Issue No. 3

FUMIGANTS AND PHEROMONES

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Featured Writer... This issue's featured writer is Jim Dawson, President of Ferguson Fumigants, Inc., of Hazelwood, MO. Jim is a well-known expert on fumigation throughout the western hemisphere. He has worked a lifetime in researching and developing spot fumigation programs for the flour milling and cereal processing industry. He has assisted in the development of most of the automatic spot fumigation equipment in use today.

Jim Dawson is a regular speaker for sanitation seminars and state recertification programs in the area of fumigation. He has tracked the happening of ethylene dibromide carefully for the past decade. Here are some of his thoughts on the subject:

Ethylene Dibromide: Here to Stay

by Jim Dawson

After a decade of review, the Environmental Protection Agency has determined that ethylene dibromide as a spot fumigant is here to stay. As a part of the last step of the RPAR (Rebuttable Presumption Against Reregistration) process, that agency is prepared to publish a few weeks from now the last position document (PD4) relative to the use of ethylene dibromide as a constituent of spot fumigant formulations.

From the beginning, Ferguson Fumigants, Inc. has actively participated in the defense of spot fumigants containing ethylene dibromide. We have sponsored research over the past ten years to develop residue information as well as applicator safety data that has played a significant role in that decision, one that will affect pest control procedures in the milling industry for many years.

We were able to demonstrate that regular spot fumigation of milling equipment with liquid fumigant formulations containing ethylene dibromide consistently maintain insect control levels required by FDA. Spot fumigation is a preventative sanitation procedure allowing for the most efficient control of insects that infest milling equipment. All other control procedures are corrective treatments normally taken long after insect populations have grown to unacceptable levels.

During the investigation of EDB, we addressed a number of areas. Utilizing several independent laboratories, we were able to prove that residues of ethylene dibromide, as a result of spot fumigation, are insignificant. We were able to show that the application equipment in use today was developed for worker safety, eliminating earlier application problems. We assisted in the development of studies that showed the effectiveness of canister-style gas mask equipment. The defense of each of these areas helped maintain a low cost, highly effective pest control program.

We are now comfortable with the fact that the RPAR process, begun in haste and with confused direction, has been concluded with sound reason based on scientific fact, resulting in a decision that will benefit the milling industry.

More on Ethylene Dibromide

We recently interviewed Dr. Bill Wells of the EPA on the subject of ethylene dibromide. Dr. Wells has worked on the RPAR process on EDB since 1977. He stated, "I am absolutely sure that some uses of EDB are here to stay." He went on to say, "Initially the risk levels were overinflated and the data on the risks of EDB to humans was exaggerated."

The chemical manufacturers believe that the label registration of EDB as a spot fumigant and space fumigant will be renewed, but the registration as a pour-on liquid fumigant will not.

A group of EPA officials will be visiting Japan in April to evaluate what the impact on the export citrus industry would be if EDB was eliminated as a fumigant for grapefruits and papayas.

A final decision on EDB will be published in the Federal Register some time after May 1 of this year.

New Pheromone Developed

A synthetic sex attractant pheromone for the spined soldier bug has been developed by a USDA scientist. The spined soldier bug is a predator of many insect pests, including the fall armyworm, corn earworm, and gypsy moth.

The pheromone will be used to attract the bug into areas infested with the insects on which it preys. The spined soldier bug will then feed on the other insects, thus reducing harmful populations. If the field needs to be sprayed, the pheromone can be used to lure this useful insect into other untreated areas.

Fumigants & Pheromones Seminar

The "Fumigants & Pheromones" seminar held in West Lafayette, IN, on December 9 and 10, 1982, was attended by 132 people from 21 states. The program was designed to provide new information that is emerging from stored product insect research and is being implemented for commercial use.

