

# Fumigants & Pheromones

Issue 35

Summer  
1994

A Newsletter for the Insect Control & Pest Management Industry

Minimize Pest Attraction...

## Landscaping Around Food Facilities

by Jerry W. Heaps, B.C.E.  
Corporate Manager,  
Sanitation and Pest Control  
The Pillsbury Company,  
Minneapolis, MN

Many of us working in the food industry have learned through trial and error, by having a pest insect, bird, or rodent problem, about what landscaping material not to plant around/near a food facility (i.e. manufacturing plant or distribution center). Common examples given are (1) boxelder bugs, *Leptocoris trivittatus*, attracted to feed on the seeds of the female boxelder tree; (2) adult Dermestidae beetles (i.e. *Trogoderma* spp.) attracted to feed on pollen from the blooms of Spirea spp. shrubbery and Crepe Myrtle flowering trees; (3) the attraction of bees to pollinate the blooms and yellowjacket wasps, later in the season, to feed on fallen/rotting fruit from flowering crabapple trees; (4) planting of thick ground covers that provide excellent cover/harborage for rodents, and; (5) the planting of landscape materials, in general, that produce a fruit, nut, berry, seed, etc. which attract pest(s) to feed on. Such problems so close to a food facility place extreme pressure on pest control responsible personnel and on the facility as a whole in their desire to eliminate pests.

Tom Imholte (1984), makes a general reference saying... "Additional landscaping should include grass, shrubbery, and a few trees. Grass and shrubbery should be kept neatly trimmed for vermin control. Plants, shrubbery, and trees that are



Black Carpet Beetle (*Attagenus* spp.) on Spirea bush.

known to attract certain insect species should be avoided; an established botanist and an entomologist can be helpful in making the proper selection."

Mallis (1982) mentions several insects as occasional pests associated with landscape plantings. For example: (1) strawberry root weevil, *Brachyhinus ovatus* and the black vine weevil, *B. sulcatus* are pests associated with several plants including rhododendrons, azaleas, and yews; (2) elm leaf beetle, *Pyrrahltia luteola* is a common and important pest of elm trees and; (3) the Asiatic oak weevil, *Cyrtopistomus castaneus*, can be a pest of white and pin oaks with the adults attracted to lights. (4) the tulip tree weevil, *Odontopus calceatus*, as light-attracted adults feed on the leaves of magnolia, sassafras and tulip poplar trees; (5) birch catkin bug, *Kleidocerys resedae* associated with white-barked birches plus adults often breed in the seed capsules of azaleas, rhododendrons and Japanese andromeda (*Pieris japonica*) and (6)

adult hackberry nipplegall maker psyllids, *Pachypsylla celtidismamma* where the hackberry tree is common.

### Summary

Personnel responsible for food facility pest management should be actively

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## ARTICLES IN THIS ISSUE

- Australia Meeting
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## Outdoor Insects Cause Indoor Problems

**Y**ou have a recurring problem with carpet beetles every year.

The problem may not be that you have overlooked something inside. It may be that the beetles are reinfesting from outside. It's the larval stage of the carpet beetle that does the damage - feeding on woolens, hairs, feathers, milk powder, and other animal materials. It is

a major pest in the museums worldwide. Yet, strangely enough, the adult carpet beetle feeds on pollen and nectar and is common on outdoor plants. This is true of many of our Dermestid beetles: black carpet beetle, common carpet beetle, furniture carpet beetle, and varied carpet beetle.

When the adult carpet beetle emerges from its pupal case, it is attracted to light. It's often found indoors crawling up light-colored walls or on window sills, trying to get outside to feed on pollen and nectar, and to mate. After mating, the female carpet beetle avoids light and may move indoors to lay eggs.



Flowering crepe myrtle and Varied carpet beetle (*Anthrenus verbasci*)

The following plants are reported to be the most attractive to adult carpet beetles:

- Buckwheat daisy
- Cleanothus
- Crepe myrtle
- Dogwood
- Pyracantha
- Spirea
- Wild aster

Both adults and larvae can be found in the nests of birds, rodents, bats, even the nests of honeybees or wasps. When the animals abandon the nest, carpet beetles may move to new sites.

source: *techletter*, Vol. 10, No. 9 (A newsletter for the pest control and food processing industry, to subscribe, call (301) 884-3020.

