

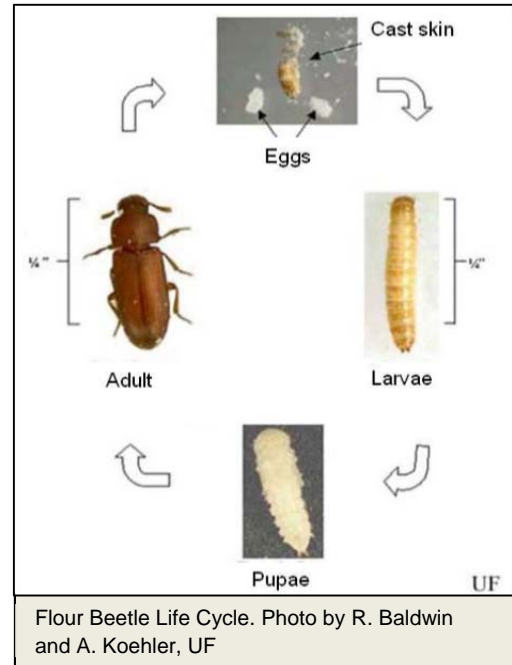
Just the Facts... Confused flour beetles (*Tribolium confusum*) and red flour beetles (*Tribolium castaneum*) are among the most commonly encountered insects infesting stored food. Both the adults and larvae feed on a variety of products to include cereals, flour, cake and pancake mixes, spices, chocolate, powdered milk, and dry animal food. Flour beetles are also found in grain based anticoagulant baits commonly used for rodent control in food warehouses.

Where do they live?

All life stages of the beetles live inside the products, but adults will often leave the food to seek mates. Adult beetles are attracted to light and are often found at window sills and the edges of interior walls. This may be the first indication that a warehouse is infested, but this will not indicate which products contain beetles or where infested products are located. Flour beetles are also found in spilled food in cracks and crevices and seams on the floors in shipping containers, rail cars, and trucks.



Three segmented club antenna of the red flour beetle (left) and the antennae of the confused flour beetle showing the gradually enlarging segments. Danielle Thomas, APHC



years. If left unchecked, beetles from a single infestation can quickly spread to other susceptible products in warehouses, retail stores, or homes.

How do they get in?

Flour beetles are free-living in the environment, but are usually brought into food warehouses (commissaries), retail outlets (exchanges and shoppettes), and homes in infested grocery products and dry animal food. Although red flour beetles can fly (confused flour beetles do not), both insects are usually transported inside food packages. The beetles may also be found on the outside of pallets containing food products and between boxes and bags of food on palletized cargo. The increased use of air-tight plastic or foil bags and pouches has significantly reduced flour beetle infestations during transit and storage since the insects cannot chew through the packaging. Dry animal food is more susceptible since many packages are not "air-tight" and exhibit small openings which permit flour beetle entry.

What do they look like?

The confused and red flour beetles are similar in appearance and were once thought of as the same species, hence the name "confused". The adults are 1/4-inch in length and are dark, reddish brown. Red flour beetle antennae are uniformly segmented with a distinctly 3-segmented club at the tip. The segments of the antennae on the confused flour beetle gradually increase in size until they form a 4-segmented club at the tip. The larvae of both beetles are approximately 1/4-inch in length and are creamy in color with darker brown heads. Pupae are light cream color and about 1/4-inch in length.

Do they multiply?

Yes. The adult female lays from 300-400 eggs. The life cycle varies from 3-7 weeks and the adult beetles live up to 3

What damage do they cause?

Dead insects, cast skins, and secretions from adults may produce a foul odor, and flour may appear gray when numerous insects are present.

Prevention methods.

Sanitation and inspection are the keys to good flour beetle control. Pheromone traps are useful in determining if flour beetles are active in warehouses, but they will not indicate the location of infested products. Inspect pallets of food upon arrival at warehouses, and inspect individual products when brought home from retail outlets. The presence of adult insects or holes in packages are indications of infestations. Inspect and clean vehicles used to transport food to remove spilled material. Inspect salvage areas in food warehouses since spillage from broken packages is more common than in the storage areas. Check rodent bait stations weekly to ensure grain-based baits are not infested. Place food pallets at least 18 inches from walls to permit routine inspection and cleaning. Rotate food products so that older stocks are sold first; frequently inspect food with older manufacturing dates for infestations since adult beetles tend to emerge from packages in greater numbers as the infestation ages. This principle also applies in the home since beetles from a single infested product can migrate and infest multiple food products stored in a kitchen or pantry. Store dry food products in containers with tight fitting lids if the contents are not used within one week after opening.

Control methods.

Remove spilled food daily and clean warehouses with a vacuum monthly, especially along walls and the edges of pallets where beetles and food accumulate. Place infested products inside plastic bags prior to disposal to reduce the spread of adult beetles. Segregate infested products in warehouses from non-infested products and cover with plastic until treatment or disposal. Place infested products in a freezer at 0 degrees Fahrenheit for 4 days to kill adults, larvae, and eggs. Do not reissue infested products or use for food preparation after beetles are killed. Infestations can also occur when rodents are present. Mice will accumulate dry animal food, crackers, and cereal in harborage and nesting areas which may be inaccessible (behind walls or under cabinets). Rodent control and pesticide treatment in void areas may be the only way to eliminate flour beetle infestations in homes after efforts to inspect and locate infested products in kitchens or pantries have failed.

For more information on surveillance and control of stored product pests, see the Armed Forces Pest Management Board Technical Guide No. 27, Stored-Product Pest Monitoring Methods, June 2005, and Technical Guide No. 38, Protecting Meal, Ready-to-Eat Rations (MREs) and Other Subsistence During Storage, June 2005 at <http://www.acq.osd.mil/eie/afpmb/docs/techguides/tg38.pdf>.