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Research Article

BIOECOLOGY AND HARM OF WHITEFLIES AND PEST RISK ANALYSIS

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ABSTRACT

Whiteflies are very small insects (1.5-2 mm), resembling microscopic moths. The wings and body are covered with white powdery pollen.

They reproduce sexually, the eggs are attached to the underside of the leaves, on the stems. They hibernate in the puparia phase (pupa) on fallen leaves, in cracks and hollows of trees. The development is complicated: the larvae of the first age are mobile, the next stages are immobile. The larvae then develop into a pupa (puparium). One generation develops within 1 month. In greenhouses it can breed all year round and give 8-10 generations.

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KEYWORDS

Lemon, wrestling, Greenhouse whitefly, Citrus whitefly, effectiveness, research, results.

INTRODUCTION

In nature, whiteflies develop on various plants. The main damage to plants is caused by larvae, they inhabit the undersides of leaves in large colonies and suck out juices. The "honeydew" abundantly secreted by the larvae stains the leaves, closes the stomata, disrupts water exchange and reduces the quality of the fiber. In cotton, in case of early colonization and high density, the yield can be reduced by up to 30%. Can give up to 3-4 generations.

Greenhouse whitefly – Trialeurodes vaporariorum Westw.

Taxonomic Tree

- Domain: Eukaryota
- Kingdom: Metazoa
- Phylum: Arthropoda
- Subphylum: Uniramia
- Class: Insecta
- Order: Hemiptera
- Suborder: Sternorrhyncha
- Unknown: Aleyrodoidea
- Family: Aleyrodidae
- Genus: Trialeurodes
- Species: Trialeurodes vaporariorum

By food specialization, the whitefly is a broad polyphage. It damages about 200 plant species from 82 families. Of the vegetable crops, the whitefly most of all damages tomatoes, to a lesser extent - cucumbers, lettuce, celery, and beans. Often observed in mass on many flower crops. In greenhouses, the whitefly is found almost everywhere.

Being a tropical species, the greenhouse whitefly does not have diapause in its life cycle, therefore, in a temperate climate with cold winters, it harms mainly in protected ground. In summer, it migrates from greenhouses to adjacent areas and breeds on different crops in natural conditions. In subtropical areas where there are vegetative plants throughout the year, the whitefly successfully overwinters in the open field. In greenhouse conditions, the whitefly develops throughout the year, giving 10-15 generations, it is especially numerous in the second half of summer and early autumn. As a rule, all stages of development of the whitefly occur simultaneously. During mass reproduction, the whitefly sometimes completely covers the leaves of plants.

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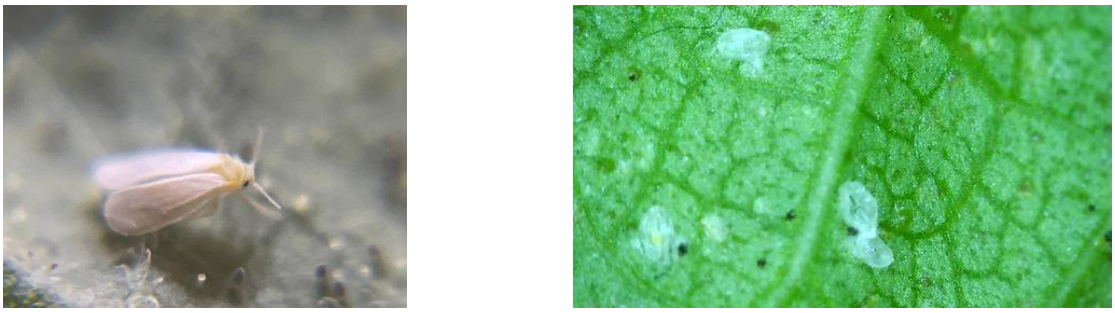

Fig. 1. *Trialeurodes vaporariorum* (Westwood, 1856)

The harm from the whitefly is to suck the juice from the plants. Harm plants larvae and adults. In addition, sooty fungi often settle on the liquid sticky sugary secretions of the whitefly, covering the surface of the leaves with a black coating. This phenomenon is called black. The sooty coating makes it difficult for the leaves to assimilate carbon dioxide and leads to a general inhibition of plants. Yellowish spots appear on damaged leaves, which gradually increase in size, and the leaves wither. Whiteflies live on the underside of leaves.

The degree of harmfulness of the greenhouse whitefly on different crops depends on the density of pest populations, as well as the intensity of its larvae excretion of liquid sticky sugary secretions, which depends on the species of the damaged crop. This is one of the reasons for the unequal economic threshold of phytophage harmfulness on different crops. For a tomato, it is 10, for a cucumber - 50-60 adults per leaf.

The adult whitefly is a fast flying insect with a body length of 1-1.5 mm. Its body is yellowish, covered with a wax coating with two pairs of powdery-white wings covered with a white coating. Forewings with one longitudinal streak extending to wing margin. During the dormant period, the wings fold along the body in a roof-like manner. The eggs are oblong-oval, small, 0.2-0.4 mm long, with a short stalk, greenish-white, later becoming dark brown, and on the 3rd-4th day the upper pole becomes dirty purple with a metallic tint. The duration of embryonic development, depending on the ambient temperature, is 4-7 days.

