

# Fumigants & Pheromones

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A Newsletter for the Insect Control & Pest Management Industry

## Fumigation and Global Trade

by John Mueller

The United States agricultural export market is over \$62 billion and continuing to grow at a staggering pace. It is challenging our ports, port resources and regulators with the lowered value of the US Dollar. The global economy continues to be an incredible opportunity for US businesses.

USDA-APHIS-PPQ stands for; United States Department of Agriculture—Animal and Plant Health Inspection Service—Plant Protection Quarantine. Only our government would come up with an acronym this big and the name of this group is as big as their job. They are better known as PPQ. Their job is to protect our borders and prevent unwanted pests from entering the US as well as preventing pests from leaving and causing problems in other parts of the world.

To complicate things more, after 9-11 the Department of Homeland

Security transferred a large number of PPQ officers. In the seven years since 9-11, global trade continues to grow faster and the quality PPQ personnel that are left continue to get the job done. It is time for the United States to recognize the need to increase funding and focus on this critically important role.

Exporters need to source services through inland ports as air cargo is growing. Development of inland ports will provide more fluid trade flow and US businesses need PPQ or PPQ accredited agencies to facilitate these services. If you or your company export any products, I encourage you to contact your Congressman or Senator and ask

them to support US businesses' access to the global trade markets and support USDA-APHIS-PPQ with increased funding. They are a great group of people doing great work with what they have—and they need more.

If you would like more information, visit [www.aphis.usda.gov](http://www.aphis.usda.gov).

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# We Fear No Weevil



by Perry Nettles

With grain prices at all time record highs, \$8.00 a bushel corn, \$9.00 a bushel wheat, and \$24.00 a bushel rough rice, it is important to protect today's stored commodities. For example, a 100,000 bushel bin of rough rice has a value of \$2.4 million dollars that could be infested with a numerous vast amount of stored product pests! A seriously infested grain bin can have its value decreased by as much as two-thirds, wreaking havoc in an already volatile market. Today's farmers, elevators, and millers can no longer afford to be uninformed about the pests that are destroying their investments. This article focuses on three of the major stored product pests that have the largest financial impact on stored grains.

## Rice & Granary Weevils:

*Sitophilus oryzae* / *Sitophilus granarius*

**Appearance:** Adult rice weevils are about 1/8 inch long and reddish brown to black with four reddish or yellowish spots on the wing covers (elytra). Adult granary weevils look similar to the rice weevils, but without the spots on the elytra. The head bears a slender snout (pronotum) and the shield behind the head has coarse round punctures. The elytra have deep lines and coarse punctures.



**Habit:** The rice weevil is one of the most serious stored grain pests

worldwide. This pest originated in India and has been spread worldwide through commerce. It now has a cosmopolitan distribution and is a serious pest in the southern United States. Both the adults and larvae feed on whole grains. The adult rice weevil is attracted to lights and can fly. When disturbed, adults pull in their legs and play dead. The adult female eats a cavity into a seed and then deposits a single egg in the cavity, sealing in the egg with secretions from her ovipositor. The larva develops within the seed, hollowing it out while feeding. The larva then pupates within the hollow husk of the grain kernel. Finally, it emerges as an adult amongst the grain it grew in.

## Red & Confused Flour Beetles:

*Tribolium castaneum* /  
*Tribolium confusum*

**Appearance:** Adult beetles, about 1/4 of an inch long, may live for more than three years. Eggs, larvae, and pupae from both species are very similar. The eggs are white, microscopic and often have bits of flour stuck to their surface. The slender larvae are creamy yellow to light brown in color. They have two dark pointed projections on the last body segment (cerci). The red and confused flour beetles live in the same environment and compete for the same food sources. The red flour beetle may fly, but the confused flour beetle does not. The red flour beetle is reddish-brown in color and its antennae end in a three-segmented club; whereas the confused flour beetle is the same color but its antennae end is gradually club-like, the "club" consisting of four segments.