Featured speakers included Dr. Daryl Faustini and Dr. Art Manzelli of Philip Morris USA, Dr. Al Barak of Zoecon Corp., Dr. Richard Beeman of the USDA Grain Marketing Research Lab, Dr. Charles Knote of Cape-Kem Labs, Dr. Gene Wood of the University of Maryland, a tri-state Extension panel, and our own FSS staff. Speakers discussed the development and use of insect pheromone traps, malathion resistance, cold temperature fumigation, CO_2 fumigation, mouse and bat control, insect growth regulators, and other updated topics.

The seminar was sponsored by Fumigation Service & Supply, Inc., and Insects Limited, Inc. Similar programs will be held every other year.

Pesticide Applicator Goes to Jail

Recently, a pest control operator in Wisconsin was fined $1,500 and sentenced to six days in jail, plus two years of probation for using Compound 1080 without a special permit. This is the second conviction within the last ten years: a few years ago, another PCO was jailed after a child died from eating bait left in his service truck.

Compound 1080 is a rodenticide for which there is no known antidote.

Are Your Gas Readings Accurate?

There are two reasons for taking gas readings during a fumigation. One is to monitor the gas concentration to determine the effectiveness of the fumigation. The second reason is for safety – to check for leaks and to determine when it is safe to enter the fumigated area.

Some type of gas detection equipment is essential for anyone who fumigates. One of the most commonly used is the hand-held pump and tubes. They are economical and relatively easy to use. But how accurate are gas readings taken with this type of detection equipment?

Dr. J. G. Leesch of the USDA Stored Product Insects Lab, tested five different pumps and seven different tubes by taking readings on a predetermined concentration of phosphine. He found a wide variation in readings when tubes by one manufacturer were used with a pump by another manufacturer. For example, Draeger low level tubes used with MSA and Kitagawa pumps gave readings varying 120–159% from the actual concentration. Auer high level tube readings varied 59–256% from the actual concentration, regardless of the pump with which they were used.

Other factors which affect the accuracy of gas detection tubes include:

1. The coloration fades after a period of time, so readings should be recorded immediately.
2. Readings may be interpreted differently by different individuals. Some require the use of calibration charts, which leaves a greater margin for error.
3. Tubes should be stored in a cool, dark place, such as a refrigerator.
4. Pumps should be calibrated correctly.

BE CAREFUL, FRED!

Accidents related to using ladders are the leading cause of injuries during fumigation.

COMMENTARY

"Weevils or Bran Bugs?"

We often receive calls from customers asking us to fumigate "weevily" products. After asking some basic questions and/or inspecting the product, we sometimes find that those "weevils" are not true weevils, but other types of beetles. A common response is "A bug is a bug."

The confusion probably began with the definition of "weevily" grain found in the **Official Grain Standards of the United States** (originating from 1910), written by the USDA Agricultural Marketing Service, Grain Division. The standards state that weevily grain (whether corn, wheat, oats, etc.) shall be that "which is infested with live weevils **or other insects** injurious to stored grain." The term "other insects" leaves interpretation wide open.

In the past few years, certification training has made us all aware of important differences between insect species, such as feeding habits, life span, and ability to fly. If we can identify a pest insect and know its biology and how it got into the product, we can better control the pests that are costing us money.

Let's take a closer look at the terms "weevil" and "bran bug."

True weevils are the so-called "snout beetles." They actually belong to the order of beetles and are distinguished by the long snout extending from the front of the head. Weevils are **internal** feeders; that is, they feed and develop inside the kernels of grain. The most common weevils found in stored products in the U.S. are the rice weevil, granary weevil, and maize weevil.

"Bran bugs" are a group of beetles which are **secondary** feeders. They feed on grain dust and broken grain, not whole kernels. These insects are more likely to infest processed grain or grain which has already been damaged by other insects. They are smaller than weevils, ranging from 1/16" to 1/8" long. Included among the bran bugs are the red and confused flour beetles, saw-toothed grain beetle, and flat grain beetle.

For further clarification, our Insect Spotlight in this issue focuses on the true weevils.

