

## How can insects get into the packaging?

Most often, harmful stored-product insects use existing openings (even very small ones) in the packaging. They are attracted by product odours. In this context, moths and beetles lay their eggs near cracks and joints from which the odorous volatile compounds of cereal products, nuts or dried fruit etc. emanate. The hatched, minute juvenile larvae can then migrate e.g. through incompletely sealed seams into a commercial food bag or through the holes of a perforation line into a folding box.

## Which packages are insect-proof?

Insect-proof food packaging includes tin cans, bags made of aluminium composite foil or permanently elastic plastics. A prerequisite is that these are sealed air-tight (e.g. packaging for coffee, baby food and most spices).

## How to store? How to prevent?

Store supplies as short as possible, keep site or package cool, dry and insect-proof!

Modern housing usually lacks cool pantries. If supplies are stored in the kitchen, temperature and humidity regularly increase due to cooking. This also increases the humidity in the stored goods and makes them more susceptible and attractive to pests during prolonged storage.

- If supplies, susceptible to infestation have to be stored at above 15° C for an extended period, the following preventive measures are helpful: Use insect-proof containers or jars with screw tops or special seals instead of commercial packaging.
- Make sure the lids close tightly. Regular metal cookie jars are often not insect-proof and were designed to allow aeration/ventilation.
- Use stored supplies according to the principle 'first in - first out'.
- Look for intact packaging, already at the time of purchase.
- Clean e.g. the pantry and spice rack regularly.
- Check supplies for frass, boreholes, webbing, and insects.
- Nuts should always be stored in the refrigerator.
- As a preventative measure, goods with low water content can be frozen for a few days to kill eggs deposited on the surface of the packaging. This is advisable especially if you have or recently had an infestation in other goods.

## What to do in case of an infestation?

Holes in food packaging usually indicate beetles or migrating moth larvae ready to pupate have made their way out. This requires a close inspection of the storage room as a whole.

- If food is infested with beetles still confined in the package, it is usually sufficient to put everything in tightly sealed bags, freeze overnight and then discard the goods.
- In case of moth infestation, the usually whitish and worm-like migrating larvae, pupal cocoons and adults must be found. Larvae often migrate from the supplies and pupate in webbings in cracks and joints of the packaging, the cupboard, or up in the corner between the room wall and ceiling. If not removed, the newly hatched moths mate and lay eggs into more products. Commercially available moth traps use sex attractants to catch some of the males and may help to detect an infestation at an early stage. However, they are not suitable for an effective pest control.

Mouldy or heavily infested food or feed should always be disposed of. In case of a persistent mass infestation, it is recommended to contact a professional pest controller who can advise you and, if necessary, carry out control measures to eradicate the pests sustainably.

**Further information on research and literature on stored-product protection as well as pest profiles can be found at the JKI website (mainly in German language):**

<http://vorratsschutz.julius-kuehn.de>

<http://www.julius-kuehn.de/oevp/ab/vorratsschutz/>

## Information from JKI: How to best protect ...

**As download you will find the information sheet:**

<http://www.julius-kuehn.de/faltblaetter-und-broschueren>

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## How to best protect stored products



**short | cool | dry | insect-proof**

From harvest and until processing and consumption, dry plant-products such as grains and nuts are generally at risk from being infested by the following pest organisms:

- Insects
- Mites
- Fungi and other microorganisms
- Rodents and birds

In the context of this leaflet, we will focus primarily on common stored-product pest insects responsible for some 80% of losses.

### What are stored-product pest insects?

Stored-product pest insects are mainly beetles, moths, and dust lice. They are specialized to live in and feed on dry plant products. By feeding and mass reproduction these insects pose a risk to food supplies, provided that the stored goods have a residual moisture content sufficient to the pests' life cycle. Once the stored products become infested, the product quality decreases. Due to pest metabolism, the product moisture content, as well as the temperature increase. This may cause the development of moulds and allow the infestation by mites. Harmful microbial toxins such as mycotoxins may develop. For this reason, heavily infested and spoiled goods should neither be consumed by humans nor fed to animals.

### Where do stored-product pest insects come from?

- Introduction with infested food and feedstuff
- Immigration from the outside environment being attracted by odours

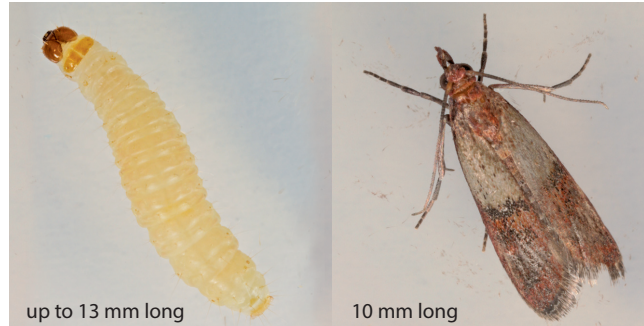
### Which products of plant origin can be infested?

- Cereals and cereal products (e.g. flours, semolina)
- Processed cereal products (like bakery products, pasta, muesli, animal feed)
- Fatty seeds, nuts, nut products (e.g. nut chocolate)
- Cocoa beans
- Fruit/herbal teas, green coffee beans
- medicinal plants and spices, tobacco
- Dried fruits and vegetables
- Pulses

### Which products are usually not affected?

- Oils and fats
- Sugar and products with a high sugar content
- Salt and highly salted supplies
- Smoked goods
- Black tea
- Roasted coffee

## Common stored product insects



up to 13 mm long

10 mm long

### Indianmeal moth (*Plodia interpunctella*)

Frequently found in grain, grain products, nuts, dried fruits, seeds, chocolates, animal feed



up to 5 mm long

3 mm long

### Drugstore beetle (*Stegobium paniceum*)

Frequently found in grain, grain products (e.g. pasta), spices, medical herbs

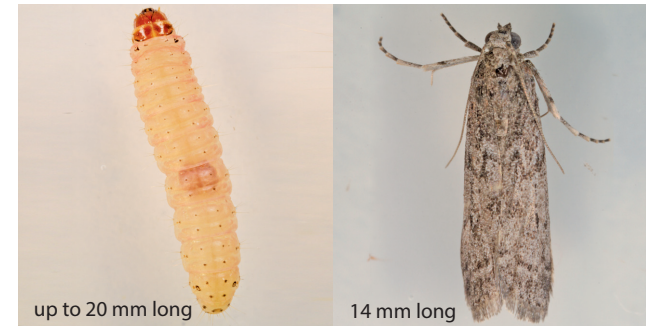


up to 8 mm long

4 mm long

### Flour beetle (*Tribolium spp.*)

Common in grain, flour and grits



up to 20 mm long

14 mm long

### Mediterranean flour moth (*Ephestia kuehniella*)

Common in grain, flour, and grits



up to 10 mm long

9 mm long

### Larder beetle (*Dermestes lardarius*)

Frequently found in dried meat products, furs and other products with contents of animal origin



up to 6 mm long

3.5 mm long

### Granary weevil (*Sitophilus granarius*)

Frequently found in grains and pasta. Larval development occurs hidden in the grain, just adults emerge.