



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

Table 2. Insecticides for Perimeters of Structures.

Product	Application	Notes
Centynal Insecticide (deltamethrin)	0.25 - 1.5 fl oz/gal water/1,000 ft ²	Treat band up to 3 feet wide ^a around structure and treat foundation to a height of 2 to 3 feet.
Centynal EC Insecticide (deltamethrin)	0.25 - 1.5 fl oz/gal water/1,000 ft ²	Treat band up to 3 feet wide ^a around structure and treat foundation to a height of 2 to 3 feet.
D-Fense SC Insecticide (deltamethrin)	0.25 - 1.5 fl oz/gal water/1,000 ft ²	Treat band up to 3 feet wide ^a around structure and treat foundation to a height of 2 to 3 feet.
Suspend SC (deltamethrin)	0.25 - 1.5 fl oz/gal water/1,000 ft ²	Do not allow runoff to occur. Treat band up to 3 feet wide ^a around structure and treat foundation to a height of 2 to 3 feet.
Tempo SC Ultra (β-cyfluthrin)	0.27 - 0.54 fl oz/gal water/1,000 ft ²	Do not allow runoff to occur. Treat band up to 3 feet wide ^a around structure and treat foundation to a height of 2 to 3 feet.
Tempo Ultra WP (β-cyfluthrin)	10 - 20 g/gal water/1,000 ft ²	Do not allow runoff to occur. Treat band up to 3 feet wide ^a around structure and treat foundation to a height of 2 to 3 feet.

^a Although the label states treat band up to 10 feet, the Oklahoma minimum standards for pesticides restricts application use up to 3 feet from the structure on a porous substrate such as bare ground, gravel or turf. Do not use this product on concrete or asphalt around the structure.

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.

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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 (active ingredient)</i>	<i>Application</i>	<i>Notes</i>
Centynal Insecticide (deltamethrin)	0.25 - 1.5 fl oz/gal water/1,000 ft ²	Do not allow runoff to occur.
Centynal EC Insecticide (deltamethrin)	0.25 - 1.5 fl oz/gal water/1,000 ft ²	Do not allow runoff to occur.
D-Fense SC Insecticide (deltamethrin)	0.25 - 1.5 fl oz/gal water/1,000 ft ²	Do not allow runoff to occur.
Diacon IGR [(s)-methoprene]	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 IGR <i>Plus</i> (deltamethrin and (s)-methoprene)	0.25 - 1.5 fl oz/gal water/1,000 ft ²	An insect growth regulator <i>Plus</i> adulticide.
Diacon-D IGR [(s)-methoprene]	Dust 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.
Dryacide 100 (diatomaceous earth)	Dust: 1 - 3 lb/1,000 ft ² Slurry: 1.5 lb/gal water/667 ft ²	For dust, wear goggles and respirator and apply using mechanical dust applicator or power equipment. For slurry, apply evenly for thorough coverage to the point of runoff.
EverGreen Crop Protection EC 60-6 (pyrethrins and piperonyl butoxide)	1 qt with 3 - 7.5 gal water and apply at 1 gal/750 ft ²	Exit area immediately and remain outside the treated area until aerosols have dispersed.
EverGreen Pyrethrum Concentrate (pyrethrins)	6 - 16 fl oz/gal water/750 ft ²	Apply as course wetting spray.
Insecto (silicon dioxide from diatomaceous earth)	Dust: 1 lb/1,000 ft ²	Wear respirator and apply dust two to three days before filling structure with grain.
NyGuard IGR Concentrate (pyriproxyfen)	8 - 12 ml/gal water/1,500 ft ²	An insect growth regulator that will not kill adults but prevents development of larvae into adults. May mix with an adulticide to control adult insects.
Protect-It (diatomaceous earth and silica gel)	Dust: 0.6 lb/1,000 ft ² Slurry: 1.5 lb/gal water/667 ft ²	Apply two weeks before filling structure with grain. For dust, apply through a running aeration fan or use a portable blower. For slurry, spray as a fine mist.
Pyronyl Crop Spray (pyrethrins and piperonyl butoxide)	1 pt with 7.375 gal water and apply at 1 gal/750 ft ²	Thoroughly treat all cracks and crevices.
Storcide II (chlorpyrifos-methyl and deltamethrin)	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 (deltamethrin)	0.25 - 1.5 fl oz/gal water/1,000 ft ²	Do not allow runoff to occur.
Tempo SC Ultra (β-cyfluthrin)	0.27 - 0.54 fl oz/gal water/1,000 ft ²	Do not allow runoff to occur.
Tempo Ultra WP (β-cyfluthrin)	10 - 20 g/gal water/1,000 ft ²	Do not allow runoff to occur.

Fumigants

Aluminum or magnesium phosphide products	Various rates	Must be applied by a certified applicator. Must have a Fumigation Management Plan in place.
ECO2FUME Fumigant Gas (phosphine 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.
VAPORPH3OS Phosphine Fumigant (phosphine gas)	Cylinderized 99.3% phosphine gas that is blended with air onsite with special equipment	Must be applied by a certified applicator. Must have a Fumigation Management Plan in place.
ProFume Gas Fumigant (sulfuryl fluoride)	Cylinderized 99.8% sulfuryl fluoride applied using the Fumiguide	Must be applied by a certified applicator. Must have a Fumigation Management Plan in place.