Integrated Pest & Crop Management

Begin Monitoring On-Farm Stored Grains for Insect and other Possible Problems

By Wayne Bailey

Warmer than normal fall temperatures may contribute to the development of stored grain insect populations in on-farm grain storage structures. If grain bins and handling equipment were not sanitized prior to grain fill and the grain was moved to storage without receiving a preventative insecticide application, insect infestations can develop in as little as 3 to 6 weeks following initiation of grain storage. In normal years, cool fall temperatures usually allow the stored grain to be cooled to 50 - 55 degrees Fahrenheit, which causes any insects infesting the grain to become inactive.

The high value of grain crops held in on-farm storage can best be protected by implementation of a monitoring program for detection of insect infestations and other problems within storage structures. Producers should monitor stored grains regularly to assess grain moisture, temperature, and determine whether insect pests are present. Grain should be monitored a minimum of once each month during the winter months of November through April and at least twice per month during the summer months of May through October. Areas of the grain mass most frequently infested include the grain surface and central core. Special attention should be given to these areas when sampling, but other areas of the grain mass should not be ignored.

Scouting methods differ by location in the bin and the specific type of insect present. To determine if insects are present, producers should visually inspect the top of the grain mass by looking through the roof access door. A sour smell, grain clumped together, condensation present on the inside surface of the bin roof, webbing on the grain surface, or the presence of insect larvae, adult beetles or moths all indicate the presence of an insect infestation. If an insect infestation is found on the surface of the grain mass and webbing is present, this usually indicates the presence of Indian meal moth. As this insect only damages the upper 12-14 inches of the grain mass, removal of the webbing and damaged grain along with an application of an appropriately labeled insecticide are recommended (See section 2B of summary for labeled insecticides). Pest strips (dichlorvos or DDVP) hung above the grain mass inside the storage structure may help prevent Indian meal moth infestations by controlling the moths of this common pest as they enter the storage structure. If no insects, webbing or foul grain odors are found during the inspection, then it is unlikely that Indian meal moths are present in high numbers. If the grain was properly leveled and the grain surface treated (capped) with an insecticide after filling of the storage structure the previous fall, it is best not to break or disturb the protective cap of insecticide previously applied at that time.

An inspection of grain from the interior of the grain mass is also needed. Monitoring of the grain mass is best achieved through the side access panel by using plastic tube traps, probe traps, and sticky pheromone traps. These traps are inserted into the grain mass for a certain period of time and then retrieved. These types of traps will attract insects and help determine the kind and number of insects present. If traps are unavailable, a quick, but less accurate method of sampling the grain mass for

Continued on page 164

In This Issue

Begin Monitoring On-Farm Stored Grains for Insect and other Possible Problems
Page 163

Forage of the Month: White Clover
Page 166

Crop Management Conference - Nov. 30 - Dec. 1
Page 167

Weather Data for the Week Ending November 15, 2011
Page 169

Begin Monitoring On-Farm Stored Grains for Insect and other Possible Problems

continued from page 163

insects, can be accomplished by direct observation of grain removed from the side door using a grain probe. Deep probes should be collected from several locations in the bin with the collected grain placed in a quart glass jar, plastic bag, or some other container through which insects can be seen if they are present in the grain. These containers of grain should be placed in a warm area to allow the grain to warm to at least 60 degrees F or higher in order to stimulate insect activity. Although there are no reliable thresholds for most insects found in stored grains, it is usually considered that if insects are found in the 1 quart samples of grain collected, the grain content of the bin should be either quickly used or treated (fumigated) to kill insects present in the grain and prevent excess loss of grain quality when stored at summer temperatures.

