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Fumigants & Pheromones

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Routing:

EPA Award Winner
Best of the Best

A Newsletter for the Insect Control & Pest Management Industry, est. 1981

Dogs Detect Pheromone

By Pat Kelley

A unique and exciting project is going on in Sweden right now that involves using dogs' noses to locate sources of insect pheromone. Dogs trained by the small company SnifferDogs Sweden are able to determine which trees in large forested areas are infested with damaging bark beetles that are decimating the spruce trees in Sweden. The promising results of this study were presented at the national Entomological Society of America meeting in Knoxville, TN in November 2012 by Fredrik Schlyter of the Swedish University of Agricultural Sciences.

Spruce bark beetles *(Ips typographus)* populations in Sweden have grown larger in Sweden since 2005 due to higher than average temperatures and the thousands of trees felled from severe wind storms in recent years. The beetles will attack living trees and taint the wood for harvest by staining it with a blue fungus. As an initial means of inspection, foresters are proposed to walk through their forested area inspecting each and every tree. This work is extremely time consuming and expensive. As an alternative, dogs are trained to identify and locate four different compounds of the aggregation pheromone scent of the bark beetle. The dogs are initially trained to recognize synthetic substances of the pheromone and are rewarded with food treats, playtime, and praise when they locate the pheromone from a wide variety of scents and smells.When field trained, these dogs are able to locate each individual tree that is infested and point it out to their trainer. The studies show that they do this much faster and more efficiently than their human counterparts.

The dog trainers release the dogs at the edge of the forest and with the aid of a hand held GPS and a locator on the back of each dog, they can accurately mark the location of each tree. As the dogs sniff their way through the woods, they come upon trees that emit the beetle pheromone and they excitedly bark and scratch the tree until the trainer comes to reward them with a treat and praise as they mark the exact location of the tree on the GPS.

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Mission Statement

In all our aim is to strive for quality service, provide the absolute best products available worldwide, to be a respected world-class organization, and maintain profitability with innovation, alternatives, and education.

Bad Bugs...

Necrobia rufipes

Red-Legged Ham Beetle

By Alain VanRyckeghem, BCE
Technical Director

Red-legged ham beetles are cosmopolitan and have been found throughout the US. They are most frequently encountered in pet food storage areas of retail and distribution centers and occasionally in production facilities where dried meats are being smoked, dried and processed. Monitoring for them has been difficult as there are no pheromones identified for this pest. Various blends of prepared meats, such as pepperoni, pet foods, fish meal, etc. have been implemented as baits on floor level glue traps with inconsistent results. Careful flashlight inspections can help locate infested materials which could be removed and fumigated or disposed of. Sanitation and removal of damaged bags and open containers can help prevent further spread of infestations.

These colorful beetles are iridescent blue green with bright to dark red legs and clubbed antennae. Two other similar species have other patterns of blue green or violet iridescence without red legs. Adults are about 3/8 in. (6 – 7 mm) long with larvae measuring 3/8 – 1/4 in (8 – 10 mm) long. They are very capable fliers and are attracted to food odors from long distances. It has been reported that adult beetles are attracted to UV insect light traps, however it has rarely been observed flying indoors or found in light traps where there are infestations. It is considered tropical and can be found in greater abundance in warmer climates of the US.

The life span of adult beetles is 40–68 days with females living slightly longer than males. The average number of eggs produced by females is 70 – 100 eggs with a potential of 350 eggs on a dried meat diet. Females lay eggs continuously over their life span. Eggs require 4 – 6 days for development. Larvae molt two or three times over 17 – 37 days at 70 – 85°F (20 – 30°C). Larvae will move from infested foods to dark protective crevices to produce a white pupal chamber. They remain in the pupa chamber for 10 – 13 days then emerge as adults to mate a few days later. It is unknown at this time if female beetles produce pheromones to attract males.

Red-legged ham beetles are also known as Copra beetles in other parts of the world where coconut is produced. These beetles are the most important pest of meat that has been dried or smoked in long term storage, such as smoked hams and fish. These pests will also infest copra (dried coconut), rancid peanuts, cheese, bacon, salt fish, dry egg yolk, bones and bone meal, moist pet foods and dry meat treats, carrion, dried figs, palm nut kernels, insect collections and guano. In the absence of food, adults and larvae will be cannibalistic, feeding on their own eggs, larvae and other adults. In some instances the adults and larvae are predatory feeding on larvae of cheese skippers, and blow flies or eggs of hide beetles *(Dermestes sp.)*. Feeding on this diet, a female has the potential to lay more than 1000 eggs.

