1 Define the term Insect ecology. Explain the effect of abiotic Factors on insects with suitable examples.

Ins:- • Insect ecology:-

The science of interrelation between insects and their environment is called insect ecology.

• Effects of abiotic factors:-

1) Climatic Factors:- These Factors include Temperature, Rainfall, Humidity, light, Air current, etc Besides this, topography of land also makes part of abiotic environment. These factors influence the life of insect in ecosystem.

a) Temperature:- It controls almost all the activities of an insect. Extremes of temperature are lethal to certain developmental stages of insect. It governs the duration of life cycle of an insect. Extreme cold and hot temperature will directly kill the insects.

b) Rainfall:- Heavy rains have adverse effect on tiny insects like aphids, thrips, groundnut leaf miners which are washed down and get killed. Due to flood situation many soil insects get killed inside soil or may come to surface on soil and are devoured by birds.

c) Humidity:- Insects have to maintain the water content of their bodies at fairly constant level, & they die when the water

falls or unduly increases, less of the water content leads to retardation of development & lowering of metabolic rate.
Ex:- Sitophilus oryzae & high in thinskinned insects like lepidoteran larvae where the water content may be as high as go to 92%.

d) Wind velocity/ Air current: Heavy air currents affect the dispersal to suitable places for food or breeding. Strong winds interfere with male finding in flights & oviposition activity. e.g Locusts in gregarious phase.

e) Sunlight: It greatly influences the size of insect population in a given area.
e.g pests of tropical & temperate regions are different. Bright sunshine days after intermittent rains and dry spell are favoura for groundnut leaf miner, e.g Dragonflies.

e). Topographical factors: The major topograp factors such as mountain, lakes, oceans, large streams, etc act as physical barriers for dispersal or spread of insect particularly on weak flyers.

Q.2 What is Biological control? Distinguish betn predator & parasite.

ans:- • Biological control:-
The study and utilization of parasites, predators and pathogens for the regulation of pest population densities.

Biological control can also be defined as the utilization of natural enemies to reduce the damage caused by noxious organisms to tolerable levels.

Predators	Parasites
1) (e.g Mantid, Lady bird beetle)	1) (e.g Trichogramma sp.)
2) Predators are larger than their prey	2) Parasites are smaller than host
3) The prey is weak & less intelligent	3) Host is larger, stronger and intelligent
4) Predators are active	4) Parasites are sluggish
5) Live independent of host	5) Remain in on the body of host
6) Prey does not determine habitat of predator	6) Host determines the habitat of parasite
7) Predator needs many individuals	7) Parasites generally need a single host
8) Predators have longer life cycle	8) Parasites complete their life cycle earlier than hosts
9) In predator organ of locomotion mouth parts, sense organs well developed	9) The organs of locomotion sense organs, mouth parts not well developed
10) Predators catch, kill & eat the prey in getting a single meal	10) Parasites derives their food gradually
11) Ovipositor not well developed	11) Ovipositor well developed

Q.3 Define insecticide. Write down the properties of an ideal insecticide/pesticide.

ans:- • **Insecticide:-**

Chemicals which are used to kill pests/ insect is called as insecticide.

• Properties of an Ideal Insecticide:-

1) Kill the target insect effectively & quickly.
2) Less toxic to natural enemies.
3) Less toxic to honey bees, soil microorganism
4) Less toxic to fishes and mammals.
5) Less hazardous & less toxic during handling or accidental consumption by human beings
6) Quickly degradable in environment & should be less persistent (Residues should be very
7) Should ~~be~~ not cause resurgence of the target insect (i.e Increase in population target insect) e.g chlorophyriphos causes resurgence of BPH on rice.
8) Should not cause outbreak of secondary pest or a minor pest by killing natural enemies.
9) It should not be phyto-toxic
10) It should be available in different formulations.

Q.4 Write down the techniques in biological control

ans:- • The major techniques of biological control

1) Conservation and encouragement of indigenous National enemy:-

Defined as actions that preserve and increase Natural enemy by environmental manipulation e.g Use of selective insecticides, provide alternate host & refugia for Natural enemy

2] Importation or Introduction:-
Importing or introducing Natural enemy into a new locality (mainly to control introduced pests).

