

# Fumigants & Pheromones

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Routing:



EPA Award Winner  
Best of the Best

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## The Monarchs

Less than 20 years ago, a billion butterflies from east of the Rocky Mountains reached the oyamel firs, and more than a million western monarchs migrated to the California coast to winter among its firs and eucalyptuses. Since then, the numbers have dropped by more than 90%, hitting a record low in Mexico last year after a three-year tailspin. Preliminary counts of migrants this fall are encouraging. "But we're definitely not out of the woods," said Dr. Satterfield, who studies human effects on migratory behavior. "One good year doesn't mean we've recovered the migration."

Unlike most migrating species, monarch butterflies employ an improbable strategy that splits their roundtrip migration between generations. So their life cycles must be intricately synchronized with those of the milkweed on which they lay their eggs. But in the Midwest, which produces half of Mexico's wintering monarchs, the scores of wild milkweed species among grasslands and farms are fast disappearing

Monarchs returning from Mexico reach the Southeast soon after native milkweeds appear in spring, producing the first of up to three generations that breed on new milkweed through summer. When the perennials start dying back

in the fall, a final generation of butterflies typically emerges in a sexually immature state. Rather than reproduce when food is scarce and caterpillars might freeze, they fly to Mexico, to wait out the winter.

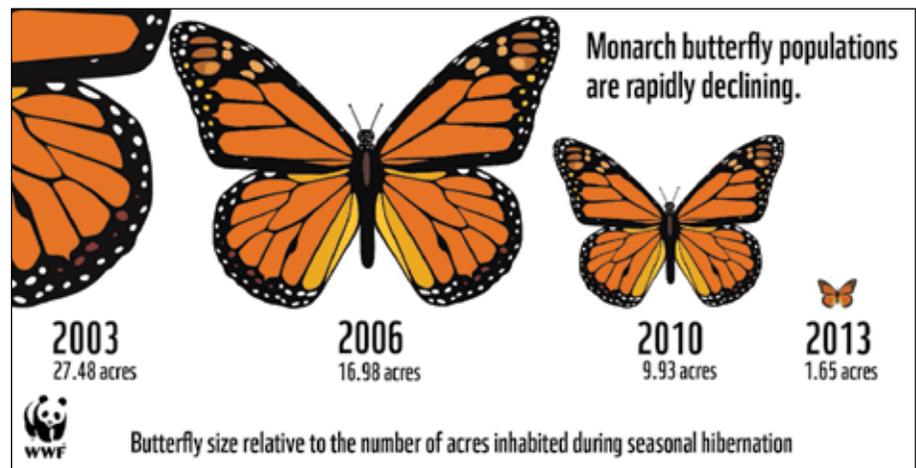
Scientists claim that droughts caused by climate change and increased use of certain new pesticides have caused the decline of the Monarch.

Source: New York Times



PHOTO: WIKIPEDIA

Monarch butterfly on milkweed.



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# IWCSP 2014 - Chiang Mai, Thailand

## International Working Committee of Stored Product Protection



by **Tom Mueller**  
Sales Manager

At the end of November 2014, roughly 350 of the best minds in Stored Product Protection, representing 43 different countries, gathered in Chiang Mai in Northern Thailand, a city where thousands of motor scooter taxis called *Took Took* own the road and the Thai food tastes so good one might never want to leave. Topics of discussion included museum pests, residual insecticides, emerging global issues, fumigation, insect biology, phosphine resistance, monitoring, quarantine, integrated pest management, grain quality, engineering, and natural products.

In the new Thai conference center, the 11th International Working Conference of Stored Product Protection kicked off its opening ceremony on November 24th. A ceremony that included a gracious welcome by Dr. Jim Throne, the President of IWCSP Permanent Committee, and Suwit Chaikiattiyos, the Deputy Director General, Department of Agriculture, Thailand. In all, there were over

250 presentations and posters to effectively relay four years' worth of scientific data and a conclusion of how we can best protect the world's most essential commodities, all within four full days.

The biggest topic of conversation was an update on the worldwide growing concern for phosphine resistance—much of the content revolved around determining whether the insects are truly resistant to the fumigant phosphine or if the pests are simply surviving due to poor fumigation techniques. While data was provided on both theories, the dialogue proved helpful for future studies and future management of these phosphine resistant stored product pests.

