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Plant resistance to insect pests

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Mechanism of resistance?

1. Antibiosis (against life)

1. The resistance mechanism which affects the **biology of the insect** **(so pest abundance and subsequent damage is reduced compared to that which would have occurred if the insect was on a susceptible crop variety.)**

2. Antibiosis resistance often results **in increased mortality or reduced longevity and reproduction of the insect.**

e.g., secondary metabolites or allelochemicals, Alkaloids, terpenoids, phenolics

a. alkaloids such as nicotine from tobacco (*Nicotiana tabacum*),
b. caffeine from coffee (*Coffea arabica*),
c. cocaine from coca (*Erythroxylum coca*)

2. Antixenosis (non-preference)

—The resistance mechanism which affects the **behavior of an insect pest** and resultantly insects don't prefer plant.

—The modification of the behaviour of an insect **by a substance or another organism**

—No mortality, as plants are not eaten

So,

–Antibiosis and antixenosis resistance cause an insect response when the insect attempts to use the resistant plant for food, oviposition, or shelter.

e.g., oils of lemongrass, clove, garlic, citronella and lemon

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3. Tolerance

A. The resistance mechanism in which a plant **is able to withstand** or **recover from damage** caused by insect pest abundance (equal to that damaging a plant without resistance characters (susceptible)).

B. Tolerance is a plant response to an insect pest. (Thus, tolerance resistance differs from antibiosis and antixenosis resistance in how it affects the insect-plant relationship.)

- Use of insect-resistant crop varieties is

1.Economic benefits occur because

I. Crop yields are saved from loss to insect pests

II. Money is saved by not applying insecticides

III. Seed of insect-resistant cultivars **costs no more**, or little more, than for susceptible cultivars.

2.Ecological and environmental benefits

I. Increases in **species diversity** in the agroecosystem, because of **reduced use of insecticides**.

II. increase **ecosystem stability** that lead to sustainable system

- 3. Insect-resistant cultivars **synergize the effects** of natural, biological, and cultural insect pest-suppression tactics.

Assignment-2

- **What are the toxic plants with their common and scientific name and toxic or harmful chemicals in their leaves or seeds or another part?**

- **What mechanism of resistance are they using to resist the insects?**

Insect host-plant relationship

- How insect select their host plant
- It has been divided into following steps
  1. Finding the general habitat
  2. Finding the host plant
  3. Accepting the plant as a proper host
  4. Sufficiency of the plant for requisites

Insect host selection/insect aspect

1.Finding the general habitat

a.Insect find their host independant of plant, How?

b.Using physical stimuli such as light, wind, (temperature and humidity) orient to host (e.g., migrating insects

2.Finding the host plant (How they find host?)

a. Insects rely on vision and/or smell, Color, size, shape to locate host e.g.,

1.aphid and whitefly are attracted to yellow green colour

2.Red cultivars of cotton, cabbage, and oats found less attractive to insects

3.Some fruit fly species (Ragoletis spp) depend on shape and size of tree to locate them

b. When insects are in contact, physical and chemical stimuli become active. Insect dont move to other host

3. Accepting the plant as a proper host

a. First insect take test bites to confirm host

b. Morphological characteristics (Physical factor) involved in acceptance of a host include

I. leaf and stem toughness,

II. pubescence (density and type of hairs)(limit mobility and feeding

III. Presence or absence of glandular secretions

C. Physiological characteristics

a. primary metabolites of plant are feeding stimulants, nutrients and toxicants (some are of no concern for insects)

b. Secondary metablites considered nonessential in metabolism, may act as chemical defense against plant eating.

c. Basis of Chemical communication

- a. Semiochemicals (plant metabolites are known as semiochemicals)
  - Allelochemics: communication bet different species
    - a. Allomones: chemicals producing negative response
    - b. Kairomones: chemicals producing +ve response

d. Above factors are important in relation to feeding and oviposition

4.Sufficiency of the plant for requisites

a. Sufficiency of plant is determined during feeding,

b. If nutrients are adequate and no toxicity occurs, the insect completes development within a normal time period.