UPCOMING SEMINARS

Here are some training programs that will focus on fumigants and pheromones. You can hear David Mueller speak on the topics of fumigants and/or pheromones on these programs. Call FSS for more information.

Rose Exterminators Technical Seminar, December 8, 1987; Cincinnati; Topic: Pheromones

Fumigation Workshop, University of Kentucky, February 10 & 11, 1988, Louisville; Topics: Fumigants & Pheromones

Fumigation Certification Training, Purdue University, February 16, 1988, West Lafayette, IN; Topics: Fogging & Fumigation

Food Sanitation Institute, Little Rock, AR, February 24, 1988; Topics: Methyl Bromide Update & Pheromones

The 2nd National Conference on Urban Entomology, University of Maryland, College Park, February 21-24, 1988; Topic: Pheromones

Fumigants & Pheromones Conference, Ministry of the Environment, 10th Structural Pest Control Conference, March 7 & 8, 1988, Toronto; Topics: Fumigants & Pheromones

10th Technical Conference, Abell Waco Ltd., May 4 & 5, 1988, Toronto; Topic: Fumigation

Check your pesticide certification license for the date of expiration and plan to attend a continued certification program this year.

TABLETS vs. PELLETS?

In field research with Phostoxin Pellets and Tablets in upright steel and concrete grain bins, pellets will give better gas concentrations at a more economical rate. Pellets will reach a higher concentration than tablets and at a faster rate. That slow breakdown is preferred in the less sealable flat storage but in upright bins, it is not simply a matter of putting in x grams of Phostoxin fumigant. If someone has recommended this, they are not taking into account such factors as generation rate, half loss time, convectional currents, etc. Since 1963 the better distribution of Phostoxin pellets has had a big effect on the outcome of the fumigation.

ARTICLES IN THIS ISSUE

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- New Products: Auer Tubes, Big Poly Storey; Part II
- Fumigation Workshop
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- Grain Storage... The Second Oldest Profession
- Insect Spotlight
- SARA: This is Not a Pretty Girl
- Alert
- Tablets vs. Pellets
CHARLEY STOREY  
INSECT REVISIONS  
IN THE GRAIN  
GRADE STANDARD  

Part II  
By Charlie Storey  

Stored grain insects across the country must have breathed a collective sigh of relief when the Federal Grain Inspection Service (FGIS) issued its Final Rule notice on Insect Infestation in Grain. The original draft would have gradually reduced the tolerance for insects in a representative sample of grain to zero over a four year period. (See Part I, Issue 12). The agency provided a last minute reprieve that will continue to allow a prescribed number of live insects in grain without the grain being defined as "infested" under the Official U.S. Standards for Grain.

"The changes actually made in the more than 60-year old insect guidelines may best be described as modest."

So where's the changes? If you look closely enough you will find that the number of other live insects injurious to grain (OLIs) allowed when no "weevils" are present was reduced from 5 to 2 for the food grains (ie. wheat) and from 15 to 10 for the feed grains (ie. corn).

Obviously, environmentalists will not have to request that stored grain insects be placed on the endangered species list to insure their survival.

For all the past debate and heated rhetoric over the insect "issue" in addition to the more recent congressional direction provided in the Grain Quality Improvement Act of 1986 that instructed FGIS to "revise grain inspection procedures and standards to more accurately reflect levels of insect infestation", the changes actually made in the more than 60-year old insect guidelines may best be described as modest.

Several factors apparently tempered FGIS's decision to move away from the more stringent guidelines originally proposed. Easily the most dominant factor was the overwhelming negative responses FGIS received on the proposal. Many of these responses resulted from efforts by the National Grain and Feed Association to alert its membership to the changes under consideration. Lobbying does work when it is organized and timely.

One letter received described a grain condition as "not seriously infested" which is about as subjective as observing that a girl friend is only slightly pregnant.

Certainly both situations can quickly lead to a much larger and more demanding problem. Another suggested that "weevily simply means that the infestation is at a level such that given proper treatment (fumigation, aeration, etc.) the grain may be restored to sound and wholesome condition." (editor's note: That means they have enough storage to blend the problem away.) There is a sermon hidden here that if the grain has sinned (ie. become infested) redemption and salvation may be achieved by applying proper grain management procedures—steps which would have likely prevented the infestation from developing in the first place.