Red-legged ham beetle larva

Dave's Soapbox

...for what it's worth

We Honor His Life: John Osmun

David Mueller remembers Dr. John V. Osmun:
"Dr. John Osmun will not be forgotten. He was a friend to the student and a visionary for the pest control industry. His pleasant smile and teaching style left a lasting impression on those who knew him. He is the architect of the present day pesticide certification programs for pesticide applicators in the United States and several international countries. He treated the University with respect and the students like his own children. The memories of Dr. Osmun can't be written on one page or even a book. It has been a pleasure to know him and his family. He has affected the way I live and think."

Bobby Corrigan, Ph.D. remembers Dr. John V. Osmun: "As undoubtedly will be said by hundreds of former students and industry professionals for many years to come. John Osmun nurtured us young entomologists and grew us as pest professionals. He also provided a great role model for being a good person. A photo of JVO on Governor's Island during the 1940s has been hanging above my work desk for a few years now. John lives on with all of us pest professionals here in the Big Apple.

"I always think of the famous John Quincy Adam's quote when I think of John: 'If your actions inspire others to dream more, learn more, do more and become more, you are a leader.' For certain, John Osmun was one of the greatest "leaders" in both academia and in "the family" of pest management professionals on a world-wide basis."

In Memory

John V. Osmun, 94, of West Lafayette, passed away on October 13, 2012. John was born in Amherst, Massachusetts. He earned a BS from the University of Massachusetts in 1940, an MA in biology in 1942 from Amherst, and a PhD from the University of Illinois in 1956.

During World War II, he served as a U.S. Army Entomologist and for three years was the Chief Entomologist in the First Army Command stationed in Governor's Island, N.Y. He then was employed as a research entomologist for Merck & Company.

In 1948, he began his association with Purdue University as an Assistant Professor of Entomology. He was instrumental in developing and teaching the first university curriculum in Urban and Industrial Pest Management in the U.S. From 1956–1972, he was Head of the Entomology Department. During this time, the department grew from a group of eight to a staff of over 100 people. From 1972–1974, on leave from Purdue, he worked in Washington, DC with the USDA and as director of the operations division for the EPA. Returning to Purdue in 1975, he was a Professor of Entomology and served as the coordinator of the Purdue pesticide programs. He retired in 1987 as Professor Emeritus.

John was a member of the Entomological Society of America, a founder and member of the American Registry of Professional Entomologists, founder, President and member of Phi Chi Omega, the National Pest Control Association, and a Fellow of the Indiana Academy of Science. He was a founder and member of Covenant Presbyterian Church. John was fortunate to have two great wives: Dorthy Osmun preceded John's passing and he later married the gracious Dortha Parker Osmun.

One cannot experience the Department of Entomology at Purdue University, the Purdue Pest Control Conference, pesticide training programs, his friends, faculty, and students without seeing and feeling the impact his six decades of commitment had on our profession. He will not be forgotten.

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In Memory

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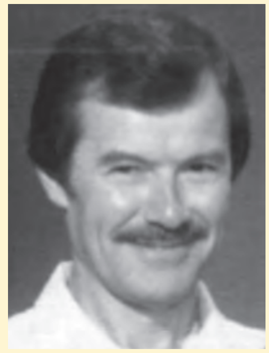
Wendell Burkholder
Pheromone Pioneer

MADISON — Wendell Burkholder, age 84, of Madison, died peacefully surrounded by his family on Tuesday, Dec. 4, 2012. He had Parkinson's disease.

David Mueller of Insects Limited remembered: "I was asked to introduce Dr. Burkholder at an IAOM meeting, and I prepared two pages of accomplishments to tell the audience at this flour millers meeting. I remember minutes before Dr. Burkholder was ready to give his presentation, he handed me a piece of paper to read as his introduction: *'He has spent thirty five years patiently studying insect ecology.'* At his request, I introduced him that way. Wendell's mentoring was instrumental in forming young commercial companies like Insects Limited."