Old habits are hard to break, but we do need to take a few minutes to identify pest insects further than "weevil" or "bran bug." There are only a few insects which actually infest stored products, and the time spent in identifying them will pay off in terms of successful control.

"Knowing the insect pest is half the battle in controlling it."

Donna S. Banes
David K. Mueller

FSS Personnel

Fumigation Service & Supply welcomes Matt Junghuhn to our staff. Matt received his B.S. degree in Industrial Supervision at Purdue University. He has worked for the past three years, while attending college, doing seed, grain, and food processing fumigations and ULD applications.

Matt's primary responsibilities with FSS include sales and service. He is presently located in our Indianapolis office, but this spring he will begin covering areas of Illinois and Iowa. A word from Matt:

"To those of you in Illinois and Iowa, please give me a call for products, service, or information. I'll try to visit each of you during the next year. I look forward to being your fumigation specialist."

Insect Identification

If you would like a second opinion on the stored product insects that are causing you problems, Fumigation Service & Supply, Inc., will provide free identification assistance. We will be happy to send you identification aids, or you may send us preserved specimens for identification.

Specimens should be carefully wrapped in loose tissue paper or enclosed in a container along with a sample of the product and a note describing the circumstances in which the insects were found (type of product, moisture conditions, etc.).

Please try to preserve the legs and antennae, as they are important aids in identification.

Insect Spotlight

Rice Weevil

The rice weevil, **Sitophilus oryza** (L.), is one of the most destructive pests of stored grain. It is a strong flier and sometimes infests grain in the field. It is found throughout the United States.

Adults are about 1/10 to 3/16 in. long and reddish-brown to almost black in color. They can be distinguished by four reddish-gold spots on the wing covers, irregular pits on the thorax, and, of course, the long proboscis (snout) with strong, sharp mandibles (jaws) on the end.

The adult female drills a hole into a kernel of grain, deposits an egg there, and then seals the hole with a gelatinous secretion so that it is very hard to detect. That egg develops into a larva (a white, legless grub), which feeds and grows entirely within the kernel. The pupa also develops inside the kernel, and a new adult emerges. This cycle takes about 4 weeks. The adult lives for 4–5 months, and each female lays 300–400 eggs in her lifetime.

Granary Weevil

The life history of the granary weevil, **Sitophilus granarius** (L.), is almost identical to that of the rice weevil. However, it is more commonly found in the Northern States than in the South.

The adult granary weevil is light brown to black and is marked with oblong pits on the thorax. There are no gold markings on the wing covers and no actual wings. The granary weevil cannot fly.

Adults live for 7–8 months, and females lay 50–250 eggs in that time.

Rice weevil

Granary weevil

Pheromone Spotlight Questions and Answers

To help explain the pheromone concept to you, our readers, this edition's pheromone spotlight focuses on questions that are commonly asked. Because this is a relatively new way to monitor pest populations, there are a few terms that confuse the issue. Most performance questions are answered during field trials and in feedback from the many people who use pheromone traps in practical situations.

We hope this column will answer many of your questions about pheromones.

Q: What is a pheromone?

A: This is a term used to describe a chemical signal that insects use to communicate with other insects. Over the years, insects have developed these precise communication skills to increase their ability to survive.

Q: What is a pheromone "lure"?

A: After a natural pheromone has been isolated and duplicated in the laboratory, a chemist synthetically reproduces this compound. Most of the pheromones which are commercially available right now are synthetically made, rather than obtained from the insect itself. The pheromone is placed in a small reservoir that releases it over a period of time. This is the pheromone lure.

Q: Explain how a pheromone trap works.

A: The trap is a cardboard or plastic device, containing a sticky glue and a pheromone lure. The insects attracted to the trap by the lure become caught and cannot escape.

Q: Is an "allomone" some type of pheromone?

