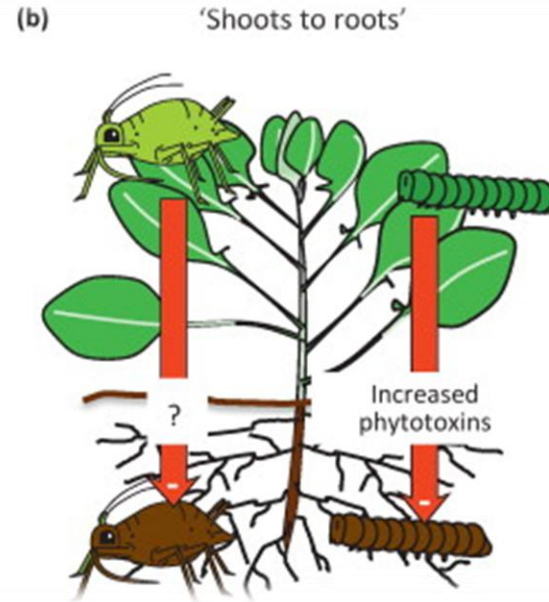
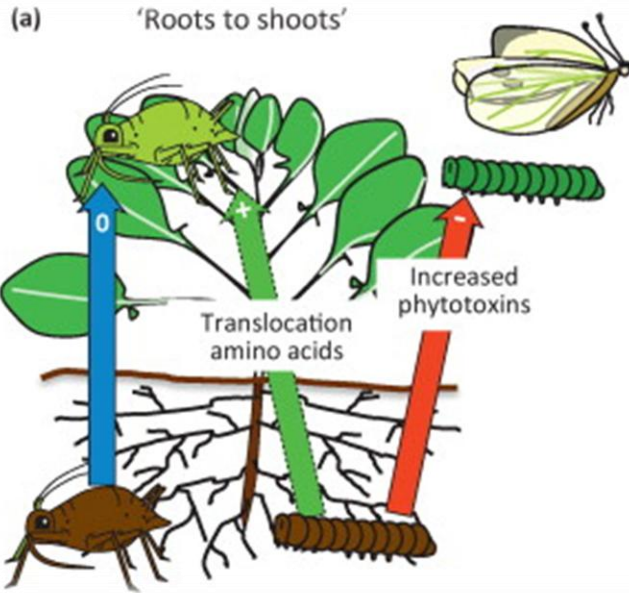


Host Plant Resistance



- Relative amount of **heritable qualities** possessed by the plant which influence the **ultimate degree of damage** done by the insect
- Lesser damage than average damage is taken as **resistance** while more is **susceptibility**
- Resistance is a **relative term** only **compared with less resistance or susceptibility**
- **Absolute resistance or Immunity** refers to the inability of a specific pest to consume or injure a particular variety under any known-conditions

Ecological Resistance or Pseudo Resistance or Apparent Resistance

- Relies more on **environmental conditions than on genetics**
- May overcome the most susceptible stage rapidly and thus **avoid insect damage**
- **Early maturing crop cultivars** have been used as an effective pest management strategy
- Pseudo resistance may be one or combination of the following

1. Host evasion: passing through the susceptible stage quickly or when insects are less in no.

Eg: Early planting of paddy in kharif minimize infestation of **stem borer *Scirpophaga incertulas***

Sowing of sorghum in June helps to overcome **shoot fly infestation**

2. Induced resistance: results from some conditions such as changes in the amount of nutrients or water applied to the crop

Eg: **Application of potassium fertilizers**

3. Host escape: lack of infestation or injury to the host plant because of transitory circumstances like incomplete infestation

Genetic Resistance

- Presence of structural barriers, allelo chemicals and nutritional imbalance
- heritable and operate in a concerted manner

A. Number of genes

i) Monogenic: resistance is controlled by a **single gene**

ii) Oligogenic: resistance is governed by **a few genes**

iii) Polygenic: resistance is governed by **many genes**, also termed as **horizontal resistance**

