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Think about Stored Grain Pests Before Harvest

By Erin Hodgson and Ken Holscher, Department of Entomology

Stored grain insect pests are an economic concern in Iowa. Growers should think about taking preventative measures now – before harvest – to protect grain quality. Infestations can directly reduce grain weight and nutritional value, in addition to indirectly causing mold and other contaminations. Primary stored grain pests feed within intact kernels while secondary pests feed on broken kernels or grain dust. Examples of primary pests include rice weevil, granary weevil and maize weevil. Common secondary pests are red and confused flour beetles, sawtoothed grain beetle, and Indianmeal moth. Integrated pest management (IPM) of stored grain pests should be implemented to increase overall profit.

Sanitation. This is the most important IPM practice for storing and protecting grain. Some experts say that successful sanitation is 80 percent of an effective IPM program in stored grains. Removing any potential pests and their food before filling grain bins will greatly enhance any subsequent management actions.

- New grain should NEVER be stored on top of existing grain; remove old grain and clean bins before adding new grain.
- Clean all grain handling equipment before harvest and storage of new grain, including combines, wagons, trucks, augers, aeration fans, etc.
- Remove any grain or grain dust from inside the bins by sweeping empty bins and brushing down walls.
- Remove any spilled grain from around the outside of the bin and storage facility.
- Carefully inspect storage bins, and seal/caulk any cracks, holes or gaps that could be potential entry points for insects or rodents.
- Look for possible moisture leaks in the roof and repair if necessary.
- Remove any vegetation from within 10 feet of storage bins to discourage insects from establishing.

Empty bin treatments. The inside walls and floors should be treated with a residual insecticide after thorough cleaning. The outside walls (up to 15 feet) and outside base of grain storage bins may also be treated. The area beneath the perforated, drying floor should also be cleaned and treated with a residual insecticide. Treating empty bins is most effective when insect activity is likely (temperatures over 60°F). Common products for empty bin treatments may be difficult to find as labels expire (Table 1).

Table 1. Insecticides labeled for empty grain bin treatments, intended to be applied four to six weeks before grain enters storage.

Insecticide (active ingredient)	Comments
Tempo SC Ultra (beta-cyfluthrin)	May not fully protect grain against weevils.
Storcide II (deltamethrin + chlormethylfos)	Bin and warehouse applications should only be applied from outside with a downward spray. All openings, except for the point of application must be closed during applications. This product may only be applied to empty grain bins using automated spray equipment.
Suspend SC (deltamethrin)	Do not allow dripping or run-off to occur.
6% Malathion dust, Malathion 5EC or 57EC, others exist	Select a product specifically labeled for treating grain storage facilities.
Diacon-D and DiaconII (S-methoprene)	Insect growth regulator that only affects immature life stages.
Dryacide and Insecto (silicon dioxide)	Select a product specifically labeled for treating grain storage facilities.

Grain cleaning and storage. Another invaluable IPM tool for stored grain pests is making sure the kernels are clean prior to storage. Dirty grain can prevent adequate airflow and uniform aeration. Uneven cooling and drying can result in hot spots that tend to favor insect development. Uncleaned grain increases the potential for spoilage since broken kernels, weed seeds, and other debris often spoil at recommended moisture levels for storing grain. Excess grain dust can also form explosive aerosol dusts. Any grain protectants, top dressings or fumigations will be more effective with clean grain.

Temperature and moisture management of stored grain is vital. It is crucial that the grain mass temperature be reduced to 50 degrees F and the moisture is below 12-13 percent soon after storage. Colder temperatures will slow development of insects and inhibit molds, and extend insecticide residuals.

