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Insect Control in Stored Grains

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Insect Control
In Stored Grains

With the increasing amount of grain in storage in South Dakota, insect problems have increased, especially since some grain is stored in poor keeping condition.

PRIMARY AND SECONDARY PESTS

Insects damage grain in several ways. Some, known as primary pests, attack sound grain in storage and spend a good part of their life developing inside the kernels of the grain. Among this group are the granary weevil, the rice weevil, and the lesser grain borer.

Other insects, known as secondary pests, feed on external parts of the grain, broken kernels, or grain dust. This group includes cadelles, flour beetles, grain beetles, saw-toothed grain beetles, dermestids, and grain moths. Some of the stored grain insect pests are noted for feeding on the germ, destroying the grain for any seed purposes. Pests with this habit include cadelles, flat grain beetles, and larvae of the Indian meal moth.

CHECK GRAIN CONDITION

An infestation of insects may be a sign that grain is dirty or damaged, is over the safe limits for moisture content, or is at a temperature which is too high for safely keeping the quality of the grain. A combination of these factors is usually present in grain that has become infested. Many of the insects are attracted to grain that is going out of condition because insects need favorable temperature and moisture conditions to survive and reproduce.

Stored grain insects require a grain temperature of at least 60° F. to reproduce. A grain temperature of 70° F. is considered to be the danger line; above this temperature, insects increase rapidly if the moisture is sufficient. The primary pests of stored grain depend entirely upon their food supply to obtain the necessary amount of moisture. These insects will attack sound grain in storage but are not able to reproduce unless moisture content exceeds 11%.

Secondary pests such as flour beetles, dermestids, and saw-tooth grain beetles, do not normally attack sound whole kernels unless the grain has a high temperature and/or high moisture content. If the grain has a lot of damaged kernels, chaff, or dirt, these secondary pests will breed, regardless of moisture content, provided the temperature is above 70° F.

In controlling insects in stored grain, suggestions here are for: (1) protecting stored grain from insect attack and (2) controlling grain infestations.

PROTECTING STORED GRAIN
FROM INSECT ATTACK

Preventive Measures

Preventive measures, if properly taken, can help keep grain free from insects. The methods used to prepare bins for grain coming in from fields are important, especially if we remember that grain coming from the fields is not infested with storage insects. Steps to help prevent insect attacks are:

1. Clean grain harvesting equipment following seasonal use.
2. Keep bins in good repair. Avoid, if possible, bins with double walls or floors and bins in other farm buildings where feeds are stored or livestock fed.
3. Clean the bins thoroughly, removing all old grain debris.
4. Spray the empty, cleaned bins with an approved bin spray. Use the spray on all inside surfaces, outside surfaces, and on the ground surrounding the bins. Spray all surfaces until “run-off” occurs. Approved bin sprays are Premium grade 57%, malathion emulsion, 1 gallon to 25 gallons of water; a 2 to 2.5% spray of methoxychlor or activated pyrethrum (pyrethrum plus piperonyl butoxide) to be used as directed on the labels.
5. Store grain that is free from excessive dockage and has a moisture content of 12% or less. Provide suitable ventilation for the size bin being used. (See USDA farmers bulletin No. 2071.)
6. Inspect grain at least once a month for insects, hot-spots, moisture, and rodents. Use a grain probe or run a metal rod into the grain at several locations. If the rod feels warm to the touch, grain has started to heat.

**USE OF GRAIN PROTECTANTS**

Grain protectants are insecticides designed to be mixed with grain at harvesting time or when grains are turned in storage. They are not effective for active infestations already present in stored grains. Protectants will keep clean grain free from insect troubles for at least 1 year’s storage.

![The Granary Weevil](image1)

**Fig. 1** The Granary Weevil, a serious stored grain pest, develops inside the kernel. Weevils live about 7 months, and the females lay about 300 eggs. During warm months, they can complete life cycles in about 1 month. The actual size of the adult is 3/16 inch long.

Two different chemicals are now available and approved for use as grain protectants. One material is 57% premium grade malathion emulsion. Recommended dosage for this material is 1 pint in 2 to 5 gallons of water for each 1,000 bushels. The 1% premium grade malathion wheat dust may also be used at the rate of 60 pounds of dust per 1,000 bushels. The other recommended material is activated pyrethrum. This material appears under various trade names and should be used at the rates stated on the label. Several forms of the activated pyrethrums are available in the ready-to-apply state while others are emulsifiable concentrates or dust.