## Landscaping Around Food Facilities

(Continued from page 1)

involved in the decision-making process when it comes to choosing appropriate/inappropriate landscape material to plant. Professionals in the nursery, horticultural, and entomological industries should be consulted beforehand, too. In this manner, potential food facility pest problems can be averted.

Other factors to consider when choosing plant materials would be: (1) aesthetic value desired from the plant, (2) their maintenance requirements, (3) amount of money/personnel time budgeted by the facility for their care, (4) soil type, (5) length of growing season, (6) temperature, (7) light availability, (8) water, and (9) fertility. It may be decided that the most appropriate route to take would be to plant flowering annuals or perennials in portable planters out away from the facility to add color.

**Dave's Soapbox**  
"On Vacation"



## An International View

*Is ours a culture of pesticide junkies?*

by Kenuel Okech Ogwaro, Ph.D

**I** am a new American who came here only five years ago. I may have a completely different approach in viewing and dealing with insect problems. I often wonder whether my difficulty in understanding the American culture of pest control is due to my own background.

Do I look at the "filth" of insects differently from the way other Americans view it? Or, does the pest control industry play a role in indoctrinating American pesticide consumers to believe that "bugs" are filth and pesticides are the tools to get rid of them?

### A real necessity?

A high proportion of pesticides used in

the United States are not necessary either. For example, earwigs underneath a moist doormat lead a homeowner to a pesticide supply store for a killer tool—wouldn't it be better to clean the mat and possibly dry it? Where did the homeowner get the idea that earwigs under the doormat are serious filth and require a chemical pesticide?

It is often noted that before mass production of pesticides, an average farmer produced food for only seven people and now he is able to produce food for 80 people. A major factor in this scenario is not pesticides, but the mechanized method of production. With pesticides readily available, a farmer in a developing country is unable to produce because of lack of mechanized means of production.

There is overwhelming evidence that the calendar issue of pesticides is aimed at increased pesticide marketing, rather than actual pest control. The scare tactics used against farmers to either use more pesticides or lose millions of dollars worth of produce, are simply in support of our pesticide-based, multi-million dollar economy.

In urban pest control service, we use pesticides because it makes it easier to earn money quickly. We could control most pests without the use of pesticides. In many cases we are not selling pest control service, but rather pesticides, because we continue to use pesticides even where there are no insects left to kill. We are encouraged to do this sometimes by consumers asking for more.

### Practical Experience

My experience in the 'pest control industry' brought back memories of my childhood and life in Africa in general, where there are real problems with insects. Locusts swarmed the area and left nothing for us to eat but the locusts themselves. An example of using pesticides based on the need to support our economic base took place in the latter part of the 1980s. The FAO offered to help eradicate locusts in North Africa. They used air and ground powers of pesticides. The total dollars spent equalled more than several African countries national budgets put together.

There were definitely other ways of using that money more profitable to increase food production. It turned out that the

economies of the supporting countries were at heart, not locust eradication. Tons of chemicals were sold. There were also other programs aimed at improving food production in developing countries, all based on large economical farming and increased chemical use. None of the programs worked because ecological interactions were eliminated and pest populations skyrocketed.

All this caused the vicious circle of selling more pesticides to control more insects, which created more resistance and led to more insects that needed to be controlled by more pesticides. The pesticide economy boomed as technical aid to those countries increased.

Now there is a realization in most African countries that the wisest course of action is to go back to the common sense alternative of harvesting our share from among the complex ecosystem of insects, plants and people.

Looking back, and observing American non-problem insects, I am convinced that there is a problem that can generally be solved without pesticides or with very little pesticides indeed. The problem of nuisance insects, or the idea of impending horror because pesticides have not been sprayed on the carpet in the last 30 days, are aspects of a culture of pesticide dependence - - not a real pest problem.

