Contents

Syllabus & Questions: Fundamentals of Soil Science

Soil-physical, chemical and biological properties; Processes and factors of soil formation; Modern classification of Indian soils; Mineral and organic constituents of soils and their role in maintaining soil productivity

Previous Year Questions

2011

1. Essential and beneficial plant nutrients for crops (10)

2010

1. Significance of C:N Ratio (10)

2008

1. Physical and Chemical weathering of Rocks (10)

2007 *(10 marks each)*

1. A note on Soil Profile
2. Kaolinite and montmorillonite clay mineral

2006 *(20 marks each)*

1. What are the important physical and chemical properties of soil?
2. State the important factors responsible for soil formation and explain effects of climate on soil formation.

2004 *(Distinguish between following....)*

1. Soil pH and Soil Eh (10)
2. Soil permeability and Hydraulic Conductivity (10)
3. Weathering and withering processes (10)

2002 *(10 marks each)*

1. C:N Ratio
2. Distinguish: Particle Density and Bulk Density

2001

1. Short note on Soil Profile (10)

Chapter 1: Introduction & Soil Physical Properties

Soils as we all know are very vital for the sustenance of life on earth and an important component of lithosphere and in turn the whole biome. Since man began domestication of plants, cultivators recognized good soils being attracted to the fertile soils of river valleys. Most great civilizations have depended on good soils. Continuous replenishment of fertility by natural flooding made possible the stable, organized communities and even cities, in contrast to the nomadic, shifting societies.

The soil not only acts as a medium for plant growth and for microbiological activity but also as a sink and recycling factory for numerous waste products which might otherwise accumulate to poison our environment.

In many regions, we find once thriving agricultural fields reduced to despair by man induced erosion or salinization resulting from injudicious management of the soil-water system. Added to that, the shortsighted depletion of non-replenished water resources as well as the dumping of poisonous wastes is indeed a consistent pattern of mismanagement. Despite the known degradation of resource, we still continue recklessly abuse such precious resource, for the sake of population which has led to environment-food crisis which are being faced by the world.

Definition of Soil

The word "Soil" is derived from Latin word 'Solum' meaning 'Floor' or 'Ground'. According to Jenny (1941) the "soil is a natural occurring body that has been evolved owing to combined influence of climate and other organisms acting on parent material, as conditioned by relief over a period of time".

So it can be comprehensively concluded that Soil is a natural body synthesized as a profile form from a variable mixture of broken and weathered minerals and decaying organic matter, which covers the earth in a thin layer and which supplies, when containing proper amounts of air and water, mechanical support and in part sustenance to plants.

Soil science has two main branches: 1. **Pedology**, which deals with the study of soil in its natural setting and, 2. **Edaphology** deals with the study of soil in relation to soil dependent uses.

Soils are important because they perform many important functions, including:

1. Sustaining biological activity, diversity, and productivity and Regulating and partitioning water
2. Filtering, buffering, degrading, immobilizing and detoxifying organic & inorganic materials
3. Storing and cycling nutrients and other elements
4. Providing support of socioeconomic structures

❖ Properties of Soil

Study of soil properties is important to understand the overall nature of soil, its fertility and also to decide on the requirement of particular soil conservation practice to be employed. These are grouped into Physical, Chemical and Biological properties.

Horticulture: Syllabus

Climatic requirements and cultivation of major fruits, vegetable crops and flower plants; the package of practices and their scientific basis

Handling and marketing problems of fruit and vegetables

Principal methods of preservation of important fruits and vegetable products, processing techniques and equipments

Role of fruits and vegetables in human nutrition

Raising of ornamental plants and design and layout of lawns and gardens

Neha

Chapter 1: Introduction to Horticulture

The term Horticulture is derived from two Latin words i.e. -*Hortus* meaning garden or enclosure and -*Cultura* meaning cultivation. So, horticulture literally means garden culture or culture of garden crops.