**Habit:** The red and confused flour

beetles may be present in large numbers in infested grain, but are unable to attack sound or undamaged grain. These beetles can be found not only inside infested grain products, but in cracks and crevices where grain may have spilled. They are attracted to grain with high moisture content and can cause a grey tint to the grain they are infesting. The beetles give off a foul odor, and their presence encourages mold growth in grain.

## Saw-Toothed Grain Beetles:

*Oryzaephilus surinamensis*

**Appearance:** The adult is a small, active, brown beetle, 1/8 inch long, with a flattened body and six saw-toothed projections on each side of the thorax. The larva is yellowish-white, about 2-3 mm long, with a brown head. The abdomen tapers toward the tip. The adults are long-lived and have been kept alive for over 3 years. Under ideal conditions the life cycle is completed in about 30 days.



**Habit:** The sawtoothed grain beetle is one of the most widespread of all stored-product pests and can originate at the manufacturing, storage, or retail levels. They may occur in million bushel grain bins or may be found in the pantry at your house. Foods that may be infested include cereals, flour, pastas, dried fruits, dried meats, candies, and other similar packaged goods. As with other stored product insects, it is the larvae that do most of the damage, yet it is the adult that is most commonly encountered. Adults cannot attack sound, solid whole kernels of grain, but rather feed on damaged kernels.

*Perry Nettles is the Delta Region Manager for Food Protection Services in Bay, AR. Please contact him if you are in this area. perrynetles@foodprotectionservices.net*

## Dave's Soapbox

...for what it's worth



# Wind Turbines:

**Profile:** 396 feet tall, weigh 48,000 lb, produces 1.75 megawatts of electricity. Wind turbine blades are 120 feet tall and are manufactured in Cedar Rapids, IA and Shreveport, LA and the steel comes from India or China. 20% of the cost of the wind turbine is in the transportation of the turbine to the site. The crane used to erect the wind turbines costs \$10,000 per day.

**Wind Farms:** One turbine is placed per 85 acres of land, at least 9 wind turbines per wind farm, needs 7-8 meters per second of steady wind, uses new zero resistant air bearings to turn nearly resistant free.

**Cost:** \$1.5 million each. Investor depreciation—50% in the first year. Energy goes to a grid and shipped to states with energy credits.

**Concrete Pad:** It takes 36 concrete trucks of concrete to stabilize one wind turbine. This concrete pad is 55' wide and 12' deep.

**Life time:** 30 years, new technology can then be placed on the same concrete pad.

**Downside:** Wind turbines kill and injure birds. The large construction equipment destroys local roads. The heavy installation equipment causes compaction that hurts the farmer's fields.

**Profit:** The return on investment for a turbine is about eight years. Local farmers can erect their own

wind turbines to produce electricity for their own operations and sell the excess electricity to the grid. Local jobs are produced to construct, feed, operate, and repair these large wind farms. Farmers receive about \$5,300 per year for the lease of their land for one wind turbine plus inflationary costs.



### International Wind Turbines:

Germany is the biggest user of wind turbines. They have turbines that are 600 feet tall and produce 4 megawatts of electricity each. In Denmark wind turbines produce 30% of their electricity. In California, 1.5% of their energy is produced by wind turbines located mostly in four counties. A flat ridge where there is an increase in constant wind velocity runs from South Dakota to southern Illinois. In northern Indiana, this ridge is called the Buffalo Ridge.

**Replace Foreign Oil:** Wind turbines produce clean and renewable energy that can replace our dependence on foreign oil. Rising prices of gasoline at the gas station pump is a constant reminder of our need to replace expensive crude oil.



## Mueller— Candidate for State Senator

In early March, Dave Mueller, president of Insects Limited, Inc. and elected School Board member declared his candidacy for Indiana State Senator. This district includes 125,000 citizens and four counties in Central Indiana. On April 26, precinct committeemen from this region met in caucus to decide the replacement for Senator Jeff Drozda who resigned as State Senator of District 21 after two years into his second term. There were four candidates for this Senate seat. In his first run for high political office, Mueller didn't win but placed second in the caucus and was recently elected as a delegate to the Indiana state convention. Mueller stated: *"Running for office teaches you many things about yourself and your community. I thoroughly enjoyed the experience and hope to run for office again in the future."*

### Renewable energy credits:

These are credits derived from large-scale renewable energy projects that displace fossil fuel-derived electricity like wind and solar power that is fed directly into the electrical grid.

