

UDC 595.752.3: 634.21: 632.7: 632
AGRIS H10

https://doi.org/10.33619/2414-2948/91/10

DISTRIBUTION Diaspididae (Insecta) AND CONTROL METHODS

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РАСПРОСТРАНЕНИЕ Diaspididae (Insecta) И МЕТОДЫ БОРЬБЫ

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Abstract. Scale insects are major pests of crops and ornamental plants, with Diaspididae, Pseudococcidae, and Coccidae being the three most important families. They can cause economic damage by sucking sap, injecting poisons, and transmitting viruses. Mealybugs and soft scales may also cause indirect damage by excreting honeydew onto the plant surface. National phytosanitary services conduct active inspections for these insects, and morphological identification is achievable, but difficult. Diaspididae are a family of fast-breeding insects that suck plant sap and produce a sticky material called pad, which attracts ants. Diaspididae is a type of sap-sucking insect that affects hard-leaved orchids, citrus, ficus, and other plants. Females are aphids and generate wax that provides a protective shield. The shield itself can be circular or extended and can range in color from light to dark brown. Diaspididae produces eggs (up to 3000 pieces) under the shield, from which very small, mobile young individuals hatch. Males have two front wings and can fly to other plants; their life cycle is only a few days long.

Аннотация. Насекомые являются основными вредителями сельскохозяйственных культур и декоративных растений, причем Diaspididae, Pseudococcidae и Coccidae являются тремя наиболее важными семействами. Они могут нанести экономический ущерб, высасывая сок, вводя яды и передавая вирусы. Мучнистые червецы и ложнощитовки также могут наносить косвенный ущерб, выделяя медвяную падь на поверхность растения. Национальные фитосанитарные службы проводят активные проверки этих насекомых, и морфологическая идентификация достижима, но затруднена. Diaspididae — это семейство быстро размножающихся насекомых, которые высасывают сок растений и производят медвяную падь, которая привлекает муравьев. Diaspididae поражают жестколистными орхидеями, цитрусовыми, фикусами и другими растениями. Самки производят воск, который образует защитный щит. Сам щит может быть круглым или вытянутым, а его цвет может варьироваться от светлого до темно-коричневого. Diaspididae откладывает под щитком яйца (до 3000 штук), из которых вылупляются очень мелкие подвижные молодые особи. Самцы крылатые и могут перелетать на другие растения; их жизненный цикл длится всего несколько дней.

Keywords: Coccoidea, ornamental plants, berry crops, sucking insects.

Ключевые слова: червецы и щитовки, декоративные растения, ягодные культуры, сосущие насекомые-вредители.

Scale insects (Hemiptera: Coccoidea) are major pests of crops and ornamental plants all over



the world. Diaspididae (419 genera), Pseudococcidae (272 genera), and Coccidae (170 genera) are the three most important families in terms of economic harm and number of genera. Scale insects can directly inflict economic damage by sucking sap, injecting poisons, and transmitting viruses that weaken the plant, decreasing fruit quality and output. Mealybugs (Pseudococcidae) and soft scales (Coccidae) may also cause indirect damage by excreting honeydew onto the plant surface, allowing sooty mold fungus to grow. Scale insects are also invasive pests that require quarantine in certain countries, resulting in product rejection during international trade.

As a result, national phytosanitary services conduct active inspections for these insects, and the presence of these insects is monitored by the majority of farm advisers. One of the most serious issues in scale insect management is the difficulty in identifying them. Morphological identification is achievable, but difficult: it necessitates a high level of competence and the inspection of adult females, which are not usually available in the wild or in commercial items. Furthermore, even when adult females are tested, distinguishing between highly similar species might be difficult.

Diaspididae are a family of fast-breeding insects. They suck plant sap and produce a delicious sticky material called pad, which attracts ants. Diaspididae affects hard-leaved orchids (*Phalaenopsis*, *Cattleya*, and *Cymbidium*), citrus, ficus, and other plants. The plant begins to deteriorate as a result of Diaspididae influence: the leaves wither, become yellow, and fall off, and the color of the leaves and flower shape alter.

Females are aphids, and they generate wax that provides a protective shield. The shield itself can be circular or extended and can range in color from light to dark brown. The shield can range in size from 0.5 mm to 5 mm. Diaspididae produces eggs (up to 3000 pieces) under the shield, from which very small, mobile young individuals hatch. Females are immobile because they are securely linked to the plant by a proboscis. The shield rises after the mother's death, and the young individuals scatter on the plant. Males, unlike females, can easily travel from plant to plant.

Pests are classified into two types based on the structure of the shield:

Diaspididae — a convex shield that is part of and attaches to the insect.

Pseudococcidae — shield flat, it may be softly picked up and lifted with a needle.

Diaspididae and Pseudococcidae are sap-sucking insects that reproduce quickly.

In urban settings, the armored scale insect *Pseudaulacaspis pentagona* infests mulberry trees in disturbed landscape habitats (roadsides, parking lots) but not trees in forested habitats (woodlots). Populations of *P. pentagona* are contagiously distributed among mulberry trees in landscape habitats [2].