According to the modern world, horticulture is defined as the crop science which deals with the production, utilization and improvement of fruits, vegetables, ornamental plants, spices and plantation crops, medicinal and aromatic plants. *Horticultural science can be distinguished from agricultural or forestry science in one or more of the following factors:*

- Horticulture produces are utilized in the fresh state and are highly perishable. In contrast, agricultural field crops are often utilized in the dried state of are usually high in dry matter content.
- Horticultural crops generally require intensive cultivation warranting a large input, capital, labour and technology per unit area of land.
- Cultural operations such as propagation, fertilization, training pruning, harvesting and marketing are skilled operations and are specific to each and every horticulture crops.
- Horticulture crops are rich in sources of vitamins and minerals where as agricultural crops are generally rich in carbohydrates or protein.
- Aesthetic sense is an exclusive phenomenon for horticulture science.

Horticulture crops occupy only 7.0% of the total cropped area. But its contribution to natural income is 18-20% of total value of agricultural produce. The export of agricultural crops contributes 25% of our export out of this horticultural crops alone contributes 56% of total earnings from agricultural sector. Horticulture crops fetch 20-30 times more foreign exchange/unit are than creates due to higher yields of price.

Divisions of Horticulture

1. **Pomology:** Pomology is the study of fruit crops and science.

   Woody Plants Evergreen – Acid lime, Litchi, Mango

   Deciduous plants – Apple, pear

   Herbaceous perennial – Strawberry, Banana, Pineapple

2. **Olericulture:** Olericulture is the branch of horticulture which deals on Vegetables like leafy vegetables, root, tuber, cole crops etc.

3. **Floriculture:** Floriculture is another branch of horticulture which deals on commercial Floriculture, landscaping and cut flowers.

   Arboriculture: Growing of trees for aesthetic/scientific/educational purpose

   Landscape gardening .

   Ornamental floriculture

   Indoor garden and Outdoor garden

4. **Spices, Plantation, Medicinal and Aromatic crops**

   Spices – used for food flavoring to aroma and flavour pepper, cardamom, clove, nutmeg

Condiments – plants used to add taste only (coriander, cumin)

Plantation crops – Arecanut, Tea, Coffee, Rubber, grown extensive area

Medicinal plants – Senna, periwinkle, Aswagandha

Aroma crops – Eucalyptus, Palmarosa, Citronella

Other branches of Horticulture

1. Fruit nurseries
2. Vegetable/Flower seed production
3. Fruit/Vegetable processing
4. Medicinal plants extraction
5. Essential oil (oleoresin)

Role of Horticultural Crops in Human Nutrition

From human nutrition point of view horticulture is most important to our daily living. Many of the horticulture crops and their products find place in our meals and diet. Human body requires vitamins, minerals, proteins, energy etc. for its health. All these are supplied by horticultural crops. Fruits and vegetables are the chief sources of vitamins, minerals, carbohydrates, fats, proteins etc.

Fruits and vegetables are recognized as protective foods as they are necessary for the maintenance of human health. The nutrition expert group presents a daily a minimum of 2400-3900 calories of energy, 55g protein, 0.4-0.5 g calcium, 20g of Iron, 3000 mg of B carotene (Vit A) 1.2-2.0 mg thiamine, 1-2.2 mg riboflavin, 16-26 mg nicotinic acid, 50 mg ascorbic acid.

To obtain this, dieticians recommended 300g of vegetables i-e . 125 g of leafy vegetables, 100g of roots and tubers, 75 g of other vegetables, 90 g of fruits. But the per capita availability works to 30g fruits 92 g vegetables only.

Vitamins: These are the important constituents of fruits and vegetables and are indispensable part of human diet. Although required in very minute quantities, they are absolutely essential for the maintenance of health. The deficiency of any vitamin from the diet for considerable period may lead to diseased state or disorder conditions. Fruits and vegetables supply several vitamins; *some of the major ones are as follows:*

Vitamin-A: It is essential for normal growth, reproduction and maintenance of health and vigour. It affords protection against cold and influenza and prevents night blindness. The deficiency of this vitamin results in cessation of growth in young children, night blindness, drying up of tear glands in the eyes, eruption of skin (Rashes on the skin) and brittleness of the teeth

Sources: Fruits-Mango, Papaya, Dates, Jackfruit, Walnut etc; Vegetables-Greens like palak, spinach amaranthus, fenugreek, carrot, cabbage lettuce, peas, tomato etc.

