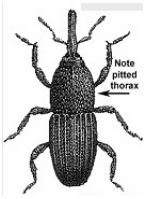
Stored Grain

Granary Weevil

David K. Weaver and Reeves Petroff



Granary Weevil.

Introduction

(*Sitophilus granarius*) This species is rarely encountered in Montana, and most records are from the eastern part of the State.

Identification

The adult weevil can be readily identified by its long slender snout. Adults are less than 3/16 of an inch in length, and color varies from medium brown to black. The thorax is pitted with elongate depressions, and there are no wings under the wing covers, so the species is flightless. Closely related pests are the rice weevil, *Sitophilus oryzae,* from wheat, and the maize weevil, *Sitophilus zeamais,* from corn. These species infest these commodities in warmer and more humid climates than those found in Montana, and occur here only after the trans-portation of infested commodities. They can be readily identified by the presence of fully-developed wings, rounded depressions in the thorax, and by the commodity they were infesting.

Damage

The granary weevil female chews a small hole in a kernel, into which she deposits an egg. The hole is sealed with a plug, and the egg hatches. The legless larva feeds within the kernel until pupation. The new adult emerges after the completion of meta-morphosis. Each female can deposit between fifty and two hundred and fifty eggs, with development taking a month under warm conditions, and taking progressively longer as the grain cools.

In Montana, both the granary weevil and the lesser grain borer are thought to be unable to infest mature grain in the field because of a short window of opportunity and cool overnight temperatures. Field infestation is typically associated with warm humid climates, like in the tropics. Grain drying under these conditions may take quite some

time, and the degree of field infestation is often correlated with the length of the period of exposure.

Biological Control

There are a number of insect predators and parasitic wasps that attack insect pests of stored grain. All are effective if used in overwhelming numbers. However, biologicals are generally not used because the Food and Drug Administration (FDA) and food processors do not accept live insects or insect parts in raw grain. This inudative approach is simply the addition of very large numbers of beneficial insects.

Biological agents have limited commercial avail-ability and are cost prohibitive, except perhaps for organic production. Specific species that attack the different groups of pests are listed below. It is important to note that there are limited numbers of naturally occurring biological control agents:

Primary Pests
Parasitic wasp of grain
Anisopteromalus calandrae
Choetospila elegans
Lariophagus distinguendus

Predaceous mites
Warehouse pirate bug - *Xylocoris flavipes*

Secondary Pests
Predaceous mites
Warehouse pirate bug - *Xylocoris flavipes*

Indianmeal moth
Habrobracon hebetor
Predaceous mites
Trichogramma pretiosum
Warehouse pirate bug - *Xylocoris flavipes*

Insecticide Treatments

Empty bin treatments include residual insecticides applied in and around the fan, aeration ducts, auger, door openings, and hatch covers, or fumigants, before bins are filled at harvest. Commercial facilities must comply with the Occupational Safety and Health Administration (OSHA) bin entry permits. Following are pesticides available for treating empty bins:

Insecticides Labeled for Use as Empty Bin Treatments

Active Ingredient (a.i.)	**Example Brands**	**Comments / Usage**
Cyfluthrin	Tempo Sc Ultra Premise Spray®	Most effective residual as compared with malathion and chloripyrifos-methyl.
Chlorpyrifos-methyl	Reldan 4E®	Can only be applied from outside of bin and sprayed downward into the bin. Degrades on hot surfaces.
Diatomaceous earth (DE)	Insecto, Protect-it®	Excellent empty bin treatment. Special grade required for grain use. Must use DE labeled for grain.
Malathion	Malathion	No longer recommended for empty grain bins because of high insect resistance and rapid degradation in warm, relatively moist grain.
Chlorpyrifos-methyl + cyfluthrin	Storcide®	Can only be applied from outside of bin and sprayed downward into bin. It is not recommended for grain intended for export.
Chloropicrin	Chlor-o-pic®	Empty bin fumigant, under false floor, aeration tubes, and tunnels.
Methyl bromide	Brom-o-gas®, others	Empty bin fumigant; seldom used.
Phosphine	Phostoxin®, others	Empty bin fumigant.

Liquid Insecticides Labeled for Use as Grain Protectants

Active Ingredient	**Example Brands**	**Comments**
Chlorpyrifos-methyl	Reldan 4E®	Reldan does not control lesser grain borer. Can only be applied to the grain stream as it is moved (augered) into the bin. Use limited to existing stocks.
Malathion	Malathion 5EC	Existing stocks are available but label has been withdrawn. Most stored grain insects are resistant.
DDVP	Vapona®	Also as strips. Used in the head space against Indianmeal moth.
Methoprene	Gentrol, Diacon II®	Kills developing insects only, slow kill of larvae, no kill of adults though causes sterility. High cost and must use other products before sale. Newly marketed.
Chlorpyrifos-methyl + cyfluthrin	Storcide®	Can only be applied to the grain stream as it is moved (augered) into the bin. It is not recommended for grain intended for

		export.
Pyrethrins	Pyrenone®	Expensive, short residual life.

Grain protectants are insecticides applied directly onto grain going into the storage or already in storage. Grain protectants do not kill insects inside the kernels. Following are insecticides labeled as protectants.

In Montana, the use of protectants should be limited to high-value commodities that need protection during storage for several months, and for which it is cost effective to use them. For direct application on wheat at first storage, there are limited circumstances where the use of a protectant is necessary.

Dust Insecticides Labeled for Use as Grain Protectants

Active Ingredient	**Example Brands**	**Comments**
Malathion	Big 6 Grain Protector®, Agrisolutions 6% Malathion Grain Dust	Top-dress treatment. Insects are resistant in many areas. Millers resist purchasing grain with strong malathion odor.
Diatomaceous earth (DE)	Protect-It™, Insecto®	Can lower the test weight of grain and is expensive if it is applied to entire grain mass, so is best applied to empty bins and to the top and bottom layers of the grain mass.

Categories: Stored Grain, Insects, granary weevil, Sitophilus granarius

Date: 12/20/2004