In general, the grain marketers opposed setting uniform insect tolerances for all grains because in their view "grain used predominately for feed or industrial use should not be burdened by the requirements of rigid wheat constraints". They consider a zero insect tolerance "unrealistic and unattainable" and that such a requirement would likely result in increased pesticide use in grain. And, they view the proposed change to expand the Sample Grade definition to include 10 or more insects (live or dead) per 1,000 grams of grain as counterproductive in that it would discourage disinfection by leaving the grain handler between a choice of having live insects in excess of the tolerance or so many dead insects if he fumigates that the grain would be designated sample grade.

In rebuttal to these arguments I suggest that differentiating insect tolerances between "food and feed" grains implies that these commodities are totally segregated in the market system and that the damage caused by the increased numbers of insects allowed in feed grains is not an important factor affecting the end use of the feed grains. While the two types are not co-mingled, they may be alternately stored in the same bins, handled through the same distribution equipment and shipped through the same mode of transport. With an official allowance of up to 5 times as many insects in corn as allowed in wheat some cross contamination of insect populations would seem inevitable. Seeds are the natural food of stored grain insects. Their feeding is generally concentrated on the most nutritious portion of the seed. The damaged kernel is now left exposed to invasion by molds and other microorganisms. Clearly, the insect damaged kernel is affected both functionally and biochemically irrespective of its end use as human food or animal feed.

Insect infestations are typically composed of both internal and external feeders whose interactions affect development of the total insect complex including reproduction, growth rate, and life span. What an insect eats is often as important as how much he eats.

Nearly 80% of the nonsupervisory personnel and only half of the supervisors had received training in insect identification.

Segregating grain insects into "weevils" and "other live insects, OLIs" assumes a clearly established level of taxonomic skill that simply doesn't exist. In a study conducted by the FGIS Insect Infestation Task Force: Grain Infestation, A Problem/Solution Report, June 26, 1985 shows that nearly 80% of the nonsupervisory personnel and only half of the supervisors had received training in insect identification. Furthermore, more than half of the personnel surveyed believed they needed additional training in the proper methods for detecting insects in grain during inspection examinations. Continuing to perpetuate the myth that there are bad and less bad insects in grain and that our inspection procedures systematically identify and totals the numbers in each category borders close to fraud. It is like taking money to a banker who can't tell the difference between a penny and a dime.

One possible solution to dealing with high numbers of dead insects in grain following fumigation is aspiration or screening.
Commercial aspiration of bulk grain was found to be highly effective in removing insect "carcasses" and body parts and in lifting out severely damaged kernels. FGIS's final rule on insect infestation also revised the Sample Grade definition to include a limit of 32 insect-damaged kernels per 100 grams of wheat. This action brings the number of insect-damaged kernels allowed in line with the Food and Drug Administration's food defect action level which prohibits such insect damaged wheat from being used as food.

CONCLUSION:
Having observed the questionable practice of blending biology and market policy in the grain standards for many years, perhaps the solution recommended by FGIS's Insect Infestation Task Force warrants further consideration. They suggested that the continued dilemma of deciding what level of infestation constitutes infested grain could be resolved by simply reporting the insects found during inspection on the grade certificate. This would afford the market place an opportunity to decide for themselves how many insects and what kind are too many.

Charlie Storey, Consulting Entomologist Retired from the U.S.D.A. Grain Marketing Lab in Manhattan, KS after 30 years in the business tells it like it is.

ALERT
With American Farmers, businesses, and consumers using more than 1 billion pounds of pesticides a year, Sen. Richard Lugar, R-Ind., is co-sponsoring legislation to step up federal review of pesticide ingredients.

The Bill, introduced 7/21/87 by Lugar and Sen. Patrick J. Leahy, D-Vt., would mandate re-registration and EPA review of the nearly 600 pesticide ingredients approved for use before Nov. 1, 1984.

Under the proposal, about half of the costs of accelerating the re-evaluation of pesticides would be paid by the pesticide makers.

Lugar, the ranking GOP member on the Agriculture Committee, pointed out that many pesticides were allowed on the market before the EPA and more stringent testing rules were established.

Source: Indianapolis Star, 7/22/87

MOSQUITOS
There are about 2,700 known species around the world; about 130 occur in North America. They are without doubt the most common and perhaps the most enthusiastic insect to regularly tap into our epidermis. Mosquitoes have been around for about 100 million years, so we were obviously not their first choice, just their latest.

