

SCHOOL OF AGRICULTURE**Paper-I: Research Methodology**

Research and Types of research: Meaning of Research- Objectives of Research- Motivation in Research. Research methods vs Methodology. Types of research – Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical. Research Process. Criteria of good Research. Research Formulation – Defining and formulating the research problem - Selecting the problem - Necessity of defining the problem - Importance of literature review in defining a problem – Literature review – Primary and secondary sources – reviews, treatise, monographs-patents – web as a source – searching the web - Critical literature review – Identifying gap areas from literature review - Development of working hypothesis. Data Collection and analysis: Execution of the research - Observation and Collection of data - Methods of data collection – Modeling, Mathematical Models for research, Sampling Methods- Data processing and Analysis strategies. Data Analysis with Statistical Packages – Hypothesis-testing, Generalization-and Interpretation

Paper-II: ENTOMOLOGY**Systematics**

History and development of entomology. Position of insects in the phylum Arthropoda, relationship with other arthropods. Classification of insects up to order level. Habit, habitat and distinguishing characters of different orders. Distinguishing characters of families of economic importance. International code of zoological nomenclature.

Morphology

Body wall: structure, cuticular outgrowths, colouration and special integumentary structures. Body regions: sderites and segmentation. Head: structure, types of mouth parts and antennae. Thorax sclerites and pterothorax. Wings, structure, venation, wing coupling and mechanism of flight. Legs: segmentation and types. Abdomen: segmentation and appendages. Genitalia and their modifications. Embryonic and postembryonic development. Types of metamorphosis

Internal Anatomy and Physiology of Insect

Structure, modification and physiology of different systems, digestive, circulatory, respiratory, excretory, nervous, reproductive, musculature and insect sense organs. Physiology of moulting. Role of enzymes in growth and metamorphosis. Nutrition of insects, role of vitamins, proteins, carbohydrates, lipids minerals. Extra and intra cellular microorganisms

Ecology

Principles of ecology, Environment and its components. Effect of biotic and abiotic factors on bionomics, distribution, abundance and natural balance. Inter-and intra-specific relationships. Dispersal and migration. Life table studies. Population models. Surveillance and forecasting. Causes of insect outbreaks

Biological Control

Principles and scope of biological control Use of parasitoids, predators and pathogens. Introduction of exotic natural enemies. Conservation and augmentation. Mass production techniques and economics. Field release and evaluation. Host parasitoid relationships. Role of bacteria, fungi, protozoans and viruses; mode of action. mass production, formulation and field application.

Insect: Host Plant Relationships

Chemical ecology. Tritrophic relation. Role of mechano and chemo receptors. Volatile and secondary plant substances. Development of biotypes and measures to combat them. Breeding for insect resistance in crop plants. Exploitation of wild species. Gene transfer. Case histories

Toxicology

Principles of toxicology. Classification of pesticides based on chemical structure, mode of entry and mode of action. Toxicity and structure activity relationships. Mode of action and therapeutic methods for control of poisoning of arsenicals, fluoro compounds, dinitrophenol, plant products (rotenoids, nicotinoids, neem), chlorinated hydrocarbons, organophosphates, carbamates, natural and synthetic pyrethroids, cartap, avermectin, chloridimiform etc. Systemic insecticides. Phyto-toxicity. Compatibility. Antagonism and synergism. Factors affecting toxicity of insecticides. Insecticide resistance and resurgence. Insecticides Act 1968. Registration and quality control of insecticides. Bioassay methods. Plant protection appliances. Pesticide formulotions. Hazards of pesticides to humans, domestic animals and wild life.

Insect Vectors of Plant Diseases

Role of insect vectors: aphids, leaf hoppers, plant-hoppers, whiteflies, thrips, Grass-hoppers and mites. Bacterial, viral, fungal and mycoplasma diseases and their transmission. Toxicogenic insects and phytotoxemia. Management of vectors.

Pests of Crops and Stored Products and their Control

Biology, nature, extent of damage and control of pests of paddy, sorghum, maize, millets, wheat, barley, pulses, fruits, vegetables, cotton and other fiber crops, tobacco, oilseeds, sugarcane, ornamental plants, plantation crops such as tea, coffee, coconut, arecanut, cashew, cocoa, spices and condiments like pepper, cardamom, clove, nutmeg and chillies. Stored products pests. Detection and estimation of infestation. Management of stored product pests. Evaluation and efficacy of storage structures. Polyphagous pests-locusts, termites, white grubs, hairy caterpillars and non-insect pests (mites, snails, birds and rats). Principles and components of integrated pest management. Economic thresholds. Economic injury levels. Action thresholds. Gain thresholds. IPM for important field and horticultural crops. Systems approach. Computer modelling. Case histories in IPM.

Useful Insects

Honey bees, lac insect and silk worms