If infestations of various flour beetles, grain weevils, or other stored grain beetles are found infesting the cold grain mass, then the immediate use of grain for livestock feed or some other use where the insects do not cause a problem in the end product is recommended. The grain should be fed to livestock prior to the arrival of summer temperatures when insect activity increases. If the grain is to be retained into the summer, then fumigation of the entire grain mass is a second, but less attractive management option. Producers can legally fumigate grain bins in Missouri providing they possess a valid private pesticide applicator license when purchasing and using the fumigants. However, due to the extreme hazard associated with the very poisonous gases emitted by the fumigation pesticides and the extreme danger if used improperly, it is strongly recommended that a professional fumigator be contracted to fumigate grain bins and other grain storage structures. A third option would be to move the grain out of the storage facility immediately after the grain has been warmed in the spring. The grain would be moved to another storage structure with the grain being treated with a recommended insecticide as the grain is moved (see section 2A of the summary for labeled insecticides). This method of insecticide application should provide satisfactory insect control on a short term basis. Of these three options, immediate use of the grain as livestock feed is generally the best option. Once the grain in removed from the bin, sanitation procedures should be implemented and the empty bins treated with an approved insecticide both inside and out.

All insecticides for stored grain insects have very specific labeled uses so special attention must be given when selecting an appropriate insecticide. Some insecticides are labeled for use in empty grain bins, but are not labeled for use on grain. Some insecticides are labeled for wheat only or corn only, whereas others may be labeled for both. Be sure to read and follow all insecticide label instructions, restrictions, and precautions when using insecticides for management of stored grain insect pests.

The following summary includes a list of labeled insecticides, use rates and labeled uses. This information was revised November/2011.

Farm Stored Grain Management Summary

1. **WHAT TO DO BEFORE HARVEST**

A. **SANITATION**. Thoroughly clean all grain residues from bins. Remove all residues from areas around the bins and any nearby feed bunks or feed storage areas. Remove all grain residues from combines, trucks, and augers. These residues will be the main sources of insect infestations for farm stored grain. This is a very important part of a good grain management program and can prevent many stored grain insect problems.

B. **RESIDUAL SURFACE SPRAYS TO EMPTY BIN.** After all debris and grain residues have been removed, an application of a residual insecticide should be made to the complete inside of the bin. This insecticide should also be applied around the exterior and to all areas where residues were removed. Spray all surfaces until wet; usually one gallon will cover 1,000 square feet prior to storing or handling grain. Use a course spray at a pressure of at least 30 psi. Insecticides are most effective if temperatures are 60F or higher. The labeled effective compounds are:

a. Beta-Cyfluthrin (**Tempo SC Ultra - 0.27 to 0.54 fl oz per 1 gallon of Water**) for application to empty bin surfaces only, not to grain.

b. Chlorpyrifos-methyl and deltamethrin (**Storcide II – 1.8 fl oz per 1 gallon of water**) Warning-This insecticide should only be applied from outside the bin using automated spray equipment. Do not enter the bin until all sprays have dried.

c. Malathion (**Malathion 5E - several products by various formulators, check specific application rates.**) Although labeled, the efficacy of this product is questionable. Some stored grain insect populations, such as Indian meal moth, have developed resistance to this insecticide. **Note: Malathion 5 E not labeled for rice.**

2. **AT HARVEST GRAIN PROTECTANTS**

A. **PROTECTANTS FOR APPLICATION TO GRAIN.** If grain is to be held in storage into the summer

Continued on page 165

Begin Monitoring On-Farm Stored Grains for Insect and other Possible Problems

continued from page 164

months of the year following harvest or longer, then a grain protectant applied at harvest is recommended. Formulated sprays, drips or dusts are typically applied to moving grain stream as it goes into storage vessel.

a. Chlorpyrifos-methyl + deltamethrin (**Storcide II**) – dilute labeled rate of Storcide II in 5 gallons of water and apply formulated spray into grain stream. Five gallons of formulated spray applied to 1,000 bushel of grain. **Storcide II** rates per 1,000 bushel of grain crop are as follows:

Barley	**9.9 fl oz per 1,000 bushels;**
Oats	**6.6 fl oz per 1,000 bushels;**
Rice	**9.3 fl oz per 1,000 bushels**
Sorghum	**11.6 fl oz per 1,000 bushels**
Wheat	**12.4 fl oz per 1,000 bushel**

b. Pirimiphos-methyl (**Actellic 5E – 9.2 to 12.3 fl oz per 5 gallons of water per 30 tons of grain (approximately 1071 bu.)**. Note: labeled for corn and sorghum only.)

c. Malathion (**Malathion 6% Dust – 10 lbs/1,000 bushels of grain.**) Insecticide dust best applied through dust applicator into grain stream. Labeled for barley, corn, oats, rye, and wheat. Malathion not labeled for use on rice.

