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Stored Product Moths (Order: Lepidoptera).

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There are many insects found in tropical and subtropical areas, which develop in grains, such as corn, wheat, and rice, and in various stored products such as dried fruits and mushrooms, flour and derivatives, cereals, biscuits, and chocolates, among others. Moths stand out as important pests, as they thrive in food, destroying and contaminating it with their feces, body fragments, and characteristic silk threads. The caterpillars of many moth species leave traces of their passage through food, through the secretion of silk threads, like webs, which serve to better move around the food and protect them when close to pupation. Sometime after pupation, the adult moth male or female emerges, mates, and continues its cycle, laying eggs, infesting new foods, or reinfesting the substrate of origin (Figure 1) [1-4].

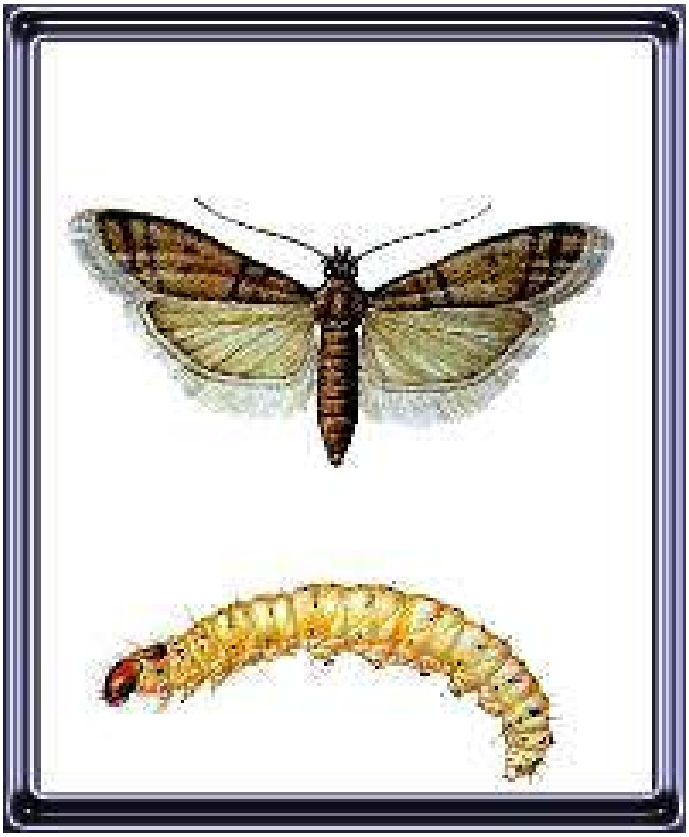

Figure 1. Stored Product Moths (Order: Lepidoptera). Source; https://www.the-piedpiper.co.uk/th7f.htm.

An infested product means tens to hundreds of eggs or larvae that will continue to develop in the product or will migrate to a nearby product, generating an infestation. These insects have a high proliferation capacity, explained by the high biotic potential, the number of individuals in each reproduction and by the number of generations in a period between harvests, cross-infestation, ability to infest the product in deposits, and in the field by the ability of polyphagy to attack different products, allowing their multiplication even in the absence of the preferred host. The fact that moths develop in food results in its destruction and contamination with feces. Fragments of the body itself, wing scales, legs of the dead insect itself and silk threads constructed near the pupation are also found (Figure 2) [1-5].

Figure 2. identifying a bird seed moth infestation. Source: https://www.moth-prevention.com/blogs/the-art-of-prevention/bird-seed-moths

Among the species of food moths, we can mention the cereal moth Sitotroga cerealella Oliver, 1789, and the Indian flour moth Plodia interpunctella. Each person's biological cycle considers factors such as temperature, relative humidity, and amount of food available. Under ideal conditions for insects, infestation can occur within a few weeks [5-8].

Sitotroga cerealella (Olivier, 1819) (Lepidoptera: Gelechiidae).

The species *S. cerealella*, known as the cereal moth, belongs to the order Lepidoptera, which comprises the Gelechiidae family. It is a primary pest that attacks entire grains, affecting the surface of the grain mass. The larvae destroy the grain, altering its weight and quality. There is also an attack on the flour, in which it develops, causing deterioration of the ready-to-eat product. Adult is 7 to 9 mm long, with a wingspan between 15 and 20 mm. The black zigzag pattern on the gray wings. Larvae are pink or greenish, depending on the food ingested. Brown head. It lives in a silk tube. Lives 152 days at 17°C, 42 days at 30°C. The adult lives from 2 to 9 weeks. (Figure 3) [8-12].

