

# STORED PRODUCTS RESEARCH & EDUCATION CENTER



## *OSU TIPS on STORED GRAIN*

The OSU Stored Product Management Newsletter

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Storing grain in Oklahoma often results in damage due to severe insect and mold problems. Managers may not be aware of the serious damage until they market the grain.

Then they incur financial losses that include:

- weight loss,
- cost of pest control,
- grade discounts, and
- market rejection.

Damage caused by insects and molds in stored grain can go unnoticed until the grain is removed from storage. Implementation of an Integrated Pest Management (IPM) system will help keep pests below economically damaging levels and minimize storage costs.

### **IPM IS CRITICAL TO SUCCESSFUL GRAIN MANAGEMENT**

**By Gary Gilbert, Area-Wide Project Manager**

The Oklahoma State University Area-Wide Project, in conjunction with Kansas State University and USDA/ARS, has collected four years of practical data as part of Integrated Pest Management (IPM). They have monitored and documented actual in-storage insect population growth while sampling many types of Oklahoma commercial grain storage over extended periods of time and conditions. The collected information has been incorporated into a large database from which a pest risk prediction model has been statistically developed.

The practical application for the model has been to assist grain management decisions based on predictable outcomes to certain responses, even if a response is not to take action. Until now, alternative testing to preventative measures could only be tested on a risky scale and too often ended with inconclusive results. Grain Management has found it difficult to generate good documented facts from which to make decisions and draw conclusions.

Soon the new more user friendly version Stored Grain Administrator (SGA) program, called SGA Pro, will be released to Oklahoma Elevators. SGA Pro can assist the grain manager in documenting success and avoiding expensive consequences. The elevator manager will be able to demonstrate savings as well as the cost justification of successful preventative measures. The cost of sampling can be rewarded by the knowledge of what might or might not happen by action, inaction or delaying action.

The Area-Wide Project has observed that one of the more cost-effective measures for successful grain management is to reduce pre-harvest insect populations as low as possible. SGA Pro software demonstrates that in just months residual insects can introduce damaging populations into new crop wheat.

Managers find it difficult to devote the required time to adequately care for stored grain during the critical early fall months. Consequently, good housekeeping and sanitation before harvest rewards them handsomely by delaying reinfestation. Implementing good IPM practices right now can more effectively make use of precious time and expensive fumigants next fall.

## **WHAT INFLUENCES STORABILITY?**

**By Gerrit Cuperus, Extension Entomologist**

Important factors affecting stored grain insect and mold population dynamics are:

- moisture content,
- temperature levels,
- time grain is in a susceptible condition, and
- pest accessibility

### **Temperature**

Temperature is the most important regulatory property in grain storage. Temperatures below 65°F are unfavorable for the development of insects and molds. The OSU recommendation is to maintain the summer grain at 80-90°F or as cool as possible in the summer time.

### **Access**

Residual insects. Sanitation and residual sprays are keys to minimizing those insects that remain from last storage season.

Immigrating insects. Most stored product insects are good fliers. Insects move between storage structures, entering through openings, especially aeration fans and eaves. Sealing eaves and screening aeration vents limit insect access.

### **Insect Ecology and Management**

*There is no scientific evidence that stored grain insects come from the field with harvested wheat.* Therefore, sanitation to reduce infestation already present in and around storage facilities is crucial. As we approach harvest, reducing the number of insects is very important.

## **Sanitation**

Sweep up and remove all debris from the bin. Remove and destroy any grain from beneath, around or near the bin area that may harbor or provide a food supply for stored grain pests. A shop vacuum, broom and scoop are very useful in a cleanup job, and all collected material should be discarded properly.

Chloropicrin may be used as a “clean-out” fumigant for empty bins and applied to the boots of elevators, beneath false floors, etc. to kill any remaining insects. Since Chloropicrin is a fumigant, placarding is required. This fumigant is significantly heavier than air, which makes it ideal for fumigating aeration ducts, sub-floors, and areas under the aeration floors. Seal and placard the access doors **and don't forget the aeration fans.**

## **Residual Bin Sprays**

Residual insecticides should be used to spray the inside and outside surfaces of storage facilities. Residual sprays also create a barrier for migrating insects and any residual insects that were not removed during the cleanup operation.