B. **SURFACE TREATMENTS OR TOPDRESSING AFTER BIN FILL IS COMPLETE.** Fill bins only to height of side walls and level grain prior to applying surface or top-dress insecticide treatments.

a. *Bacillus thuringiensis* (**Biobit HP and Dipel DF – 1 lb/ 10-20 gal/1,000 square feet**). Most often used for Indian meal moth larval control. See label for specific instructions and target pests.

b. Diatomaceous earth (**Insecto at 4 lbs/1,000 square feet and Protect-It at 40 lbs/1,000 square feet if grain not previously treated with this protectant**). See label for specific instructions and target pests.

c. Pirimiphos-methyl (**Actellic 5E – 3.0 fl oz per 2 gallons of water per 1,000 square feet of grain surface.** Note: Labeled for corn and sorghum only.)

C. **GRAIN FUMICANTS.** Recommend use of commercial pest control specialist when using grain fumigants for stored grain insect control.

a. Aluminum Phosphide (phosphine gas - restricted use) (**Phostoxin, Fumitoxin, Phoskill, Phosteck, Phosfume Weevil-cide – see specific labels for rates of pellet or tablet use**).

3. **MONITORING FOR INSECT PESTS IN STORED GRAIN MASS** (See previous text)

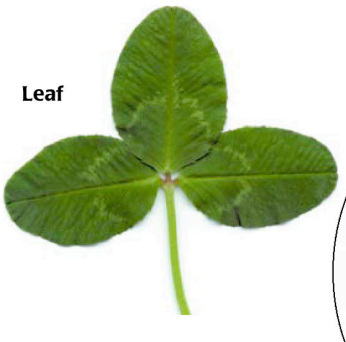
Color images of common stored grain insects can be found on the Commercial AG Electronic Bulletin Board at http://agebb.missouri.edu/storage/pests/insect.htm.

Wayne Bailey
baileyw@missouri.edu
(573) 864-9905

Forage of the Month: Clover, white (*Trifolium repens* L.)

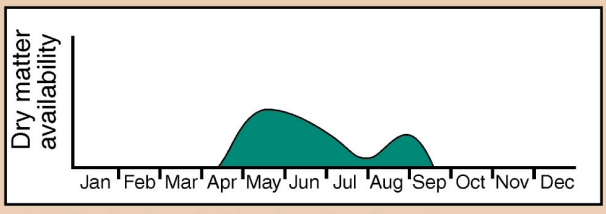
By Rob Kallenbach

White clover is a legume adapted to cool, moist climates. In Missouri, it is presently grown on about 8 million acres of pastureland in combination with perennial coolseason grasses. Like other legumes, the forage it provides is both palatable and nutritious. All cattle relish white clover but have a tendency to overgraze it in mixed pastures. A rotational grazing system helps manage this problem. White clover has good tolerance to poorly drained soils, but it is not drought-tolerant. In addition, white clover causes cattle to bloat if used as the only forage in the diet. Because of its high forage quality, white clover has wide application in grazing systems.



Origin: Mediterranean
Adaptation to Missouri: Statewide
Growth habit: Prostrate, stoloniferous, perennial.
Leaf: Palmately trifoliolate, glabrous, arise from stolons on long petioles. Leaflets are ovate or circular with minutely serrate margins, often have V-shaped white mark, underside is shiny.
Stems: Prostrate, glabrous, solid, and develop stolons.
Stipules: Oblong to lanceolate, pale and translucent with a short point.
Flowers: Formed at the end of long peduncles. Florets are white, often tinged pink, forming an almost spherical head.
Fertilization: No N needed if nodulated. Maintain 30 lb P/acre and 250 lb K/acre.
Timing of production: 70 percent of annual production between April 1 and June 30.

When to begin grazing: Often based on the height of the grass in the mixture. Few if any pure stands exist.
When to cut for hay: Not normally cut for hay unless mixed with a companion grass. Harvest based on the maturity of the grass.
Lowest cutting or grazing height: 3 inches
Fall management: Avoid severe grazing from Sept. 15 until the first hard killing frost.