Vitamin B1 (Thiamine): Tones the nervous system and helps in proper functioning of the digestive tract. Its deficiency in human diet results in –Beriberi, paralysis, loss of sensitivity of skin, enlargement of heart, loss of appetite ,loss of weight and fall in body temperature.

Sources: Fruits-Orange, pineapple, jack fruit, cashew nut, walnut, dry apricot, almond, banana etc. Vegetables-Green chilli, beans, onion, sweet potato, tomato (red), leaves of colocasia.

Vitamin B2 (Riboflavin): This vitamin is required for body growth and health of the skin. The deficiency of this vitamin causes sore throat, anorexia cataract, and loss of appetite and body weight and also development of swollen nose.

Sources: Fruits- Bael, papaya, litchi, banana, apricot, pomegranate, pear etc.; Vegetables - Cabbage, cauliflower, potato, peas and beans, methi, lettuce, asparagus, green chillies, leafy vegetables etc.

Vitamin-C (Ascorbic Acid): This vitamin promotes general health and healthy gums, prevents scurvy disease which is characterized by pain in the joints and swelling of limbs (rheumatism), bleeding of gums, tooth decay and keeps the blood vessels in good condition.

Sources: Fruits: Amla, guava, ber, citrus, strawberry, pineapple etc. Vegetables: Tomato, palak, menthi, cabbage, green chillies, spinach, potatoes, peas and beans and carrot etc,.

Vitamin-D: This vitamin is necessary for building up of bones, preventing rickets and diseases of teeth.

Sources: All green leafy vegetables are rich in this vitamin.

Vitamin E: Has an important effect on the generative functions and promotes fertility.

Sources: Green lettuce and other green vegetables.

Vitamin-K: This vitamin prevents blood clotting

Sources: All green leafy vegetables are rich in this vitamin

Minerals: Human body requires minerals like P, Ca, Iron, and Iodine etc for maintaining good health.

Calcium: It is essential for development of bones, regulation of heartbeat, controlling blood clots

Sources: Fruits- Acid lime, Orange, Fig, Dried apricots, wood apple etc. Vegetables - Cabbage, greens, beans, carrot, onions, peas, tomatoes, agati, spinach, drumstick leaves etc.

Iron: It is required for production of haemoglobin and it is constituent of red blood corpuscles. Its deficiency causes anaemia, smooth tongue, pale lips, eyes and skin and frequent exhaustion.

Sources: Fruits- Custard apple, Guava, Pineapple, Straw berry, Grape, Black currents, dried dates etc. and vegetables like Carrot, Drumstick leaves, beans and agati etc.

Phosphorous: It is essential for maintaining the moisture content of tissues and for development of bones.

Sources: Fruits-Guava, Grape, Jackfruit, Passion fruit, Orange and vegetables like Carrot, Chilli, Drumstick leaves, Beans, cucumber and onion.

Proteins: These are bodybuilding foods. These are essential for growth of the body. The deficiency of proteins in the body causes retarded growth and increases susceptibility to diseases and causes lethargy.

Sources: Fruits- Most of the fruits are low in proteins except Guava and Banana. Vegetables like peas and beans are rich in proteins.

Enzymes: These are required for controlling several metabolic activities in the body.

Sources: Papaya-Papain and Pineapple-Bromelin.

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Contents

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Syllabus and Questions: Social & Agroforestry

Important features, scope and propagation of various types of forestry plantations such as extension, social forestry, agro-forestry and natural forests

Previous year Questions

2012

1. Differentiate between Agri-silviculture and Silvi-pasture (10)

2010

1. Note on Traditional Agroforestry systems existing in India (10)

2008

1. Comparison: Commercial forestry and social forestry (10)

2007

1. Comparison: Social forestry and Agro-forestry (10)

2006

1. What do you understand by social forestry? State the advantages of social forestry. (20)

2005

1. Energy plantation (10)
2. Discuss Alley cropping and its advantages (10)
3. Difference between: Reserve and Protected Forests (10)

2003

1. Compare: Social forestry and Agroforestry (10)

2001

1. Justify the role of agro-forestry in meeting the human needs. How do you plan for new agro- forestry programmes for wasteland development? (40)

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Chapter 1: Social Forestry & Agroforestry – Basics

Introduction

The word forest is derived from Latin word *'Foris'* means outside. Therefore forests are areas covering practically all uncultivated and untended lands fairly extensive stretch of land covered with rather tall and dense tree growth.