The following are available residual pesticides:

Tempo 20WP  
Tempo 2EC  
Methoxychlor 25% EC  
Reldan 4E  
Diatomaceous earth

These insecticides should be applied liberally to all seams, cracks, crevices, floors, ceilings, and walls of the bin to the point of runoff. Be sure to apply to “sheltered” areas, such as false floors, aeration ducts, and unload conveyors. The best time to apply a residual spray is two to three weeks before new grain is binned. We recommend keeping the bin sealed to reduce migration. The outside walls and floor foundations should be sprayed as well as a perimeter spray around the outside of the bin.

## **Diatomaceous Earth**

Recommended application of DE products includes treating the first loads of grain in the bottom of the bin and the last load. This is designed to reduce migration of insects into the grain mass. There are several trade names available including: Insecto, and Protect-it.

## **Dichlorvos Strips**

Dichlorvos (vaponal) is presently cleared for use in headspaces of grain storages. Dichlorvos strips should be placed after harvest to reduce Indianmeal moth adults as they migrate and reproduce, therefore breaking the life cycle. It is recommended that 1 strip/1000 ft<sup>3</sup> be used. For small bins (<25,000), 2-3 strips should be used. If Indianmeal moth has been a historical problem, strips should be used in the summer and the next spring.

## RESISTANCE TO CERTAIN INSECTICIDES

Stored grain insects have developed pesticide resistance to stored grain insecticides.

Many of our stored grain insects are resistant to malathion. **OSU does not recommend malathion.** Work done by Carl Reed (K State) and Gerrit Cuperus (OSU) showed the bins treated with malathion increased insects compared to untreated control. (Resistance is the ability of insects to tolerate a dose lethal to normal populations). The red flour beetle and lesser grain borer have shown high resistance to **Malathion and it is not recommended.** The lesser grain borer has showed moderate resistance to Reldan. **Do not use Reldan to control lesser grain borer.**

Volume 2 No. 2 of Stored grain OSU tip\$ focuses on harvest issues. Sanitation is critical as we approach harvest. Reducing the number of insects is critical as we approach harvest.

### Where do most of our pests come from?

Mold spores – are everywhere. If you provide the correct moisture content you will have molds. Mold requires about 15% moisture or higher.

Insects – Reducing the population prior to storing clean, new grain is important. Most of our stored grain insects are good fliers and key places to look are points of access such as doors, aeration ducts. In Vol. 1 No. 1 I shared data from a graduate student who studied migration into metal steel bins.

Table 1. Insects collected in sticky traps on steel bins at an OK grain elevator.

Bin wall location	Trap catch (Insects/trap)
Eaves	4.89
2/3 height	2.78
1/3 height	2.36
Ground	2.18

Taken from Fact Sheet FS-7180

### Pre-harvest control

Sanitation and residual sprays are keys to minimizing populations, residual populations and insects entering storage facilities. Openings, especially aeration fans and eaves, or for those insects that remain from last storage season are prime areas of concern. When not in use, sealing aeration fans limits insect access.

## FUMIGATION WORKSHOP DATES SET FOR THE STORED PRODUCT RESEARCH AND EDUCATION CENTER (SPREC)

The 2002 fumigation workshops will be held at SPREC on August 13, 14, or 15. You will receive a separate mailing for this. The workshop will highlight lots of hands on experiences including sealing techniques and new fumigation techniques. The attendees will be treated to a tour of future research and education. Newly developed phosphine application techniques will be highlighted including cylinderized phosphine and phosphine generation cabinets. The new Fumigation Management Plan will be highlighted and templates will be distributed for attendees.

There will be a focus on respiratory protection and phosphine monitoring including demonstrations of new electronic sensors

**USDA SUSTAINABLE AGRICULTURE RESEARCH AND EDUCATION GRANT**  
**By Ron Noyes, Extension Agricultural Engineer, USDA SARE Project Leader**

The OSU Stored Products Group received a 1.5 year USDA Sustainable Agriculture Research and Education (SARE) Grant in April 2002. Ron Noyes, Extension Agricultural Engineer is the Project Leader.

