Fumigants & Pheromones

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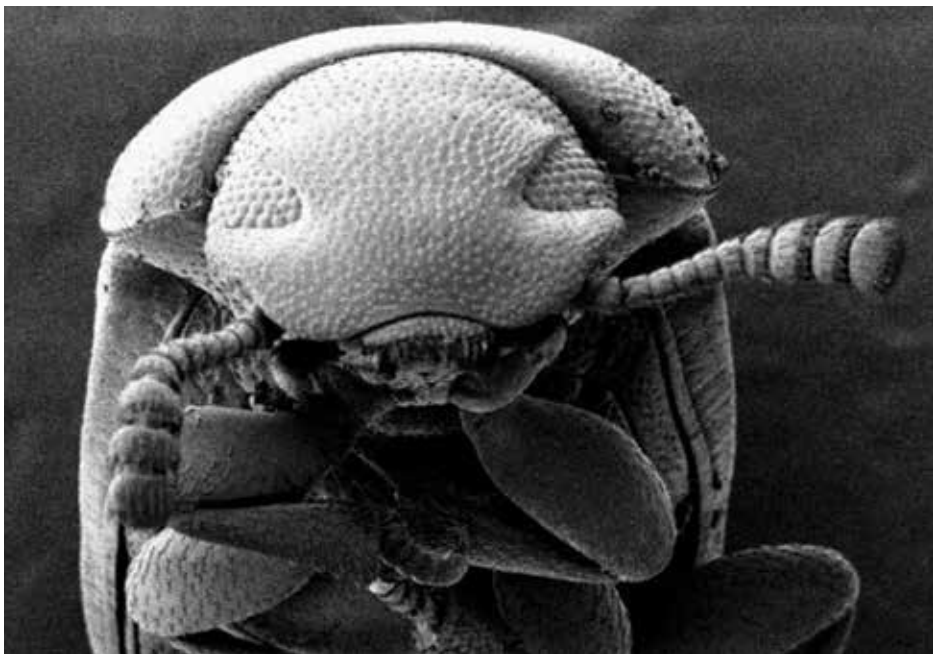
EPA Award Winner
Best of the Best

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

Smart Packaging: NEW IPM CONCEPT

By Jim Bagwell,
President of ProvisionGard Technology



Stored product insects like this confused flour beetle feed on milled food fragments that contain the insect growth regulator methoprene. This will stop the larva from developing into a mature reproductive adult. Because the beetle is sterile, the pest population will decline. Methoprene is the active ingredient in new ProvisionGard.

Product Overview

A new technology in pest management is an insect resistant packaging that is US EPA approved and FDA compliant for all types of food, feed, and seed packaging. ProvisionGard was designed to protect commodity for over one year from stored product insects and can be implemented easily at current packaging suppliers for pennies per bag. Designed for paper/woven bags and super sacks, it requires no labeling and safely reduces insect populations in and around your stored products. The following study demonstrates efficacy using common stored grain beetles:

Studies are being conducted by the USDA-ARS and ProvisionGard Technologies to evaluate residual efficacy of packaging material with the insect growth regulator (IGR) methoprene (0.1 % active ingredient) incorporated into the laminate exterior of bag packaging.

Treated bags and also companion untreated bags were tested by the USDA ARS in Manhattan, KS. Methoprene residual tests on bags were conducted to measure efficacy. Test insect species are 4-week-old larvae of the red flour beetle (RFB) and the same age larvae of the confused flour beetle (CFB).

Materials and Methods

Experimental units for beetles consisted of either the inside or outside of untreated or treated bags placed in the bottom of a 62 cm^2 Petri dish (10 mm high), and sealed by caulking around the edges. Ten larvae of either beetle species were placed in an experimental dish, and there were 6 replicates for the inside and

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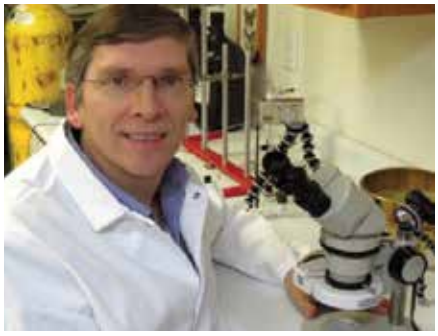
Mission Statement

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...