The solution that works best is the assurance that in any case of pest invasion, we will be there to help, but meanwhile let us watch what happens. This solution is hard to sell. A person who is addicted to pesticide consumption will most likely turn to other pest control companies that are willing to give them assurance of a continuous presence of chemical pesticides; however, I believe that as professionals, we should work ethically, avoiding placing pesticides where they are not needed.

source: *Pest Control*, February 1993

### Ozone Police

The owner of a car-repair shop in St. Louis, Missouri, who admitted to having let the refrigerant from a car's air-conditioner leak into the air has become the first person prosecuted under a federal law intended to protect the atmosphere's ozone layer by tightly regulating such chemicals.

Harold-Tribune May, 1994.

## Methyl Bromide Alternatives

### The Methyl Isothiocyanate Used as a Grain Fumigant

by Valérie DUCOM  
Laboratoire Nationale  
d'études des techniques  
de fumigation  
et de protection des  
Denrées Stockées  
Chemin d'artiques -  
33150 Cenon -  
FRANCE



Presented at the 6th I.W.C.S.P.P. in Canberra, Australia, April 1994:

**F**armers of villages in Niger, traditionally incorporate dried leaves of *Boscia senegalensis* to their silos of niebe beans to protect them against insect pests.

After separation analysis and antennography, the native molecules responsible for this insecticide property were identified as methyl isothiocyanate (MITC). MITC is presented as crystals which sublime at ambient temperature. The molecular weight is between that of methyl bromide and phosphine; 73 g.mol.

The biological efficacy assays of MITC on Granary weevil (*Sitophilus granarius*)

(all stages) were done at 20°C (60% RH) in four hours exposure time and different concentrations. All gas concentrations were measured by gas chromatography using a TSD detector. Statistical analysis was done with the S.A.S. system.

The biological efficacy of MITC on all stages show that 99% of mortality was obtained between 3 to 10 g.h.m<sup>-3</sup> and that the pupae stage is the most tolerant stage. Other biological experiments show that we obtained the same efficacy at 10°C.

Sorption experiments showed that MITC is very sorptive and can be as high as 100%. The MITC that sorbs on the grain doesn't degrade into other compounds as shown by mass spectrometer analysis.

### Conclusion

MITC is an interesting molecule. Its high rate of sorption leads to apply MITC either to mix with the grain during loading or to use it with a recalculation system. That sorption gives a persistence of action thanks to the very low desorption rate if the grain remains in the bin. It allows also to use in non-gas tight silos. The actual dosage rate from these trials should be between 20 to 40 g.m<sup>-3</sup> during a 24-hour period at a temperature of 10° C or higher.





UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460

APR 29 1994

David E. Mueller, BCE  
President  
Fumigation Service and Supply, Inc.  
10540 Jessup Boulevard  
P.O. Box 40641  
Indianapolis, IN 46280-1451

Dear Mr. Mueller:

Thank you for your letter of November 20, 1993 requesting a determination of whether your proposed alternative to methyl bromide fumigation would require registration under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). Specifically, your system utilizes a combination of federally registered carbon dioxide and hydrogen phosphide products for use in flour mills and food plants at dosage rates which are less than the maximum rates currently allowed for the use of these chemicals. It is your intent to develop and distribute this process as an alternative to methyl bromide.

Based on an evaluation of the process described with your letter of November 20, it is the Agency's opinion that the process that you have described falls under the provisions of Section 2(ee)(1) of FIFRA. Under Section 2(ee)(1), use of registered pesticide products at lower than the dosages specified on the label is not considered use in a manner inconsistent with the labeling. Consequently, your proposed alternative technology would not require registration or amendment of the labeling for the registered sources of carbon dioxide and hydrogen phosphide.

I hope that this response satisfactorily responds to your inquiry. If you have additional questions, please let me know.

Sincerely yours,

*Walter C. Francis*

Walter C. Francis, Deputy Chief  
Antimicrobial Program Branch

## 6th International Working Conference on Stored Product Protection

Canberra, Australia  
April 17 - 23, 1994

### Report on Fumigation Sessions

Out of over 300 papers presented at this conference, 52 papers were on stored-product fumigation.

The biggest single issue in the last four years has undoubtedly been the implication of methyl bromide in ozone depletion. It has been significant in terms of our positive approach to this, that there have been no papers on methyl bromide per se at this conference.