*D. K. Mueller*



there's a bug that will eat it.

To help us make certain we're doing an excellent job of monitoring for pests, the IMA has Pat Kelley from Insects Limited come to the grounds every month to check the buildings for possible activity. He and I have looked at a number of art objects that showed signs of prior insect activity, carefully taking the time to identify each one that is found. One of his counterparts, Alain Van Ryckeghem runs the Insects Limited lab where they are developing pheromones for better insect monitoring. These two guys are pretty much the CSI equivalent of the insect world. I've never seen an insect they can't identify."

## Training Days

This year, we decided to hold a Museum and Historic House Pest Management Workshop. As an overview of this unique training session, instead of having us write it, attendee Richard McCoy with the Indianapolis Museum of Art wrote this 'museum blog':

"Some may think that spending a whole day looking at little things that have long Latin names wouldn't be very cool, but it was for me. Where else am I going to learn about the 'Dirty Dozen' of museum pests? To help share my experience and keep my co-workers at the ready, I think I'll make these Bug Flash Cards and start quizzing anyone I see in the hallway or at lunch.

While we rarely see any of these guys at the Indianapolis Museum of Art, we stay on the watch so we can squash a problem before it even starts to get serious.

Ask anyone who works with a museum collection: the appearance of just one webbing clothes moth, dermestid beetle, or wood eating insect is enough to put a whole department on high alert. These insects will eat art and that's not

good for anybody. For every ethnographic object, rug, tapestry, gown, piece of paper, feather, or furniture

## Mating Disruption Summit



On Tuesday, April 1st, Insects Limited, Inc. with co-sponsor, Whitmire Micro-Gen held the first Mating Disruption Summit where Entomologists from all over the United States came together to report their findings on the future of this product, Allure MD™.

Pheromones have been used to monitor pest insect activity for over 30 years. Today, there are new methods to attract female insects. Mating disruption is a new way of controlling pest insects without the use of pesticides. This bio-rational technique has been used successfully in agriculture in several areas and now is ready to move into the pest control industry. It has shown to be successful on the Indianmeal moth, Angoumois grain moth, and the Almond moth.

Speakers included those that have spent years working with the mating disruption theories, Dr. Tom Baker, Dr. Tom Phillips, Jonathon Berger, Larry Pierce, Jeff Weier, Alain Van Ryckeghem, and Dave Mueller.

## House Mice



by Dan Collins, BCE

House mice (*Mus musculus*) are the most common rodent pests in our urban landscapes and have been labeled as a “mammalian weed” by researchers and rodentologists. Millions of dollars are spent every year managing the house mouse by pest professionals and do-it-yourselfers. But what makes the house mouse such a formidable foe, particularly in the fall and winter months when these cryptic pests enter our structures seeking heat, food and refuge?

House mice are small, secretive mammals that require very little water and feed on a wide variety of food resources. Mice can enter gaps one-quarter inch or larger. A common urban myth often heard states that mice are contortionists and lack rigid skeletal structures, but this is untrue. In reality, the mouse’s head height (1/4-inch) dictates where it can and cannot enter. Once the mouse’s head is in, the body can follow.

Some of the more mouse vulnerable entry zones at facilities include ground-level, overhead doors and employee entrance doors, improperly sealed utility penetrations and sub-slab foundation cracks. Mice are also excellent climbers and can easily scale rough sur-



faces such as wood, brick, and block then gain entrance via loose soffits or unsealed rooftop penetrations.

House mice also commonly hitch-hike into buildings, particularly food warehouses and production facilities, within incoming goods and pallets. Employees responsible for inspecting incoming product (the “gatekeepers”) should be trained how to properly inspect incoming goods relative to mouse detection. Every gatekeeper should have a bright flashlight to illuminate nooks and crannies of palletized goods to search for rodent signs such as gnaw marks, fecal pellets, grease marks and urine stains.

