod Vector of Plant Diseases-

Common arthropod vectors viz., aphids, leaf hoppers, plant hoppers, whiteflies, thrips, psyllidae, beetles, weevils, flies, bees and mites and their relationship with the plant pathogenic fungi, bacteria, viruses, mycoplasma. Mechanism of pathogen transmission: Active mechanical transmission, biological transmission. Toxicogenic insects, mites and phytotoxemia. Some important arthropod vector transmitted diseases and their epidemiology in India. Management of vector and its effect on control of diseases.

Unit 6: Beneficial Insects-

Honey Bees- Honey bees and their economic importance. Bee species, their behaviour, habit and habitats. Bee Keeping: bee pasturage, hives and equipments, seasonal management. Bee enemies including diseases and their management, Bee poisoning.

Silkworm- Silkworm species, their systematic position and salient features. Rearing techniques of mulberry-muga-eri and tussar silkworms. Nutritional requirements of silkworms. Sericulture: rearing house and appliances, silkworm breeds, principles of voltinism and nioltinism, seed production and its economics. Enemies and diseases of silkworms and their management. Sericulture organization in India.

Lac Insect- Lac insect, its biology, habit and habitats. Host Trees: pruning, inoculation, lac cropping techniques, and harvesting. Enemies of lac insect and their management.

Other Useful Insects-Pollinators, biocontrol agents of weeds, soil fertility improving agents, scavengers. Use of insects and insect products in medicines. Usefulness of insects in scientific investigations, insects as food.

Unit 7: Pests of Field Crops-

Distribution, host range, biology and bionomics, nature of damage and management of arthropod pests of cereals, millets, oilseed, pulses, forage, fibre crops, sugarcane and tobacco. Polyphagous pests: locusts, termites, hairy caterpillars, cut worms, fall armyworm and white grubs.

Unit 8: Pests of Horticultural Crops-

Distribution, host range, biology and bionomics, nature of damage and management of arthropod pests of vegetables, fruits and plantation crops, spices, condiments, medicinal plants and ornamentals.

Unit 9: Pests of Stored Products –

Fundamentals of storage of grains and grain products. Storage losses, sources of infestation/infection, factors influencing losses. Microflora in storage environment and their control. Storage structures, bulk storage and bag storage, their relative efficacy and demerits. Grain drying methods and aeration. Non-insect pests (rodents, birds, mites) of stored products and their control. Stored grain pests and Integrated approach for their management.

Unit 10: Biological Control-

Importance and scope of biological control, history of biological control: Important biocontrol agents-Parasites, predators and insect pathogens. Important entomophagous insect orders and families. Ecological, biological, taxonomic, legal and economic aspects of biological control, phenomena of parasitism, its types and their applied importance.

Principles and procedures of using exotic biocontrol agents. Utilization of natural biocontrol agents: conservation, habitat management and augmentation. Mass multiplication techniques of important bioagents. Effective evaluation techniques, Biocontrol organizations in world and India. Successful cases of biological control of pests. Entomophilic pathogens: bacterial, fungi, viruses, protozoan and nematodes, modes of transmission, methods of uses, symptoms of infection. Microbial insecticides and their formulation. Merits and demerits of microbial control. Role of biocontrol agents and microbial insecticides in Integrated Pest Management.

Unit 11: Chemical Control and Toxicology-

History, scope and principles of chemical control. Insecticides and their classification. Formulations of insecticides, physical, chemical and toxicological properties of different groups of insecticides: chlorinated hydrocarbons, organophosphates, carbamates, synthetic pyrethroids, chlordimeform, chitin synthesis inhibitors, avermectins, nitroguanidines, phenylpyrazoles, botanicals (natural pyrethroids, rotenone, neem products, nicotine, pongamia etc). Combination insecticides. Problems of pesticide hazards and environmental pollution. Pesticide risk analysis, safe use of pesticides, precautions and first aid treatments. Insecticides Act 1968, registration and quality control of insecticides. Evaluation of toxicity, methods of toxicity testing, determination of LD 50, LT 50, RL 50 etc. Pesticides residues in the environment and their dynamics of movements, methods of residue. Pharmacology of insect poisons. Mode of action of different groups of insecticides; neuroactive (axonal and synaptic) poisons, respiratory poisons, chitin synthesis inhibitors. Metabolism of insecticides; active and degradative metabolism, detoxification enzymes and their role in metabolism. Selectivity of insecticidal actions; insecticide resistance; mechanism, genetics and management of insecticide resistance.

Unit 12: Host Plant Resistance-

Chemical ecology: mechano and chemo receptors. Host plant selection by phytophagous insects. Secondary plant substances and their defenses against phytophagous insect. Basis of resistance (Antixenosis, Antibiosis, Tolerance). Biotypes development and its remedial measures. Tritrophic interactions, induced resistance. Breeding for insect resistant plant varieties. Resistance development and evaluation techniques. Genetics of Resistance: vertical resistance, horizontal resistance, oligogenic resistance, polygenic resistance. Role of

biotechnology in development of transgenic insect resistant plants, its advantages and limitations. Case histories. Insect resistance to transgenic plants and its management.

Unit 13: Innovative Approaches in Pest Management-

Behavioral control: pheromones- types and uses, advantages and limitations. Hormonal control: types and functions of insect hormones, insect hormone mimics, advantages and limitations. Chemosterilants, antifeedants, attractants, repellents; their types, method of applications, advantages and limitations. Genetic control: concepts and methods, advantages and limitations. Potentialities in IPM.

Unit 14: Integrated Pest Management-

History, concept and principles of IPM. Components of IPM: Cultural, mechanical and physical methods, chemical methods, biocontrol agents utilization, genetic and behavioral control strategy etc. IPM strategies for field and horticultural crops. IPM case histories. Concept of damage levels- Economic Threshold Levels (ETL), Economic Injury Levels (EIL) and their determination. System approach, Agro ecosystem and cropping system vs. IPM. Constraints and Strategies of IPM implementation.

Unit 15: Pesticide Application Equipments-

Types of appliances: sprayers, dusters, fog generators, smoke generators, soil injecting guns, seed treating drums and flame throwers, etc. Power operated sprayers and dusters. Types of nozzles and their uses. Maintenance of appliances. Aerial application of pesticides, principles of aerial application, factors affecting the effectiveness of aerial application. Equipments for aerial applications. Advantages and disadvantages of aerial application.
