PROAGRO
LECTORIUM

Fundamentals of agricultural entomology (diversity of phytophagous pests, types of plant damage, and polyphagous pests)

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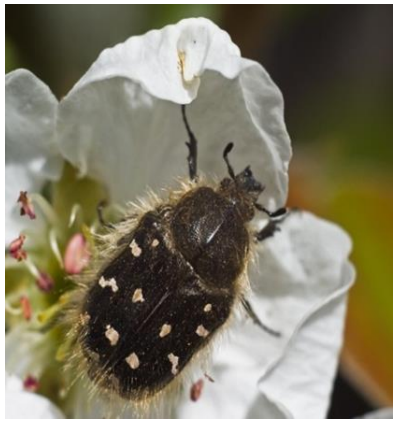
Training plan

1. Main groups of animals, including plant pests (rodents, molluscs, nematodes, mites, insects).
2. Types of mouthparts and typical plant damage.
3. Polyphagous insects.
4. Protection against the main groups of phytophagous animals.

Phytophagous pests

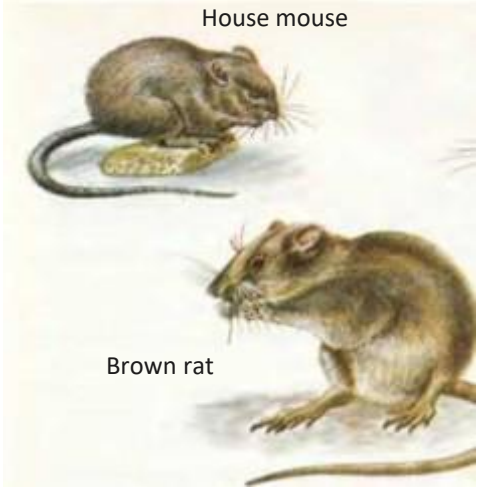
Pests are any animals that are able to cause (or cause) harm (or damage) to cultivated plants. Moreover, pests can damage plant products during storage.



Type: Chordate
Class: Mammalia
Order: Rodentia

Rodents are classified as follows based on their diet:

- Herbivores (voles)
- Granivores (mice)
- Omnivores (hamsters, hares)



Protection measures:
Compaction of snow (by trampling) around tree trunks
Spreading baits with bacterial (Bacterodencid) and chemical (Kilrat Super, Klerat, Dedmais, Izocin BFK) rodenticides approved for use in agriculture and the use of glue traps.
Use of ultrasonic repellers.
Growing plants (mint, lavender, etc.) that repel rodents.
Wrapping young fruit trees with hare-resistant cloth.

Type: Mollusca

Class: Gastropods

The most harmful species:

Slugs: gray garden slug, garden slug, marsh slug, leopard slug.
Roman snail
Damage field, vegetable, berry, and fruit (in nurseries) crops if there is enough moisture.

Protection measures:

Attracting natural foes: birds, hedgehogs, ground beetles.
Creating barriers: spreading crushed shells, fine gravel, coarse sand, pine needles, sawdust, ash, lime, and chalk between rows; placing plastic barriers.
Spreading metaldehyde-based molluscicide granules (Slizneed Neo, Groza-3, Stop Ulit) approved for use in agriculture on the soil surface, paths, and between row.

Type: Nematode Class: Nematode

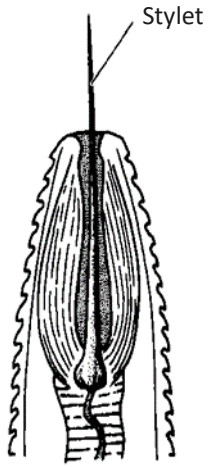
About 1,500 species are plant pests.
Size: from microscopic to large. The body is not segmented. The mouth includes a sharp stylet. Mainly develop and feed inside plants. Some of them are entomophages.