Yield distribution of white clover in Missouri.

Rob Kallenbach
KallenbachR@missouri.edu
(573) 884-2213

Crop Management Conference to be held Nov. 30- Dec.1

By Kevin Bradley

The Crop Management Conference will be held November 30 - December 1 at the Hilton Garden Inn in Columbia. Below is the schedule for the event. If you are interested in learning more information about the conference visit http://plantsci.missouri.edu/cmc.

Crop Managment	Nutrient Management	Pest Management	Soil & Water Management	Professional Development

Day	Time	Hawthorne	Cypress I	Cypress II
Wednesday, November 30	8:30 to 9:20	Keynote Session: Implications of the Federal Budget Problems on Agriculture, Ron Plain		
	9:30 to 10:30	Nematodes that Feed on Corn: What to Make of it All - Greg Tylka	A Decade of Drainage Water Management - Kelly Nelson	How to Choose the Best Nozzles - Greg Kruger
	10:45 to 11:45	Nematodes that Feed on Corn: What to Make of it All - Greg Tylka	A Decade of Drainage Water Management - Kelly Nelson	Maximizing Pesticide Applications with Adjuvants - Greg Kruger
	12:30 to 1:30	Successful Nitrogen Management - Peter Scharf	Corn Stalk Management - Bill Wiebold, Kellar Nelson, Deanna Boardman	How to Choose the Best Nozzles - Greg Kruger
	1:45 to 2:45	Using Nutrient Balance to Inform Nutrient Decisions in Pastures - John Lory	Impact of Climate Variability on Farmer Decisions - P. Guinan & R. Massey	Maximizing Pesticide Applications with Adjuvants - Greg Kruger
	3:00 to 4:00	Successful Nitrogen Management - Peter Scharf	Corn Stalk Management - Bill Wiebold, Kellar Nelson, Deanna Boardman	Weed, Insect, & Disease Mgmt. Update - Wayne Bailey, Laura Sweets, Kevin Bradley
	4:15 to 5:15	Using Nutrient Balance to Inform Nutrient Decisions in Pastures - John Lory	Impact of Climate Variability on Farmer Decisions - P. Guinan & R. Massey	Making the Most of Your Presentation - Tracy Kitchel

Continued on page 168

Crop Management Conference to be held November 30 - December 1

continued from page 167

Crop Managment	Nutrient Management	Pest Management	Soil & Water Management	Professional Development

Day	Time	Hawthorne	Cypress I	Cypress II
Thursday, December 1	8:00 to 9:00	Crop Management After Flooding - Gene Stevens	Slug Management in Field Crops - Ron Hammond	Soil Health of Grass-lands - Alan Franzluebbers
	9:15 to 10:15	The 6 R's of Her-bicide- resistant Weed Mgmt. - Kevin Bradley	Management of Soybean Insects and New Threats - Ron Hammond	Fate of Ergot Alkaloids in Tall Fescue Hay and Silage - Craig Roberts
	10:30 to 11:30	Crop Management After Flooding - Gene Stevens	Slug Management in Field Crops - Ron Hammond	Soil Health of Grass-lands - Alan Franzluebbers
	12:30 to 1:30	The 6 R's of Her-bicide- resistant Weed Mgmt. - Kevin Bradley	Management of Soybean Insects and New Threats - Ron Hammond	Fate of Ergot Alkaloids in Tall Fescue Hay and Silage - Craig Roberts
	1:45 to 2:45	Making the Most of Your Presenta-tion - Tracy Kitchel	Yield Map Data Collection and BMP's - Ken Sudduth and Brent Myers	Land Economics: Market and Leasing Trends - Ray Massey
	3:00 to 4:00	Weed, Insect, & Disease Mgmt. Update - Wayne Bailey, Laura Sweets, Kevin Bradley	Yield Map Data Collection and BMP's - Ken Sudduth and Brent Myers	Land Economics: Market and Leasing Trends - Ray Massey