Another subject discussed throughout the conference was the topic of emerging global issues. In recent years there has been a very large push to aid developing countries with cost effective techniques on storing and maintaining high quality grain to ensure its ability to withstand weather anomalies or the presence of stored product pests. It was proven there have been great strides made by all actively involved in this area of the industry, and we see this by the involvement and backing of The Bill and Melinda Gates Foundation



*Tom and Dave Mueller at the recent IWCSP conference on stored product protection in Chiang Mai, Thailand*

([www.gatesfoundation.org](http://www.gatesfoundation.org)) and its support for PICS2, the Purdue Improved Crop Storage project (<http://www.entm.purdue.edu/pics2/>).

Dave Mueller, president of Insects Limited, gave a presentation on the FAST Fumigant Scrubbing System. Highlighted was new information about using this liquid fumigant destruction method under cold conditions for cut flowers, fruits, and vegetables.

The International Working Conference on Stored Product Protection occurs every four years, and it was announced during this year's closing ceremony that we can expect the same hospitality in Berlin, Germany as this will be the next host site of the 12th IWCSP in 2018. For more information about this conference, contact [t.mueller@insectslimited.com](mailto:t.mueller@insectslimited.com).



## A Winter Visitor

The Brown Marmorated Stink Bug (BMSB) was first introduced into the U.S. from Asia back in the late 90s. It is believed that it came in through Pennsylvania and has evolved into a major pest along the entire east coast. It reached Indiana last year and moved west, coming into homes, offices and other structures in large numbers.

During the year, it feeds on different types of plants and can cause significant damage to crops and gardens. In the fall, it gathers to overwinter, swarming on structures of all types in different areas. The best way to control this invasive insect is by exclusion.

## Dave's Soapbox

...for what it's worth

by David Mueller



### **We are blessed.**

When you have 17,000,000-year-old soil to grow your food, you don't get much to eat. Most of this planet is uninhabitable. Some because it is covered by oceans and some because the climate is too harsh to survive. There are many places where humans barely exist. Modern agriculture is working to offer those border zones with new drought resistant seeds and practices that can provide food consistently.

The insects of the world have flourished in warmer, temperate countries where food is scarce and poorly stored. The insects' reproductive capacity is great in hot climates. It is not unusual to see 8-11 generations per year in these regions when we have 3-4 in our temperate climate. The conditions of many border regions are conducive for the spread and development of destructive six-legged animals. In some parts of the world over 50% of the food is eaten by insects, contaminated, or destroyed.

So the first world humans, like you and I, live in the modern "Land of Milk and Honey" with vast crops produced on new moist fertile soils that arrived recently when the glaciers receded. The African soils have diseases, nematodes, insects and worn out nutrients that make it hard to grow a crop. This results in humans that need to work 100% of their time on small plots just to feed

*Dr. Duedoune Bartutia demonstrates the proper use of the Purdue Improved Crop Storage (PICS) to villagers in western Africa.*

their families. Compare this to most of us reading this newsletter. In America we spend about 13% of our income on food. This means that we can spend the remaining 87% on homes, cars, computers, cell phones, going out to eat, spare time for recreation and pleasures. We may be technically advanced but we are blessed that we live where we do.

Recently at the IWCSPP Conference in Thailand

we heard several talks about the PICS storage system. Dr. Duedoune Bartutia of Purdue's Entomology Department, along with his large team of scientists including Dr. Larry Murdock and Corinne Alexander, have made a difference in the world by understanding the culture of the people and matching a pest control strategy to protect food for people and not lose it to pests. People who spend their lives growing chickpeas (blackeyed peas), which is a staple in Western Africa and other parts of the world, did not have an effective, safe, or economical way to protect their cash crop before PICS. By filling and sealing the chickpeas in three poly bags and securing them tightly, this hermetically sealed bag will retain the carbon dioxide from the cowpea weevils that infest the cowpeas. The concentration of carbon dioxide reduces the oxygen and causes the insects to dehydrate and die. Basically an organic CO<sub>2</sub> fumigation in special 50 kg bags.