3] Augmention:-
Propagation (mass culturing) and release of Natural enemy to increase its population.
Two types:-
i) Inoculative release: Control expected from the progeny and subsequent generations only.
ii) Inundative release: Natural enemy mass cultured and released to suppressed pest directly.
e.g Trichogramma sp., egg parasitoid, Chrysoperila carnia predator.

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5 Classify the insecticides on the basis of mode of entry.
:- • Classification of insecticides on the basis
= • of mode of entry.

a) Stomach poison
b) Contact poison
c) Fumigant
d) Systemic poison

a) Stomach poison:- The insecticide applied on the leaves and other parts of the plant when injected act in the digestive system of the insect and bring about kill. e.g Malathion.

b) Contact poison: The toxicant which brings about death of the pest species by means of contact. e.g fenvalerate.

c) Fumigant: Toxicant enters in vapour from into the tracheal system (respiratory poison) through spiracles. e.g Aluminium phosphide.

d) Systemic poison: Chemicals when applied to plant or soil are absorbed by foliage roots translocated through vascular system & cause death of insect feeding on plant e.g. Dimethoate, imidacloprid.

Q.6 Enlist the formulations of insectides and d any three

ans⇒ • Formulations of Insecticides:-

The commonly used formulations are as follows:-

a) Dust
b) Granules ~~WA~~
c) EC (emulsifiable concentrate)
d) wettable power
e) Solutions
f) Concentrate insecticide liquid
g) Aerosols
h) Fumigant
i) Poison baits

j) Mixture of active substances
k) Insectotape
l) Insect Sticky traps
m) Cream n) Chalk o) Shampoo
p) Insecticide fertilizer mixture.

1) Dusts:-
i) The insecticides, which are used dry, are mixed with organic flours (soybean flour, walnut shell flour) minerals (sulphur, lime, gypsum, tale). clays (bentonite, kaoline, etc).
ii) The concentration of toxicant varies from 0.65 to 10 precent, generally used @ 20-25 kg/ha.
iii) Dusts are easy to handle and are used in early morning hours for good results as the plants are wet due to dew. e.g Quinalphos 1.5 D, Parathion 2D.

2) Granules:-
i) It consists of inert material with toxicant absorbed on to it.
ii) The granules size varies from 0.25-2.5 mm in diameter. This formulation contains 2-10% toxicant such granules are broadcast in soil, in plant whorls and no water is needed.

Advantages:- i) There is very little drift
ii) Release of toxicant is slow
iii) Water is not needed for application
e.g. Phorate 10G: Carbofuran 3G, Disulfoton 5G.

3) Wettable powers:-
i) It is a powdered formulation which gives a

stable suspension when diluted with water.
ii) The toxicant ranges from 15-18% blended with a dispersing agent.
iii) They are diluted in water & used as spr
A good W.P formulation should be:-
i) stable in storage
ii) It should form quick suspension & slow settling.
iii) Good wetting & spreading properties.
iv) Good wetting and spreading properties
v) Retention on treated surface for a longer time e.g carboxyl so WP, sulphur

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(7) Describe the types of pheromones:-
ans ⇒ Types of pheromones
1) Sex pheromones
2) Alarm pheromones
3) Trail pheromones
4) Aggregation or arrestants.

I) Sex pheromones
i) The sex pheromones represent diverse assemblage of compounds. Though most commonly released by females, they ma be released by either sex.
ii) The Male & female sex pheromones diffe in their property and actn.
iii) Most of the females of lepidopterous pest produce sex pheromones which attract males for mating.
iv) The release of sex pheromones is a complex process correlated with sexual Maturity of the virgin female & inhibitn

and light intensity.
e.g Bombykol - produced by female of Bombyx Mori.