Rather the emphasis has been on making the most of the existing alternative, phosphine. In the light of concerns on health and safety and environmental issues, scientists were urged to collect data on the environmental fate of phosphine to bolster the data in support of this useful fumigant.

New methods of formulation and application (mixtures with carbon dioxide and in combination with heat, and constant flow

systems) have been strongly represented.

In the light of this need to nurture phosphine, there was much discussion on the practical significance of resistance and the need to distinguish between detection of the resistance gene and the significance in terms of field dosages. The importance of rapid detection as an early warning was acknowledged, but the need for a test which reflected the field significance was stressed.

In the same context the need for improved education and training in good fumigation practice, as perhaps the single most important factor in the continued effective use of phosphine, was discussed.

Alternative fumigants have emerged at this meeting. Carbonyl sulphide is developing as an exciting prospect for the future and the re-evaluation of other existing alternatives, such as methyl isothiocyanate, offer promise. Indeed this may rekindle interest in the international scientific community in the search for yet more alternative chemicals.

Returning to the theme of protecting useful fumigants, a general agreement emerged that:

#### Resolution

1. Government and regulatory authorities, in co-operation with manufacturers and distributors, provide accurate information for the effective training of fumigators.
2. Adoption of effective fumigation practice be fostered by:
  - ◆ appropriate extension by Government
  - ◆ effective training for fumigators including regulation;
  - ◆ identification of incentives that ensure fumigations are carried out in the best possible way, including;
  - ◆ effective preparation of enclosures using pressure tests standards;
  - ◆ concentration monitoring during the fumigation to ensure minimum effective concentrations are exceeded.

Nick Price of MAFF, Central Science Laboratory in Slough, UK concluded the three days of fumigation sessions by saying: "Fumigants may not be an endan-

gered species as has been suggested."

By: Nick Price, C. Waterford, and Peter Annis, Session Convenors

## Pheromone Presentations

Dr. Mike Mullin reported:

Considerations for Trap Design by:

1. Target pest
2. Environment
3. Type of glue to use
4. Dust resistance
5. Ability to discourage humans or animals from disturbing traps
6. Ability to place traps where people don't get too curious

Tom Phillips Reported:

There are now 38 species of stored-products beetle and moths that have pheromones identified.

Mass trapping is possible under low population levels. 90% or more of the males must be trapped in order to mass trap a certain population. When there are only 8% males present. Unmated females will begin to appear in the population.

What was the first stored-product insect pheromone?

Answer: Black carpet beetle, Journal of Science, 1967.  
Trogoderma, 1968  
Indian meal moth, 1972

N.G.K. Karanth of India reported:

Bt for beetles  
86% mortality for beetle adults  
26% mortality for beetle larvae

"Biopesticides based on Btt (*Bacillus thuringiensis tenebrionis*) may be useful in the management of Coleopteran (beetle) pests of stored wheat in place of hard chemical pesticides."

Dr. M. Pöschko of Germany reported successes with a predator (*T. nigresceus*) of the very destructive Larger Grain Borer (*Prostephanus truncatus*) as well as nineteen other beetle pests including lesser grain borer and sawtoothed grain beetle adults.

## Inert Dusts

The Dryacide Company of Australia demonstrated that their slurry formulation of diamotmacious earth was excellent for empty warehouses and top-dressing stored grain. The slurry formulation also reduces much of the airborne hazards that

continued on page 7

Wendell Burkholder and past student A. Hussain of Pakistan, one of the recipients of the Wendell E. Burkholder Student Travel Scholarship sponsored by Insects Limited, Inc., discussing his talk on "Response to *Tribolium castaneum* to different bait and traps in the laboratory".



John Mueller, J. Leos-Martinez, and P.S. Pruthi at a very busy "stand".



Rudy Florre, Institute for Stored Product Protection, Berlin, Germany: "Talked about Granary Weevil Pheromone"

## 6th International Working Conference on STORED-PRODUCT PROTECTION

Canberra, Australia, 1994

Paul Cogan, CSL, Slough and Jane Wright of CSIRO, Canberra organized the well-attended Pheromone Trapping Workshop.