Forests are also defined as an area set aside for the production of timber and other forest produce and is under woody vegetation for certain benefits which it provides.

Definition of Forestry

Forestry stands for the theory and practice of constitution and management of forests and utilization of their products. It also stands for scientific management of forests for the continuous production of goods and services.

As we are aware of many traditional practices such as, shifting cultivation, farm steads, it can be precisely concluded that Agroforestry is a new name for old practices with certain modifications.

A strictly scientific definition of agroforestry should stress two characteristics common to all forms of agroforestry and separate them from the other forms of land use, namely:

- The deliberate growing of woody perennials on the same unit of land as agricultural crops and/or animals, either in some form of spatial mixture or sequence;
- There must be a significant interaction (positive and/or negative) between the woody and non-woody components of the system, either ecological and/or economical.

But with escalating importance of planting activities due to deforestation, global warming and increasing threat of Climate Change, many terms became popular today with -forestry ending. Notable among these are *Community Forestry, Farm Forestry, and Social Forestry.* Although these terms have not been defined precisely, it is generally accepted that they emphasize the self-help aspect - people's participation - in tree planting activities, not necessarily in association with agricultural crops and/or animals as in agroforestry, but with social objectives ranking equally in importance with production objectives.

I. Social Forestry

Social Forestry is considered to be the practice of using trees and/or tree planting specifically to pursue social objectives, usually betterment of the poor, through delivery of the benefits (of trees and/or tree planting) to the local people; it is sometimes described as "tree growing by the people, for the people." The term social forestry was first used by a forest scientist named Westoby in 1976. Social forestry is the greatest instrument of land transformation.

Community forestry, a form of social forestry, refers to tree planting activities undertaken by a community on communal lands, or the so-called common lands; it is based on the local people's direct participation in the process, either by growing trees themselves, or by processing the tree products locally. Though claimed to be suited for areas with abundant common lands, the success of community forestry has been hampered by the "tragedy of the commons".

evolution

Reference Material for 2013-14

Contents

Syllabus and Questions on Ecology

Ecology and its relevance to man, natural resources, their sustainable management and conservation. Physical and Social environment: As factors of crop distribution and production. Climatic elements as factors of crop growth, impact of changing environment on cropping pattern as indicators of environments.

Previous year question papers (10 marks each)

2012

1. Agro-ecosystem and its components.

2011

1. Plant ecology and edaphic factors affecting it.
2. Impact of global warming on Indian agriculture.

2010

1. Resource management for sustainable agriculture.
2. Impact of climate change on Agriculture.
3. Resource conservation technologies in modern agriculture.

2009

1. Plant ecology.

2006

1. Effect of mulching.

2005

1. Cropland ecosystem.
2. Differentiate between Halophytes and Hydrophytes.

2003

1. Plant ecology.
2. Symbiosis and Synergisticity.

Chapter 1: Introduction to Ecology

Ecology

Ecology is the part of biology that examines the interrelationships between organisms and their environment. It also draws heavily upon, and contributes to, other areas of biology, other sciences like chemistry, physics, meteorology, and earth science, as well as to other fields like mathematics, economics, medicine and sociology. As practitioners of a basic science, ecologists seek an accurate understanding of natural phenomena through observation and experimentation. At the same time, ecologists seek to utilize the gathered information toward preserving the ability of the earth to sustain all forms of life (including humans). In 1869, German biologist Ernst Haeckel coined the term *ecology* from two Greek words: *oikos*, meaning "house" or "place to live" and *logos*, meaning study.

