

Fumigants & Pheromones

Issue 60
Summer
2001

Routing:

Celebrating Our 20th Anniversary ❖ 1981-2001

Grain Fumigation with ECO₂Fume

ECO₂FUME® phosphine fumigant is a non-flammable mixture of phosphine and carbon dioxide. It is manufactured by Cytec Industries Inc. of West Paterson, New Jersey. ECO₂FUME fumigant was developed in Australia over ten years ago. They currently fumigate over 12 million metric tons of wheat with ECO₂FUME fumigant each year. In August 2000, ECO₂FUME fumigant received full registration by the US EPA and is currently registered in five countries worldwide. The first flour mill fumigated in the United States using ECO₂FUME fumigant in combination with the patented method of using heat and carbon dioxide was successfully completed in Michigan in 2000 and again in May 2001.

Formulations of the fumigant gas phosphine in pressurized metal cylinders could represent improve-



Fumigating grain takes special training and special products. If grain weevils were this big we would only need a big rifle.

ments over methyl bromide, magnesium phosphide plates, and pellet-based formulations for controlling stored product insects. The dose of phosphine gas applied to a structure or commodity is more easily controlled with a cylinder formulation, and is not affected by temperature and reaction time. Dispensing phosphine from cylinders allows the applicator to work outside the treated facility by delivering gas through tubes or pipes, rather than requiring entrance to the treatment area to apply fumigant. Cylinder-based phosphine leaves no substantial residual dust like that left following fumigation with metallic phosphide pellets. This eliminates the messy and potentially dangerous

task of deactivation of spent solid fumigant. For more information about ECO₂FUME phosphine fumigant, go to...

(continued on page 2)

New Catalogs!

Call for your
2001 Fumigation
Service and Supply,
Inc. and Insects
Limited, Inc.
Product Guides

call—
1-800-992-1991
or email—
insectsltd@aol.com



IN THIS ISSUE:

- ❖ Grain Fumigation with ECO₂FUME
- ❖ Indianmeal Moths
- ❖ Dave's Soapbox
- ❖ Grain Bin Inspection
- ❖ Pheromones
- ❖ Quotable Quotes
- ❖ Meeting Calendar
- ❖ Bad Bugs

VISIT US AT: www.insectslimited.com

Grain Fumigation with ECO₂FUME®

(continued from page 1)

www.insectslimited.com for complete labeling, MSDS sheets, and product information.



ECO₂FUME® Phosphine fumigant being used on large grain bins in Chicago. One cylinder of ECO₂FUME fumigant will treat 77,500 cu. ft. at 200 PPM. A pallet rack of 16 cylinders of ECO₂FUME fumigant will treat 500,000 cu. ft. at 500 PPM. The cost is the same as magnesium phosphide and pre-packaged aluminum phosphide.

The following data collected by Oklahoma State University shows that ECO₂FUME has a faster mortality rate than aluminum phosphide with about half the dosage rate.

Species	Life Stage	ECO ₂ FUME Fumigant Mortality	Aluminum Phosphide
Red flour beetle <i>(Tribolium castaneum)</i>	Eggs	100	93.4
	Adult	100	100
	Pupae	100	100
Lesser grain borer <i>(Rhyzopertha dominica)</i>	Adult	100	93.7
Rice weevil <i>(Sitophilus oryzae)</i>	Adult	100	100
Indianmeal moth <i>(Plodia interpunctella)</i>	Larvae	100	98.0
	Pupae	87.2	74.4

Results after 24 hours exposure at 90°F (32°C) in grain bins at a dosage rate of 3.6 g. of ECO₂FUME and 6.8 g. of Phostoxin. All insects showed mortality after 2-7 days.

QUOTABLE QUOTES

“Safe food sells.”

— Mike Hillyer
Ralston Purina

“It wasn’t raining when Noah started building the ark.”

— Howard Ruff
Entrepreneur and Writer

“Dear Valued Customer, today we have made several changes to our menu. Because of a decrease in the number of requests for specific meat products, we are replacing them and offering menu substitutions for your dining selection.

— KLM Airlines international flight after Mad Cow disease (BSE) was found in Holland

“It doesn’t matter if you win or lose—until you lose.”

— Charles Shultz
American Cartoonist

“Why bite when all you need is a growl.”

— Kim Kemp
Ralston Purina

“The Federal government doesn’t understand consumer confidence. All the consumer sees is when another NASDAQ darling is puking blood.”