Wendell was a pioneer in the field of insect pheromones for biological pest control as an alternative to the widespread use of insecticides. His landmark research and product development have preserved countless tons of food supplies particularly in developing countries. Wendell traveled throughout the world sharing his knowledge. He was the inventor and original patent holder of a synthetic pheromone used in controlling grain weevils and a pesticide-free trap for the monitoring and control of insects.



The Wendell Burkholder Award was created by Insects Limited in 1993 for excellence in stored products protection. He was a grantee of the National Science Foundation, Rockefeller Foundation and National Institute for Occupational Safety and Health. Wendell served as a member of the editorial board of the Journal of Chemical Ecology from 1980 to 1996 and the Journal of Stored Products Research from 1992 to 1998. He also contributed chapters to books and articles to professional journals, for a total of more than 150 scientific publications.

Wendell was a gentle and kind man with a wonderful sense of humor. All who knew him treasured the frequent twinkle in his eye and his smile. Wendell was devoted to his wife and family. A patient and generous mentor, Wendell was much beloved by his many graduate students and visiting scholars from around the world.

Webbing Clothes Moth
Notice the orange hairs on the head and buff colored wings

Case-making Clothes Moth
Notice the darker wings and the grey-brown hairs on the head

Phosphine Resistance Testing

By Ethan Estabrook

After 60 years of use worldwide, evidence of insect resistance to phosphine fumigations are showing up in many parts of the United States. There are three things that you can do to overcome this genetically linked resistance.

1. **Test for resistance**
2. **Increase phosphine dosage rate**
3. **Rotate to alternative chemical**

Increasing the dosage rate or rotating to an alternative chemical can be costly. Knowing the species of insects and their level of resistance will give one a better understanding of the extent of insect infestation and promote more effective and efficient fumigation decisions.

Resistance Testing:

Testing insects for phosphine resistance can be performed at Insects Limited, Inc. of Westfield, Indiana. Our staff of experienced chemists and entomologists can provide the information you need to make critical fumigation decisions about phosphine resistance. By simply sending insect samples to Insects Limited, we will provide a report on whether your pests are resistant to phosphine. Each test will require about 200 live adult insects and completion of the Phosphine Resistance Testing Data Sheet. The cost will be depend on the number of samples.

A report follows the laboratory test with a detailed recommendation if resistance is found. If resistance to a group of insects is suspected, further tests can be performed to determine the level of resistance (low, medium, or high). This information will be gathered to help pinpoint regions and species that have increasing phosphine resistance.

Ethan Estabrook performing phosphine resistance testing on insects gathered from grain bins.

Fumigation Failures:

Sometimes a fumigation will be said to be a failure and phosphine resistant insects are blamed. The real reason for the failed fumigation may be from low gas concentrations from:

- **Poor application methodologies or sealing practices**
- **Low or wrong dosage rates**
- **Inadequate fumigation time to penetrate commodity**
- **High winds**
- **Poor structure**
- **Tolerant target species**

More information: Call Ethan Estabrook at 1-800-992-1991, email insectsltd@aol.com or review our website: www.insectslimited.com

The Weevil Mobile

In the last decade there have been changes in the regulations governing fumigants, pesticides, and the transportation of these products by the Department of Transportation with the restrictions becoming stricter every year. We found that there were only two freight carriers willing to transport certain fumigants. One of the perplexing problems confronting us was our fumigant being "bumped" from delivery by the common carrier because they had food on board.

This sometimes led to the problem of having a fumigation crew on site with no fumigant to complete the job. This was unacceptable both to our company and our customers. The obvious answer was to add a freight truck to our fleet of service vehicles. The "Weevil Mobile" is a Kenworth diesel with a 24-foot box and lift gate to deliver fumigant and remove the empty cylinders from the customer's property in a timely manner. This added service helps the customer with a fumigation completed on schedule and considerable reduction of the delivery cost.

Merle Bennett; m.bennett @fumigationzone.com

Merle Bennett loads a pallet of ProFume® cylinderized fumigant for a timely delivery to FSS crews performing fumigations in Kentucky, Illinois, Michigan, Ohio, Iowa, and Indiana.