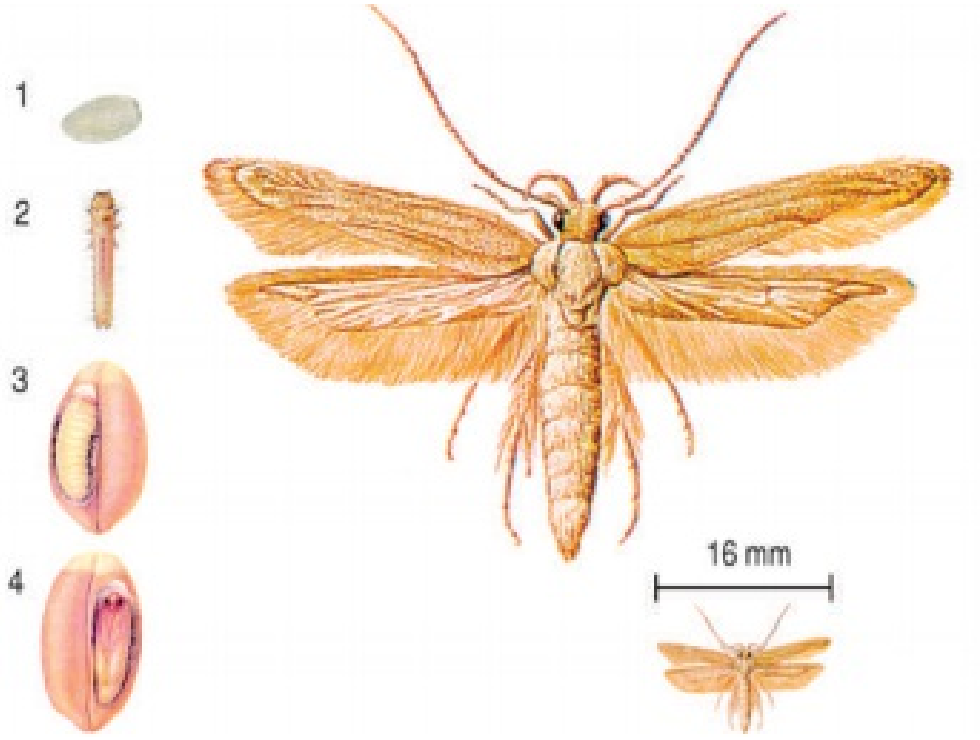

Figure 3. Eggs: Deposited on stored grains or in the field. Up to 100 eggs alive. Larvae: Do not move. They develop inside the grains. Pupae – Formed inside the grains. Adults: They do not feed, they have a short life span, maximum 7 days and they fly a lot. Source: https://bequisa.com.br/pragas/traca-dos-cereais/.

Plodia interpunctella (Hübner,1813) (Lepidoptera: Pyralidae)

The Indian flour moth, also popularly known as the cereal moth, is a lepidopteran insect, originating in Europe and now spread throughout the world. The larvae are white or pink and feed on grains and grain products, such as dried fruits, seeds, cookies, nuts, powdered milk, chocolate, and dried flower arrangements. Adults 7 to 9 mm long, with a wingspan between 10 and 20 mm. The first third of the front wings are light beige. The rest of the wings are reddish-brown. Larvae - yellowish-white, reddish, or greenish depending on the diet. They live for 35 days but live longer at lower temperatures or when eating foods low in nutrients. They feed on nuts, other dried fruits, and cereals such as corn (Figure 4) [8-12].

