Tribolium castaneum (Herbst, 1797) - Red Flour Beetle

Summary

The red flour beetle is found in most tropical and subtropical countries in the world. It is a pest of stored maize and a variety of stored products. Both adults and **larvae** feed on internally on maize grains.

Common Names

Red flour beetle, bran bug, rust red flour beetle, flour beetle, rust red flour beetle

Synonyms

Colydium castaneum Herbst 1797

Taxonomic Position

Phylum: Arthropoda; Class: Hexapoda (Insecta); Order: Coleoptera; **Family**: Tenebrionidae

Geographic distribution: Worldwide, but more common in warmer regions. This pest occurs in temperate areas, where it survives winters in protected places, especially with central heating.

Morphology: Body of adults flat, reddish-brown, about 3-4 mm long, thorax slightly darker then the elytra, densely punctated. Elytra with punctate, parallel-sided striations. Last three antennal segments larger than all others, almost square. Larvae initially whitish, later becoming brown, length up to 5 mm, terminal abdominal segment bears a pair of dark, upturned projections.

Description

The adult red flower beetle is approximately 3-4 mm long with a flattish curved-sided body which is reddish-brown in colour. The **head** and upper part of the **thorax** are covered with minute punctures and the wing cases (**elytra**) are ridged along their length. The antennae are enlarged at the tip (capitate) with the last three segments wider than preceding segments. The eyes are reddish-black in colour.

Eggs are approximately 0.5 mm long, cylindrical and white or colourless. They are sticky which causes them to become covered in flour and stick to containers.

The **larvae** are yellowish-white, slender, and cylindrical and covered with fine hairs. The **head** is pale-brown and the last segment of the **abdomen** has two upturned dark, pointed structures.

The pupa does not have a cocoon and is yellowish-white, becoming brown later.

Similar Species

It is possible to confuse the red flour beetle (*Tribolium castaneum*) with the ‘confused flour beetle’ (*Tribolium confusum*). It is very difficult to distinguish between the **larvae** of both species. Adults of both species are similar in size and colouration but they can be distinguished by the following features among others: the eyes of the red flour beetle are larger and closer together than those of the confused flour beetle; the red flour beetle has a curved-sided **thorax** while the confused flour beetle has a straight-sided **thorax** ; the last three antennal segments of the red flour beetle are much broader than the previous segments while the antennal segments of the confused flour beetle gradually broaden. Adults of both species have well developed wings but only the red flour beetle has been observed to fly though it is not a strong flyer.

Life Cycle

Females lay between 300-400 eggs in their 5-8 month adult lifespan. Under optimum conditions of 35°C and 60-80% relative humidity, the development times for each stage are approximately 3 days for eggs, 16 days for **larvae** and 5 days for pupae. Both stages cause significant damage to grains that are already damaged physically or by the action of other pests. Adults move quickly and rapidly run for cover when disturbed. They can be found at the surface or deep within grain stores. Adults disperse over short distances through flight.

Pest Destructive Stage

Adult and **larva** which feed mainly on the germ of the cereal

Host Range

The red flour beetle has a very broad host range. It is a major pest of the following crops among others: maize, groundnut, oats, Brazil nut, barley, walnuts, lentil, rice, beans, peas, almond, rye, sorghum and wheat. The red flour beetle also attacks a wide range of dried stored products.

Host Lifestage Affected

Post-harvest and storage

Host Plant Part Affected

Fruits, pods, seeds, grains and vegetative organs

Damage Symptoms

Seeds and grains: internal feeding; contamination with faeces, promoting mould

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Pest Management

Detection methods
Red flour beetles can be difficult to detect at low densities. Simple traps baited with food such as carob beans, ground nuts and cereals can help detect individuals when their numbers are low. At higher densities holes and tunnels in grains and seeds can be seen as can the adults and **larvae** as well the dust created by their feeding activities. The eggs that stick to storage containers can be detected and there may be a pungent odour at high densities.

Cultural practices
The severity of a red flour beetle infestation can be reduced by good store hygiene: cleaning the store between harvests, removing and burning infested residues, immersing grain sacks in boiling water and removing wood from stores or fumigating the store to eliminate residual infestations and the selection of only uninfested material for storage.

Physical control
The removal of adult insects and **larvae** from the grain by sieving can reduce populations but this is very labour-intensive. The addition of inert dusts such as ash and clay to the grain can reduce insect numbers by causing the insects to die from desiccation.

Biological pest control
The red flour beetle is affected by a variety of parasites, parasitoids and predators that affect it at all stages. The editors could not find information on the effectiveness of these agents as grain moth control agents. The fungus *Beauveria bassiana* has proven efficacy for many insect pests of stored grain and grain products but is not considered a commercially viable stand-alone option for controlling the red flour beetle.

Controlled atmosphere
Where suitable infrastructure exists, low oxygen and carbon dioxide-enriched atmospheres can be used to control stored product pests.

Freezing and Heating
Where the infrastructure exists, freezing for several days and heating for 24 hours have proved to be effective control methods for stored product pests.

Chemical control
Organophosphates, pyrethroids and fumigants have been used to control red flour beetle. Tetrachlorvinphos was the most persistent insecticide used against the red flour beetle in Pakistan, followed by diazinon, malathion, azinphos-methyl and dichlorvos. The red flour beetle has developed resistance against a variety of insecticides in a number of countries. Pesticides are poisons so it is essential to follow all safety precautions on labels.