

Protecting Grain Quantity, Quality In Storage

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According to the 2000 Pennsylvania Agricultural Statistical Reporting Service (PASS), about 60 million bushels of corn, 5.3 million bushels of oats, and 7.6 million bushels of wheat, are stored at some point in on-farm storage facilities.

This means that Pennsylvania farmers are storing \$153, \$19, and \$8.2 million of corn, wheat, and oats, respectively, in safe deposit boxes on their farm. Unfortunately, these facilities are not secured against insect and pathogen thieves.

National USDA statistics suggest that 10 percent of the grain crop is lost during the period from harvest to the point of feeding or processing. Based on these numbers, insect and pathogen robbers are stealing \$18 million from Pennsylvania farmers each year. These figures do not include losses in on-farm stored soybeans and other small grains.

So what can farmers do to prevent losses to these thieves? Unfortunately, the defenses are getting weaker as many grain protectants and fumigants are currently under review by the EPA for continued registration. Grain protectants like Malathion, Reldan, and Actellic, and the fumigant phosphine gas (Fumitox and Phostoxin) are all organophosphates. The fumigant methyl bromide's registration has already been limited to 2005. This will leave us with only biologicals such as *Bacillus thuringiensis* formulations and inert materials such as diatomaceous earth as protectants and possibly no fumigants in the near future. There are a couple of materials that can be used as crack and crevice treatments.

Fortunately, there are other methods to protect grain. These, however, require farmers to pay much closer attention to grain while it is in storage.

Good stored grain management begins before harvest. You must clean out your harvesting equipment and granary. The first step is to clean out old grain from a bin. This requires getting grain and dust out of cracks and off the walls and ledges. Insects that attack grain are very small and thousands can be harbored in small concentrations of broken grain particles. *Never, put newly harvested grain in on top of old grain that is infested with insects.* Once old grain has been removed and the bin thoroughly cleaned, new grain can be added. If this grain will be stored for longer than six months, a treatment of a grain protectant will help. In all cases it is a good idea to spray the walls and floor with a barrier treatment before placing grain in the bin.

Grain harvesting equipment can also harbor insect infestations in augers. These areas should all be cleaned out before harvesting begins. Otherwise insects living in the grain residues can be moved into the grains with the first few loads, despite other sanitation efforts. Grain should always be dried to less than 13 percent moisture for long-term storage. If your sanitation procedures are good, you can be assured that the grain going into the holding facility is free of insect infestations. Once the bin is full, a surface treatment is needed to seal the barrier around the grain. If the whole grain mass was treated, a surface treatment is not needed.

Unfortunately, following good sanitation techniques

only insures that the grain will be insect free immediately after being placed in the bin. Once in the bin, other physical and biological processes can lead to grain degradation. Moisture migration is a phenomenon that causes pockets of moisture to develop in the grain mass that leads to fungal growth and possible insect activity. In a metal grain bin where the outside temperature is cooler than the inside grain temperature, air circulates in clockwise direction picking up moisture as the temperature warms in the middle of the bin and then drops it out at the top. This moisture then allows the grain to begin imbibing moisture and respiration begins giving off heat. Once temperatures get above a critical level, fungi begin to develop and give off more heat in the process. When the grain mass temperature exceeds 40 to 50°F, then insects can begin to develop and reproduce. During the summer this process is reversed and moisture pockets can build up along the edges of the grain mass.

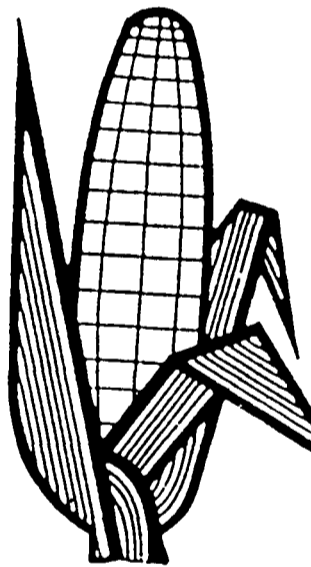
Because of this relationship between heating and moisture, the bin fan can be

your best pest management tool. A good practice is to draw the temperature of the bin below 50°F once the outside temperature is below 50°F. This prevents moisture migration and the development and reproduction of insects that might be in the bin. Once drawn below 50°F, the grain mass will stay cool until well into the summer because of the grain's insulating ability. It is best to keep the grain temperature within 10°F difference of the outside temperature. *Do not run the fan to cool the grain unless the air is dry.* It is also important to make sure the grain is clean and there are few broken kernels. Broken kernels and other debris allow insects to become established. A number of the common grain infesting species do not establish well without broken kernels.

Other details to pay attention to are: 1) level off the grain mass after the bin is full, 2) use a grain distributor to prevent a column of fine materials in the middle of the bin that will prevent good aeration, 3) eliminate spilled grain from around the bin, 4)

keep weeds away from the bin (many grain insects can feed on weed seeds), 5) prevent moisture leakage onto the grain, 6) prevent rodents and birds from contaminating the grain, and 7) use a space fumigant such as dichloro resin strips above the grain. Remember, it is important to check the grain once a month for areas of moisture and heat. When these are observed, it is best to draw air into the grain mass to cool it and eliminate the moisture. If you pay close attention to these simple practices, the likelihood of insect contamination and grain quality deterioration is minimal.

When grain is treated with an insecticide, it should be protected up to 18 months; with the exception of malathion which has only a six month period of protection. If the grain is not protected, insects can still invade and begin building up populations. For more information on storing grains, check the 1999-2000 Penn State Agronomy Guide, pg. 47-51, or online at <http://AgGuide.agronomy.psu.edu/>.



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Mycogen	2833	186.8	16.7	1
Agway	AG6001	183.7	15.8	1
Mid-Atlantic	MA9090YG	181.4	15.6	12
Garst	8342GLS/BT/IT	180.2	16.9	10
Doebler's	749XYG	179.0	17.6	4
Golden Harvest	H-8906	178.3	15.6	4
Hubner	H-3555	177.1	16.9	2
Chemgro	7311	174.2	17.7	5
Hyttest	HT7712	174.2	17.8	7
Mycogen	2799IMI	173.5	17.5	0
Agway	AG6191	173.2	15.9	3
Garst	8484BT	172.7	17.8	3
Pioneer	33A14	170.9	16.4	1
Mycogen	2652	170.4	15.0	4
Mid-Atlantic	MA8011RR	170.1	16.0	2
Mycogen	7474	170.0	16.1	7
Golden Harvest	H-9471	169.2	17.3	3
Garst	8362IT	169.2	17.4	4
Pioneer	33J81	167.2	17.7	7
Chemgro	7525BT	165.9	18.5	6
Chemgro	7155RR	165.3	16.3	1
Doebler's	747XY	164.5	17.6	14
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