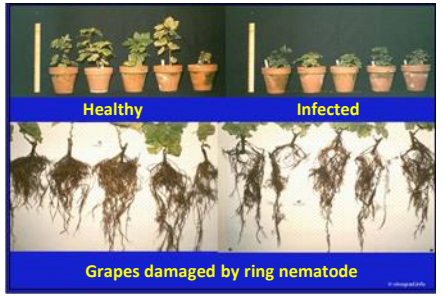
Main pests:

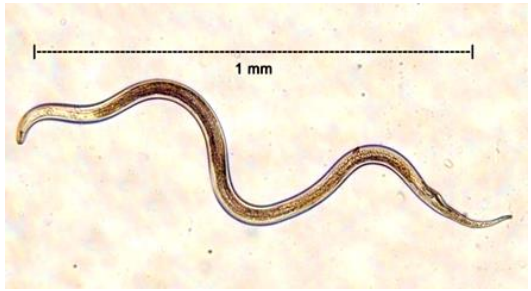
Ring nematode
Onion stem nematode
Root-knot nematodes
Strawberry stem nematode
Strawberry leaf nematode
Soybean cyst nematode
Yellow potato cyst nematode (quarantine).

Protection measures.

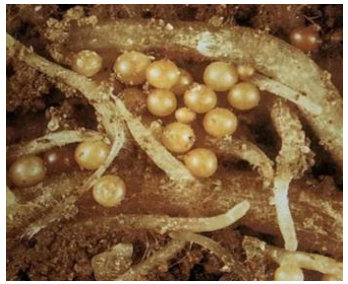
Application of soil nematicides in rows and holes (Fitoverm, Vidat 5G). Removing affected plants. Crop rotation. Highly resistant varieties and crops.







Strawberry leaf nematode

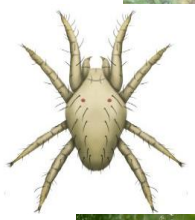


Yellow potato cyst nematode

Superorder: Parasitiformes, class: Arachnids

Size: small, microscopic (0.3–0.6 mm). The body is compact, round-shaped.
Four pairs of legs (larvae may have three pairs).
Mouthparts : chelicerae and pedipalps.
Damage to plants: pierce external plant tissues and feed on sap.
Signs of damage to plants:
Discolored spots, crinkles, fading, gall formation.
Main pests:
Spider mites European red mite
Pearleaf blister mite
Blackcurrant gall mite, etc.
Protection measures. Use of approved acaricides and predatory mites (Phytoseiulus, etc.). Appropriate agricultural practices. Highly resistant varieties.

Pearleaf blister mite



Spider mite

Blackcurrant gall mite

Fundamentals of phytophagous insect taxonomy

Order: Orthoptera
- Grasshoppers
- Mole crickets
- Acridoidea

Order: Hemiptera (true bugs)
- Plant bugs
- Jewel bugs

Order: Homoptera
- Cicadas
- Jumping plant lice
- Whiteflies
- Aphids
- Scale insects

Hemimetabolous insects

Order: Thrips

Class: Insecta

Order: Diptera
- Gall midges
- Grass flies
- Anthomyiidae

Holometabolous insects

Order: Coleoptera (beetles)
- Click beetles
- Darkling beetles
- Leaf beetles
- True weevils

Order: Lepidoptera
- Moths
- Leafroller moths
- Pyralid moths
- Pieridae
- Geometer moths
- Owlet moths

Order: Hymenoptera
- Sawflies

Types of phytophage mouthparts

There are 2 main types of mouthparts: scratching, and piercing and sucking.
The type of plant damage that can be used to identify pests and select a group of insecticides to control them depends on the diet and the structure of mouthparts.

Scratching mouthparts

Intended for feeding on solid plant food
Typical for:

- Dragonflies
- Orthoptera
- Coleoptera
- Lepidoptera (larvae)




Piercing and sucking mouthparts

Intended for feeding on liquids under the external tissues of plants

Typical for:

- True bugs
- Homoptera
- Thrips, etc.

Leaf damage

Rough eating


Figured eating


Gnawing holes


Skeletonization


Leaf rolling


Mining



Types of damage to buds, flowers, fruits, bark, and wood

External damage to flowers and buds.
(weevils, caterpillars of many butterflies)
Internal damage.
The pest gnaws a small hole through which it consumes the contents of a bud or fruit (fruit weevils and some other insects).
The contents of fruit are consumed through a small hole gnawed by the pest (caterpillars of leafroller moths).
The pest makes galleries in the bark and wood (bark beetles, caterpillars of leopard moth and goat moth).