Dryacide™ (diatomaceous earth) in an aqueous formulation



Pasquale Trematerra, University of Molise, Italy, Sampling and Trapping Keynote Speaker: "The use of sex pheromones to control *Ephestia kuehniella* (Mediterranean flour moth) in flour mills by mass trapping and attracticide methods".

President Larry Zettler at opening announces that over 400 in attendance from 51 nations.



Opera House in Sydney Harbor



"Noah" Jonathon Banks, CSIRO, shows bunker storage during a field trip.



David K. Mueller, with poster display on "A New Method of Using Low Levels of Phosphine in Combination with Heat and Carbon Dioxide."



Larry Pierce, Food Protection Services, "Showing the results of a five-year study using pheromones for location and suppression in Hawaii."



Bob Winks, CSIRO Stored Grain Research Lab., Australia and Ch. Reichmuth, Institute for Stored Product Protection, Germany discussed phosphine fumigants, resistance issues, and the use of nitrogen.

## Conference & Workshop Dates Announced

**1994 Fumigants & Pheromones Technical Conference and Workshops** will be held December 6-8, 1994, at the University Place Hotel and Conference Center in Indianapolis.

**Innovative Pest Management:** It takes a full complement of options and the knowledge to implement them.

**Purpose:** This year's conference will be somewhat different from the previous eight conferences:

**New speakers:** Seventeen of the twenty speakers have never spoken at this conference before.

**International speakers:** More international speakers have been invited to Indianapolis to discuss how Innovative Pest Management is implemented in different parts of the world.

**International audience:** Approximately 20% of the audience will be from outside the United States. This allows for an international sharing and exchange through education. This was the theme of the highly successful Lübeck, Germany Fumigants & Pheromones Conference in December 1993, where 27 countries were represented.

**Workshops:** This year's conference will also have two workshops added to the third day.

The **Fumigation Workshop** will allow people to work directly in the field on a combination fumigation, along with other types of fumigations and instrumentation. This will not be a 'stand back and watch' workshop.

The second workshop will cover **Museum Pest Management**. The control of museum pests is a science that is different than any other type in our industry. Expert speakers from the museum industry will discuss the latest techniques in Innovative Pest Management.

### Speakers & Topics Day 1

**William B. Thomas, Ph.D.**  
*The Current Status of Methyl Bromide... A U.S. and Global Perspective*

**David K. Mueller, B.C.E.**  
*Alternatives to Methyl Bromide*

**Robert Corrigan,**  
*Innovative Rodent Pest Management (Including the current status of the deadly Hantavirus)*

**Michael Potter, Ph.D.**  
*New Technologies in Innovative Pest Management*

**Alan W. Postlewaite**  
*Working in a Museum...It's Not for the Novice*

**Paul Fields, Ph.D.**  
*Freeze Them or Fry Them: The Control of Insects with Extreme Temperatures*

**Henrik Lange**  
*Total Pest Management in the Food Industry...A system that works.*

**Jerry Sullivan, Ph.D.**  
*Toxicology 101; An Introductory Level Study of Poisons*

### Reception at The Children's Museum

**Day 2**  
**Prof. Dott. Pasquale Trematerra**  
1). *The Role of Ultrasound Production and Chemical Signals in the Courtship Behaviour of the Indianmeal moth (*Plodia interpunctella*)*  
2). *Innovative Uses of Pheromone Traps to Capture and Control Insects in Food Plants in Italy.*

**Curt Hale**  
*Food Born Allergies*

**Jerry Sullivan, Ph. D.**  
Wrap-up and Review

### Museum Pest Management Workshop

Thursday, December 8, 8:30 - 4:30. The museum industry is on the brink of implementing many Innovative Pest Management

**Tom Strang**  
*Innovative Pest Management in Museums*

**Michel Maheu**  
*Using the Rentokil Bubble to Fumigate Museum Pieces*

**Prof. Dott. Pasquale Trematerra**  
*Museum Pest Management in Italy*

**Gerhardt Binker, Ph.D.**  
*Fumigating for Woodworm in Europe*

**Arthur Slater, B.C.E.**  
*A Pest Controllers Viewpoint to Solving Museum Pest Problems*

### Fumigation Workshop

Thursday, December 8, 8:30 am to completion. Workshop participants will be asked to help seal and fumigate the structures. The workshop will go on throughout the

entire fumigation (24 hours). Workshop participants are encouraged to join in and learn to use these new techniques and new equipment first-hand. Fumigations near Indianapolis.