A: Yes, an allomone is a pheromone. However, unlike most pheromones we think of, it is not for sex attraction; it is a repellent. An example is seen in the saw-toothed grain beetle. During its defenseless pupal stage, a secretion is formed at the end of each saw-tooth projection on the thorax. Predators which come into contact with the bitter secretion (an allomone) are repelled by it. Thus, the allomone acts as a defense mechanism for the beetle.

Q: How long will a pheromone lure attract an insect?

A: The length of time varies with the different lures available; it ranges from four weeks to four months. In deciding which type of lure to use for a particular pheromone, consider these factors: (1) how often you wish to have the traps checked, and (2) whether your surveillance program will be short-term, long-term, or continuous.

Pheromone Spotlight (continued)

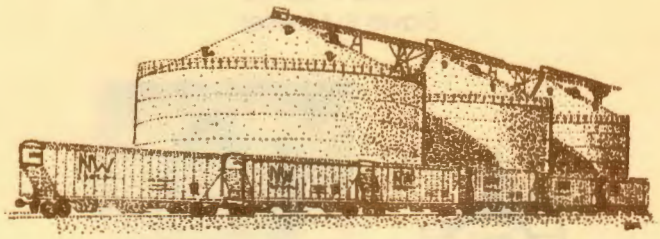
For more specific information about the different types of lures available, and recommendations on which type to use, contact Insects Limited, Inc.

Q: What is the best way to store pheromone traps and lures when they are not in use?

A: Lures should be kept in a refrigerator, freezer, or other cool area. Avoid repeated sudden temperature changes, as this will shorten the period of effectiveness. Lures will last indefinitely if they are kept in a freezer. Traps can be stored in areas where the temperature does not exceed 100°F. The sticky substance will liquify if subjected to heat.

Q: How many types of pheromones are available at this time?

A: We believe that every insect species uses pheromones to communicate. Scientists around the world have isolated pheromones in over 600 insect species. There are commercial lures available for approximately 200 of the more economical pests. Here are the stored product insects for which a pheromone lure is available: Indian meal moth, almond moth, Mediterranean flour moth, meal moth, raisin moth, tobacco moth, Angoumois grain moth, warehouse beetle, furniture cabinet beetle, Khapra beetle, **Trogoderma glabrum**, black carpet beetle, cigarette beetle, and lesser grain borer.



Railcar Reminder

With warmer weather approaching, many companies will resume the fumigation of in-transit boxcars and hopper cars. You are required to serve notice to the receivers of these vehicles regarding when the fumigation will begin, when the railcar will arrive, what to expect, how to handle defumigation of the railcar, and especially how to dispose of the spent fumigant.

Many incidents of improper treatment of fumigated railcars occur each year. The most commonly reported incidents are: 1) improper disposal, 2) failure to notify the receiver that the car has been fumigated.

Aluminum phosphide (Phostoxin®) is the only type of fumigant listed for in-transit railcar fumigation. Fumigation Service & Supply, Inc., will be glad to provide you with literature and information in this area.

Reminder: Truck trailers **cannot** be fumigated in transit.