— Ian McCormick
ConAgra Foods.

“We are all lay persons outside our own area of expertise.”

— Dr. Bobby Corrigan
RWC Pest Management,
Greece 2001, Fumigants and Pheromones International Conference

“Nothing is obvious to the lay person.”

— Bobby Corrigan

“Rachel Carson’s book Silent Spring was the point where man went from conquerors of nature to protectors of nature.”

— David Mueller
Greece 2001

Sometimes a picture speaks a thousand words. When experts estimate that there will be 9 billion people on this planet by 2050, the stark reality will be: **Who has food and who doesn't?**

Dave's Soapbox

...for what it's worth



Grain Bin Inspection



Bruce McKenzie, Professor of Ag Engineering at Purdue University always used to say: "Every bin owner should be inside each bin every two weeks during the winter months and every week during the fall, spring, and especially after July 1 in the summer. Anything less is risky and poor grain management."

"You should know what to look for. Use the old poke, feel, and look, and smell test. Poke the grain mass with a metal rod and your arm to check for caked grain and hot spots. Feel the grain surface to see if moisture is causing kernels to stick together. If you smell something rotten, you should have been looking earlier. Check the roof to see if there is moisture or condensation."

Mueller Honored

David Mueller has been announced by Purdue University as the winner of the 2001 John V. Osmun Alumni Professional Award in Entomology. This award was established in 1987 by John's friends, former students, and peers, to recognize and promote both high achievement and professionalism in entomology and its related fields. It honors Dr. John Osmun's many years of service to entomology and Purdue University.

Dave Mueller commented: "I'm honored to receive this award from Purdue but I'm especially excited about receiving it from Dr. John V. Osmun, a professor who taught me not only entomology but professionalism and integrity in business."

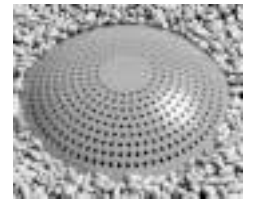
The award will be presented October 26 at a reception, and homecoming activities.

20 Years in Business!

Fumigation Service & Supply, Inc. and Insects Limited, Inc. celebrate their 20th anniversary in business this year. FSS works with fumigation of stored products and structures while IL strictly works with developing and distributing pheromones and non-toxic products for stored product insects. These companies are located in Westfield, Indiana.



The PC Grain Trap is another good tool for determining the population increase in stored grain.



Much can be determined by using these simple grain traps. The type of insect is especially important. A whole sound feeder like the Granary weevil is more serious than scavengers or secondary insect pests like the Foreign grain beetle or a Red flour beetle. The Foreign and Flat grain beetles would be indicative of spoiled grain that contains fungus. Immature insects, including Indianmeal moth larvae, are captured while crawling on the surface in this blunder trap.

Tip: No pheromone lure is necessary in the PC Traps, but an ounce of water will increase trap catch.

Indianmeal Moths



How to Use Pheromone Traps:

The Indianmeal moth is the most common stored food and grain pest in the United States and is found in most parts of the world. It is common in grocery stores and warehouses where it infests all kinds of packaged and bulk food products including popcorn, cereals, candies, nuts, and dried fruit. In homes, it's more often found infesting dry pet food, nuts, and bird food.

Pheromone traps are an excellent monitoring tool to alert you to the presence of Indianmeal moths. In residences, pheromone traps can be part of the control program if populations are not out of control. The Indianmeal moth pheromone is a sex attractant. It attracts the male adult moth to the scent of a female adult moth. Even very small amounts of the pheromone are extremely attractant to the male moth. The moths are drawn to the impregnated plastic lure and are captured on a sticky surface inside the trap. The Pantry Patrol trap can be placed on a shelf near stored food. This pheromone trap uses a liquid attractant that contains the pheromone to drown the moths along with many other stored product insect beetles.

When doing a standard pesticide treatment for Indianmeal moths, it's

a good idea to leave pheromone traps to record the population rebound in the warehouse and to evaluate effectiveness of the treatment.

Tips for Trapping Indianmeal moths with Pheromones:

Remember, the pest you're trying to trap can fly. Hang pheromone traps a little above eye level on racking away from forklifts and at least 50 feet from open doors and vents.

Indianmeal moths will begin to fly when temperatures are above 60° F (18° C). Start placing traps out in the spring before the indoor temperatures are 60° F. (In Chicago this would be about April 1).