FRED THE FUMIGATOR
BE CAREFUL, FRED!
Fred, you know that you can't drink for 24 hours before, during, or 24 hours after a fumigation!

JIMINY CRICKETT
Believe it or not, bugs may be a partial answer to the available problem of malnutrition and starvation.

The fact is that bugs are good eating and rich in nutritional values. Where beef has 15 to 20 percent protein and chicken, also, about 20 percent, termites, for example, have 40 percent protein and grasshoppers have about 60 percent.

Some successfully experimented bug dishes include bee croutons in salads, termite cookies, termite pilaf, grasshopper bread, and bugs sauteed in butter and served as a main dish or in soups, salads, and stews.

Source: The Commercial-News, Danville, IL

PHEROMONE SEMINAR
Symposia on Practical Applications of Insect Pheromones and Other Attractants To be held at the National Conference of the Entomological Society of America, Boston, November 29-December 3, 1987. Sponsored in-part by Insects Limited, Inc.
TRENDS

Flour millers are taking a second look at the effect of the oil that is being used for dust suppression on the milling quality of wheat. This could be an important selling point of your stored grain to a food processor.

In a presentation to the Grain Elevator and Processing Society (GEAPS) International Technical Conference in Columbus, Ohio this past spring, Robert G. Reid, Vice President of Dixie Portland Flour Mills, Inc. and chairman of the Association of Operative Millers (AOM) Technical Committee, made the following comments:

"In these times of low feed prices, a good yield is essential to most mills' profitability. Obviously, we have to make a product that satisfies our customers and we have a wide range of criteria to meet as far as flour specifications are concerned.

We began applying oil to two of our milling locations in 1985. Approximately 90% of the wheat milled at these two plants had oil treatment. The oil used was mineral oil. The application rate for both oils was 1 1/2 gallons per 1,000 bushel.

"During this period we experienced generally poorer yields and lower daily capacities at both plants when compared to the periods immediately prior to and after using the oil and our results the previous year."

Another problem which we were having was at the soft wheat mill. They were having a great deal of trouble with the break sifters choking. Hardly a day went by when they didn't have to shut the mill down to clean out a sifter. Once we began getting wheat without the oil, that problem went away.

If you treat your grain with mineral oil or vegetable oil, the food processors could refuse your grain.

This trend could be important for wheat handlers now, but could affect the corn millers and rice millers in the future.

NEW PRODUCTS

The most convenient and least expensive method to measure fumigants is through the use of detector tubes. MSA is marketing the Auer detection tube for phosphine low range (0.1 – 100 ppm) and the Auer Gas-Tester, an aspirator-bulb type pump.

Another factor in the use of oil which I think you should be all aware of is that while it is effective in controlling dust and reducing the possibility of an explosion, the oil itself is quite flammable and we are introducing another risk factor.

I know of an incident at a plant where they had been applying oil on a receiving belt for well over a year. When they were doing some cutting in the area, a spark ignited the saturated PVC belt and they immediately had an inferno which destroyed the belt in a matter of seconds.

Mr. Reid went on the prove that the estimated loss from mineral oil or vegetable oil due to negative effects on milling and flour quality would cost his company about $294,000 per year besides the added cost of shutdowns due to choke-ups.

If you treat your grain with mineral oil or vegetable oil, the food processors could refuse your grain.

The Auer Pump is not the bellows type pump (ie. Draeger). It has a built-in stroke counter that helps one remember the number of pumps taken during a reading. This feature is an additional $25 with the Draeger model 31 pump. It is $55 less expensive than the $175 Draeger pump too. I personally prefer the Draeger pump, the Auer low range tubes and the Draeger high range tubes.

The Accuracy of Different Sampling Pumps and Detector Tube Combinations Used to Determine Phosphine Concentration

By Dr. J.G. Leesch
USDA Stored-Product Insects Research & Development Laboratory Savannah, GA

In a field evaluation with the Auer and the Draeger equipment, the phosphine Draeger and the phosphine Auer low range tubes gave identical readings when used with the Draeger pump during a space fumigation.

The Draeger - low level: The readings ranged from 120 to 159% of the actual concentration. The actual concentration is significantly different from the actual concentration of 2 ppm of phosphine sampled which is 2.0 ppm This tube was very difficult to read because the purple-gray discoloration resulting from the reaction of the phosphine with the chemical in the tube blended into the white background.