By Alain VanRyckeghem, BCE
Technical Director



Case Study:

Ant Bees/Flat Wasps

Recently, reports of biting/stinging insects have occurred in food plants. One concern obviously would be bedbugs, but in these cases there were no bedbugs to be found in the plant or lockers. The stings would occur on the neck, cuffs and hands of employees while actively working. This is not typical of bedbug biting. Some of the welts were quarter sized.

After collecting samples from clothing with a lint roller and further inspection of the material recovered, there were several tiny insects caught on the tapes. At first they appeared like ants; in fact they resemble pharaoh ants which were light yellow and about 1-2 mm long with elbowed antennae. The giveaway that these were not ants was the lack of a node between the thorax and abdomen. The insect was identified as *Cephalonomia gallicola*, which belongs to the aculeate wasp family *Bethylidae*.

This tiny 1-2 mm wasp has a wingless female and a male that can have wings or not. Identification to species can be confirmed by the overall light yellow color, flattened head, squared off posterior corners of the thorax, and terminal 6 segments of the antennae darker than the basal six. The male wasps can fly, while the female does not. Both will sting. This most often occurs when the insect is caught up against the skin and clothing. The females can crawl readily like ants and so may move onto clothing or fall off surfaces onto people while handling product. The key element to understanding and managing this insect was to determine the origin of the wasps.

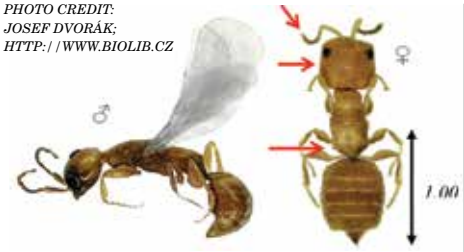


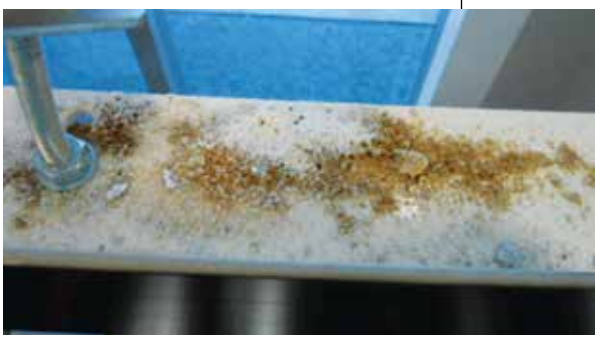
PHOTO CREDIT: JOSEF DVORÁK; HTTP://WWW.BIOLIB.CZ

***Cephalonomia gallicola*: a Bethylid wasp called 'Flat Wasps' in Germany and 'Ant Bees' in Japan.**

This wasp is a parasite of the larval stages of cigarette beetles, drugstore beetles and some spider beetles. Other relatives in the Bethylidae family are also parasites of Anobiid beetle larvae like the furniture beetles, *Anobium punctatum*. Those wasps, *Sclerodermus domesticus*, also can deliver stings and severe reactions.

These wasps have been recorded in the eastern US, Europe, and Asia, and are likely cosmopolitan. Adults emerge from parasitized larvae from February through October with the majority appearing from July through September. Spring emergence requires 60 days from egg to adult while summer only requires 20-30 days. Adult females can overwinter for a period of 60-180 days, but males die about 10 days after emergence and mating. Females will not lay eggs below 60 °F (15.5°C) or above 104°F (40°C). This wasp will continue to survive indoors year round if larvae of the cigarette beetle *(Lasioderma)* and drugstore beetle *(Stegobium)* are readily available. Spilled product of only 2 mm thick on ledges can support larval development in cigarette beetle. Small pockets of spillage or accumulations in cracks and crevices also provide suitable habitat. For more information, contact insecthelp@aol.com

This Ant Bee sting on a man's arm is the size of a quarter.