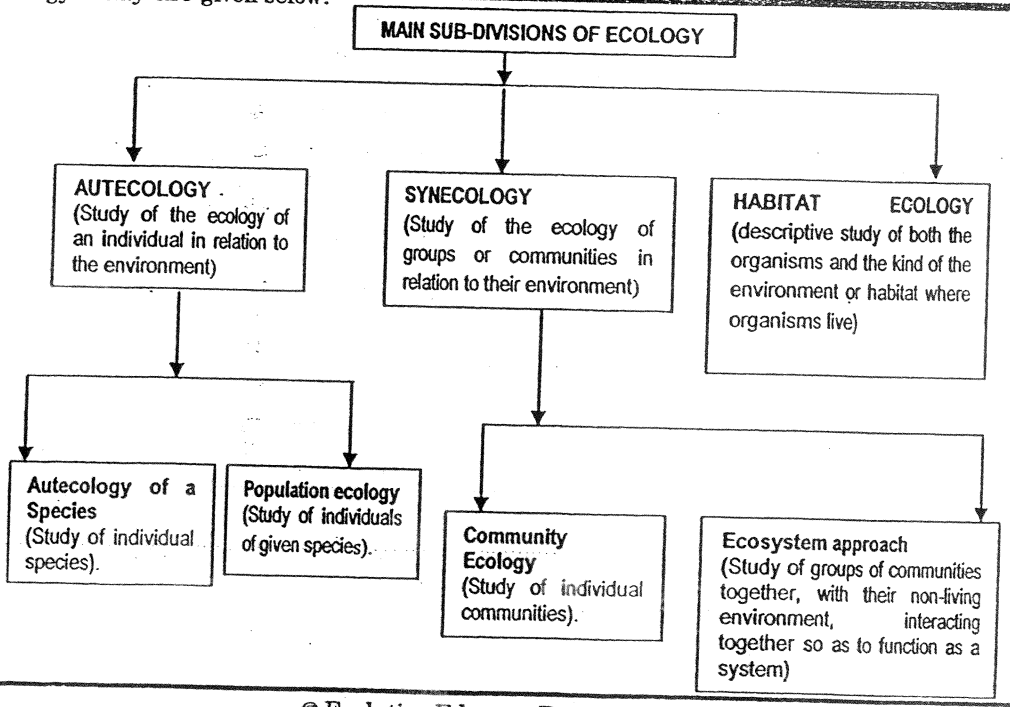
Haeckel (1870): "By ecology we mean the body of knowledge concerning the economy of Nature – the investigation of the total relations of the animal to its inorganic and organic environment."

Odum (1963): "The structure and function of Nature"

General Definition: "Ecology is the scientific study of the processes regulating the distribution and abundance of organisms and the interactions among them, and the study of how these organisms in turn mediate the transport and transformation of energy and matter in the biosphere (i.e., the study of the design of ecosystem structure and function).

Subdivisions of Ecology

Ecology was earlier divided into plant and animal ecology. However, modern ecology does not make any such distinction since plants and animals are intimately interconnected and interdependent amongst themselves and on their environment. The three main subdivisions of ecology today are given below:



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Introduction

All organisms collectively grouped under different species, represent a specific set of characters which differentiate one species from another. Each character on the other hand is controlled by a gene or a set of genes. As such every character be it a flower, a leaf or a root is the manifestation of ultimate expression of a series of biochemical reactions triggered at the gene level. The genes on the otherhand lie in a linear order in the chromosome, the latter maintaining a constancy in number in the species. The chromosomes are located inside the nucleus, which is the most important organelle of the cell. However in the plant system, the genetic material also exists in two other organelles, namely, chloroplastids and mitochondria. The former is involved in the process of photosynthesis and the latter in respiration.

The multitude of cells ultimately constitute the different organs vis-à-vis the entire body itself. The expression of diverse characters in an organism is a reflection of diversity of its gene content and their expression.