Auer - low level: There was a wide variation with this tube, from 90% to 180% of the actual concentration sampled.
METHYL BROMIDE UPDATE

Sure am hearing alot of rumors flying around about the demise of methyl bromide. I have not made any statements about this in the past because I did not want to add 'fuel to the fire'.

"From a risk side, the EPA has not seen any data to show that there is a problem with this chemical so far."

Now, things are changing. An article in Pesticide & Toxic Chemical News, a very up-to-date, well-read periodical from Washington D.C. states the following:

EPA Sketches Bleak Future of Methyl Bromide Food Use

The future food use outlook for methyl bromide is bleak, according to indications given by EPA officials at a meeting earlier this month with representatives of the Chocolate Manufacturers Association and the National Coffee Association.

Meeting minutes from Jeff Kempler, Product Manager, Disinfectants Branch, Registration Division, OPP, EPA, noted agency responses to questions from the associations' representatives, including:

- Uses will be suspended if data supporting those uses are not filed.
- Toxicology data may be required or risk estimated on structural activity or toxicity of related chemicals even if no residues show at the 10 parts per billion limit of detection.
- "Industry asked whether EPA could take an approach similar to FDA's extrapolation inhalation studies for methylene chloride to determine risks from ingested residues. EPA responded that such an approach may require that pharmacokinetics data be developed. Also, there is evidence that the potency of similar chemicals has been shown to be 40 times greater for the oral route as for inhalation. Therefore, EPA might not be inclined to follow this route."

Question: Now what the hell does this mean?

Ring, Ring, Ring.

"Mr. Kempler would you please explain to me what you were quoted as saying and expand on it a little."

Mr. Kempler (7/13/87)

Question: What is the status of methyl bromide?

"Data needs to be collected and submitted to EPA for methyl bromide. I attended this meeting of EPA, the Chocolate Manufacturers Association, and the National Coffee Association to explain what data are required by the Methyl Bromide Registration Standard issued in August 1986."

"If the main registrants (Ethyl Corporation, Great Lakes Chemical Corp, etc.) won't support these data requirements, the users will have to do so. The users were told by the main registrants that the total amount of methyl bromide sold for post harvest uses was relatively small."

(Editor's note: Post-harvest domestic usage per year, ca. 2,000,000 lbs. at about 60 cents/pound) and that there was no money to support the data for those uses. It was at this meeting that EPA explained to this user group what data are required. The bottom line is that if the data are not supplied, the products would be suspended. This is the normal course of action."

"However, if these users are interested in submitting data and want to work with the registrants, EPA would be glad to review this information. The user groups appeared interested in taking this approach. There has been no discussion about 'potential unreasonable adverse effects' on methyl bromide. From the risk side, EPA has not seen any data to show that there is a problem with this chemical so far."

"The registrants have petitioned a waiver of all long term toxicological testing. We will be responding to this soon."

"The residue chemistry data requirements are split out depending on soil and post-harvest uses. We want to see what happens in both situations."

Question: It looks like the product is guilty until proven innocent, is this correct?

"This is not a question of guilt or innocence. The law (FIFRA) requires that EPA assure that a pesticide will not cause unreasonable adverse effects. To assure that public health is protected, EPA needs an adequate amount of data. FIFRA places the burden of providing these data and of proving that a pesticide is safe on the registrant. In this case, a substantial amount of data are lacking and it is necessary to collect the data."

"It is not an insufficient burden, but the burden of proof does lie with the registrant."

Question: When are the deadlines for this data call-in?

The Registration Standard for Methyl Bromide was issued in August 1986.

<table>
<thead>
<tr>
<th>STUDY</th>
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<tbody>
<tr>
<td>Sub-Chronic, 90 day Inhalation (Rat &amp; Rabbit)</td>
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<tr>
<td>Teratology (Rabbit)</td>
<td>11/87</td>
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<tr>
<td>Reproduction (Rat)</td>
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<td>Chronic Toxicity (Rat &amp; Dog)</td>
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<td>Residue Data: Various types</td>
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<td>Oncogenicity</td>
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<td>Product Chemistry</td>
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"Dr. Vern White, Great Lakes Chemical Corp., would you care to comment on what Mr. Kempler has said?"

"Negotiations are underway for the development of alternative data (for Methyl Bromide). So the question of suspension is moot. As we discussed, the post-harvest usage is 2 million lbs."