II) Alarm pheromone:-
i) These are produced by Mandibular glands or are produced by odoriferous sting apparatus in worker bees and by a variety of organs in other insects i.e aphids, termites, ants, etc.
ii) Alarm pheromones are primarily an antipredator device, a warning to can specifies about the presence or attack of an enemy.

3) Trail pheromone:-
i) These are produced by foraging ants & termites. the ant Formica rufa L appears to use formic acid as a trail marker pheromone.
ii) Hexanoic acid is a pheromone secreted by termites.

4) Aggregation pheromone:-
i) As the name indicates, these pheromone induce aggregatn or cogregatn of insects for protectn, reproductn and feeding or combination there of
e.g:-
a) Pheromones of khapra beetle
b) Pheromones of bark beetle

Q.8 Write short notes on:-

1) Mechanism of HPR

The three important Mechanism of resistance are - Antixenosis (Non preference)
- Antibiosis
- Tolerance

I) Antixenonis:- i) Host plant characters responsible for non-preferen of the insects for shelter, oviposition, feeding, etc.

ii) It denotes presence of Morphological or chemical factors which alter insect behaviour resulting in poor establishment of the insect.

e.g Trichomes in cotton - resistance to whitefly.

open panicle of sorghum - supports less Helicove

II) Antibiosis:- i) Adverse effect of the host plant on the biology (survival, development & reproductn) of the insects and their progeny due to the biochemical & bio-physical factors prese in it and is Manifested by larval deat abnormal larva growth etc.

Antibiosis may be due to -
- presence of toxic subn.
- Absence of sufficient amount of essential Nutrients
- Nutrient imbalance / improper utilizatio of Nutrients chemical factors in Antibiosis

e.g chemicals present in plants impart

resistance against DIMBOA against European corn borer, Ostrinia nubilalis,

III) Tolerance:- i) Ability to grow & yield despite pest attack.

ii) It is generally attributable to plant vigour, regrowth of damaged tissue to produce additional branches, commensato by growth of neighbouring plants.

Use of tolerance in IPM:-

→ Tolerant varieties have high ETL- require less insecticide.

→ Apply lesses selectn pressure on pests Biotype development is less.

Q Define pest outbreaks. Describe in detail the causes of pest outbreak.

A:- Pest outbreaks:-

Due to natural condition, sudden increased in the pest population occur in small amount of time.

Causes of pest outbreak:-

i) Destruction of forest on large area -

Affect the weather condition such as wind velocity humidity etc in that locality affect. The insect forest trees are dispersed to neighbouring area due to destruction of forest.

ii) Destruction of Natural Enemies:

The natural enemies like parasite & predators keep a natural check on the destruction by man or other population. Insecticides may affect the parasite & predator.

DDT kills parasite & predator.

iii) Destruction by intensive & extensive cultivation

When one or more crops are grown on extensive area there ~~crop~~ becomes no limitation & no competition for food & shelter this occur favourable condition for insect population.

iv) Introduction of new crops/ strains:-

New plants or crops are introduced in an area where it was not previous grown may serve as new host for insect.

HYVP - The high yielding variety are suspetible to insect pest. The introduction of new variety called insect of minor importance may become major pest. e.g improved cotton variety are suspetible to grown worms. Hybrid sorghum is more attack by shootfly, Migefly, stem borer and the local variety.

v) Improved ~~org~~ agronomic practices: Tillage operation, timely irrigation, application of fertilizer improved the crop growth but it makes vulnerable on insect pre-disposed the insect attack. Nitrogenous fertilizer gives luxrant growth but it makes vulner

on insect attack.
e.g Stem borer in rice Aphid jassids in cotton spraying insecticides make kill over insect species but it allows Multiple or destroy.

vi) Introduction of new pest:- When an insect is introduced in a new area without its natural enemy It becomes more abundant.
e.g White woly aphid parasite - Aphelinus mali

vii) Accidental introduction of foreign pest:-
The Moder species travel system has increased the chances of introducing foreign pest. DPM - Plutella xylostema & Phyllotreta opercultal Quatraspidiotus perniciosus scange scale. Green bulb on coccus vinidis.

ix) Resurgence of pests: -
It has been observed that plant treated with systemmic inucticides after protection against sucking pest initially but increases the pest population later.

x) large scale storage structures.

