



Preparing Grain Bins and Flat Storages Prior to Harvest or Incoming Product Storage

Carol L Jones, PhD, PE
Stored Products Engineering Associate Professor

Edmond L. Bonjour
Extension Entomologist for Stored Products

Oklahoma Cooperative Extension Fact Sheets
are also available on our website at:
<http://osufacts.okstate.edu>

Introduction

Protecting grain in storage is a key management process to maintain the quality of grain and result in the best economic gain and the safest working environment. Grain with insect damage, mold, damaged seeds and kernels and off odors pose many hazards to workers around storage facilities. Many of the quality indicators are also reflected in lower grain grades at marketing time, impacting profit. Therefore, it pays to take every precaution to preserve grain quality. There are steps that can be taken even before the grain is harvested to ensure quality.

Facility Preparation

The smallest amount of moldy grain, old grain, insect-infested grain or trash can contaminate the freshly harvested grain coming into storage. It is essential to clean all equipment that will be in contact with new grain. Remove old grain, trash and dust from combines and combine headers, trucks, grain carts, augers, driers, pits, bins and any other equipment used to handle or transport the grain.

Grain will be in contact with the bin for a long period of time. Therefore, that's when the greatest amount of damage may happen. Sanitation of this area is very important and is worth the time to do extensive maintenance and preparation. Remove grain and dust from walls, floors, grates, doors, door ledges, ladders, steps, hollow tubes and channels. Vacuum or brush all surfaces thoroughly. Remove all dust and debris from fans, exhausts, aeration ducts and under slotted floors as much as possible. Dispose of debris away from the storage facility and in a lawful manner. Removing this debris from the premises makes certain insect activity does not return to the storage area from this material.

Insects harbor in grass and weeds on the outside of storage bins, particularly if spilled grain has collected there. Keeping grass cut to a minimum length is an important step in preventing the insects from moving inside the grain bins. Bare dirt or gravel is preferred next to a bin. Grass may attract insects. No matter what the surface, spilled and residual grain must be removed and disposed of, or the problem will only multiply.

Maintenance

Once the equipment and area has been cleaned, conduct a thorough inspection for leaks or areas where moisture can enter the bin. Caulk or repair any suspicious areas. It is also a good time to check belts, bearings, belt alignment, safety shields and guards, temperature cables and electronic equipment. Electrical cords, connections and cables must be inspected for mouse damage, corrosion, frayed wires or bare areas in wiring. Corroded connections can cause malfunction of electrical equipment and can be hard to locate later on. Thorough inspection and repairs now can save time and money later. Test all aeration fans. If repairs and replacements need to be made, there is time for the contractor or sales company to make these adjustments before the aeration system at harvest time is needed.

Insecticide Application

After the sanitation and maintenance steps have been completed, insecticides for empty-structure treatments can be wise investments. If there are areas that are hard to clean, such as under perforated flooring, these insecticides can be very helpful in controlling insect activity. If there is a history of insect problems in a structure, these treatments can be helpful to break the cycle of infestation. It is best to give empty structure treatments two weeks to work before loading with grain. Allow at least 24 hours for liquid sprays to dry before loading the grain. More time—up to two weeks—is the best schedule. Perimeter sprays can reduce infestation entry from outside the structure. A heavily infested structure may require insecticide fumigation before treatments will help. Insecticide fumigation generally uses phosphine gas and must be applied by certified fumigation specialists that are licensed in your state. After these initial infestations are controlled and sanitation and maintenance steps have been completed, the empty structure sprays can do the job as protectants and prevention. Tables 1 and 2 show a list of insecticides approved for empty structure treatments and perimeter sprays.

It is the **law** to read the labels and follow instructions on the insecticide containers. These change from time to time, so reading the label every time insecticides are used is important.

It is important to check with the buyer of the grain, especially in specialty crops, to make sure they do not have restrictions on insecticide use on the commodities they buy.

Be sure to use insecticides as they are intended, within their **expiration date** and as the **label instructs**. It is especially important is to wear personal protective equipment as instructed on the label when mixing and applying insecticides. **Never** leave insecticides in the vicinity or reach of children or people not trained in insecticide use and application.

Harvest and Handling Tips

Paying close attention to details during harvest and in handling the grain can help preserve grain quality and storage success. Do not load new grain on top of old grain. Broken kernels and trashy grain are highly susceptible to insect and mold attacks. Make sure combines are set correctly to reduce trash and damaged seeds. Have grain cleaned prior to loading it into the bin, if necessary. If fines and broken seeds must be removed once the grain is in the bin, coring of the bin can be useful. Coring brings the small particles in the middle out through the unloading system to be disposed of or distributed more evenly back into the bin. Removing fines makes aeration systems work more efficiently and breaks up insect-infested trouble areas. Never load a grain bin past the sidewall height

and level the top surface as much as possible. Use a spreader, if available, or core the bin to reduce the center peak height. Bins filled to the peak have more condensation problems, poor aeration distribution, greater potential for insect infestation, are more difficult to fumigate and are hard to monitor....not too mention the possible instability and damage to the bin.

Safety

Safety is important around all agricultural machinery and structures. All workers should know how to de-energize and turn off equipment and should be trained in the proper use of equipment. Proper protective equipment must be worn. Fire extinguishers must be close by and functioning. An emergency number should be available at all times and the location of the number should be known by all workers. When workers can react quickly and call for help efficiently, lives are saved. While preparing facilities is essential for successful storage, so is worker safety training. Combining facility preparation with proper training will make harvest and storage time more profitable and much safer for everyone involved. One tragic accident can take away the success of a harvest and storage year.