The Indianmeal moth sex pheromone will draw moths from 30 to 50 feet away (further if there's a breeze near busy doorways) In a warehouse, place your traps in a grid pattern 50 to 100 feet apart; nearer if you suspect a problem in a given area.

Indianmeal moth adults prefer to stay near walls, often resting in a vertical position. Traps should be placed inside near the perimeter walls.

Place pheromone sticky traps where children can't reach them. In ware-

houses, keep them out of the path of forklift operators.

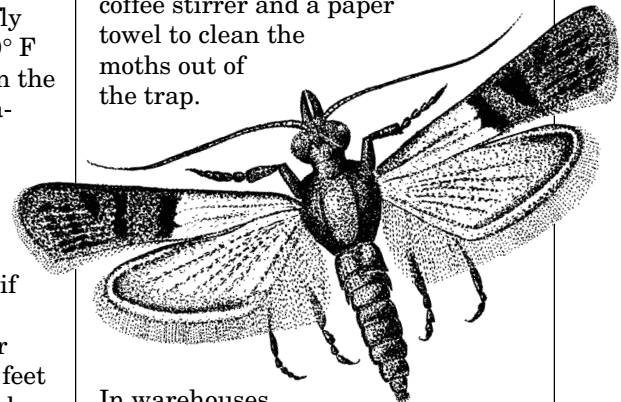
If traps continue to get buried by stored product in a warehouse, move the trap to a better location, perhaps near a fire hose station. A trapping scheme should not be too rigid. Be flexible in the first year of trapping.

Replace lures every 8-10 weeks indoors and every 4 weeks outdoors. Old lures need not be removed, just add a new one. Like perfume, the remaining scent could still attract moths.

Unless you like moths following you around all day, wear gloves when handling lures. The pheromone can be absorbed through the skin and then you become a pheromone lure yourself.

The only thing to write on the trap is the date the new lure was placed or replaced inside on the bottom of the trap. Map out your trap locations and secure it in a file.

Replace the entire trap when it is dusty or when it is full of moths. If you're catching only a small number of moths, use a Popsicle stick or coffee stirrer and a paper towel to clean the moths out of the trap.



In warehouses, grain storage, or grocery stores, where you're likely dealing with more than just Indianmeal moth, double up on lures. Inside the same trap, in addition to the Indianmeal moth lure, you can also add a lure for the Warehouse beetle, or the Cigarette beetle. The Indianmeal moth lure will also attract the Mediterranean flour moth

(*Anagasta* spp.), and the Almond moth (*Ephestia* spp.). The *Trogoderma* lure will trap about 16 species of *Trogoderma* beetles.

Recommendations:

The Indianmeal moth can enter a home from outdoors via places like fireplace flues that are not completely sealed tight. Rodent harborage that accumulates seeds and nuts will provide food for future populations of Indianmeal moth. Food products that have not been properly inspected can reach the homeowner. Products improperly rotated on grocery shelves and warehouses are often sources of infestation too.

A program of prevention, monitoring and control is the combination strategy that works best for the long-term eradication of IMM. Sanitation and thorough cleaning and vacuuming are the most important preventative steps. Discarding or freezing all suspect food products is important. Monitoring for the presence or absence of IMM with pheromone traps is essential along with regular inspections from a trained pest management profes-

Source: Techletter, April 15, 2001, with permission from Pinto and Associates, Inc.

sional is advised. The use of Insect Growth Regulators (IGRs) quarterly would greatly reduce the immature moth population by preventing them from reproducing without harming pets or humans. A good educational program to help the homeowner or commercial businessman understand what causes a build up of pest IMM would be recommended as part of a pest management program.

Conclusion:

Indianmeal moths are troublesome nuisance pests throughout the United States and in many parts of the world. They are controllable. They are not harmful to our health. They don't have chewing mouthparts and cannot chew into wood or personal property. The larva can rasp through a plastic bag if given enough time. The reproductive capacity of this moth is very large with 400 eggs per female and the life cycle is quite short at 18-40 days from egg to adult. This moth is vulnerable to freezing when shocked. The single most important recommendation is to remove the food supply in open and hidden locations to prevent future infestations from reoccurring.

Insect Light Traps



*New UV-A Meter
for UV Insect
Traps*

UV Bulbs stop producing UV long before their visible light declines—users can't tell by looking at them. This electronic meter will help determine if the bulbs are delivering the correct intensity.

It is important to assess and demonstrate UV output and bulb condition. By testing your insect light traps periodically, you can get better fly control.