"The interested user groups are working with the Panel to develop the data and thus there will be no data gaps. In fact, EPA has stated at a subsequent meeting, that they can't do a risk assessment on methyl bromide because there are no negative data on which to base a risk assessment."

"Details on the Agency's response to our waiver request is due momentarily. We understand that they have agreed to some pharmacokinetics studies in lieu of the gavage tests."
"There are no methyl bromide residues from soil fumigation applications. There are some false positives which we are working to identify."

"How can anyone demand the removal of a material that poses no risk and is not present in detectable quantities in any food as consumed?"

"The final chapter has not been written on this subject. Meetings are still being held on this subject (Jack Moore's office, Doug Camp's office, Ed Tinsworth's office, and the working groups within the Agency). The food groups have pledged their cooperation, data is being developed, and we fully expect methyl bromide to continue to be available."

DAVE'S SOAPBOX

There have been some pretty negative rumors floating around about the demise of methyl bromide since EDB was issued an emergency suspension of the product back in February 1983. That was a scary time for the food and grain companies throughout the world. Some very big named companies got quite the 'black eye' from that one.

Will it happen again?

There are three things that can happen as I see it: 1) The data can be collected and the EPA can make judgement on the registration of methyl bromide in due course. 2) The users and registrants may not be able to justify the cost of collecting these data and the product would be suspended. 3) Rumors can reach the newspapers (ie. EDB & DDT), the newspapers can alert the uneducated general public, and the uneducated general public will demand its removal and with it all products treated with methyl bromide.

I believe that methyl bromide can withstand the review process if the users and the registrants can afford it. ($5,000,000 to $6,000,000). But, can it survive the increasing pressure from unfounded rumors, poor journalism, and uneducated public opinion?

Question: Will methyl bromide be taken off the market?

Answer: I don't know, what do you think?

CORROSION DAMAGE WITH PHOSPHINE

More and more there seems to be problems with corrosion on copper and precious metals from the use of aluminum phosphide and magnesium phosphide. This damage can be slight or extensive. One recent case in a warehouse rang up a $176,000 bill from damage after one fumigation with magnesium phosphide.

Here are some of the things that we know have been damaged from corrosion from metal phosphides:

- Fork Trucks
- Copy Machines
- Telephone Panels
- Telephones
- Calculators
- Computers
- Sprinkler Heads
- Lighting, copper strip type
- Printed Circuits on Instrument Panels
- Photographic Film
- Electrical Panels
- Welding Rods
- Refrigeration Units
- Electronic equipment
- House plants

In general, any product that contains copper or precious metal could receive damage from just one fumigation with this fumigant. Corrosion cannot be predicted.

It is a combination of:

1. Concentration of gas
2. Humidity
3. Temperature

Most reported cases of corrosion damage from metal phosphide fumigations seem to occur during July/August, especially under hot, muggy, weather conditions and not during the fall or spring seasons.

Often the damage from corrosion is due to the volume of the structure to be fumigated being figured incorrectly. If we are placing fumigant in a structure for 1,000,000 cu ft and there is only 600,000 cu ft., problems could occur.

Remedy:

WD 40 and other silicon lubricants will remedy most corrosion to metal. Spray questionable circuit boards, sprinkler heads, and other metal objects that cannot be removed from a fumigated building.

We also run fresh air into a fumigated area and force positive pressure against a poly wrapped piece of equipment or telephone panel. Double wrap the piece of equipment thoroughly and run a 3/16th inch poly hose inside the equipment from a fish tank aeration pump located in fresh air. This has been very successful in preventing corrosion to suspect items. Be careful to notice if the piece of equipment has an internal ventilation system (ie. Computer, Telephone equipment). The wrapping of this type equipment will overheat the equipment and burn-up the motors and the electronic components.

The best remedy for the problem of corrosion on metal items is to remove all suspect items and to thoroughly check inside everything to be fumigated. It may take an hour or more to pull open boxes and cabinets, but it may save you a headache later on.

Help, Help, Help...

We would like to publish a list of all products that have been damaged by corrosion from aluminum or magnesium phosphide. If you would send a list of those items that you have observed being damaged to David Mueller, Fumigants & Pheromones Newsletter, P.O. Box 40641, Indianapolis, IN 46280, we will compile this list and make it available to our customers and 'listening audience'.

How to Reduce Corrosion During a Fumigation.