Information on safety training is available through your county Extension offices and through the Stored Products Research and Education Center at Oklahoma State University.

Table 1. Insecticides for Empty Grain Bins and Flat Storages.

<i>Product</i>	<i>Application</i>	<i>Notes</i>
Centynal	0.25 - 1.5 fl oz/gal water/1,000 ft ²	Do not allow runoff to occur.
Diacon IGR	1/30 fl oz/gal water/1,000 ft ²	An insect growth regulator that will not kill adults but prevents development of larvae into adults. May apply as a tank mix with Centynal.
Diacon-D IGR	Duat applied at 1.5 oz/1,000 ft ²	An insect growth regulator that will not kill adults but prevents development of larvae into adults. Wear dust mask and protective gloves. Use a bulb duster or other suitable equipment to apply.
Diatomaceous Earth (Dryacide, Insecto, Protect-It, etc.)	Dust application varies by product.	Wear goggles and dust mask. Apply with hand or power duster. May apply through aeration fan.
Diatomaceous Earth (Dryacide, Insecto, Protect-It, etc.)	Slurry application varies by product.	Spray evenly to just below the runoff point
EverGreen Pyrethrum Concentrate	6 - 16 fl oz/gal water/750 ft ²	Apply as course wetting spray.
EverGreen Crop Protection EC 60-6	1 qt with 3 - 7.5 gal water and apply at 1 gal/750 ft ²	
Pyronyl Crop Spray	1 pt with 7.1875 gal water and apply at 1 gal/750 ft ²	
Storcide II	1.8 fl oz/gal water/1,000 ft ²	Only spray from outside the bin or warehouse using automated spray equipment. Only downward spray is permitted. Not for use in corn storage.
Suspend SC	0.25 - 1.5 fl oz/gal water/1,000 ft ²	Do not allow runoff to occur.
Tempo SC Ultra	0.27 - 0.54 fl oz/gal water/1,000 ft ²	Do not allow runoff to occur.
Tempo Ultra WP	10 - 20 g/gal water/1,000 ft ²	Do not allow runoff to occur.
FUMIGANTS		
Aluminum or magnesium phosphide	Various rates	Must be applied by a certified applicator. Must have a Fumigation Management Plan in place.
ECO ₂ FUME Fumigant Gas	Cylinderized mixture of phosphine (2%) and carbon dioxide (98%) applied at 0.4 - >36 lbs/min	Must be applied by a certified applicator. Must have a Fumigation Management Plan in place.
VAPORPH ₃ OS Phosphine Fumigant	Cylinderized 99.3% phosphine gas that is blended with air on-site with special equipment	Must be applied by a certified applicator. Must have a Fumigation Management Plan in place.
ProFume Gas Fumigant	Cylinderized 99.8% sulfuryl fluoride applied using the Fumiguide	Must be applied by a certified applicator. Must have a Fumigation Management Plan in place.

Table 2. Insecticides for Perimeters of Structures.

Centynal	0.25 - 1.5 fl oz/gal water/1,000 ft ²	Treat band six feet to 10 feet wide around structure and treat foundation to a height of two feet to three feet.
EverGreen Pyrethrum Concentrate	0.25 - 0.5 fl oz/gal water	Kills on direct contact with insects. Degrades rapidly in sunlight.
Suspend SC	0.25 - 1.5 fl oz/gal water/1,000 ft ²	Do not allow runoff to occur. Treat band six feet to 10 feet wide around structure and treat foundation to a height of two feet to three feet.
Tempo SC Ultra	0.27 - 0.54 fl oz/gal water/1,000 ft ²	Do not allow runoff to occur. Treat band up to 10 feet wide around structure and treat foundation to a height of two feet to three feet.
Tempo Ultra WP	10 - 20 g/gal water/1,000 ft ²	Do not allow runoff to occur. Treat band up to 10 feet wide around structure and treat foundation to a height of two feet to three feet.

The pesticide information presented in this publication was current with federal and state regulations at the time of printing. The user is responsible for determining that the intended use is consistent with the label of the product being used. Use pesticides safely. Read and follow label directions. The information given herein is for educational purposes only. Reference to commercial products or trade names is made with the understanding that no discrimination is intended and no endorsement by the Cooperative Extension Service is implied.

Oklahoma State University, in compliance with Title VI and VII of the Civil Rights Act of 1964, Executive Order 11246 as amended, and Title IX of the Education Amendments of 1972 (Higher Education Act), the Americans with Disabilities Act of 1990, and other federal and state laws and regulations, does not discriminate on the basis of race, color, national origin, genetic information, sex, age, sexual orientation, gender identity, religion, disability, or status as a veteran, in any of its policies, practices or procedures. This provision includes, but is not limited to admissions, employment, financial aid, and educational services. The Director of Equal Opportunity, 408 Whitehurst, OSU, Stillwater, OK 74078-1035; Phone 405-744-5371; email: eeo@okstate.edu has been designated to handle inquiries regarding non-discrimination policies; Director of Equal Opportunity. Any person (student, faculty, or staff) who believes that discriminatory practices have been engaged in based on gender may discuss his or her concerns and file informal or formal complaints of possible violations of Title IX with OSU's Title IX Coordinator 405-744-9154.

Issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Director of Oklahoma Cooperative Extension Service, Oklahoma State University, Stillwater, Oklahoma. This publication is printed and issued by Oklahoma State University as authorized by the Vice President, Dean, and Director of the Division of Agricultural Sciences and Natural Resources and has been prepared and distributed at a cost of 20 cents per copy. 1215 GH