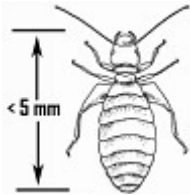


## Stored Grain

### Booklice

David K. Weaver and A. Reeves Petroff



Booklice.

### Introduction

(*Psocoptera*) In Montana, these tiny insects are seldom found in very large numbers in properly stored wheat. They are not known to damage wheat significantly. Elevator operators and other buyers may require treatment for a very large number of booklice, but this is very unlikely to occur in a cool dry climate like Montana. The presence of booklice in a grain sample during grading should not result classification as “infested” grain.

### 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*

<b>Active Ingredient (a.i.)</b>	<b>Example Brands</b>	<b>Comments / Usage</b>
Cyfluthrin	Tempo Sc Ultra Premise Spray®	Most effective residual as compared with malathion and chlorpyrifos-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*

<b>Active Ingredient</b>	<b>Example Brands</b>	<b>Comments</b>
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*

<b>Active Ingredient</b>	<b>Example Brands</b>	<b>Comments</b>
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.

*The information herein is supplied with the understanding that no discrimination is intended and that listing of commercial products, necessary to this guide, implies no endorsement by the authors or the Extension Services of Nebraska, Colorado, Wyoming or Montana. Criticism of*

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*products or equipment not listed is neither implied nor intended. Due to constantly changing labels, laws and regulations, the Extension Services can assume no liability for the suggested use of chemicals contained herein. Pesticides must be applied legally complying with all label directions and precautions on the pesticide container and any supplemental labeling and rules of state and federal pesticide regulatory agencies. State rules and regulations and special pesticide use allowances may vary from state to state: contact your State Department of Agriculture for the rules, regulations and allowances applicable in your state and locality.*

Categories: Stored Grain, Insects, booklice, Psocoptera

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