Equipment Calibration Time

Modern day fumigation companies use electronic gas detection equipment to measure their high and low range fumigant levels. The low range levels can be in the fractions of one part per million. Proper calibration will offer a way to have confidence in these important safety readings. Phosphine detection with the MSA PAC III or MSA 7000 is available with quick turn around from Fumigation Service & Supply. The cost is $105 per unit and the calibration is good for one year. Call 1.800.992.1991 to arrange for your annual calibration and other safety equipment needs.

Now is the time to recalibrate your gas detection equipment. Here are the MSA 7000 and PAC III low range detectors being recalibrated.

Dogs Detect Pheromone

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This allows the land owners to come in after the inspection to remove the infested trees, leaving the remainder of the trees healthy.

This behavioral response in dogs is not only exciting for the forestry industry, but it opens up a wide array of opportunities for other pest insect inspections as well. Imagine a dog being able to locate a single cigarette beetle infestation by the sex pheromone in an entire warehouse of tobacco, or similarly, an elusive saw-toothed grain beetle population that has plagued a food distribution center. Pest work by dogs is becoming more commonplace as dogs are used to search for termite nests and bedbug infestations from the odors these pests produce, but successfully isolating a sex pheromone for the dogs to locate is worth howling about!

To view of video of a SnifferDog in action, go to the website: http://www.flickr.com/photos/49401769@N05/6454065513.

Insect Eggs

Why are some stored product insect eggs difficult to kill using fumigants?

By S. Gautam, G.P. Opit, (Oklahoma State University), and S. Walse, (USDA ARS)

Sulfuryl fluoride (SF) is considered an important postharvest fumigant of the future and has already filled some of the critical void created by the regulatory phase-out of methyl bromide (MeBr). In fact, the dried fruit and nut industry relies heavily on SF when rapid disinfestations are required to protect commodities from post-harvest insect pests. However, there is international agreement by scientists, including those at Oklahoma State University and United States Department of Agriculture – Agricultural Research Service (USDA-ARS), that SF is a highly species-specific ovicide and for some species may require several days exposure for effective control. For example, concentrations required to kill dried fruit beetle (DFB) eggs *(Fig. 1A)* are extremely high, and DFB eggs are 45 times more tolerant to SF than navel orangeworm (NOW) eggs. These two insects are key pests of dried fruit and nuts. Understanding egg external morphology (structures on the outside of the egg wall) of these insects could help find ways of lowering the concentrations of SF required to kill eggs which are tolerant. Information linking the structures on the outside of the egg wall of stored-product insect eggs to their susceptibility or tolerance to fumigants had been lacking. Our research investigated this link.

Fumigants in the environment disperse by diffusion. Similarly, gaseous exchange in insect eggs takes place by diffusion through respiratory structures (openings on the egg wall) such as aeropyles and micropyles. Aeropyles are microscopic holes that dot the surface of an egg and extend radially into the chorion (egg wall), down to the inside of the egg creating a network that allows gaseous exchange with the environment surrounding the egg. Micropyles are openings on the surface of the egg wall through which male insect sperms enter the egg. Both aeropyles and micropyles allow gases to move in and out of insect eggs.

