CRITTERS IN THE BIN—WHAT NOW?

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There are over 100 different insects and mites found infesting grain in Wisconsin. About 90% are small beetles while most of the remaining species are caterpillars and moths. These insects and mites can be divided into three general groups depending on the types of feeding, potential damage, and the environments they prefer. One of the major problems is that these insects look so similar, but control options will differ depending on what insect is associated with the stored grain. Not all infestations need to be fumigated or sprayed.

PRIMARY FEEDERS (Internal feeders) are those stored product pest which can feed on and breed inside whole, sound grain. There are only 6 to 8 species that are primary pests in the U.S. and only 3; the GRANARY WEEVIL, MAIZE WEEVIL, and occasionally LESSER GRAIN BORER are found in Wisconsin. At temperatures above 60^{o}F these insects can go through a generation in 3 to 4 weeks and each female lay up to 300 to 400 eggs during her lifespan. Larvae develop within the grain kernels, completely destroying the interior, and leave behind a hollowed kernel. On a worldwide basis and in warmer areas in the southern U.S., primary feeders are the most serious stored grain pests. They will go through 12-generation/ year and can even infest grain in the field. In Wisconsin they are not very common, can only go through 3 to 4 generations per year and we DO NOT get infestations before harvest.

SECONDARY FEEDERS (**external feeders**) only feed and breed on broken kernels, fines and grain damaged by primary feeders. They can feed on milled and processed foods as readily as whole grain. There are about 30 common species statewide and are often called bran bugs. They include the red flour beetle, saw-toothed grain beetle, Indian meal moth and mealworms. Most species will to through one generation per month during summer conditions and populations can increase by 10 to 15 times per generation. High populations can become a significant problem and will feed on fines, and broken grain. Like the primary pest, they are not the most common group of insects found in Wisconsin stored grain.

INDIAN MEAL MOTH deserves special attention because it has become increasingly common in the past years and it shows moderate resistance to some treatments. The adult is a small tan moth and does not feed on grain. The larva is a yellowish caterpillar that feeds in the upper few inches of the grain mass and will web grain together. Crusting and webbing will often develop on surfaces. This prevents proper air movement and can lead to serious moisture problems. Infested bins can be fumigated or treated with any one of a number of insecticides (besides malathion) but the webbing, crusted, or spoiled grain must be removed before application.

FUNGUS FEEDERS are insects and mites found in stored grain that do not attack the grain, but feed on the mold and mildew associated with damp grain. Any grain above 15 to 20% moisture content is susceptible to being attacked. Many species are rusty red or brown beetles that look similar to the other stored product pests mentioned previously. Most fungus feeders can fly and are attracted in large numbers to musty smelling grain. A large population generates heat and will cause additional moisture to condense, more mold will grow and additional fungus feeders will be attracted to the site. A chemical treatment (fumigating and/or grain protectent) will kill these insects but if you do not

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correct the moisture problem new insects will begin to fly in almost immediately. The foreign grain beetle, flat and rusty grain beetles, the hairy fungus beetles and grain mites (Acarus) all belong to the fungus feeding group. Over 80% of the insect infested corn samples sent to the U. W. diagnostic lab contained fungus feeding insects as their major problem. These insects would not be present in properly handled low moisture grain. Control of these fungus feeders can be as simple as proper aeration.

Environmental Requirements

None of the insects that attack stored wheat, barely, oats and corn will develop at temperatures below 50^{o}F. Grain that is harvested and placed in a clean bin will be free of any insect problems until the following summer. Grain that is held at 12 to 13% moisture content will not become moldy and will not attract major insect problems.

Never place new grain on top of old grain. And remove residue from fans, rafters, floors, walls, and ducts. Grain that contains cracked kernels, weed seeds or other foreign material tends to become infested more readily than clean sound grain. Screening will help reduce many problems except the primary feeders. To prevent any increase in moisture content, all holes in the roof must be sealed and proper aeration techniques must be utilized.

Stored grain should be inspected every 2 to 4 weeks from May through October and monthly from November to April. Grain probes can be used, or specially designed probe traps will help monitor insect problems. When insects are found, you must determine whether or not the infestation warrants control. Get help in proper identification of the insects involved. It is very important to know what you have got to be able to predict potential damage and select the proper control.

Type of Treatments Available

Residual bin sprays are used on walls, ceilings, roof, and floors of clean bins prior to harvest. All debris should be swept up and all cracks and crevices sprayed with a residual insecticide. The area under perforated floors will need to be cleaned out or fumigated. Do not store livestock feed close to the grain bin as this is a source of insect infestations. Products registered for treatment of empty bins include Storcide II (chlorpyrifos-methyl + deltamethrin), Storcide (chlorpyrifos-methyl + cyfluthrin), Tempo (cyfluthrin), Malathion (not all labels), Reldan 4E (chlorpyrifos-methyl-discontinued)), Diacon II [(s)-methoprene], Silicon dioxide and/or diatomaceous earth (DE) (Insecto, Perma-Guard, and others), and Bacillus thuringiensis (Bt) (Dipel, Biobit- Indeain meal moth only.

A number of insecticides are labeled for use on stored grain. Depending on the situation and insect involved insecticides can be used as a surface treatment (for Indian meal moth) or applied uniformly as grain is being loaded or transferred. In most cases all grain will need to be treated. Treatment can put on as a protectent to prevent problems in storage. Read the label carefully as not all products are labeled for all grains. Products registered for this use include Actellic (pirimiphos-methyl), Storicide Dipel (for Indian meal moth) silcon dioxide/diatomacous earth and the growth regulator Diacon II and dust formulations of Malathion

Grain that is already infested can also be fumigated. All fumigants are extremely toxic and dangerous if improperly used. Recently the EPA revised fumigants regulations and proper use requires self-contained breathing apparatus and gas concentration monitoring equipment to use the fumigants according to label directions. Fumigants are tricky to use properly and their effectiveness is influenced by temperature, wind speed, bin size and grain being treated. There are also other regulations which must be followed for proper use. A commercial fumigator should be hired for treatments. They have the experience and the equipment to do the job properly.

There are three fumigants now being used for treating grain. Cloropicrin (tear gas) can only be used in empty bins. Because it is heavier than air it is used to control insects in subfloor areas. Phosphine is a solid fumigant that when exposed to moisture releases the toxic gas phosphine. The grain mass is often tarped after treatment and the bin is kept sealed for 2 to 8 days, depending on temperature. Methyl bromide is an odorless gas hat is highly effective on all life stages of insects, but it is likely to be banned in the next few years because of ozone depletion concerns. It is a restricted use product that is available only to professional fumigators. For proper use grain temperature must be at least 50^{o} and preferably above 60^{o}F for treatment with any fumigant.