

# Controlling Insects in Stored Grain

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INSECTS IN GRAINS AND BEANS STORED ON FARMS in Michigan have been a minimal problem in the past. There are two good reasons for this: the short storage period that has been the custom; and the generally low temperatures that impede the development of insects. Some reports of damage, however, were received each year and growers regularly lost money to these pests. With the increased practice of storing grains on the farm, the reports of stored grain insects have increased dramatically over the past few years. The losses are caused by the lower quality — broken grains, frass, webbing, insect fragments, off odor, and off color — of the infested grain. Only rarely is the grain so badly damaged by the insects alone that it is valueless. With care, these losses can be prevented.

A total of about 35 species of insects have been reported damaging stored grains in Michigan. There are two general types of these insects in stored grains and beans: (1) primary pests that can attack sound, dry grains (examples are saw-toothed grain beetle, granary weevil, and bean weevil); and (2) secondary pests that can increase only in grain that is high in moisture or in cracked grains and other dockage (examples are mealworms, flour beetles, mealmoth, and even booklice). Most of the problems reported have been with the secondary pests. Note that the grain has to be in poor condition before these secondary pests can increase. The insects are really more a symptom than a cause of the poor grain.

The same conditions — high moisture and dockage — that favor the insects also impede insect control in stored grains. Good management and good facilities to maintain the stored grain or beans in good condition

are essential both to preventing insect infestation and to control the insects if they do appear in the bin. Growers should thoroughly review their operations, facilities, and equipment to be sure that grain quality is assured during storage.

Extension Bulletin E-799 ("Drying and Storing Shelled Corn" by Robert L. Maddex) explains how to maintain stored grain in tip-top shape. Actually, if sound management is employed, stored insect problems would be reduced to the rare occasions that the primary pests appear.

**Clean, dry grain in a clean, dry bin  
is essential to insect control.**

## CLEAN-UP

Some stored grain insects can fly and can move into storage bins from the field or from neighboring farms. The greatest source of stored grain insects, however, is from insects in or near the bins. The second step (the essential first step is good general management) in preventing losses is to eliminate any possible source of infestation *before* new grain is moved in.

1. All infested grain should be removed completely from the premises by sale, utilization, or by dumping at a location remote from the storage area.
2. Old, sound grain should be inspected for insects, removed from the area where the new grain will be stored, and fumigated (see below) if insect infestation is noted.

3. All trash, old sacks of seed or feed, and spilled grain or feed should be removed completely from around the storage area.
4. The bin and grain handling equipment should be thoroughly cleaned and the trash and debris from the bin and equipment removed completely from the storage area. Special care should be taken to clean out elevator boots, truck or trailer beds, and hidden areas (behind safety shields, for example) that can easily be overlooked.
5. The bin structure should be checked and repairs made when needed to rain-, rat-, and bird-proof the bin in order to reduce spoilage and prevent contamination.

#### SANITARY SPRAYS AND SPOT FUMIGATION

The clean-up, if thorough, may be all that is needed to eliminate stored grain insects from the storage area. Wooden bins, and some steel bins, with many cracks and corners that are inaccessible for good cleaning, will need an insecticide to assure kill of hidden insects. Three types of insecticides can be used to clear empty bins of insects that may be hidden in them.

1. Sprays of premium grade malathion or synergized pyrethrins (*Pyrenone*) can be applied to the inside of the bin and equipment where corn, small grains, dry beans, or soybeans are to be stored. Mix the insecticide with water, and apply as recommended in the specific information on the label of the insecticide that is used. Take special care to spray elevator boots and other areas where broken grains could accumulate. The grain or beans can be put in the bin immediately after spraying.
2. Strips of dichlorvos impregnated on resin (*Farm Strips*) can be placed in empty bins where corn, small grains, or soybeans (but not dry beans) are to be stored. One strip per 1,000 cubic feet of bin should be used and the strip should be placed in the bin for at least one week before the new grain is added.
3. Small amounts of fumigants can be applied (spot fumigation) in elevator boots or other hard-to-reach areas in bins or equipment to be used for storing corn or small grains (but not dry beans or soybeans). Storing, handling, and application of fumigants can be hazardous. Read the label on the container of the specific formulation that you will use and follow the instructions carefully.

#### GRAIN PROTECTANTS

Corn and small grains (but not dry beans or soybeans) going into long-term storage can be treated with special insecticides to protect them from insects. Grain protectants are especially recommended in loose bins where fumigation may be difficult or hazardous. The grain protectants are intended to protect grains from infestation and are applied as the new grain is going into storage. They are poor in controlling established infestations in grain. A fumigant (see below) should be used to control insects already in the grain. The protectants are much reduced in effectiveness in grains that are high in moisture and dockage. New grain must be thoroughly cleaned and dry before it is treated with a grain protectant, and kept dry during the storage period.

The grain protectants recommended for use are premium grade malathion or synergized pyrethrin (*Pyrenone*). These products are formulated as liquids to be mixed with a little water and sprayed on the grain as it moves into the bin. Read the label on the specific formulation that will be used for the amount of insecticide to be applied. Metering the spray is extremely important both to avoid too low a dosage as well as to avoid excessive insecticide residue on the grain. Special equipment is available for this use and should be carefully calibrated and frequently checked while in use.