Newly hatched larvae of the whitefly (tramp) are flat-oval, with short two-segmented antennae. Their body is pale yellow, about 3 mm long. In the first 15 hours of their life, the larvae actively move in search of places to feed. When they start eating, they lose their mobility. During this period, a wax coating forms on their body, which in the initial period is accompanied by the appearance of a characteristic halo of wax secretions along the edge of the body. Larvae of the first stage, especially before the formation of a wax coating, are very sensitive to high temperatures (above 30°C) and low air humidity (below 70%). The duration of this phase is 4-6 days. Before molting, the larva swells, its skin is torn in the head section, and the second instar larva emerges. Larvae of subsequent instars also lead an immobile lifestyle. Larvae of the second age lose their limbs and antennae and start feeding immediately after hatching. In contrast to the first instar larvae, they are more transparent, so they are often difficult to detect on plants. Their body length is 0.4 mm, life expectancy is 1-3 days. Larvae of the third age darken, increase in size up to 0.53 mm, the duration of their development is 2-6 days.

Larvae of the fourth age (nymphs) differ markedly from the rest, have a white-matte color, 0.8 mm long,

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their integuments are more chitinous, with barely noticeable 10 pairs of wax gland tubercles, from which the rudiments of wax filaments extend in the form of spines. On the second day, the edges of the body of the larvae are bordered by a fringe of short light hairs, and fragile wax threads appear on the dorsal surface of the body, located at a considerable distance from each other and close to the outer edge, then they lengthen and turn into 7 pairs of dorsal processes. At this time, the nymph acquires a more thickened and convex shape. The duration of development of fourth-stage larvae is longer - 10-16 days.

After the third molt, an adult insect emerges from the pupa, which, with quick movements of the hind pair of limbs, collects the wax secreted by the glands located on the abdomen and covers the surface of the head, wings, antennae, etc. with it.

The duration of development of one generation is 17-32 days. The lower temperature threshold for whitefly development is 8.3 oC, the sum of effective temperatures required to complete the full development is 380.7 oC. The lifespan and reproductive capacity of the pest depends on the food plant. When eating on eggplant, life expectancy is 35, on cucumber - 19, tomato - 14, pepper - 24 days, and the reproductive capacity is 364, 170, 47 and 2-3 eggs per laying period, respectively. The level of natural death of insects during the period of preimaginal development on eggplant is 8.8%, tomato is 10.6, cucumber is 21.0 and pepper is 92%.

With the onset of the new season, the females lay their eggs on the underside of the leaves in groups of 10-20, placing them in a ring. The hatched larvae stick to the leaves. After two molts, the larvae turn into nymphs, and the latter into adult insects. One female lays an average of 130 eggs in 25-30 days of life. Due to the length of the oviposition, all phases of the pest occur simultaneously.

Citrus whitefly – Dialeurodes citri Ashm.

Taxonomic Tree

- Domain: Eukaryota
- Kingdom: Metazoa
- Phylum: Arthropoda
- Subphylum: Uniramia
- Class: Insecta
- Order: Hemiptera
- Suborder: Sternorrhyncha
- Unknown: Aleyrodoidea
- Family: Aleyrodidae
- Genus: Dialeurodes
- Species: Dialeurodes citri

The citrus whitefly is found in Japan, India, China, North and South America; in Russia - on the Black Sea coast of the Caucasus. Dangerous quarantine pest of citrus crops.

The whitefly damages citrus fruits and a number of other plants, in particular, laurel cherry, gardenia. On the territory of the CIS, the species has become widespread on the Black Sea coast of the Caucasus. Damages plants also in greenhouse and, more rarely, room conditions.

When fighting whiteflies, one treatment is usually not enough, two or three treatments are required,

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preferably with drugs from different chemical groups, a week between treatments.

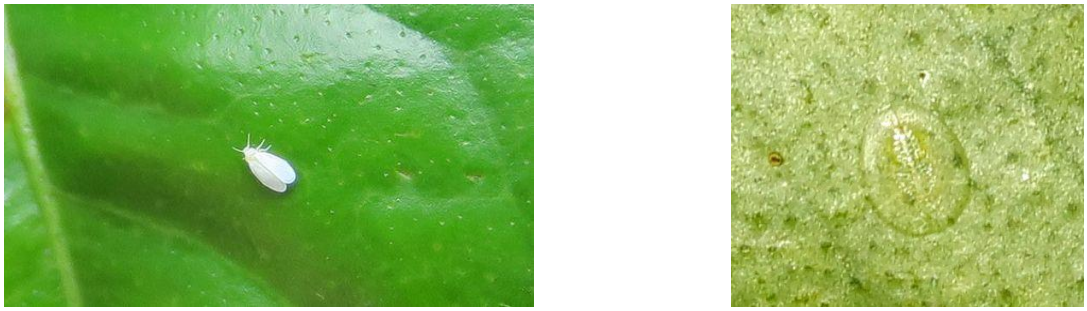

Fig. 2. *Dialeurodes citri* (Ashmead, 1885)

Imago 1.6–2 mm long. The body is light yellow or greenish, with two pairs of milky white wings. The larva is flat-oval, light yellow or light brown. Larvae of the 3rd instar hibernate in puparia. Imago fly out at the end of May. Females lay eggs singly or in groups on the underside of young leaves, under favorable conditions - up to 250 each. Embryonic development lasts 10–13 days. The larvae are mobile for several hours, and then stick to the leaves. In summer, one generation develops within 40 days, in spring - about 2 months, in autumn - more than 100 days. Relative air humidity above 80–85% is necessary for the development of the whitefly. In winter, at temperatures below -11 ° C, it dies. In our country, the whitefly gives 3 generations.

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