



Pest Facts

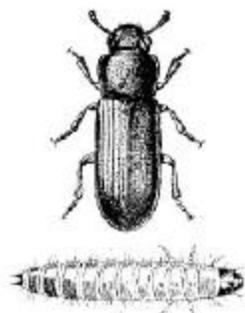
Confused and Red Flour Beetles

Both the confused (*Tribolium confusum*) and red (*Tribolium castaneum*) flour beetles, primarily infest milled grain products, such as flour and cereals. Both adults and larvae feed on grain dust and broken kernels, but not undamaged whole grain kernels. Some populations may survive, particularly in food service and storage facilities, on food accumulations in cracks and crevices. Excellent sanitation is critical in preventing or limiting infestations. Badly infested foods are characterized by a musty odor and moldy flavor. These insects do not bite, spread disease or damage facilities.

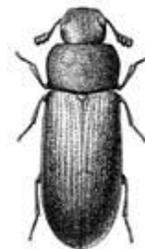
Identification

Both beetles are similar in appearance. They measure about 1/8 inch long and are flat, shiny, reddish-brown and elongated. Antennal segments of the confused flour beetle increase in size gradually from the base to the tip to form a club of four segments; in the red flour beetle, the last segments at the tip of the antennae are abruptly larger than the preceding ones, forming a three-segmented club. Additionally, the confused flour beetle has a straight-sided thorax, while the thorax of the red flour beetle has curved sides.

The eggs, larvae and pupae are similar in both beetles. Eggs are whitish or colorless and microscopic in size with food particles adhering to their sticky surface. Brown-headed larvae are cream to yellow in color and slender, reaching a length of 1/4 inch. Larvae have six legs and two-pointed or forked projections located on the last body segment. Pupae are white to light brown.



Confused Flour Beetle



Red Flour Beetle

Life Cycle and Habits

Female beetles up to 400 eggs in flour or other foods during a period of five to eight months (two to three eggs per day). Within 5-12 days, the eggs will hatch into slender, cylindrical, white larvae with faint yellow markings. The larval period varies from 22 to more than 100 days; the pupal period is about 8 days. Once fully grown, the larvae pupate and emerge as adults in about a week. The life cycle requires 7-12 weeks, with adults living for three or more years.

Adults tend to be extremely active and are often found running to hide if disturbed. They can be found either on the surface or deep within the food material. Because of their small size and shape, they frequently infest storage containers as well as the food itself. Both beetles breed in damaged grain, grain dust, high-moisture wheat kernels, flour, etc. Beetle specimens have been found in barely, breakfast cereals, corn, cornmeal, crackers, flour, millet, oats, rice, rye, wheat and wheat bran, nutmeats, dried fruits, legume seeds, beans, milk chocolate, cottonseed, peas, powdered milk, sunflower seeds, vetch seeds, spices and even rodent baits poisoned with arsenicals. The red flour beetle can fly short distances, whereas the confused flour beetle does not fly. Confused flour beetles are more common in northern states; the red flour beetle is more common in warmer parts of the southern United States.

Integrated Pest Management Program

The following information describes guidelines followed during the development and implementation of a comprehensive flour beetle management program. While an effective program will contain many of these elements, every program is dependent on site specific parameters and should be reviewed by a pest management professional before and after implementation.

1. Specific Program Recommendations

Red and Confused Flour Beetles- These beetles feed on almost every food consumed by people. Their small size makes it possible for them to hide in tiny cracks or to enter the smallest opening in packaging. In some cases, they may eat their way into easily-penetrated packaging. Infestations are common under the bottom of display or storage shelving. These sites should be periodically examined and cleaned as well as surrounding products or the display/storage area. When an infested product is identified, immediately segregate the material to an isolated morgue location for timely disposal/return. Practice timely stock rotation. Conduct receipt inspections. If an infestation is suspected, the product should be immediately returned. If necessary, treat shelving units (i.e., cracks, crevices and supports) with an insect growth regulator. Begin active surveillance using pheromone traps combined with visual monitoring for insects as well as sanitation problems. Periodically examine rodenticide bait, if present, for beetle infestation.

2. General Stored Product Arthropod Pest Program Design

A. Surveillance: Identifying the Problem

Visual Inspection

All facility areas (inside and outside) must be thoroughly reviewed to identify active/potential problem areas and to document program effectiveness. Include the following:

-Outside of the facility: Keep the area around the facility clean. Keep vegetation trimmed. Do not let pallets and debris collect. These are potential harborage for rodents and insects. Eliminate horticultural plantings that attract insects (i.e. pittosporum shrubs attract flies, many flowers attract warehouse beetles). Replace any outside mercury vapor lights with sodium vapor lights which attracted fewer insects.

-Bulk display bins and dispensers: Clean around, underneath and in. Take special care to clean all inside corners.

-Shelving and display cases: Clean and dust under, on and around shelves and display cases. Prevent food particles from collecting by sealing cracks with silicone or other flexible caulk.

-Infestible Products: Check for torn bags and buildup of debris. Monitor shelving for individual insects. Inspect all infestible foods before stocking on shelves. For a list of target products, see insect description section.