#### SURFACE TREATMENT

Some infestations of insects are restricted to the surface of the grains. If not detected for some time, a crust of webbed, moist, moldy grain will form on the surface. This crust should be removed and destroyed. The surface infestation is commonly aided by condensation at the grain surface in poorly ventilated bins. This grain should be tested for moisture, turned and dried, and fumigated (see below) if needed. If the grain is dry, a spray of premium grade malathion should be applied to the surface of the corn and small grains (but not dry beans or soybeans) to eliminate any insects remaining in the grain under the crust that was removed. Follow the instructions on the label of the insecticide for mixing and applying the malathion. Strips of dichlorvos (*Farm Strips*) can also be placed in the space above the stored grain, small grains, and soybeans (but not dry beans) to kill the surface feeding insects. Place one strip per 1,000 cubic feet of air space above the grains. Provisions should be made for adequate venting of the grain to reduce further condensation and other problems with the surface-feeding insects.

## FUMIGATION

Fumigants are gases that penetrate the grain and kill insects both on and in the grains. They are sold as gases or as solids or liquids that produce gases when exposed to the moisture in the air. They are thorough in their effect when properly applied. They may be used to eliminate "seed" infestations of insects in new grain shortly after it is put into long-term storage. Fumigation is usually done when temperature and moisture of the grains stabilize (about six weeks after filling the bin). Fumigants are especially recommended for this purpose with small grains that are harvested during the hot summer months. Fumigants are also commonly used to control established infestations of insects in stored grain. Grain to be stored into the summer should be periodically probed and checked for insects, starting early each spring, and fumigated if insects appear.

Many fumigants can be used in corn and small grains. Methyl bromide is the only fumigant registered for use in dry beans at this time. Dry beans should, therefore, be stored only in tight bins where methyl bromide can be effectively used. No fumigants are currently registered for use in stored soybeans. Be especially careful in cleaning the storage area, drying and cleaning the soybeans, and in storage management to avoid infestation of the soybeans.

The method of application depends on the physical state of the fumigant. Those sold in the form of a gas under pressure (such as methyl bromide) are injected into the grain in the bin through piping or ducts. Fumigants sold in a solid form (such as *Cyano-gas* or *Phostoxin*) are added to the grain either manually or by special equipment as the grain flows into the bin. Liquid fumigants (such as *Dowfume 75* or *Tetrafume*; these are also called "pour-ons") are poured or sprayed over the surface of the grain in the bin. The liquid fumigants are the easiest to apply and require the least amount of special equipment. They are especially recommended where fumigation is a special, not a routine, operation.

The amount of fumigant applied will depend on the specific type of fumigant, the type of grain, the type of storage bin, and the grain temperature. Read the label carefully to determine how much you should apply. High moisture and dockage will impede the penetration of the fumigant into, and removal out of, the grain. Make sure that the grain is properly clean and dry before it is fumigated.

Fumigants must be penetrating, toxic gases. These characteristics put restrictions on their safe, effective use:

1. Custom application by competent, fully equipped

and insured commercial applicators is strongly recommended.

2. The storage area must be removed from barn, shop, and other places where people or livestock could be exposed to the fumes.
3. The bin must be sufficiently well sealed to hold the fumigant until the insects have been killed. Tightly sealed steel or concrete bins are fine for all fumigants, including the highly penetrating methyl bromide gas. Slower-moving liquid fumigants (*Dowfume 75*, *Tetrafume* and others) should be used in wooden bins that are not completely airtight.
4. Read the instructions on the label of the fumigant you intend to use before you buy it. Do not buy unless you can and will comply with the safety instructions presented on the label.
5. Obtain the safety equipment called for on the fumigant label, or check your existing equipment for effectiveness at the same time you obtain the fumigant. This equipment may include full face mask, special canister, goggles, rubber gloves, or protective clothing.
6. Store the fumigant for as short a period as possible in a cool, dry, secure place where it cannot be contacted by people, pets, or livestock or threaten any life in case of accident. A locked tool shed away from house and barn may be a good place.
7. Clear obstructions from around fumigation area, seal the bin, and do anything else that is needed around the bin before the fumigant is applied. Simply avoid any need to work in the area until after the specified safe period has passed.
8. Handle and apply the fumigant in strict accordance with the label instructions. Take special precautions not to overdose nor reapply more often than is specified on the label. Two persons, one to assist in case of accident, should work together on all fumigations. Warning signs should be conspicuously posted just before fumigation and removed after the specified safe period has passed.
9. Open, ventilate, or turn the fumigated grain as instructed on the label. Do not enter the bin until well after the safe period.

### **IMPORTANT POINTS FOR INSECT CONTROL**

1. Thoroughly clean the storage area in advance of harvest. Use a sanitary spray or spot fumigant if unreachable cracks and corners are present.
2. Clean and dry the grain properly before it is put into storage. A corn or wheat grain protectant may be applied while filling the bin, or the grain may be fumigated about six weeks after filling the bin.
3. Follow good management procedures to avoid spoilage as well as insect infestation.
4. Check the grain periodically for insects, and fumigate if insects appear.
5. Read the label on the stored grain insecticide and follow its instructions exactly.

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