Remember, mice are small, secretive breeding machines that leave over 3,000 micro-droplets of urine each day and deposit 50-75 fecal pellets daily. Their presence should never be tolerated inside any facility, particularly those that store and produce food-related goods.

Dan Collins, BCE is the owner of Collins Pest Management in Evansville, IN. If you would like to contact him, his email is [collinspest@insightbb.com](mailto:collinspest@insightbb.com)

## Quotable Quotes

**“Knowing is not enough—we must apply.”**

—Johann Wolfgang von Goethe

**“Each of us bring to our job, whatever it is, our lifetime of experience and our values.”** —Sandra Day O'Connor

**“Success is getting what you want. Happiness is wanting what you get.”**

—Brother Dave Gardner

**“Global warming and more frequent extreme weather events are likely to emphasize the importance of flight as a factor in the spread of infestation particularly in temperate climates, increasing the occasions on which pest species can fly as well as the total number of individual insects flying.”**

—P.D Cox et al / Journal of Stored Products Research 43 (2007) 111-117

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# We Fear No Weevil



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# Why is fumigation a battlefield...



by John Mueller

Commercial fumigation services have only been around for little over half a century. This short period has been very volatile with the introduction and subsequent elimination of many compounds. For the later half of this period the market has settled to three fumigants; **phosphine, methyl bromide, and sulfuryl fluoride**. These three compounds make up 99% of post harvest fumigations performed in North America.

In truth, not a lot is known about these fumigants other than the fact that they work well to disinfest insects from stored product and stored product processing facilities. As an example of how little we know, it is unclear how two of the three fumigants kill insects. If this wasn't enough to create market uncertainty consider the fact that, until very recently, fumigant application labels were very broad with large margins of gray area for applicators to work in. The true capabilities of fumigants became muted and fumigant application became convenient.

Today, convenience is still the rule for many fumigators who learned how to fumigate from their predecessor and not through objective learning and questioning. I can say this because in most states it is easier to get a commercial fumigation license than a "Right-of-way" license to spray Round-Up®. For most Right-of-way licenses it

takes a two year apprenticeship or a university degree.

We need higher standards for fumigators. Regularly, we hear people say "Well, I don't need to monitor fumigant gas levels because we have been doing this for 30 years and we just know it works," or something along those lines. The act of fumigating or using any pesticide is applied science and these old ways of thinking and



opinions break down abilities to be effective.

A trend to increase observation and monitoring of fumigations is taking place – but this is today's fumigation battlefield. The battle is not among fumigants but among thinking. All fumigants work well at labeled rates. Phosphine and sulfuryl fluoride have newly reviewed [modern] labels. Methyl bromide's label is currently in review and should soon have an application label reflective of the needs and requirements for now and in the future. These new labels have diminished, and in some cases removed, gray areas of applicator interpretation.

New labels are forcing the fight between new and old ways of

thinking and proof of performance is the result. The first step was using bioassays [small cards or vials with live active stages of insects sealed in a permeable enclosure] to evaluate the effectiveness of a fumigation. This was a good first step but still a little flawed. All fumigants kill active stages [larvae and adult] at very low rates – (10% to 20% the dosage rate it takes to kill the inactive stages egg and pupae). Fumigation can be a failure based on scientific requirements but if all the active bioassays are dead then the fumigator or the customer is satisfied. A good way to continue to evaluate fumigation results is to save these bioassays for 30 days in a warm office or lab. Check them each week for emergence.

The next step in fumigation improvement is in graphic documentation of high range gas readings taken during the fumigation. These are post fumigation review assets which are critical in understanding and improving from one fumigation to the next. Having a post fumigation meeting to review this data is very important and will create the kind of dialog needed to move improved results forward for future successful fumigations.

Our industry is improving. The results of the last ten years of fighting over what is best for our industries has yielded improved practices, justified dosage rates, brought awareness to fumigation needs, and created focused communication toward continuous improvement, and, in the end, we are all providing better fumigations.