One method that FSS suggests to reduce the potential for corrosion with metal phosphides, is to keep the gas concentration below 500 ppm during the fumigation. This can be determined by using Draeger high range detection tubes during the fumigation. This peak will usually occur during the first 24 hours. If the concentration exceeds 500 ppm, purge the building by opening doors or forcing fresh air into the fumigated structure. If you can control the inside temperature of the building, reduce it to 80 degrees. This is the optimum temperature for insect activity and could help to reduce the corrosive effect of metal phosphides.

Spray all items that can't be removed with WD 40 silicon spray or cover the item with poly and insert fresh air into the poly covers. But, best of all, take out any suspect copper or precious metal.
Calculation of Potential Concentration of Metal Phosphides

One gram of phosphine gas will produce 25 ppm per 1000 cubic feet. If you apply 33 grams of metal phosphide (165 pellets/1000 cu. ft., 33 tablets/1000 cu ft., or one Fumi-cel plate/1000 cu ft.) you could potentially give-off 825 ppm. Theoretically speaking, a good fumigation will retain about 50% of the maximum gas concentration. About 400 ppm is a good concentration to shoot for during a structural fumigation.

The exact concentration necessary to induce a kill on a target insect depends on which insect is the target. A Rice Weevil is much harder to kill than a flour beetle. A Trogoderma (warehouse beetle) larva is much harder to kill than an adult Trogoderma.

If 200 ppm of phosphine (hydrogen phosphide) gas is held in the presence of an insect for 72 hours, it will die.

At FSS we try to hold 200 ppm for 48 hours and at least 50 ppm at the end of the 92 hours.

Remember that with phosphine, the longer you run the fumigation, the better the gas will work.

Unlike methyl bromide, you can't shorten the duration and increase the dosage rate. It doesn't work that way.

Fumigator's Tip

Lil’Jimmy Bag: A protective/organizer is needed when we carry around our detection equipment (i.e. Draeger, Auer). The tubes can be misplaced and the current product labeling can be burdensome to carry around. A good idea has come to our attention from Jim Vanness of Lil’Jimmy’s Popcorn of Tipton, IN. He suggests going to K-Mart or a similar type department store and buying a simple $10 to $20 vinyl camera case to store your detection equipment, various detection tubes, and labeling rather than buying an expensive leatherette case from the manufacturer in the $100 range. We use our Lil’Jimmy Bag on all of our fumigations, it makes sense (cents).

INSECT SPOTLIGHT

Metamorphosis

Insect development is truly one of life's mysteries. Anyone who has observed a butterfly emerging from a cocoon and drying its wings out for that first flight as a beautiful-delicate creature will agree. What about the ugly looking dragonfly nymph that crawls up the cattail and sheds its protective armour only to grow long wings before your eyes and races away in search of life? Metamorphosis is the conspicuous change from one life stage to another. It is insect development.

Phosphine indoors and is relatively inexpensive; $275/roll.

Pesticide users and distributors who store more than the “threshold quantity” of these pesticides must report to their governor or state emergency planning commission. By August 17, you needed to identify the location where the pesticides are present in excess of the threshold quantity and give the name and address of your facility. The state will then contact these people with further instructions in the future. If you need to know the phone number in your state, you can find out through the U.S. Environmental Protection Agency’s hotline, (800) 535-0202.

Note: After speaking to this governmental service, I found them to be very knowledgeable and helpful. If you have additional questions, you might want to give them a call. Pest Management Magazine
GRAIN STORAGE... The Second Oldest Profession

By H.Z. Levinson and A.R. Levenson


It is generally accepted that settled agriculture was started by hunter-gatherers approx. 10,000 years ago and about 240,000 years have presumably passed from the appearance of man on this planet until the above mentioned activity was initiated. Cultivation of cereals was developed approx. 6000 years ago, while grain storage was initiated about 4500 years ago.

The ancestors of wheat and barley were probably the world's first plant species brought under cultivation. Wheat cultivation probably began in Syria and Palestine from where it spread west and south to Egypt and east to Iran. The earliest specimens of barley were excavated in Iraq dating back to 6750 years B.C. Indeed, the cereal remains found in the tombs of the earlier dynasties of Egypt are wheat and barley. The tomb of Ramses II had 33,672 sacks of wheat and 8,015 sacks of barley in it.

FUMIGATION WORKSHOP
February 15 & 16, 1988
Lexington, Kentucky
Hyatt Regency
1-800-228-9000
$100

Support Ducks Unlimited
In its 50th year as the Leader of Wetlands Conservation

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