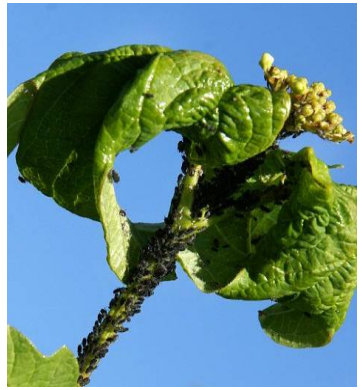
Different types of damage

Web nests on leaves

Gnawing on root collars and roots

Internal damage

Deformation



Specialized fruit pests

Fruit crops are infested with a wide range of pest insects of various orders. In young orchards, the main pests are polyphagous pests that damage underground parts of plants: larvae of click beetles, darkling beetles, and scarab beetles; cut worms; mole crickets.
As plants grow, various types of more specialized pests reproduce on them.
Common pests of the order Homoptera: apple psylla, pear psylla, green apple aphid, rosy leaf-curling aphid, apple mussel scale, European brown scale; of the order Hymenoptera: pear sawfly; of the order Coleoptera: strawberry fruit weevil, apple blossom weevil, apple leaf cutter, pesch weevil;
of the order Lepidoptera: apple ermine, black-veined white, brown-tail moth, winter moth, codling moth, apple ermine, apple clearwing.

Polyphagous pests of the order Coleoptera

Family: Click beetles (Elateridae)

Larvae **(wireworms)** of click beetles; their development takes place in the soil and forest litter.
In moderate climate, the development continues for 3–4 years.
Damage the roots of young fruit and berry crops
Representatives: Agriotes reitteri, Agriotes sputator, Agriotes gurgistanus, Agriotes ponticus,
Selatosomus latus, Melanotus fuscipes.


Adult click beetles and their larvae

Family: Darkling beetles (Tenebrionidae)

Blaps (similar to click beetles).


Adult blaps and their larvae

Family: Scarab beetles (Scarabaeidae)

Maybug, summer chafer


Adult maybugs and their larvae

Polyphagous pests of the order Orthoptera

Family: Short-horned grasshoppers (Acridoidea)

Larvae and adult insects severely damage almost all crops.
The most dangerous gregarious species of the family Acridoidea: migratory locust, Italian locust, Moroccan locust, desert locust; the most dangerous non-gregarious species: Siberian grasshopper, Eastern banded grasshopper, dark-winged grasshopper.
Egg-laying — emergence of larvae — emergence of winged forms (usually by the third instar) — migration, feeding — egg-laying. Egg-laying: untreated areas, topsoil, rhizosphere.

Family: Katydids (Tettigoniidae)

The most common are great green bush-cricket, eastern green bush-cricket, and wart-biter. One generation per year. Eggs overwinter in the soil in groups (2–8 eggs).

Family: Mole crickets (Gryllotalpidae)

Mole crickets are polyphages; they damage vegetable crops, as well as fruit crops (in nurseries).
They live in the soil and only occasionally appear on the surface.
One generation per year; larvae and adult insects overwinter at a depth of up to 1 m.

Migratory locust

Great green bush-cricket

European mole cricket

Polyphagous pests of the order Lepidoptera

Family: Owlet moths (Noctuidae)

Two main types are stem borers and cut worms.
Caterpillars of the first type damage aerial parts of plants, while caterpillars of the second type more often live in the soil and damage plants at the soil level or underground.
Caterpillars overwinter in the soil.
Generations: 1–3 generations.
Main representatives:
Cotton bollworm, silver Y, turnip moth

Family: Pyralid moths (Pyralidae)

Main representatives:
Sod webworm
The majority of meadow moth cocoons overwinter on perennial grasses, fallow land, or natural meadows

Cotton bollworm

Silver Y

Sod webworm

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Thank you!