The primary objective of the SARE Proposal is to develop model grain storage facilities that utilize a new method of suction aeration and closed loop fumigation for storing grain at three commercial grain elevators and three farms in both Oklahoma and Texas. Grain storage facilities at these 12 facilities will be monitored for grain insects and grain temperature management to compare manual vs automatic aeration control of conventional suction aeration systems.

Concrete silos without aeration at several of the commercial elevators will receive suction aeration systems that operate at lower airflow rates than conventional aeration. Closed loop fumigation (CLF) will also be installed in conjunction with new suction aeration systems.

Part of the steel grain bins on all six farms will receive automatic aeration controllers, temperature monitoring systems and CLF during Year 1. Other bins will use conventional management methods, serving as "Check" bins. These bins will be monitored and compared with bins using SARE technology. CLF installations will involve sealing the grain storage structures, increasing the level of efficacy of future fumigations.

The CLF systems at all farm and elevator facilities will be fumigated using a new external phosphine gas release cabinet (PGRC) developed by Ron Noyes to eliminate confined space bin entry at farm and elevator storage. The PGRC technology should be an excellent tool for commercial fumigators as it will minimize the size of work crews and allow them to provide full service management to more farm and elevator customers. PGRC units will allow lower initial dosages followed by redosing as needed based on headspace gas levels, which can be monitored at ground level at the CLF blower or the inlet to the PGRC unit.

CLF with PGRC has special benefit for concrete elevator facilities as it will allow fumigation of concrete elevators without "turning" grain, reducing grain damage, dust emissions, housekeeping requirements and will save handling equipment wear and labor. Elevator and farm safety will be enhanced. Fumigation management plans will be developed for all facilities.

During Year 2, field days at the cooperator farm and elevator test sites will be conducted to present the data to OK and TX elevator operators and producers. The data will also be used in fact sheets and will be available on the OSU Stored Product Web Site. Once the project is complete, producers and elevator managers will continue to use the SARE technology to improve their grain handling operations.

**RELDAN STATUS**

**By Jim T. Criswell, Pesticide Coordinator**

Dow AgroSciences and Gustafson have requested from EPA voluntary cancellation of chlorpyrifos-methyl (Reldan). This was done on April 24, 2002.

This was in response to EPA's Tolerance Reassessment and Risk Mitigation Decision. EPA has determined there was not a dietary risk from the use of Reldan; however, EPA had worker exposure concerns.

EPA has stated that they will not remove Reldan from the marketplace until a suitable replacement is registered for use. To that end, Gustafson is working to develop a product that uses one-half the rate of Reldan in combination with another insecticide.

It appears that the use of Reldan at the 6ppm rate will be phased out in the near future. "Near" may be as soon as six months or as long as over a year.

To date, Reldan dust has been voluntarily canceled and removed from the market place. The Reldan liquid is still legal to use.

The OSU Stored Product IPM team and Pesticide Applicator Education program will keep you informed of this situation.

**GRAIN ELEVATOR AND PROCESSING SOCIETY (GEAPS) MEETING HELD AT THE STORED PRODUCT RESEARCH AND EDUCATION CENTER (SPREC) ON THURSDAY, MAY 9, 2002.**

**By Ron Noyes, Extension Agricultural Engineer**

Fifteen members of the Cherokee Strip Chapter of GEAPS International met at the OSU Stored Products Research and Education Center (SPREC) for a tour and program conducted by members of the OSU Stored Product Group) on Thursday, May 9, 2002 from 6:00-9:30 pm. Gerrit Cuperus, OSU and Lloyd Dayton, ADM/Farmland coordinated the meeting.

Ron Noyes, Extension Agricultural Engineer welcomed the GEAPS members to SPREC. After dinner, supplied by the OSU Stored Product Group, Edmond Bonjour, Manager of the SPREC facility, conducted a tour of the grain handling and storage center and the 500 bu research bin site, then he took the group through the Center Building.

After the tour, Mr. Bonjour presented a power point computer slide show of the 12 months construction of SPREC from October 11, 2000 Ground Breaking to the October 11, 2001 dedication of SPREC. Tom Phillips, Research Entomologist on Stored Products followed up with a discussion of current and future research projects that are being conducted at SPREC.

Mr. Robert Winters, President of the Cherokee Strip Chapter of GEAPS conducted the election of officers for 2002-2003, and then adjourned the meeting.

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