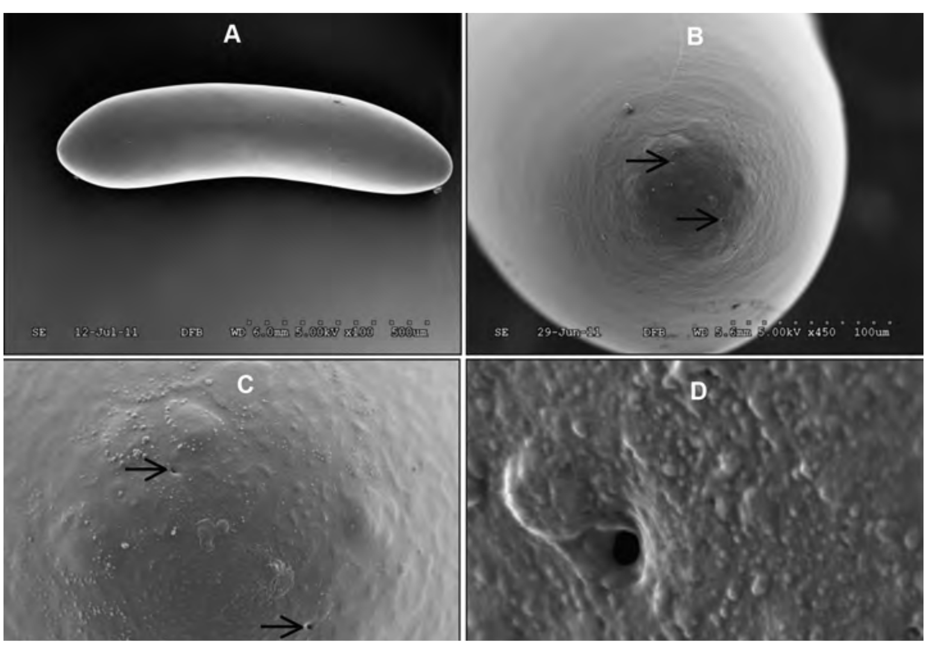

Fig. 1. Scanning electron micrograph of a dried fruit beetle egg. Intact egg (A), anterior end of an egg with aeropyles as indicated by arrows (B and C), and a magnified aeropyle (D).

We studied the structures on the outside of egg walls of DFB (beetle) and NOW (moth) using a scanning electron microscope to identify any structural differences that may explain why they respond to SF differently. We found that DFB eggs have only 2 aeropyles that are restricted to only one end of the egg *(Figs. 1B-C)*. On the other hand, NOW has between 5–13 aeropyles which are distributed on both ends of the egg. A DFB egg doesn't have a micropyle whereas a NOW egg has one. It is possible a NOW egg with a micropyle and several aeropyles may allow more fumigant penetration than a DFB egg. In a DFB egg with only 2 aeropyles, the route for fumigant entry may predominantly be diffusion through the chorion. However, fumigant entry into the egg by diffusion through the chorion may be comparatively slower compared to entry through aeropyles and/or micropyle.

Therefore, the tolerance of DFB eggs to SF is probably a result of reduced fumigant penetration into eggs because of the small number of respiratory structures on the wall of the egg. This may mean that the susceptibility or tolerance of insect eggs to fumigants is determined by whether they have a large or small number of respiratory structures, respectively, on their egg wall.

NEWSLETTER

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: Peggy Rutkowski, Fumigation Service & Supply, Inc., 16950 Westfield Park Rd., Westfield, IN 46074 USA.

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CALENDAR OF EVENTS

* attending
^ exhibiting
** invited speaker
*** organizer

*** **January 28 - 29**
Smucker's Food Safety Summit; Westfield, IN

** **February 19 - 21**
10th Serrico Anniversary Educational Program; Tokyo, Japan

** ^ **February 24 - 26**
Grain Elevator and Processing Society (GEAPS); "What's New Program"; Louisville, KY

** **March 4 - 5**
Minnesota Pest Management Conference, Minneapolis, MN

^ **March 10 - 11**
UNIVAR Environmental, San Diego, CA

^ **April 8 - 10**
PEST EX, London, England

** ^ **April 29 - 30**
International Association of Operative Millers (IAOM), Niagara Falls, Canada

*** **June 2 - 4, 2014**
11th Fumigants & Pheromones Conference, Pest Management Around the World; Krakow, Poland

If you are looking for a speaker for a continued education program or someone to organize a tailored program for your company, contact Insects Limited, 1-800-992-1991.

Quotable Quotes

"Nature loves to hide."
— Heraclitus, Greek Philosopher, 475 BC

"I did not know I even had a heart before mine was broken."
— The Tin Man, The Wizard of Oz

"Contentment is appreciating what you have."
— Church sign

"A positive attitude causes a chain reaction of positive thoughts, events and outcomes. It is a catalyst and it sparks extraordinary results."
— Wade Boggs

Purina Food Safety Symposium notes:

"Instead of being an applicator we become detectives."

"You are not in the food business; you are in the food safety business."

"40% of the cost of our food is in labor; packaging is 16%; profit to the farmer is 20%."

"Pest management is a partnership based on mutual accountability. "

"Knowledge is the foundation of pest management."
— Jim Campbell, PhD., USDA entomologist