

## Biology

Scales (Coccina), armoured scales (Diaspididae) and soft scales (Coccidae or Lecaniidae) are small to medium insects with extreme sex dimorphism, i.e. males and females are very different as to their shape and size. Often male insects, which are nearly always wingless, cannot be found or they are at least very rare. In these cases there is virgin birth (parthenogenesis). The females never have wings, their body is compact and hardly segmented, they have no antennae and their legs are clearly visible. The bodies of the females are covered with a wax coating protecting them from unfavourable external conditions. During their development cycle the armour, which gives them their name, is formed by cast off maggot, faecal matter and other substances. Scales lay eggs. The development of the insects may be completed after a few weeks depending on the species, as a result of this many generations develop quickly. The young maggots - the so-called crawlers - are able to move, whereas the adult insects sit on the plant nearly immobile. Armoured scales on Orchids live on nearly all parts of the plant with the exception of the roots in the substrate. In the beginning they live hidden and are difficult to see. So there is a high risk of passive dispersal. As most species are adapted to high temperatures, considerable potentials have to be expected in imports from tropical and subtropical countries. The major pests on orchids are armoured scales and soft scales.

Armoured scales have a cover-shaped armour which is not connected with the body and can be removed easily. The insects suck the liquid from individual cells, so there are no phloem suckers.

There are many different species, the most common species on orchids is the Boisduval scale (*Diaspis boisduvalii* Sign.). The armour of the female is about 2 mm long, flat, oval, yellow to light brown and transparent covering the lemon-yellow insects and their eggs. The armour of the male is 0.8-1.0 mm long, oblong with white wax threads. In favourable conditions, large colonies are found especially on the underside of the leaves and on bulb-forming orchids. These insects are found regularly on *Cattleya*, *Zygopetalum*. The armour of Boisduval scales is tightly connected to their bodies, it is made of the bowed skin of the insects and cannot be removed. The armour is often shiny, like lacquer. Various species occur on orchids. The soft scale (*Coccus hesperidum* L.) is 3-4 mm long, flat, oval and of yellow-brown colour with a longitudinal rib in the middle. The females are viviparous and produce up to 1000 maggots in 2-3 months. Within only a few days, the emerging young maggots settle on other plants and are found along the middle rib. The development cycle from egg to adult takes about 2 months. This species excrements considerable amounts of honeydew. The wax scale (*Saissetia coffea* Walker) is up to 4 mm long, round-oval, 1-3 mm high, curved, dark brown to blackish and shiny. The females lay up to 2000 eggs under the armour. After the death of the mother, the armour opens and the young maggots migrate to new plant parts not yet infested. are small to medium insects with extreme sex dimorphism, i.e. males and females are very different as to their shape and size. Often male insects, which are nearly always wingless, cannot be found or they are at least very rare. In these cases there is virgin birth (parthenogenesis). The females never have wings, their body is compact and hardly segmented, they have no antennae and their legs are clearly visible. The bodies of the females are covered with a wax coating protecting them from unfavourable external conditions. During their development cycle the armour, which gives them their name, is formed by cast off maggot, faecal matter and other substances.

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## Damage

Extreme honeydew formation with subsequent dark mildew infestation is characteristic of soft scale infestation. Infested blossoms fade prematurely. While eating, the armoured scales secrete poisonous saliva, yellow to reddish brown spots form where the insects had sucked. Where there is noticeable infestation the growth of the plants will be disturbed, in rare cases there is deformation.

## Control

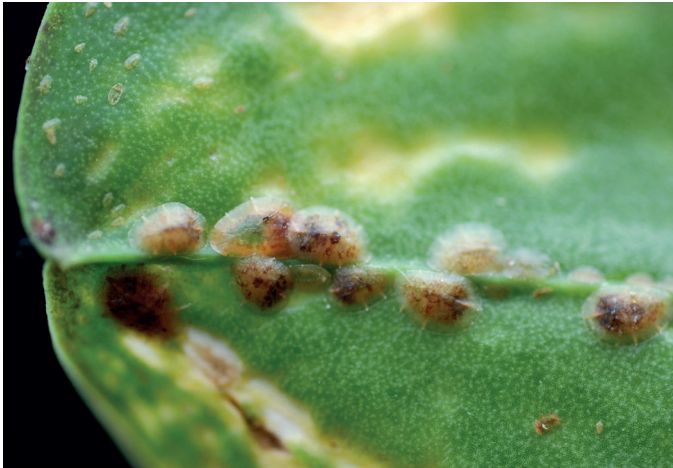
Pesticide control has to be carried out consequently and repeatedly. In case of infestation, at least 2-3 treatments have to be carried out in intervals of 2 weeks are required. Mineral oil has a reliable effect, but is problematic when used frequently, as some orchids might not tolerate it. When using pesticides it has to be ensured that the groups of effective agents are changed regularly.

## Biological plant protection

Prior to applying biological treatment against scales in orchid stands, an exact diagnosis of the respective species has to be carried out, because some beneficial animals are specialised in certain scales only. No differential diagnosis is needed in cases of armoured scale infestation. The commercially available beneficial insects do not make a difference between the species and exterminate all of them. Beneficial insects to be used to control armoured scales are parasitic wasps *Aphytis melinus* and several ladybird species (*Chilocorus nigritus*, *Rhyzobius* sp.). In cases of soft scale infestation, the respective species has to be determined. The parasitoid wasps *Microterys flavus*, *Metaphycus helvolus* and *Encyrtus lecaniorum* can be successfully used to control *Coccus hesperidum*. If there are *Saissetia* species, the parasitic wasp *Coccophagus lycimnia* can also be used in addition to *Metaphycus* and *Encyrtus*.

Animal pests

# Scales



*Phalaenopsis*: soft scales (*Coccus hesperidum*)



*Phalaenopsis*: soft scales (*Coccus hesperidum*)



*Zygopetalum*: armoured scales (*Diaspis boisduvalii*)



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