CYTOLOGY

The *cytology* and *cell science* deals with an understanding of cell structure and function of its constituents. The structural characteristic and functional details of all cell organelles with special emphasis on the most important component—the nucleus, come within the purview of cytology. The way in which the chromosome—the vehicles of hereditary material—the genes, behave in the life of an organism obviously comes within the scope of *cytology or cell science.* In fact, cytology deals with all organelles of the cell including the details of structural characteristics of chromosome, the physical and chemical, and their behaviour both in the somatic and reproductive cells. The influence of their

behaviour on the maintenance of hereditary stability on the one hand and diversity on the other leading to origin of species too, come within its purview.

GENETICS

Genetics by implication, is the science of genes and heredity. The study of genes, its physical and chemical characteristics as well as its property and behaviour form the main theme of genetics. The way through which genes replicate and perpetuate in different biological systems and the mechanism of gene expression controlling all characters form some of the basic themes of genetics. The mechanism through which the nucleic acid language of heredity is translated into the amino acid language of proteins and enzymes constitutes genetic code. The different factors which affect the expression of gene as well as their interaction with each other, come under the category of gene interaction. The mapping of gene in chromosomes, utilizing the data of linkage and crossover in meiosis, and the correlation between the genotypes and phenotypes follow some of the established concepts of genetics. The characteristic behaviour of cytoplasmic genes as well as their involvement in sex differentiation are also included within the scope of genetics.

CYTOGENETICS

Cytogenetics on the other hand deals with all aspects of genetic behaviour as can be studied at the cellular level. The expression of genetic behaviour originating at the cellular level and culminating at the expression in the phenotype is within the scope of cytogenetics. The chromosome study in detail, its behaviour in replication, reproduction, organ development as well as evolution of species are included within the discipline of cytogenetics. The origin and analysis of genome as deduced at the chromosome level and their behavioural characteristics in hybrids and mutants, also come within domain of cytogenetics. The identification of gene sequences at the chromosome level, and through cytological and genetic method, form an important component of cytogenetics as well. The cytogenetics being a overlapping discipline area, it is often very difficult to demarcate the border between genetics and cytogenetics. In practice, the cytogenetics is concerned with all aspects of cellular behaviour with special reference to chromosomes, cell cycle differentiation, reproduction, hybridization and evolution.

CHRONOLOGY OF CHIEF EVENTS

Year	*Investigator/s*	*Event*
1665	Robert Hooke	Discovered cell
1831	Robert Brown	Described presence of nucleus in cell
1838	M. J. Schleiden & T. S. Schwann	Formulated Cell Theory
1861	Schultzee	Proposed Protoplasm Theory
1866	Gregor Johann Mendel	Formulated the Laws of Heredity

contd.

Entomology: Syllabus

Pests of field vegetables, orchard and plantation crops of India

Causes and classification of plant pests

Principles of control of plant pests

Biological control of pests

Integrated pest management

Epidemiology and forecasting

Pesticides, their formulations and modes of action

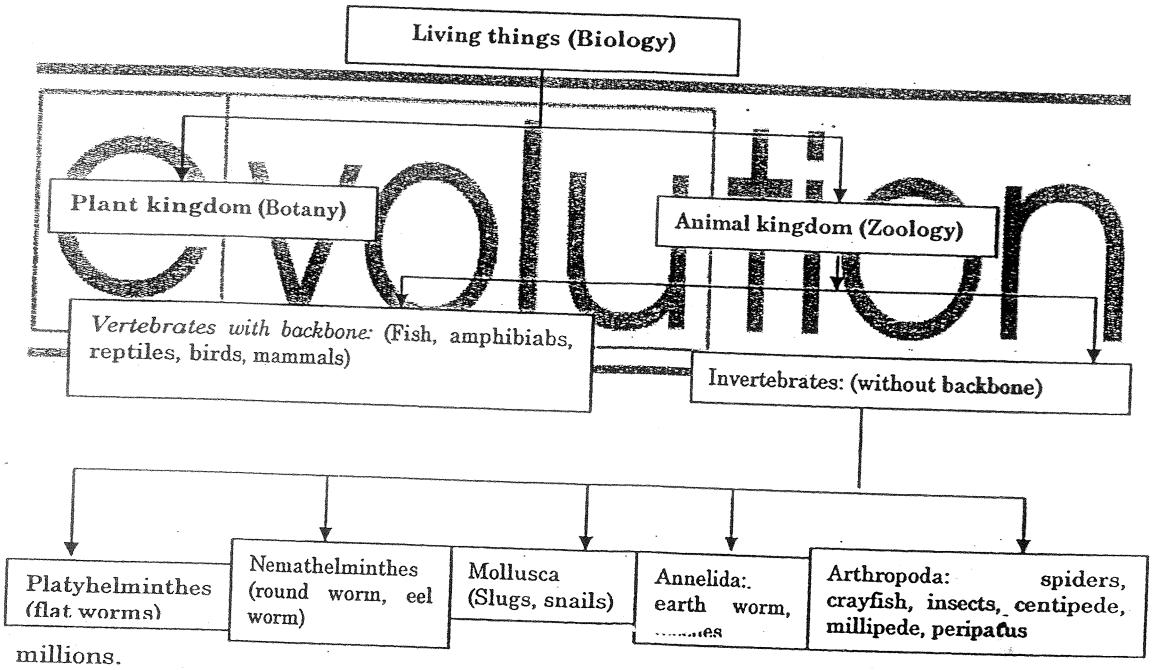
Storage pests of cereals and pulses and their control