The bulbs on the insect light traps often are not checked or changed often enough. Many people use these insect attracting bulbs for years without replacing them. The UV-A Meter tells when and if to change bulbs in insect fly traps. Here are some advantages of using this simple electronic device from England:

- Clearly shows bulb condition
- Allows timely bulb replacement
- Easy to use, with instant readout
- No calculations necessary
- Optimizes location and output for new traps
- Works on all sizes of light traps
- The UV-A meter is durable

Available from Insects Limited, Inc. Price: \$99.00 each. Order: 1-800-992-1991

TEMPO® Research

Dr. Frank Arthur has been working on insecticides that kill stored product insects in empty bins. Tempo WP (cyfluthrin wettable powder) is a commonly used empty bin treatment that has replaced many uses of malathion. This synthetic pyrethroid insecticide has low mammalian toxicity but good persistence in dusty empty grain bins and on the perimeter of grain and food facilities. Here are some of Frank's findings: **High Temperature Decrease the Effectiveness of Cyfluthrin WP.** Red flour beetles were exposed at different time intervals on concrete treated with cyfluthrin (Tempo WP) and held at different temperatures. Bioassays were conducted at 2-week

intervals for 8 weeks. After 2 weeks, beetles exposed at temperatures of 25° C (77° F) began to survive and by 8 weeks, survival at this temperature was at least 90%. In contrast, survival of beetles exposed at 20° C (68° F) remained below 5% for the entire 8 weeks. These results indicate that cyfluthrin may have to be applied more frequently to control red flour beetles during the warmer months of the year or in warmer climates.

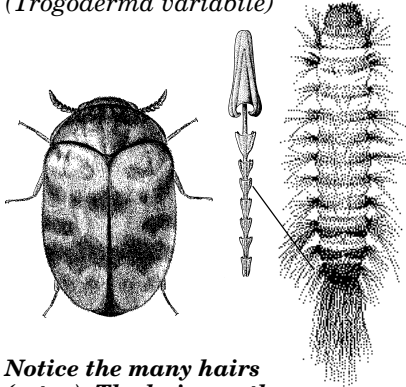
For more information contact Dr. Frank Arthur at email: arthur@usgnrl.ksu.edu or call Fumigation Service and Supply, Inc. to help you solve your grain storage problems.

Bad Bugs...

Insects That Can Cause Health Problems

Warehouse Beetle

(*Trogoderma variabile*)



Notice the many hairs (setae). The hairs on the rear of the larva are called the guard hairs and are shaped like tiny arrows to protect the larvae from behind. These hairs can become lodged in small animals and infants' throats and cause serious medical problems.

If there is an insect that is truly a voracious feeder and a potential health hazard to humans and young animals, the warehouse beetle falls into that category because of the long list of foods that it attacks. Next to the dreaded quarantine pest, the Khapra beetle, it is the most serious stored product insect pest.

Imagine an insect that can live for three years without food or water. Imagine an insect that can live in a freezer for five days. Imagine an insect that can hide in cracks only to emerge to cause havoc with a museum collection or a complaining customer. That is the nature of the Warehouse beetle.

Let's take a close look at this common stored product insect:

The Warehouse beetle prefers feeding on animal protein. This could be anything from road kill to dog food to powdered cheese and milk. The beetle will feed on plant material but a dead insect or mouse would be its preferred food source. You will often

find *Trogoderma* spp. feeding in insect light traps on dead insects. It is important to empty these lights on a regular basis.

The larva (see figure) of the Warehouse beetle is approximately 1/4 inch long and prefers to breed in dark places, such as packed food cartons. Larval color varies from yellowish white to dark brown as the larvae mature. Warehouse beetle larvae have two different tones of hairs on the posterior end. These guard hairs protect them against attack from the rear. The warehouse beetle has about 1,706 hastisetate hairs and about 2,196 spicisetate hairs according to a publication by George Okumura. Since a larva sheds its hairs during each molt, the damage of this pest insect comes from the 1000's of these pointed hairs that escape and enter a finished food product as an insect fragment. These insect fragments then can be swallowed by humans, young horses or pets and get lodged in their throats.

Health Hazard

Okumura (1967) mentioned two medical reports:

Case #1: "The establishment of a case of canthariasis in an infant in Indiana was based upon the following information: Two larval specimens of *Trogoderma* were submitted to me for identification. The specimens were collected in the stool of a four-month-old baby boy who was ill. Live larval *Trogoderma* were submitted later from packages from the same lot of high-protein baby cereal which had been fed to the child."