Asexual or sexual reproduction is possible; some species are viviparous, while others lay eggs. The newborn individual develops through numerous stages after emerging from an egg. They are very little (invisible to the human eye), mobile, and can spread swiftly from plant to plant at first, but then lose their ability to move and become overgrown with shield. Males have two front wings and can fly to other plants; their size ranges from 1 to 2 mm; and their life cycle is only a few days long. Females, unlike males, live for several months. Dispersal and colonization of new areas by armored scale insects (Hemiptera: Diaspididae) is achieved by mobile first-instar nymphs, called crawlers. Few studies have considered the actual mechanisms by which crawlers disperse, and although crawlers are capable of actively wandering over short distances (generally <1 m), their dispersal over longer distances has been thought to be wind-mediated. Here, we present evidence of a potentially more important means of dispersal over longer distances (>1 m) [1, 5].

Pests do not infect well-developed, healthy plants that produce insect repellents. Infected plants are weak and highly nitrogenous, as a result of inappropriate care (light, improper watering, too hot or too cold air, etc.). Plant sap undergoes various changes that offer optimal circumstances

for pest multiplication, which is especially problematic in the winter owing to limited sunshine and dry air. Armoured scale insects (Sternorrhyncha, Coccoidea: Diaspididae) are sap-sucking hemipterans with certain distinguishing characteristics when compared to other scale insect family groups. They, for example, have a blind gut with no direct connection between the stomach and the anal orifice, and hence do not produce honeydew, a delicious secretion. In order to mitigate this, their bacteriomes contain vertically transmitted endosymbionts that aid in the manufacture of essential nutritional components (e. g., amino acids) that are missing from the plant sap that they consume.



Figure 1. Hemiptera: Diaspididae [8]



Figure 2. Hemiptera: Diaspididae [8]

Scale insects are a complex collection of primarily sap sucking insects that include at least 30 families and around 8,000 species. These insects feed on the leaves and branches of a variety of beautiful plants produced in gardens and nurseries. They cling to plants and feed by sucking fluids with straw-like mouthparts. Scale insects are classified into two types: armored scale and soft scale. The differentiation is significant because the behavior and management styles of the two groups differ. Both groups live beneath waxy coatings that keep predators, parasitoids, and insecticides at bay. Soft scales secrete a waxy covering over their bodies that cannot be removed. During their life cycle, soft scales emit sugary honeydew and may travel from branches to leaves. Diaspididae, or armored scales, is the most species-rich family of scale insects, with over 2,400 known insects [4, 6].

Armored scales are also among the most challenging nursery pests to handle since they cause considerable plant damage, and their “armor” makes them difficult to manage successfully. They have overrun every continent except Antarctica and are among the world’s most invasive insects. Euonymus scale, tea scale, oystershell scale, Japanese maple scale, false oleander scale, poplar scale, and juniper scale are some of the most frequent armored scale species in nurseries. The list will differ depending on your location and the crops you cultivate [7].

Most armored scale species have many generations per year and overwinter mostly as first instar nymphs and adult females. Crawlers are legged, mobile nymphs that roam about hunting for new areas to feed after hatching from eggs. In the case of females, these crawlers remain permanently attached to the host plant. Males seek for females to mate with once they reach maturity. Crawlers are the sole mobile life stage, and they colonize plants during this brief period. Except for crawlers and adult males, armored scales have no visible appendages and spend their entire lives feeding in the same location. Sexual or parthenogenetic reproduction is possible. Some species are oviparous (laid eggs), while others are viviparous (have living young). Some armored scales exclusively attack branches, while others attack foliage or fruits. A severe armored scale infestation can weaken or destroy a tree or plant. When certain scale species are plentiful, they

weaken the plant and cause it to grow slowly. affected plants show signs of water stress, their leaves become yellow and drop prematurely, and plant sections that remain extensively affected may perish. The dead brownish leaves on scale-killed branches may survive, giving plants a burned appearance. Even if the scale does not harm the plant by producing honeydew, the sticky faeces, sooty mold, and ants attracted to honeydew can disturb people.

Chemical control. Because most contact pesticides cannot penetrate the waxy layer on scale nymphs and adults, these insecticides only control the crawler stage. Systemic products containing dinotefuran, acetamiprid, or thiamethoxam, on the other hand, will aid in armored scale management [3].

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Работа поступила
в редакцию 15.05.2023 г.

Принята к публикации
20.05.2023 г.

Ссылка для цитирования:

Rahmonov A. Distribution Diaspididae (Insecta) and Control Methods // Бюллетень науки и практики. 2023. Т. 9. №6. С. 90-94. <https://doi.org/10.33619/2414-2948/91/10>

Cite as (APA):

Rahmonov, A. (2023). Distribution Diaspididae (Insecta) and Control Methods. *Bulletin of Science and Practice*, 9(6), 90-94. <https://doi.org/10.33619/2414-2948/91/10>