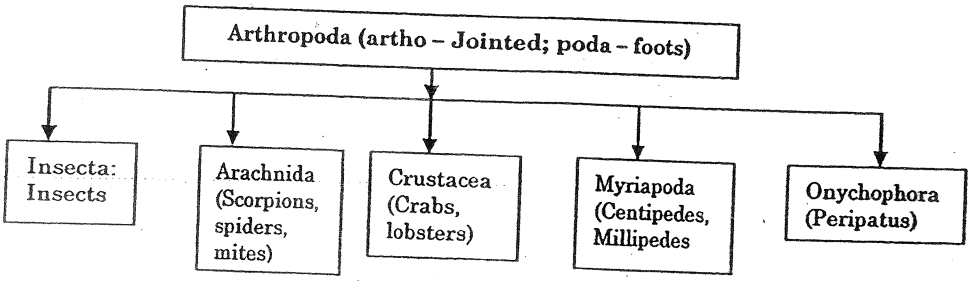
Chapter 1: Introduction to Entomology

We live in a world teeming with insects. The number of individual species of insects so far known is over a million and each of these species numbers into millions even billions of individuals. Doubtless, insects are harmful to us in one way or another but the benefits they offer in so many visible and invisible ways are also great that they cannot be assessed in terms of money. One radical quote on insects reads "If all mankind were to disappear, the world would regenerate back to rich state of equilibrium that existed ten thousand years ago; if insects were to vanish, the environment would collapse into chaos" – Edward O. Wilson.

Position of the insects in animal kingdom

Living things (Biology) are broadly classified into two kingdoms, Animal kingdom (Zoology) and plant kingdom (Botany). Insects are members of the class Insecta in the invertebrate phylum Arthropoda, the largest in the Animal kingdom. Phylum Arthropoda is the large group of animals that contains the insects and their relatives. Out of 1.35 million living species of animals, 900,000 are insects. Arthropoda comprises some 85% of all living animals and of these the vast majorities are insects. So far 1 million species were described and yet undescribed species are 3 to 4 millions.





Economic classification of insects related to human being

INSECTS

Possessing economic importance
(Economic Entomology)

Harmful insects

A. Pests of crops and plants
(Agricultural Entomology) & Forest Entomology (damage caused by feeding, oviposition, using plant parts for construction of nests, disseminating organisms of plant diseases)

B. Pests of stored products
(Storage Entomology) & Household pests (Medical Entomology) (By feeding, contaminating with their excretions, seeking protection or building nests or tunnels)

C. Inimical to man
(Medical Entomology) & Animals (Veterinary Entomology) (By causing annoyance, applying venoms, disseminating diseases, feeding etc)