Later a consulting doctor further explained: "As far as I know the symptoms in the Indiana infant with ulcerative colitis were attributed to the beetle larvae of *Trogoderma*

glabrum (closely related to Warehouse beetle)."

Case #2: "The case of a four-month old baby boy in California was similar to the Indiana case. Here the baby was fed a high-protein baby cereal in which the larvae of *Trogoderma onatum* was later found. (One live, one dead, and two cast skins) were taken from the original package of the baby cereal. According to the mother, the baby became ill two or three days after eating the cereal. The baby did not vomit, but had mild diarrhea. The interviewed mother stated: 'the baby showed signs of varying degrees of digestive distress, culminating in a severe outbreak of screaming and crying and absolute refusal to eat. Anytime it was offered food it became rigid and red, and arching his body and screaming, evidently in pain).'"

The doctor did not administer medication and after a couple of days the baby recovered.

Identification

There are 16 species of *Trogoderma*. The female adults are twice the size as the male beetles. They are members of the Dermestidae family that also includes Black carpet beetles. However, they are not a carpet beetle. When inspecting it is often easy to spot the cast skins. This is much like a snake that sheds its skin. The adults are about 1/8 inch and dark in color with yellowing mottling on the wing covers (elytra). This mottling can take on various shapes even within the same species.

The larvae is the damaging stage and can over winter in wasp nests and mud-dapper nests feeding on old insect carcasses and guano. During the spring months when plants are flowering, it is common to see *Trogoderma* adults on plants collecting pollen and looking for a mate.

Small white flowering bushes like spirea are very attractive to Dermestids. The adults have distinct antennae that other beetles lack.

For a positive identification of this or any stored product insect, Insects Limited, Inc. can provide this laboratory service.

Pheromones

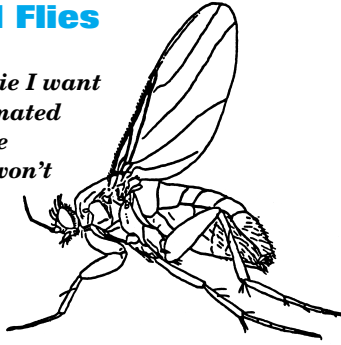
The pheromone for the Warehouse beetle and other *Trogoderma* species is very effective in monitoring for the presence or absence of this pest insect. The pheromone lure lasts for 2-3 months and should be placed at least 50 feet from an open door or vent. Traps should be placed outdoors to detect pressure from the surrounding area. It is not uncommon to capture 1000 *Trogoderma* adult males in one trap in the summer months. By examining the hairs (setae) on these captures beetles one can often detect hitchhiking food particles like cheese, milk powder, fish meal or pollen. This will give an indication where this pest insect was crawling last.

Pheromone traps should be placed at eye level on vertical support beams. A date when the pheromone was last replaced should be written on the trap. Each trap should be examined every week on the same day and captured insects should be removed and recorded. An important pest management tip for *Trogoderma* pheromones is that the male beetle emerges 5-7 days before the female beetle. The pheromone trap captures only males. This allows an advanced warning to when a new generation of Warehouse beetles is emerging from the pupa stage. The other important tip is that the Warehouse beetle adults don't fly until the temperature is about 73° F. (23° C). So you may have Warehouse beetles and still not be capturing them in traps until the temperature is warm.



Phorid Flies

“When I die I want to be cremated so that the Phorids won't eat me”



The Macabre

“An early German report entitled *'Fauna of the Grave'* refers to small flies, many species which are 'interested more in dead men than living' and which breed in human corpses and feces in 'countless million.' More than 70% of survey respondents collected Phorids from human cadavers.”

By the way, Phorid flies are a major pest of wet food processing areas in food facilities.

Just the Facts

W. Robinson states: “Eggs are laid in groups of 20-40 over a 12-hour period with hatching occurring after about 24 hours. This accounts for the common observation by pest managers: 'I fogged that area last night and today we see these little black flies back again.' This fly has the habit of running on tables, walls, and windows.” One key characteristic is that the Phorid hovers unlike the housefly and fruit fly that can hover in the air almost suspended until you reach for it and it rushes away.

Some call this the Humpback Fly because of the way the back of the adult is humped over. The adults are very small 1/8 inch (like a fruit fly).

