

Biology and identification

Weevils are a class of beetles that have a distinct snout, and there are three closely related species in the genus *Sitophilus* known as grain weevils. These are the wheat weevil (*S. granaries*), the rice weevil (*S. oryzae*), and the maize weevil (*S. zeamais*). They are worldwide in distribution and commonly attack pantries in Honduras.

Sitophilus granarius is also called the “wheat weevil” or “granary weevil”. It can be found all over the world, but mainly in temperate zones. The adults deteriorate the grain, where the females oviposit around 200 eggs approximately and the larvae develop inside the grains and undergo 4 molts before pupating. The adult grain weevil is somewhat cylindrical, 3 - 5 mm long, dark brown or almost black, with furrowed wings and a long bill extending from the front of the head down to a distance of about one-fourth of body length. The larvae do not have legs. The adult has oval grooves on the thorax and cannot fly because its elytra (the hardened forewings) are fused. The life cycle takes 4-6 weeks in warm conditions, but may take up to 20 weeks in cooler temperatures. The adults can live for 8 months, and survive for a month or more without food in cooler conditions.



Sitophilus oryzae is known as the “rice weevil”. This beetle affects not only rice but also other grains, cereals, and by-products from them. Distribution is almost cosmopolitan with constant expansion due to modern cereal storage conditions. The adult is 2 to 3 mm long with round indentations on the thorax and reddish spots on the elytra. The head is characterized by being elongated with a peak. The larvae do not have legs and are cream-colored with a brown head with a length of 3 mm. Both adults and larvae destroy the grain. The adult female may live for 4-5 months and produce 250-400 eggs in her lifetime. The full life cycle takes about one month in warm conditions in the summer, but requires much longer time in cooler temperatures. Adults can fly.



Sitophilus zeamais commonly refers to the “maize weevil”. It is one of the most destructive pests of stored grain, especially corn in hot humid, tropical, and subtropical regions. The adult female weevil causes damage by piercing the grain and laying eggs. The larvae and pupae then eat the internal parts of the grain, resulting in damaged grain and reduced grain weight. Infestation raises the temperature and moisture content of the stored grain mass, which can lead to the growth of fungi, including toxigenic strains of *Aspergillus flavus*. This weevil has a morphological appearance and color very similar to the rice weevil. This weevil also has four yellowish-reddish spots on the elytra and round indentations on the thorax. For a long time, it was considered to be the same species as the rice weevil, although slightly larger in size. It is now recognized as a different species. Their color is slightly darker than the rice weevil, although this is not a characteristic that allows them to be differentiated. For identification, it is necessary to dissect their genitalia to corroborate the species. This is an insect with great flight capacity that infests cereals from the field. Its biological cycle is very similar to that of rice weevil.



What problems can they cause?

The grain weevils are one of the most destructive insects for cereals in the world, causing considerable economic losses. They are considered the primary pests of stored products because they attack undamaged, whole grains. The larvae feed and develop inside the grain and chew their way out. This is different from the secondary pests, such as the cigarette beetle and the red flour beetle, which feed externally and attack broken, damaged grain and powdered products. However, primary pest infestation can be followed by secondary pests, which worsens the damage. The grain weevils infest a variety of grains and food materials. They attack all grains; however, they are most commonly found in corn, oats, barley, rye, and wheat. They cannot reproduce in finely processed grains, but they will reproduce easily in manufactured products such as macaroni, noodles, and ground cereals that have become hard from excess moisture. The grain weevils are pantry pests because they settle and breed in places where food such as grains and flours are stored for long periods of time. In general, they cause destruction of stored grains, causing them to lose weight and quality, where the conditions for their development are favourable.

Management

Inspection for infested products

The best control strategy is to find damaged products or goods and dispose of them. This can be done by searching the pantry or storage area for exposed products, open packaging, torn packaging, or damp areas that could have compromised the packaging. Next, the shelf itself needs to be inspected to determine if there is any chance of pests moving to neighbouring shelves. In the case of most grocery stores where the shelves do not touch a wall, that shelf, the shelves below it, and any connecting shelves should be inspected for pupae, larvae, and adults of the pest. In the event that the shelves touch or are connected to a wall, such as along the side of the store or in a pantry, all neighbouring shelves should be inspected, and the produce removed. Pantry doors, door seams, ceiling and floor corners and edges should also be inspected.

Cleaning and disposal of infested materials

Weevils die in any of their states at a temperature of 50 °C and in a dry atmosphere. When infested products are found, they can be kept in the freezer (below -18 °C) for one week or heat treated in the oven (above 60 °C) for one hour. It is recommended that when a pest infestation is found, all produce should be removed from that shelf and inspected for pests. After removing and inspecting products, shelves and connecting structures should be thoroughly cleaned (e.g. vacuumed, washed, or heat treated). This includes repairing or sealing any small cracks on the surface or under the shelves where the pupae might be hiding. The surrounding area of the shelves also needs to be inspected and cleaned to ensure that all pupae, larvae, and adults have been removed. Infestations in large quantities of grain can be controlled by fumigation, which must be applied by a certified pest control professional.

Good sanitation and proper storage for prevention

In general, hygiene and inspection measures are key to avoiding infestation. In households, the mechanical method is proper storage by placing the products in containers with tight lids. It is important to conduct preventative practices early and for the long term. If there is a suspicion of a possible weevil

infestation, adults should be carefully searched for in holes in the center of the kernel. Another way is the immersion of the grain in water; if it floats, it may indicate an infestation. Early detection of infestation can help control the pests and prevent their further spread.

References

- Crome. (2019). The weevil, the plague of the cupboards in the hot months.
<https://www.elobservador.com.uy/nota/el-gorgojo-la-plaga-de-las-alacenas-en-los-meses-de-calor-201924184330>
- Mendoza, F. and Gómez, J. (1983) Main insects that attack economic plants in Cuba. Editorial Pueblo y Education. Page 30.
- iProfessional. (2020). Weevils are small insects that can be found on grains.
<https://www.iprofesional.com/actualidad/315238-puede-ser-peligroso-comer-gorgojos>
- Sun, Q. and Richardson, S. (2021). Managing stored product pests of homes and businesses. Louisiana State University Agricultural Center.
(<https://www.lsuagcenter.com/profiles/qsun/articles/page1613620996926>)
- Mason, L. J. (2018). Stored product pests. Purdue University, Extension Entomology.
<https://extension.entm.purdue.edu/publications/E-237/E-237.pdf>
- Bhusal, K. and Khanal, D. (2019). Role of maize weevil, *Sitophilus zeamais* Motsch. on spread of *Aspergillus section flavi* in different Nepalese maize varieties. Advances in Agriculture, vol. 2019, Article ID 7584056, <https://doi.org/10.1155/2019/7584056>