-Checkout counters: Keep clean. Do not allow build-up of food matter behind or underneath scales, cash register and counter.

-Floors: Fill or eliminate cracks. Sweep and mop regularly. Inspect corners and edges for insect activity. Keep free of dust and debris. Inspect old drain holes and clean out or eliminate them if possible.

-Cellars: Keep clean and well organized. Do not allow refuse to build up or storage of damaged or returned product. Examine for pest accesses such as holes around utility lines, poor fitting doors, window screens absent or in disrepair and pest harborage such as crevices around utility boxes, sinks, door frames, etc.

-Product storage areas: Keep food off floor on pallets or shelving made of non-porous materials at least 18" from the wall. This provides an inspection and cleaning corridor. Dust ledges and window sills, examine for signs of insects. Return or discard damaged/infested stock immediately. Place in isolated (morgue area) away from other products. The longer infested product remains in the facility, the better chance the infestation will spread. Practice sound product rotation (first in, first out).

Pheromone Trapping

Pheromones are scents (chemicals) used by insects for communication. Some pheromones are emitted by female insects to attract the male for mating. These are called sex attractants. Some insects also produce aggregation pheromones. These chemicals attract both males and females to areas favorable for living and hiding.

Pheromones are generally species specific. Each pheromone attracts only insects of one species or those of closely related species.

Pheromone traps consist of a two part system: the lure which attracts insects to the trap and the trap which captures insects once they have been attracted to it. Neither the lure nor the trap contains chemicals that kill insects. The lure is simply an attractant. The trap employs a sticky substance to which the insects adhere to, thus preventing escape.

Pheromone Trap Monitoring:

The following provides general information concerning pheromone surveillance. Additional information may be obtained from the Armed Forces Pest Management Board publication Technical Information Memorandum Number 27, Stored-Product Pest Monitoring Methods. Before implementing a pheromone surveillance program, consult your local pest management professional for guidance.

-Monitoring for an infestation (preventive): With traps in place, any increase in the size of a moth population will be detected. If this occurs, it is an indication that a general infestation is being established or infested merchandise has been imported into the facility

-Locating an Infestation: If an infestation is located in a specific area, traps closest to the vicinity of the infestation may have a higher than normal catch. Manual searches for the infestation may then be concentrated in this area.

-Determining the Effectiveness of Control Management Measures: When management measures are implemented and prove to be effective, traps will indicate a population reduction. If numbers remain stable or increase, control measures must be re-evaluated.

-Indication of Need for Improved Protection: A trend indicating elevated trap counts may



signal a need to improve/modify of preventive measures. This may mean removal of infested merchandise and elimination of an infestation site (i.e., spilled merchandise)

B. Exclusion/Sanitation

Seal off/repair/pest proof possible entry points and eliminate harborages. These include improperly stored or excess equipment, poorly fitted doors/windows/screening, cracks, crevices and holes, vents, etc. Ensure high levels of sanitation. (See inspection/monitoring)

C. Preventive Inventory Stocking Procedures.

a. Warehouse and Receiving Area

-Date stock as it enters warehouse or receiving area. Rotate on first in, first out basis.

-Rotate entire inventory on a regular basis

-Keep excessive inventory down to help facilitate rotation. Buying a large lot on sale and storing it may lead to problems unless it can be rotated quickly.

-Keep slow moving products under constant surveillance

D. Suppliers/Distributors

Suppliers/distributors are an important link in the food distribution chain and must be considered when planning a pest management program. Suppliers have their own pest management problems to handle and sometimes are, unavoidably, the source of infestation/re-infestation.

Keep excellent documentation. If you are regularly receiving infested merchandise from a particular supplier/distributor, consider the following actions:

-Carefully examine incoming merchandise

-Document all problems, offer suggestions to the distributor/supplier. Change the label of a consistently infested product.

-Change supplier/distributor if the problem is not resolved

E. Climatic Manipulation

Climatic conditions have an important impact on insect populations. Cool and dry conditions tend to suppress growth and development and may result in mortality. Warm and humid conditions tend to speed development, increasing the number of generations produced per year. If possible, place infestible products (i.e., pet foods, pasta) in cool/dry storage areas or, if possible, refrigerator/freezer.

F. Chemical Control

Chemical control should only be considered in conjunction with other techniques and performed by a certified applicator. Crack and crevice (residual) treatments are often used in areas where adult arthropods rest or larvae migrate to pupate. Space sprays or fogs are used periodically in isolated areas, mainly to reduce adult density (space sprays are not residual insecticides and only affect those insects which directly contact the chemical during application). Trapping may also be used for surveillance and in isolated areas to reduce the size of isolated or small populations. **Remember, application of insecticide without addressing the causes of an infestation will result in limited short-term success.**

For additional information regarding stored product pest management, contact your local pest management professional or DSCP at 510-337-8122, DSN 686-8122 or email paa5245@exmail.dscp.dla.mil.

Disclaimer: Mention of a product or service is for illustrative purposes only and does not constitute endorsement by the United States government, Defense Department, Defense Logistics Agency or the Defense Supply Center Philadelphia.