Poisoning Information

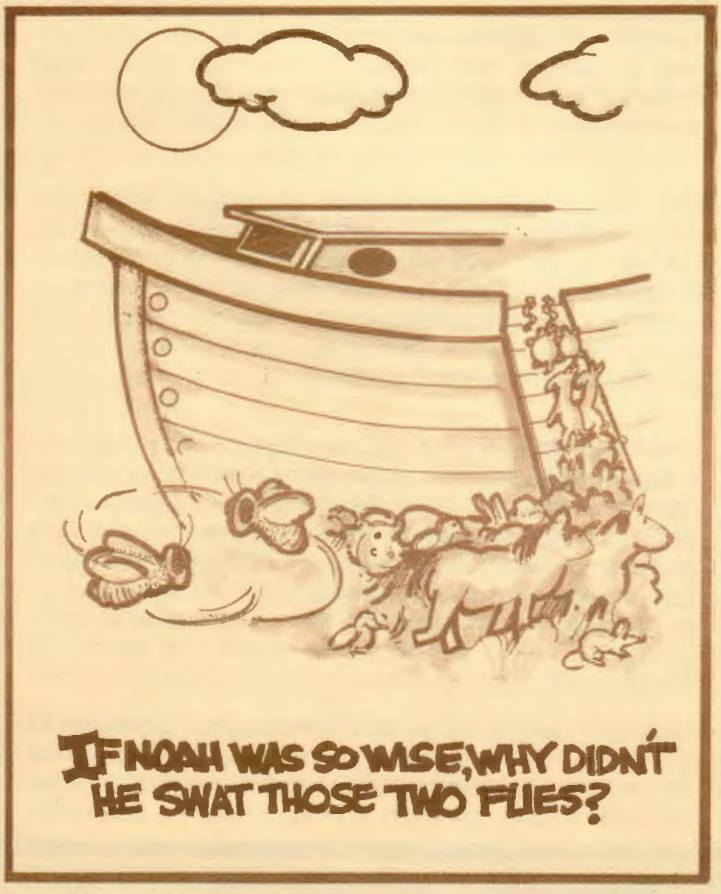
At the right of this page, you will find a card which can be cut out and taken with you, along with the pesticide label, when you fumigate with phosphine (Phostoxin®). The top half lists symptoms of phosphine poisoning and immediate first aid procedures to be taken at the fumigation site. The bottom half gives instructions to the physician.

If a poisoning occurs, refer to this card for first aid, then give it to the physician so he will know immediately what treatment is necessary. Remember, the time saved by quick reference to these directions may save someone's life.

Pesticides are safe in the hands of professionals!

Applicator Receives Fine

A grain elevator manager in Iowa was found guilty in 1983 of selling a restricted use pesticide to non-licensed individuals. He was caught selling partial flasks of aluminum phosphide pellets in small bags. The fine was $1000 with $3000 in legal fees.



PHOSPHINE POISONING SYMPTOMS

- May occur immediately or be delayed.
- Mild exposure: fatigue, ringing in ears, nausea, uneasiness, pressure in chest.
- Greater exposure: fatigue, nausea, vomiting, stomach ache, diarrhea, dizziness, chest pains, difficulty in breathing.
- Very high concentrations: difficulty in breathing, bluish-purple skin color, agitation, difficulty in walking, unconsciousness, death.

IMMEDIATE FIRST AID

- Remove patient to fresh air.
- Keep patient lying down and covered to keep warm.
- Administer artificial respiration if patient stops breathing.
- Get medical attention.
- Mild poisoning symptoms are reversible and will disappear within a few hours.

To the Physician: Phosphine Poisoning

In its milder forms, symptoms of poisoning may take some time (up to 24 hours) to appear; the following is suggested.

- Complete rest for 1–2 days; keep patient quiet and warm.
- If patient suffers from vomiting or increased blood sugar, administer appropriate solutions. Treatment with oxygen breathing equipment is recommended, and administration of cardiac and circulatory stimulants.

For severe poisoning (Intensive Care Unit recommended):

- If pulmonary edema is observed, steroid therapy should be considered, and close medical supervision is recommended. Blood transfusions may be necessary.
- In case of manifest pulmonary edema, perform venesection under vein pressure control. Heart Glycosides (I.V.) (in case of hemoconcentration, venesection may result in shock). On progressive edema of the lungs, immediate intubation with constant removal of edema fluid and oxygen over-pressure respiration, as well as shock treatment. In case of kidney failure, extracorporeal hemodialysis is necessary. No specific antidote known.
- If swallowed, empty stomach by vomiting and flush with a diluted potassium permanganate solution or solution of magnesium peroxide until it ceases to smell of carbide. Application of carbo medicinalis.

Phosphine poisoning is not chronic; phosphine action is reversible, and symptoms will disappear by themselves.

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Attention Mailroom Personnel (or Addressee) – Please Reroute if Necessary.