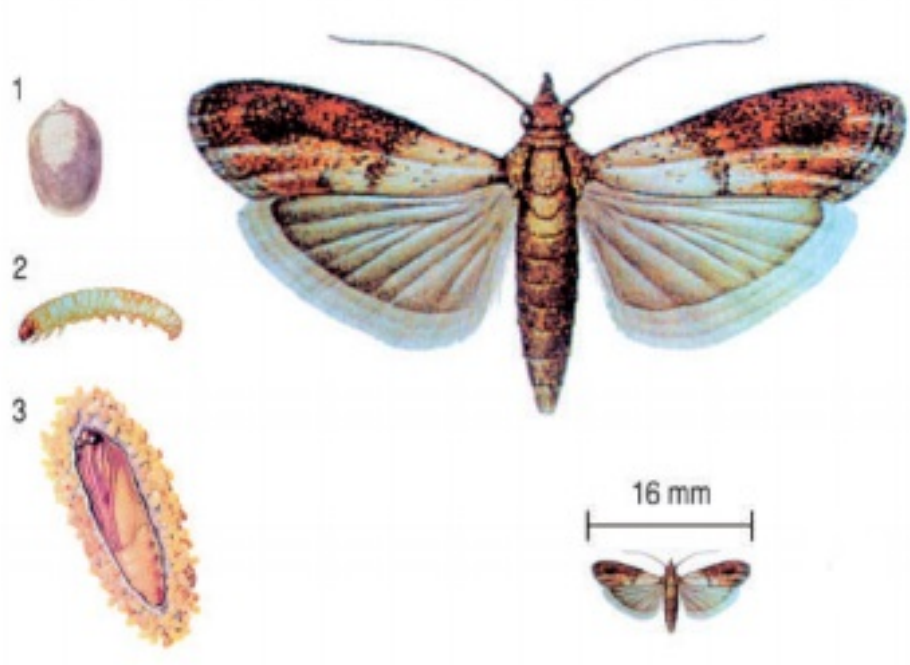

Figure 4. Eggs: They are deposited randomly on the surface of bulk products or bags (up to 400 per female).Larvae: They move superficially through the grains, produce webs and feed, preferentially, on embryos. Adults: They are short-lived and do not feed. They are nocturnal and concentrate their infestation on the surface. Source: https://bequisa.com.br/pragas/traca/.

Ephestia kuehniella (Zeller, 1879) (Lepidoptera: Pyralidae).

It normally occurs in all regions of the world. In Brazil, it is distributed throughout the country's grain-producing region. It occurs in the storage of products throughout the year if food is available. These moths attack soybean grains and seeds, wheat, corn, cocoa, tobacco leaves, dried fruits, nuts, and their by-products. The female lays 200 to 300 eggs. The larvae reach up to 15 mm in length, and have a pinkish color and brown legs and head. They spin a silk cocoon, where they transform into pupae [8-12].

The period from egg to adult lasts approximately 40 days. The incubation period lasts about 3 days, the larval stage 32 days, and the pupa stage 7 days. The longevity of adults is approximately 15 days. The eggs of this moth are laid by females on or near the attacked products. The larvae walk on the grains, feeding and producing silk threads with which they weave protection. Adults are short-lived, do not feed, and are nocturnal (Figure 5) [8-12].

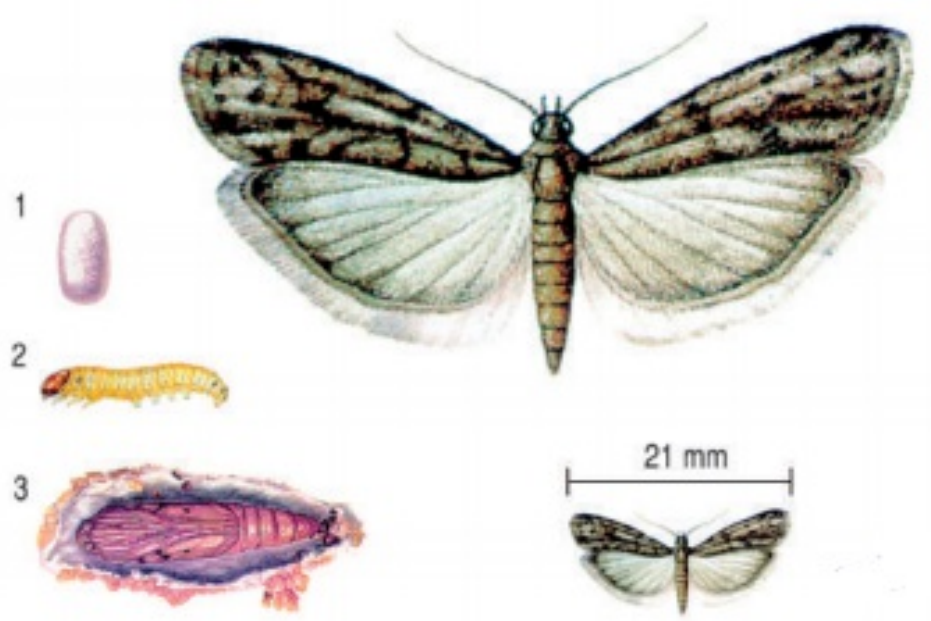

Figure 5. The eggs of this moth are laid by females on or near the attacked products. The larvae walk on the grains, feeding and producing silk threads with which they weave protection. Adults: Adults are short-lived, do not feed and are nocturnal. Source: https://bequisa.com.br/pragas/traca-da-farinha/.

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