- Combination fumigation
- New detection equipment
- New confined space entry requirements
- Current respiratory equipment and safety programs
- Trailer Fumigation, Rail Car/Tarp Fumigation
- Silo fumigation with phosphine and carbon dioxide

Conducted by:  
**John Mueller, Pat Kelley, Bob Kelly**



**Gerrit Cuperus, Ph.D.**  
*Decision-making; RISKS: Perceptions vs. Economic Consequences for Elevators, Grocers, and Food Processors*

**Paul M. Cogan**  
*Innovative Pest Management of Bulk Grain with Detection Tools*

**Herb Yeaman**  
*Innovative Pest Management in a Tobacco Facility*

**Mike Chambers, Ph.D.**  
*VIKANE; A Current Update on the Uses of Sulfuryl Flouride*

**Gerhardt Binker, Ph.D.**  
1). *Building Pressure Testing... A salvation to fumigant resistance*  
2). *Vikane Fumigations in Europe*

technologies. These include the use of nitrogen, argon, and carbon dioxide to control storage pests, also oxygen depletion for insect control and controlled uses of heat and cold. The new pheromone for the webbing clothes moth (*Tineola bisselliella*) is now being used by museums around the world. A report will be given on their successes and failures.

**Alan Postlewaite**  
*Museum Conservation*

**David Mueller, BCE**  
*The Practical Use of the New Clothes Moth Pheromone*

**Mark Gilberg, Ph.D.**  
*Non-Toxic Alternatives to Conventional Chemical Fumigants for the Disinfestation of Museum Objects: Theory and Practice*

## Australia Conference

(Continued from page 4)

the dry dust formulation cause. It was good to see the science oriented and professionalism that the Dryacide people showed that other DE companies have lacked in the past. \*

## INTERNATIONAL NEWS



**Dortmund** - This joint meeting with the European Pest Control Association (CEPA) and the German Pest Control Association (DSV) was held in Dortmund on May 11-14. There were over 350 participants and 50 exhibitors. T. Volk, Association Director and his staff did an outstanding job organizing this educational meeting and trade show. The certification of P.C.O.'s is a new directive from Brussels. Mandatory certification of the pest control industry will allow for a greater exchange of ideas and methods throughout Europe.

### The German Market

The 'New Germany' is green - bright green. They are environmentally conscience in their thinking, their products, their clothes, their glasses, their watches, and their attitude of an alternative way of thinking.

"Bio, Green, Less-toxic, non-toxic, no pesticides is important to the New German's gardens and their homes.

In commercial pest control pheromone traps are available but the advanced technology to maximize their use seems to be lacking. The New Germany is a response to the dominate grip that the mega-chemical companies have had on the lives of these 80 million people.

### Political Power

Over 8 million people in Germany have voted the Green Party. That is 10% of the votes. This means seats in the legislature and important votes on decisive issues. \*



## Colkim Has Big Success

**Bologna, Italy**- Bologna was the site of the Fumigants & Pheromones Congress on May 5th. Over 280 attended this conference on stored product protection. It was attended by top officials of the grain, flour milling, pasta companies, and bakeries of Italy.

Carlo Albertazzi, Ph.D., president of Colkim s.p.a. and his company organized this successful conference. He said that it was patterned, in part, after the International Fumigants & Pheromones Meeting in Lübeck last winter. Simultaneous translation from English to Italian allowed American, English, and German speakers to participate.

The issue of alternatives to methyl bromide, pheromones for control, and pest management were the key topics of the congress.

Bologna will be the site of the next International Fumigants & Pheromones Technical Conference; February 1996. \*

## Promotion Announcement



**F**umigation Service & Supply, Inc., announces the promotion of John Mueller to Vice-president. He is also a new stockholder in the company.