PICS bags have created a local market by setting up distributors of the bags to sell to the local farmers at a profit. The farmer can now store his dried peas for several months when the market prices are higher. This allows the farmers to make more money and raise their standard of living. In short the PICS program helps raise the standard of living for hundreds of thousands of people that live on \$1-2 a day. The PICS project has distributed over 1.5 million bags to 35,000 villages in 20 countries....saving food and producing a business model that helps improve the local economy.

This project was funded in part by the Bill and Melinda Gates Foundation ([www.gatesfoundation.org](http://www.gatesfoundation.org)) and carried out by a dedicated team of Purdue University scientists who understand people, their culture, and pests.

**PURDUE**  
UNIVERSITY

# A Safety Culture



*by Ryan Yutzky  
Safety and  
Compliance Manager*

Fumigation Service and Supply, Inc. is committed to providing a safe working environment for our customers and our employees. It is stated in our Mission Statement. We at FSS are proud of the fact that we have not had an on-site lost time accident for 24 years.

Our newest **Experience Modification Rating (EMR)** from the insurance industry is 0.68. This rating is an all-time low for our company and is attributed to an ongoing employee safety culture. The

EMR is a numbering system that insurance companies use to evaluate the impact and cost of annual workplace injuries that a company incurs and the chances of risk associated with that company in the future. Many companies choose their contractors by using this EMR.

A key element of this safety program is training. Each FSS employee goes through many hours of safety training in the classroom and on the job. Before each fumigation is performed the crew is gathered together to discuss the risks that could occur that day and how to prevent accidents from happening. FSS prides itself on the ability to adapt to the many on-site environments that require special attention to safety. One other reason that our EMR is so low is employee retention. Many of our fumigation



crew leaders and fumigation technicians have been with the company for 10 - 20 years or more. This experience is important for a safety program. We will continue to serve you with this safety culture and we appreciate the faith you have placed in us for 34 years.

*Ryan Yutzky is a graduate of Purdue University. He has handled safety and compliance for Fumigation Service & Supply since 2010. Ryan is a frequent speaker on continued education programs.*

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# Fumigants



by **Pat Kelley**  
Vice President

With all of the science in today's world we have a pretty good understanding of exactly how most types of pesticides kill insects. We know that about 90% of insecticides target the nervous system of insects. The nervous system is a perfect target because a relatively small amount of pesticide affects the functional integrity of nearly every aspect in the life of that insect. Scientists have even been able to narrow down the exact target location in the insect's neurons where the different insecticides make the changes that kill the insects.

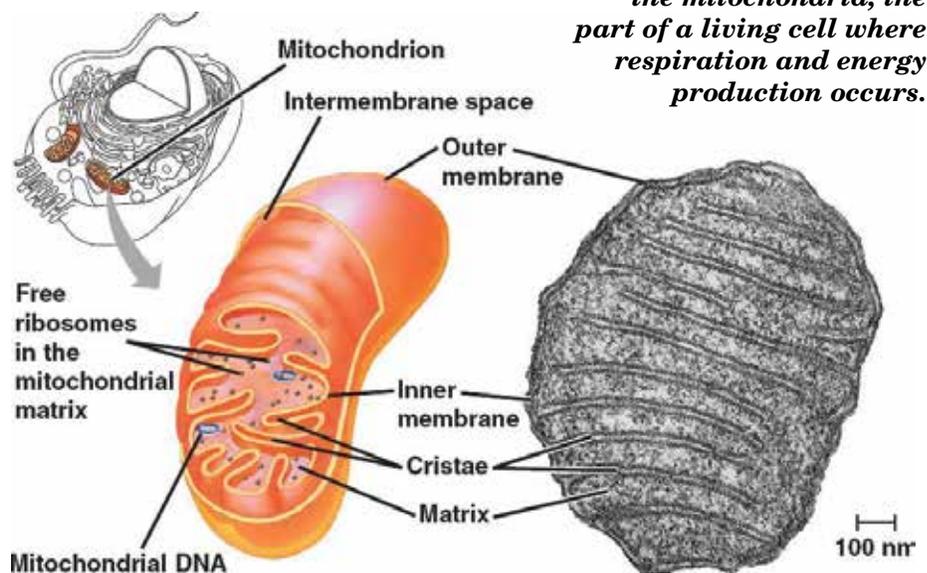
When it comes to phosphine and other fumigants though, the "mode of action" that causes death becomes a bit less clear. Scientific papers on several different theories of how phosphine works have one common theme throughout; the precise means of how phosphine kills has many unknown aspects. If you are a fumigator, you may have already been asked how phosphine works by a coworker or client. In order to give you a bit of information to help you answer this question, here are a couple of the most common theories.