Kevin Bradley
BradleyKe@missouri.edu
(573) 882-4039

Weather Data for the Week Ending November 15, 2011

By Pat Guinan

Station	County	Weekly Temperature (ºF)						Monthly Precipitation (in.)		Growing Degree Days‡	
		Avg. Max.	Avg. Min.	Extreme High	Extreme Low	Mean	Departure from long term avg.	November 1-15	Departure from long term avg.	Apr. 1 - Oct. 31	Departure from long term avg.
Corning	Atchison	58	36	64	29	46	+4	2.60	+1.45	3913	+488
St. Joseph	Buchanan	58	67	64	31	47	+4	3.39	+2.43	3768	+333
Brunswick	Carroll	60	64	70	28	48	+4	3.69	+2.23	3778	+287
Albany	Gentry	57	29	63	24	43	+1	3.04	+1.89	3611	+261
Auxvasse	Audrain	64	38	74	27	50	+5	3.09	+1.36	3863	+324
Vandalia	Audrain	63	36	74	23	49	+4	2.05	+0.46	3762	+269
Columbia-Bradford Research and Extension Center	Boone	63	37	73	25	50	+4	3.08	+1.60	3801	+142
Columbia-Capen Park	Boone	64	33	75	24	48	+2	3.22	+1.72	3753	-38
Columbia-Jefferson Farm and Gardens	Boone	63	39	73	26	51	+5	3.01	+1.53	3948	+281
Columbia-Sanborn Field	Boone	63	41	74	29	52	+6	3.34	+1.84	4172	+381
Columbia-South Farms	Boone	63	39	74	27	51	+5	3.25	+1.75	3925	+263
Williamsburg	Callaway	65	39	75	24	51	+6	2.61	+0.87	3831	+352
Novelty	Knox	60	34	70	24	47	+3	4.28	+2.66	3534	+120
Linneus	Linn	60	34	69	25	47	+4	4.64	+3.32	3616	+280
Monroe City	Monroe	61	36	72	24	48	+5	3.35	+1.71	3698	+235
Versailles	Morgan	64	40	72	31	52	+5	3.35	+1.72	4162	+398
Green Ridge	Pettis	61	40	71	29	50	+5	4.27	+2.70	3946	+424
Lamar	Barton	63	43	71	33	53	+5	3.34	+1.52	4311	+367
Cook Station	Crawford	65	40	76	23	53	+5	2.18	+0.09	3814	+53
Round Spring	Shannon	66	37	79	23	51	+4	1.97	+0.05	3630	+37
Mountain Grove	Wright	62	42	73	30	52	+5	2.22	+0.18	3855	+283
Delta	Cape Girardeau	63	43	75	28	53	+5	5.59	+3.68	4214	+44
Cardwell	Dunklin	65	46	78	32	56	+6	5.28	+3.56	4639	+83
Clarkton	Dunklin	65	44	77	30	55	+5	4.30	+2.47	4541	+59
Glennonville	Dunklin	65	44	77	30	55	+5	4.72	+2.94	4517	+67
Charleston	Mississippi	64	44	76	28	55	+6	3.90	+2.27	4413	+212
Portageville-Delta Center	Pemiscot	65	47	76	34	56	+6	4.23	+2.47	4755	+235
Portageville-Lee Farm	Pemiscot	65	48	77	32	57	+7	4.19	+2.46	4700	+214
Steele	Pemiscot	66	47	78	34	57	+6	4.37	+2.62	4787	+257

‡Growing degree days are calculated by subtracting a 50 degree (Fahrenheit) base temperature from the average daily temperature. Thus, if the average temperature for the day is 75 degrees, then 25 growing degree days will have been accumulated.

Weather Data provided by Pat Guinan
GuinanP@missouri.edu
(573) 882-5908

Insect Pest & Crop Management newsletter is published by the MU IPM Program of the Division of Plant Sciences Extension. Current and back issues are available on the Web at **http://ppp.missouri.edu/newsletters/ipcmindex.htm**. Mention of any trademark, proprietary product or vendor is not intended as an endorsement by University of Missouri Extension; other products or vendors may also be suitable.

Editor: Kate Riley (rileyka@missouri.edu).