Grain protectants and top dressing. If grain is expected to remain in storage bins for over 12 months, consider using a protectant to reduce pest activity. These products are generally applied to whole grains as they are being augered, loaded, or turned into storage facilities. A consistent rate of application is important to ensure an even distribution throughout the grain mass. Low pressures and large droplet sizes are recommended with pressurized spray systems. These products are not highly volatile, and penetration into the kernel is limited. Do not apply grain protectants before high temperature drying because the extreme heat can cause rapid volatilization of the insecticide. Protectants applied when temperatures drop below 40 degrees F will limit the residual effectiveness. Grain protectants applied at 13 percent moisture will have a greater residual life compared to applications made at 15 percent or greater moisture. When protectants are applied according to the label, they can be sold or fed immediately after application (Table 2).

Table 2. Common protectants applied to grain stored longer than 12 months; applications should be made to clean, dry grain.

Insecticide (active ingredient)	Comments
Dipel DF or ES (<i>Bacillus thuringiensis kurstaki</i>)	Labeled for all crops. Will only control moth larvae, such as the Indianmeal moth. Slow to kill existing infestations. Some Indianmeal moth populations may be resistant to Dipel.
Storicide II (deltamethrin + chlordane)	Labeled crops include wheat, barley, oats, sorghum and rice. Product effective against a broad spectrum of insects.
Actellic 5E (pirimifosmethyl)	Labeled crops include corn (including pop corn) and grain sorghum.
Diacon-D and Diacon II (S-methoprene)	Labeled crops include barley, corn, grain sorghum, oats, peanuts, and wheat. Insect growth regulator that only affects immature life stages. Dilute DIACON II with water or FDA approved food grade oils and apply to the moving grain stream as a coarse spray.
Dryacide and Insecto (silicon dioxide)	Labeled for all crops.

Sometimes, a top dressing of insecticide is recommended instead of treating the entire grain mass. Applications should be made as soon as the grain bin is filled and the surface is level. Any disturbances to the surface may require another top dressing application. Follow label directions for these types of applications; some products recommend treating the top ten feet of grain and other products suggest the top few inches (Table 3).

Table 3. Top dressing insecticides for stored grain pests.

Insecticide (active ingredient)	Comments
Dipel DF or ES (<i>Bacillus thuringiensis kurstaki</i>)	Labeled for all crops. Mix into the top 4 inches of grain surface. Will only control moth larvae, such as the Indianmeal moth. Slow to kill existing infestations. Some Indianmeal moth populations may be resistant to Dipel.
Actellic 5E (pirimifosmethyl)	Labeled crops include corn (including popcorn) and grain sorghum. Do not use as a top-dress treatment where Actellic was used as a grain protectant.
Diacon-D and Diacon II (S-methoprene)	Labeled crops include barley, corn, grain sorghum, oats, peanuts, rice and wheat. Insect growth regulator that only affects immature life stages.
Dryacide and Insecto (silicon dioxide)	Labeled for all crops. Some products carry instructions on use as top dressing treatments either alone or in combination with treatment of rest of the grain mass.

Grain monitoring. Any time the grain mass is above 50 degrees F, it should be inspected for insects every two weeks. Samples should be taken from several depths and locations, paying particular attention to the grain mass surface, central core, and any developing hot spots. Proper insect identification is important to determine their damage potential and control options. Purdue Extension put together a [key to distinguish species](#). Control measures should be implemented immediately to protect grain quality.

Fumigation. There are three options for stored grain infested with internal grain feeders (e.g., weevils and lesser grain borer): feed as is, sell it at a discounted price, or fumigate. Fumigants are extremely hazardous because of the application method, and therefore, are restricted use products and should be applied by a licensed professional. Unfortunately, fumigant

insecticides have no residual activity and grain will become susceptible to reinfestation within 72 hours. Using proper sanitation prior to storing grain will likely prevent the need for fumigation. A storage bin with clean, whole grain is important to deter insects that feed on broken kernels and grain dust.

Locate a licensed applicator in your region of Iowa, [through this link](#) and searching for "7c-Fumigation." For information on becoming a certified pesticide applicator in fumigation, contact the Iowa Department of Agriculture and Land Stewardship Pesticide Bureau at (515) 281-8591.

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