**1. Energy Metabolism:** A majority of research suggests that a decrease in energy metabolism is the reason that phosphine kills. The **mitochondria** are the living parts inside a cell where respiration and energy production occur. One theory suggests that in the mitochondria, phosphine affects energy metabolism by inhibiting the electron transport chain. Another theory suggests that there is a disruption in the mitochondrial respiratory chain due to inhibition of a certain enzyme (cytochrome c oxidase). The real answer may be that there are multiple modes of action taking place in phosphine toxicology.

**2. Narcosis:** In this scenario, a research paper suggests that phosphine's mode of action on insects can be considered more physical than physiological. Their

mode of action on insects is as a narcotic that induces sleep, narcosis or unconsciousness. These narcotics reside throughout the insect body in lipid (fat)-containing tissues including the nervous system. **Phosphine basically knocks bugs out and they don't wake up.**

If we know that phosphine kills insects, why do we need to know how it kills? The answer is simple, as phosphine resistance becomes more prominent, knowing the exact mode of action of phosphine will help us come up with strategies that assist us in fending off resistance. **Fending off phosphine resistance is the only way we will be able to keep using this valuable tool against stored product insects for many years to come.**



# Pheromones

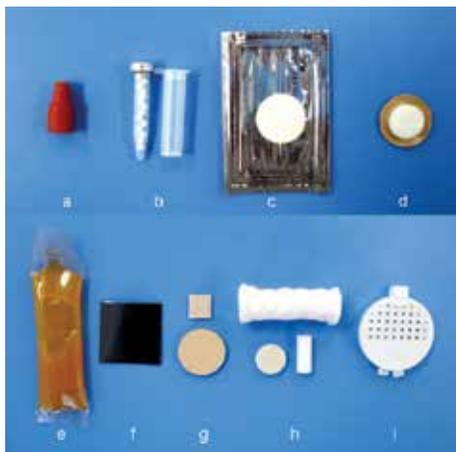
## Lure Loads and Release Rates



by **Alain VanRyckeghem, BCE**  
Technical Director

After a pheromone has been synthesized in a chemistry lab, it is placed into a delivery device, or lure. These devices come in various forms: rubber septa, hollow fibers, flakes, tape, laminated plastics, membranes over reservoirs, and polyethylene vials with acetate beads (shown above). The lure design should deliver the pheromone into the environment in a manner that mimics natural release rates and concentrations of the target insects. Lures vary in duration of effectiveness and distance of attraction due to differences in pheromone load and release rates. Many insects can be overpowered and repelled by too much pheromone (e.g. flour beetles, granary weevils). A controlled-release lure will allow the pheromone to be released in small enough concentration to lure the pest into the trap, but strong enough to reach out and attract them in from a useful distance. In addition, the lure needs to remain effective over a several-month period.

The quality of pheromone is important for some species such as the cigarette beetle, *Lasioderma serricornis*, flour beetles, *Tribolium spp.* and warehouse beetles, *Trogoderma variable*. Some impurities in the synthesis are repellent in concentrations less than 5%. Good quality pheromones have high purity of the desired chemical structure. Some pheromones are a



blend of chemicals and require a specific ratio. These lures are more attractive than lures that use only one common compound that attracts several related species. Use of species specific blends in lures may reduce the catch of closely related species. For example Indianmeal moth, *Plodia interpunctella*, (IMM) and almond moths, *Ephesia cautella*, are attracted to a common pheromone and is widely sold as such. If you use a blended pheromone for IMM that has additional pheromones, one of these compounds will repel the almond moth and reduce its catch.