10) Define IPM - Enlist tools of IPM Describe in detail cultural Methods of pest control

8:⇒ IPM:-
Smith & Ronalds (1965) defined as the pest population Management system that utilizes all suitable techniques & Methods in a

Compatible Manner to reduce & Maintain the pest population below economic injury level.

• Tools of Integrated pest Management:-

i) Cultural Method or use of agromonic practices
① Crop rotation
② Crop refuse destruction
③. Tillage · of soil
④ Variation in Time of planting or Harvesting
⑤. Pruning or Thinning
⑥. fertilizer Management
⑦ Water Management
⑧. Intercropping
⑨. Trap crop.

ii) Host plant Resistance- Antixenosis, Antibiosis, tolerance.

iii) Mechanical Methods of pest control
① Hand destruction
② Exclusion by screen, barriers
③ Trapping, suction devices, collecting Machine
④ Crushing & grinding

iv) Physical Methods
i) Heat
ii) Cold
iii) Energy
iv) Sound

v) Biological Methods:-

1) Protection and encouragement of Natural enemies.

2) Introduction, artificial increase and colonizing specific parasitoids & predators.

3) Pathogens on insects like virus, bacteria, fungi & protozoa.

4) Use of botanicals like neem, pongamia, etc.

vi) Chemical Methods -

1) Attractants 2) Repellants

3) Insecticides – OC, OP, carbonates, pyrethroids, etc.

4) Insect growth inhibitors

5) Chemosterilants

vii) Behavioural Methods

1) Pheromones 2) Allelochemicals

viii) Genetic / Biotechnology Method

1) Release of genetically incompatible

2) Transgenic plant.

ix) Regulatory Illegal Method:-

1) Plant / animal quarantine

2) Eradictn & suppression programe.

Objectives

Section B

1.1) Fill in the blanks:-

① The animals do not have precise mechanism to regulate their body temperature are called as poikilothermic.

② ~~Insects which are active at Insect which~~
② When both the symbionts are beneficial by the association it is known as balance of nature.

③ Fecundity is the average number of eggs laid by a female in its life.

④ Sporadic pests have close association with that particular crop.

⑤ Pests occurs on a few isolated localities are treated as endemic.

⑥ Economic Injury level is the lowest population at which the pest will cause economic damage.

⑦ When resistance is governed by a few genes, it is called ~~Sprotric~~ resistance.
oligenic

Q.2) Define the following terms:-

1) Pest resurgence
⇒ An increase or revival of pest oftens a period of little activity is known as pest resurgence.

2) Pheromones
⇒ A pheromone is a chemical or a mixture of chemicals released by an organisms to the outside that cause a specific reaction in a receiving organism of the same species.

3) Parasitoid
⇒ An organism which is often about the same size of its host, consume all the tissues and nutrients of host & killing it known as parasitoid.

4) Insect ecology
⇒ Science of interrelationship between the insect and its environment known as insect ecology.

5) EIL
⇒ The lowest population density that can cause the disease is known as EIL.

6) Median lethal concentration
⇒ The concentration of insecticide required to kill 50% of the given organism or insect known as Median lethal concentration

7) Economic Threshold level

=> The lowest population at which control measure should be applied for preventing the increasing populatn from reaching the EIL known as ETL.

8) Endemic pest

=> The pest that occure in a low level in few pockets regularly and confined to particular area known as endemic pest.

9) Biological control

=> Utilizatn of natural enemies to reduce the damage caused by noxious organisms to tolerable levels known as Biological control.

Q.3) State the true or false:-

1] NPII remand as MIPHM recently during 2008.

=> True

2] NCIPM was established as new delhi in 1988.

=> False

3] Crop rotation is the practice of Mechanical Method of pest control.

ans => False

4] DDT was first synthesized by german scientist other zietler in 1874.

Ans:- True