The larvae can be found in dark, secretive, damp and mouldy places. They hide in drains and tiny places where they feed on highly nitrogenous organic matter that has begun to rot. Stale beer and fruit juices in bars are difficult places to control this tiny fly. Many Phorid larvae live as scavengers in the nests of ants, bees, wasps, and termites.

Health Effects

Phorids have been found to infest fruit that gets swallowed and digested. It has been proven that these flies have lived and mated in human intestines. Now do you need to ask if Phorid fly larvae can live in drains? This is an example of the extreme tolerance of these flies at all stages to asphyxiation and to chemical action. Larvae will also infest wounds and will live in preserved materials of all kinds, even specimens preserved in formalin.

Control

The only really long-term solution to controlling Phorid flies is to remove the food source. This means cracks, drains, internal hiding places and more. Prevention and monitoring are the two keys to a pest management strategy. Control tools like pyrethrin fogs are only temporary.

Many times the problem may be under a floor. For example a garbage disposal line broke and liquid garbage soaked in to the ground under a kitchen floor. By drilling the floor with 1/4 inch holes every 3 feet in the suspected area and placing a paper cup over the holes, detection of where to start tearing the floor up was decided. In one case in Kentucky, over ten 55-gallon drums of waste were removed from under the broken garbage disposal line. Many times the solution to a Phorid fly problem is complex and costly.

Conclusion

Start with the insect first by proper identification. Controlling fruit flies is much different than controlling Phorids. Do not attempt to bluff the customer if you are unfamiliar with the pest causing the problem. Work with your customer to locate the source of the problem by conducting interviews with those close to the infestation (housekeeping, kitchen staff, etc.). Finally, develop a control program that utilizes the appropriate control measures and solves the problem on a permanent basis.

Source: Dr. Chris Christiansen, PCT/March 1988, and *The Natural History of Flies*, Dr.W.Robinson

M E E T I N G C A L E N D A R :

- Oct. 1-3, 2001** 2001: A Pest Odyssey, British Library Conference Centre, London, England. Contact: Belinda Sanderson, Belinda.sanderson@bl.uk or fax: 44 20 7412 7796
- Oct. 28-31, 2001** National Pest Management Association, Pest Management 2001, New Orleans, LA. Contact: NPMA 1 (703) 573 8330 or fax 1 (703) 573-4116
- Nov. 5-8, 2001** 2001 Annual International Research Conference on Methyl Bromide Alternatives and Emission Reduction, San Diego, CA. Contact: Gary Oberdorf, Doubletree Hotel, www.mbao.org or fax 559-436-0697
- July 7-10, 2002** The 4th International Conference on Urban Pests, Charleston, SC, USA. Contact: Richard Cooper, rcooper@cooperpest.com or fax: 609-799-3859
- July 22-26, 2002** 8th International Working Conference on Stored Product Protection, University of York. Contact: Nick Price www.cis.gov.uk or fax 44 1904 462252
- Aug. 19-23, 2002** 6th National Stored IPM Training Conference, Manhattan, KS. Contact: Dr. Subi Bhadriraju, KSU, 1 (785)532-4092, bhs@wheat.ksu.edu
- First Announcement—
June 2003** 6th Fumigants & Pheromones International Technical Conference and Workshop, Sharing Through Education, Copenhagen, Denmark. Contact: David Mueller, www.insectslimited.com; Tel. 1-317 896-9300, Fax 1-317-867 5757 or Henrik Lange, lange@tanaco.dk.

TEN Commandments of Business

1. *Admit it if you're unsure of an answer.*
2. *When you're right, don't gloat.*
3. *Share credit for a job well done whenever you can—with all who contributed.*
4. *Ask for help when you're in over your head.*
5. *Apologize if you're wrong—and take the blame if it's your fault.*
6. *No task is beneath you. Help out with duties that no one wants to do.*
7. *Never gossip, no matter how tempting it may be.*
8. *Be diplomatic. If you don't like someone, don't let on.*
9. *Keep your salary to yourself.*
10. *Be gracious. If you don't get something you want, let it go and move on.*



Fumigants & Pheromones is published by Fumigation Service & Supply, Inc. and Insects Limited, Inc. We hope that the information that you receive from this newsletter will help you in your business, and you, in turn, will support our business efforts. If you have an associate who would be interested in receiving this newsletter, please contact the address below. We would welcome any comments or suggestions for topics. Address correspondence to: David K. Mueller, Fumigation Service & Supply, Inc., 16950 Westfield Park Rd., Westfield, IN 46074 USA.



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