It is important that the users of pheromones determine the shelf life, duration of pheromone release, recommended spacing of lures, production dates and general composition (e.g. blended pheromones) of the pheromone lures from the manufacturer in order to get consistent, long-term release and attraction to the lures by the insects. Cheaply made lures have very little pheromone, no control over release rates, are poorly packaged and are often found on retail store shelves for many months. These poorly made

The Bullet Lure from Insects Limited has a unique design with several features that enhance functionality and performance. The reservoirs can hold a higher pheromone load than most other formulations. This means several pheromones for different species (like the new Multi-species lure) can be combined and not be limited by the capacity of the lure. The Bullet Lure contains colored beads that provide a large surface area to allow pheromone to vaporize within the reservoir and release more evenly over the life of the lure. The beads also act as a way to identify the species of insects it was designed to attract; and lastly the aluminum cap has membrane technology to regulate the release of the pheromone at a desired rate.



## New Pheromone Technology

### Multiple pheromones in one lure:

- Indianmeal moth
- Mediterranean flour moth
- Warehouse beetle
- Cigarette beetle
- Almond moth
- Tobacco moth
- Cabinet beetles and more

### Uses Bullet Lure Technology with slow-release membrane and color coded beads

**Lasts 60-90 days**

**Made in USA**

products have comparatively very poor results and can even be past shelf life (expired) by the time they are purchased. For this reason, all pheromones and pheromone lures produced by Insects Limited are placed in a freezer prior to shipping.

## Fumigant Legislative Update

The United States Department of Agriculture (USDA) recently proposed rules regarding adjustment to fees for Agricultural Quarantine Inspection services and overtime reimbursement rates that affect a wide variety of industries, including import fumigators, cargo and passenger vessels, international and domestic shippers, importers, and the ports. The proposed changes are significant, and it is expected that a \$375 charge per container will be added to the cost of each import container fumigation. The onus of the billing and bill collecting will be placed on the fumigation company. This is on top of a four hour minimum charge for USDA inspectors to be on sight during fumigation treatments.

The explanation for this added charge is not clear, but there are large industries, like railroad companies that carry the burden of paying many of the costs for importation of goods into the United States. This new action could be a political shift of fees to and from other industries to balance various costs. It is a way to help expense the additional inspection requirements pressured by the executive branch to upgrade homeland security.

The explanatory statement accompanying the pending government funding legislation directs APHIS to meet with pest management professionals and other stakeholders within 30 days of enactment of the government funding legislation. The bill should be enacted soon.

Source: Gene Harrington, NPMA

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## People who call a language their native or first language:

Mandarin	850,000,000
Hindi	340,000,000
Spanish	330,000,000
English	320,000,000
Arabic	200,000,000
Bengali	200,000,000
Portuguese	175,000,000
Russian	165,000,000
Japanese	120,000,000
German	100,000,000
French	80,000,000
Cantonese	70,000,000



**March 6-9,  
2016**

**Adelaide,  
South Australia**

**Intercontinental Hotel  
and Convention Center**

The 12th Fumigants & Pheromones Conference will take place in South Australia. Adelaide is a city of over one million citizens who like to be active outdoors with beaches, car racing, cricket, bike racing, wine tasting, and many outdoor festivals. It also has a rich agricultural background. It has two grain export ports and some of the finest vineyards in the world. This conference brings together people from around the world to share practical information on how to protect stored products. A blend of Australia and New Zealand's best science and technology along with your favorite international speakers from past conferences will surely make you better at your profession. The third day of the conference will offer a field trip in 'down under' that will showcase grain storage, fumigation, export treatments, breathtaking sights of animals in the open, and finally a restful visit to a local vineyard. This will truly be another world class conference on stored product protection.

**So mark your calendar and  
start making your plans for  
Adelaide 2016.**



*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

- \*\* February 21-24; Grain Elevator and Processing Society (GEAPS), St. Louis, MO
- \*\* March 13-14; Norwegian Pest Control Association, Oslo, Norway
- \* May 4-8; International Association of Operative Millers, Palm Springs, CA
- \*\* June 28-July 1; Integrated Protection of Stored Products, Zagreb, Croatia • [www.iobc-ipsp2015.com](http://www.iobc-ipsp2015.com)
- \*\* August; Nestle Purina Food Safety Symposium, St. Louis, MO
- \*\*\* March 6-9, 2016; 12th Fumigants & Pheromones Conference; Adelaide, Australia

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



“Quotable Quotes”

**“People will not remember what you write or what you say, but they will always remember how you made them feel.”**

— Dr. Mike Culy stated, 2014 John V. Osmun Award Presentation, Purdue Entomology.