John Mueller was been working for Fumigation Service & Supply, Inc. since 1983. He started working part-time fumigating grain bins and food processing plants. Today, John is one of the most technically specialized fumigators in the world. His perseverance and dedication to doing the job correctly has allowed him to provide consulting and fumigation service to some of the major companies in the food processing and pharmaceutical industries. He is involved in over one hundred fumigations per year and speaks at dozens of training conferences.

John will be the leader of the hands-on Fumigation Workshop at this year's Fumigants & Pheromones Technical Conference and Workshops in Indianapolis on December 8. \*

## Pheromone Tip

By Larry Pierce,  
Food Protection Services



In Hawaii, Food Protection Services uses pheromone triangulation as the technique of choice for locating insect infested products in food storage facilities. With Hawaii's year round subtropical climate, early detection and location of infested products is critical.

Using the **pheromone triangulation technique**, the layout of the pheromone trapping grid is not changed from week to week. Pheromone traps are deployed in a fixed grid pattern on the racks at 4 to 15 meters (15 to 50 feet) intervals. The distance between traps remains constant. The lures in the traps are the same age. The number of insects captured in each trap is recorded weekly.

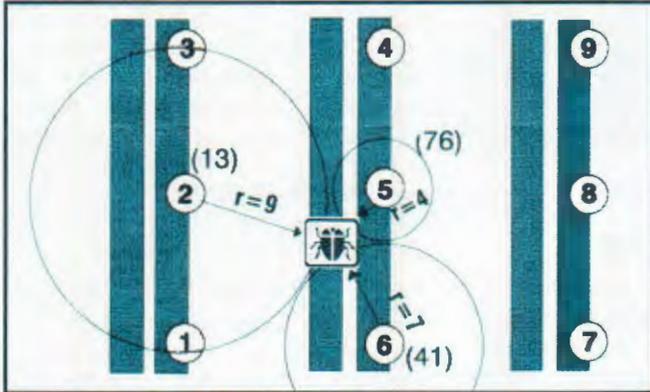
When insect captures reach or exceed seven insects per trap in a week, the active area or "Hot Spot" is noted: The two or three adjacent traps with the highest captures are noted. These captures are

*continued on page 8*

**Pheromone Tip**

(Continued from page 7)

**PEROMONE TRIANGULATION TECHNIQUE**



then added together and a percentage share of the total is calculated for each of the three traps. Each percentage share is subtracted from 100. The resultant numbers are the approximate location of the infestation.

**Example:** The accompanying diagram shows a typical facility diagram with pheromone trap positions. The number of captures at site 5=76 insects, site 6=41

and site 2=13. The total number of captures at these three sites is 130 insects.

The percent share of captures at each of the sites is: 59%, 32% and 10% respectively. Subtracting each of the percentages values from 100. The resulting numbers are 42, 68, and 90. They have a ratio of 4:7:9 are the relative distances of each trap from the source of the insects. These numbers are used as radiuses of the circles drawn on the trapping diagram.

While this technique has some limitations, it is routinely used to detect and locate hidden moth and beetle infestations in Hawaii's food warehouses.

**“ QUOTABLE QUOTES ”**

- “10% of life is what is dealt to you and 90% is what you do with it.”  
*Lew Holtz, Notre Dame Football Coach*
- “Eighty percent of success is showing up.”  
*Woody Allen*

“With Lyme Disease we are disabled, but if you come down with Hantavirus you will be in the hospital quickly and dead within a week.”

*Dr. Kramer, Nebraska Dept. of Public Health*

“Democracy is the art of saying “nice doggie” until you can find a rock.”

*Will Rogers*

“Never slap a man who chews tobacco.”

*Willard Scott*



Fumigants & Pheromones is published by Fumigation Service & Supply, Inc. and Insects Limited, Inc. for the professional applicator. 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., P.O. Box 40641, Indianapolis, IN 46280.



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**New Fumigation Catalog**

Now Available

- New illustrated layout
- Expanded product line that includes over 300 products including many hard to find fumigation supplies
- Stored-product insect identification section
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City \_\_\_\_\_ Zip \_\_\_\_\_  
Country \_\_\_\_\_ Tel.# \_\_\_\_\_

**Fumigation Service & Supply, Inc.**

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