B. Major or minor genes

i) Major gene: controlled by one or few major genes and have a **strong effect**

This is also called **Vertical resistance**

ii) Minor gene: controlled by a number of minor genes, **each contributing a small effect**

This is also called as **horizontal resistance**

C. Biotype reaction

i) Vertical resistance

- when infested with the same insect biotype, **some cultivars show a resistant reaction** while others show a susceptible reaction
- It is also referred to also as a **qualitative or biotype- specific resistance**
- generally of a **high level, less stable** and is controlled by a major genes or oligogenes

ii) Horizontal resistance

- A series of different cultivars' of a crop show **no differential interaction** when infested with different biotypes of an insect
- **Biotype-non-specific , general or quantitative** resistance
- controlled by **several poly genes or minor genes**, each with a small contribution
- **Moderate**, does not exert a high selection pressure on the insect, and is thus **more stable**

Host Plant Selection Process by an Insect

1. Host-habitat finding

- Any pest arrives at general host habitat by **phototaxis or anemotaxis and geotaxis**
- **Temperature and humidity** play important role
- Normally crop pests stay within general area where crops are planted

2. Host finding

- Purposeful search to locate its **appropriate host plant** for its establishment
- The essential **visual or olfactory mechanisms** help the contact
- Once it contacts the host, **tactile and olfactory sensory organs arrest further movement**

3. Host recognition

- This phase is usually taken care of by **ovipositing female adult**
- Done with the help of **specific volatile from the plants**

Eg:-**Onion maggots, Delia sp** attracted to its host by the **odour of propyl disulphide**

Cabbage maggot fly, Delia brassica get attracted by crucifer by **few glucocyanolides**

4. Host acceptance

- **chemicals** present in the host species actually govern the feeding process of insects
- These chemicals responsible for **initial biting, swallowing and continuation** of feeding

Eg: Presence of **phagostimulants like morin** in mulberry *Morus alba* for silk worm

5. Host suitability:

- The nutritional value in terms of **sugars, proteins, lipids and vitamins**
- **Absence of deleterious toxic compounds**
- In relation to the **development of larvae, longevity and feeding**

Mechanisms of Host Plant Resistance

- R. H. Painter (1951) has grouped the mechanisms of host plant resistance into
1. Non-preference (Antixenosis) 2. Antibiosis 3. Tolerance
- **Kogan and Ortman (1978)** proposed that the term non preference should be replaced by antixenosis

Non-preference or Antixenosis

- **Response of the insect to the characters of host plant**, which are **unattractive** to the insect for feeding, oviposition or shelter
- **Kogan and Ortman (1978)** proposed the term '**Antixenosis**'
- Absence of desirable characters in that plant like **texture, hairyness taste, flavour**
- Presence of undesirable characters

Eg. **Hairy varieties of soybean and cotton** are not preferred by leafhoppers for oviposition

Open panicle of sorghum supports less *Helicoverpa armigera*

Wax bloom on crucifers deter diamondback moth *Plutella xylostella*

Antibiosis

- **Adverse effect of host plant on the insect** due to the **presence of some toxic substances or absence of required nutrients**
- The adverse effects may be **reduced fecundity , decreased size , long life cycle , failure of larva to pupate or failure of adult emergence, and increased mortality**
- antibiosis may result in an **increased exposure of the insect to its natural enemies**

Eg: When BPH females fed on Rice variety **Mudgo**, **ovaries of BPH are underdeveloped** and contain few mature eggs in it due to less quantity of **amino acid asparagine** content

Tolerance

- Withstands insect damage insect **by producing more number of tillers ,roots, leaves etc**
- Tolerance usually results from one or more of the following factors
 1. **General vigour of the plant**
 2. **Regrowth of the damaged tissues**
 3. **Strength of stems and resistant to lodging**
 4. **Production of additive branches**
 5. **Efficient utilization of non vital plant parts by the insect and**
 6. **Compensation by growth of neighbouring plants**

Eg: Early attack by the sorghum shoot fly on main shoot induce the production of a few synchronous tillers that grow rapidly and survive to produce harvestable ear heads