Of no economic importance
Harmless insects

Beneficial insects

i. Products from secretion of insects
- **Silk** (silkworms)
- **Bees wax** (honey bee)
- **Shellac** (lac insect)
- **Illumination** (giant firefly)

ii. Bodies useful as or contain substances such as
- **Dye** (cochineal insect)
- **Cantharidin** (blister beetle)
- **Fish bait** (stone-fly nymph)

iii. Collect, elaborate and store plant product
- **Honey** (nectar collected by bee)

iv. Products from plant galls caused by insects
- **Tannic acid**
- **Inks**
- **Dyes**

v. Insects as food
- **for fishes, birds, certain animals and human beings**

B. Helpful insects
- **Aid in pollination**
- **Parasites** and predators of injurious **insects**
- **Destroy** weeds
- **Improve** soil fertility
- **As scavengers**
- **Insects** and their products useful in **medicine**
- **Certain** species are idea material in **scientific investigations**
- **Have aesthetic and entertaining value**

Insect Outbreaks

The insect pest problems in agriculture are probably as old as agriculture itself. However, under subsistence agriculture, the pest problems were generally low as the productivity was poor. The insect pests were kept in check by cultural and mechanical practices developed by the farmers largely through trial and error. Rapidly increasing population has necessitated the intensification of agriculture through expansion of irrigation facilities, introduction of high yielding varieties and application of increased amounts of agrochemicals. Besides, the cultural practices like spacing, crop rotation, sowing times and tillage methods were also modified to achieve maximum productivity per unit time for the available land. While undoubtedly contributing to higher yields, this technology package has also resulted in severe

outbreaks of insect pests in agricultural crops. Activity of human beings which upsets the biotic balance of ecosystem is the prime cause for pest outbreak. The following are some human interventions - *Reason for outbreak*

i. Deforestation and bringing under cultivation

- Pests feeding on forest trees are forced to feed on cropped
- Biomass/unit area more in forests than agricultural land
- Weather factors also altered - Affects insect development

ii. Intensive and Extensive cultivation: Monoculture (Intensive) leads to multiplication of pests - In agriculture, the natural community is removed, destroyed and usually replaced by a single crop species. Modern agriculture with its emphasis on HYV's, further narrows down the genetic base of these crop species. Even within the same crop, modern plant breeding with its emphasis on inbred, uniform strains has fostered a widespread trend towards genetic erosion, which is depleting the genetic base of our many crop plants.
Eg: *Wheat*- 80% of 2.5million ha in Hariyana and Punjabis under a single var. HD-2329
Paddy- more than two thirds of the area is under a few HYV's, which in turn are derived from a fewer number of parents.

iii. Destruction of natural enemies

Due to excess use of insecticides, natural enemies are killed.
This affects the natural control mechanism and pest outbreak occurs, e.g. Synthetic pyrethroid insecticides kill natural enemies.
Extensive cultivation of susceptible variety in large area - No competition for food - multiplication increases e.g. Stem borers in rice and sugarcane

iv. Introduction of new varieties and crops: While altering the genetic makeup of the crop plant to increase yield with little or no attention given to pest attack, natural resistance may be lost or greatly reduced. Efforts to breed plants more palatable to human taste by elimination of such factors like bitterness and hairiness may also result in development of more susceptible varieties. The fields planted with modern varieties, which are short and heavy tillering, develop a distinctly different microclimate conducive for the proliferation of insect pests. BPH, WBPH, GM, LF and WM have become major pests after the introduction of HYV's. Varieties with favourable physiological and morphological factors cause multiplication of insects. *Eg:*

- Succulent, dwarf rice varieties favour leaf folder
- Combodia cotton favours stem weevil and spotted bollworm
- Hybrid sorghum (CSH 1), cumbu (HB1) favour shoot flies and gall midges

v. Improved agronomic practices

Increased N fertilizer - High leaf folder incidence on rice
Closer planting - BPH and leaf folder increases
Granular insecticides - Possess phytotonic effect on rice

vi. Introduction of new pest in new environment

- Pest multiplies due to absence of natural enemies in new area
- Apple wooly aphid *Eriosoma lanigerum* multiplied fast due to absence of *Aphelinus mali* (Parasit)

vii. Accidental introduction of pests from foreign countries (through air/sea ports)