Grain protectants can be applied at various stages in the harvesting or binning operations. A good place to apply the material is at the hopper spout as the grain flows from the combine into the truck or wagon. Another possible situation would be to apply the protectant to the grain at the elevator hopper or auger as the grain is being elevated into the storage bin. The main requirement is to get the amount recommended into the grain with as much uniformity as possible. Elaborate spray equipment is not required; a “trombone” type sprayer or 3 gallon compressed air sprayer works quite well.

When grain is to be held for a period of 6 months or longer, use a grain protectant. Protectants cost from a fraction of a cent to 2 cents per bushel depending upon the material used. Use of a protectant can save the higher cost of a fumigation which might become necessary later on.

**CONTROLLING INFESTATIONS IN GRAIN**

**Exposure to Cold Temperatures**

During cold weather with freezing temperatures, control insects, temporarily by exposing them to the cold air. Turning the grain or moving it slowly from one bin to another will stop insect activity for a while. This method will work in a situation where fumigation is not practical at the particular time when insects need to be controlled.

**Fumigation**

Fumigating is the surest way to control insects that have become established in stored grain. Circumstances determine the need for fumigation, but, generally speaking, the presence of any primary pests, such as granary weevils and lesser grain borers, calls for immediate control measures. If probe samples show an average of five secondary pests per quart, and if this is accompanied by heating, start control measures.

A number of good grain fumigants are sold under various trade names. Usually these are composed of a variety of mixtures of chemicals, some of the common ones are carbon tetrachloride, carbon disulfide, sulfur dioxide, ethylene dichloride, and ethylene dibromide.

![Confused flour beetles](image2)

**Fig. 2** Confused flour beetles are about 1/8 inch long. Beetles live about a year, and the females lay about 450 eggs, usually in grain and flour. A life cycle may be completed in 6 weeks.
One fumigant commonly used is known as "80-20" and contains 80% carbon tetrachloride and 20% carbon disulfide. Since there are a number of fumigants, it is important to follow manufacturers' recommendations on the labels. The type of bin (metal, concrete, or wood), its bushel capacity, and the kind of grain stored (shelled corn, barley, wheat, oats, or sorghum) affect the amount of fumigant required.

Some important requirements for successful fumigation are:

1. Level the surface of the grain and break-up any "caking" on the surface.

2. Seal bins as tightly as possible. The gas fumigant should be retained in the grain and not allowed to "leak" out. Use building paper or other material to cover all holes and cracks.

3. All fumigants should be handled with caution. Fumes from the chemicals are toxic and should not be breathed. Apply the fumigant from the outside of the bin if possible. If it is necessary to be exposed to the fumes, wear a gas mask with an approved canister for the fumigant being applied. Always have a second person nearby when fumigating. If you spill some fumigant on the skin, wash immediately. If you spill fumigant on clothing, change at once.

4. Apply fumigant on a calm day with little wind and when grain temperatures are at least 65° Fahrenheit. Should "hot-spots" develop in winter with average grain temperature below 65°, either turn grain in cold air or spot treat area until such time as a complete fumigation can be given.

5. Use full amount of fumigant that is recommended for your particular situation.

6. Keep all persons and animals out of the building for at least 36 hours. Fumigated grain may be fed to livestock 3 or 4 days after treatment if it is stirred to hasten evaporation.

**Surface Treatments**

Indian meal moth infestations are located on the surface of the grain. These can be controlled by surface treatments of malathion or activated pyrethrins. Infestations of this moth are easily recognized from the large amount of webbing the larva spins over the surface of the grain. Shelled corn is the grain most often attacked by this pest. **Premium grade 57% malathion emulsion** will control Indian meal moth at the rate of ½ pint in 1 to 2 gallons of water per 1,000 square feet of grain surface area. Activated pyrethrum (pyrethrum plus synergist such as piperonyl butoxide) is available to be used as a surface treatment for Indian meal moth. Directions on the label should be followed for this material. Pyrethrum is often used as a space spray against the adult moths. Fogging devices are often used since penetration throughout the head space is thought to be somewhat superior.

Surface treatments of malathion or activated pyrethrum may be used to kill stored grain insects that have come to the surface as a result of fumigation. The combination of the two will kill more thoroughly and prevent the pests' migration.

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