*John Mueller is President of Fumigation Service & Supply, Inc. If you would like to contact him, [j.mueller@fumigationzone.com](mailto:j.mueller@fumigationzone.com)*

## The Grains of Change

by Jeff Waggoner

We have been honored to work with Dr. Dirk Maier in the field on fumigation projects where we can utilize the technology and processes developed at Purdue University and apply it to more precise fumigation techniques. He has also been kind enough to share his knowledge through speaking at our seminars and workshops. Dr. Maier was the Associate Head and Extension Engineer in Agricultural and Biological Engineering. He worked on post-harvest grain quality as it relates to proper conditioning, insect control, processing optimization, and handling systems. Recently, he has made a move from Purdue University to Kansas State University where he has earned the title Department Head of Grain Science and Industry.

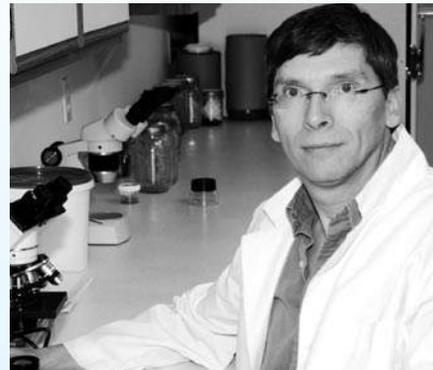


Dr. Dirk Maier

We will be hearing of his work but will sure miss him in the Purdue system (although he claims he is a 'Junk Professor' there). Dirk gave his last talk as a Purdue Professor at Fumigation Service & Supply's Ohio Regional Fumigants and Pheromones Conference on March 19, 2008 where he discussed his SLAM (Sanitation, Loading, Aeration and Monitoring) approach to maximizing grain quality and profits through IPM. See more of Dr. Maier's work at [www.grainquality.org](http://www.grainquality.org).

We certainly will miss having you around West Lafayette and the beautiful Purdue Campus. So from all of us at FSS we wish you the best of luck in your continued work on stored grains at Kansas State. Oh, one more thing, Dirk...Boiler Up!!!

## Insects Limited Receives Grant



Alain Van Ryckeghem, BCE; Technical Director, Insects Limited, Inc.

WESTFIELD—Insects Limited in partnership with Purdue University, received a Small Business Initiative Research grant (SBIR) from the state of Indiana and the United States Department of Agriculture (USDA) for work in the area of insect biosensors. This is one of only four state and federal SBIR grants awarded in Indiana this year. The grants totaled \$160,000.

Dave Mueller, President of Insects Limited stated: "We are excited to work with Purdue on this new Insect BioSensor project. This new technology has the potential to change how our industry evaluates its treatment of traditional and organic food products throughout the world. It could reduce the total amount of pesticides used on our food products."

A biosensor is a way to use live insect eggs to determine when the treatment is complete by measuring the oxygen produced. When the eggs stop using oxygen, the biosensor technology will determine that the treatment is complete. This method has the potential of replacing today's gas concentration methods used in post harvest agriculture treatments. Insects Limited will make an application for the phase two SBIR grant in 2009.

## Now is the time to order!

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Webbing Clothes Moth  
(*Tineola bisselliella*)

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Indianmeal Moth  
(*Plodia interpunctella*)

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Insects Limited / Fumigation Service & Supply will be speaking, attending, or organizing the following:

**June 22-25\***  
**Rice Millers Association,**  
 Napa, CA

**June 24\*\***  
**Seed Specific Pest Control and Fumigation Conference,**  
 Ames, IA

**June 28-31\***  
**Institute of Food Technology,**  
 New Orleans, LA

**August 3-6**  
**International Association for Food Protection,** Columbus, OH

**October 8-11\***  
**National Hardwood Lumber Association,** San Francisco, CA

**October 22-25\***  
**National Pest Management Association,**  
 National Harbor, MD

**March 3-5, 2010\*\***  
**9<sup>th</sup> Fumigants & Pheromones Conference,** Valencia, Spain

\*Attending  
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# 9<sup>th</sup> Fumigants & Pheromones CONFERENCE & WORKSHOP



March 2010

Valencia, Spain



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