***Spillage of food found on the edge of an overhead conveyer belt shows feeding by cigarette beetles. This type of condition can support the parasitic wasp** Cephalonomia gallicola.*

Careful inspection of the facility determined that open spills of food were supporting the development of cigarette beetle larvae and the parasitic wasps. A detailed inspection of the facility found just handfuls of food material spilled on overhead conveyers. Once the spillages were removed, followed by a light fogging of pyrethrin, this stinging issue was solved.

Dave's Soapbox

...for what it's worth

by David Mueller

As many of you know from past newsletters, I am not a big fan of cell phones. I still dislike cell phones.

Top three reasons I dislike cell phones:

1. **They are dangerous**
2. **They get lost with all my important information**
3. **Batteries die when you really need to use it**

How many times have you been traveling and checked the battery life on your cell phone and it is in the "red" zone and you still need to return several calls and check your fantasy football picks?

Our lives have really changed with cell phones. What I thought would be a simple replacement for the telephone with a cord, now controls my life and just about everyone who is reading this. The scary thing is that these cell phones will stop working in an emergency. Is there even a plan B if your cell phone and everyone else's around you doesn't work?

Recently there was an emergency school evacuation in our city of Westfield, Indiana. The kids pulled out their cell phones to call home. The parents tried to call their kids and everyone's phones were useless. I was recently at a Purdue Football game when I tried to send a picture of the game to my kids. So many people were texting and calling that the cellular phone system didn't work. In a real disaster, it would be good to bring a blanket and some matches to start a fire to send smoke signals.

Meetings have become a place to bring a cell phone and pretend you are really paying attention to the speaker while you're wandering off with your "mini computer phone" and doing personal business or searching a topic more interesting like where your next vacation will be.

I especially enjoy boarding a plane or being in a confined area when 'Ernie the Executive' comes on board and continues to talk "business" loud enough for all on the plane to hear. I want to hold up a sign that says **"RUDE."**

Cell phones at stop lights is another example of our lives being affected. How many times have you been stopped at a traffic light behind someone who is talking or texting on the phone and the light turned green 10 seconds ago?

The new iPhones are amazing when you think about what they have the capacity to do, like suck the money out of your pockets much like the TV cable companies have done to our home TV watching. What is the cost of your cable and cell phone combined these days? A heroin addiction might be less.

"Another Pleasant Valley Sunday, here in status symbol land." Fashion and add-ons for our phones have become the one up thing to do. By placing your new series 7 million iPhone on the table in a meeting with your designer plastic cover that you can get online for $1.99 but you paid $99.99 will surely attract stares from the group. A cracked screen will be the 'wart on the frog' that causes you to leave your phone in your pocket until you can take out a loan to replace the screen or phone. How about when the phone company comes out with the new model that everyone has to have, and they change the charging cords and you need to buy three more; one for the office, one for home and one for your car. That's BS.

Driving Distractions

DANSDETAIL.COM

How about standing in line at the phone company store to get anything changed or fixed on your cell phone. I really enjoy this quality time. "Excuse me, how long was that contract for?"

Phones have changed our lives. Some good and some bad. Car accidents and fatalities associated with cell phone use is something we hear about often. We used to ask if the driver was wearing a seat belt, now we look to see how smashed the front of the car is and if there were any skid marks before impact. Phones can be damaging and deadly when used improperly.

The moral of the story is that technology is driving our lives. Technology can offer more information faster. This information can be used to make decisions .... faster. But there is a cost of new technology. At the beginning we really didn't

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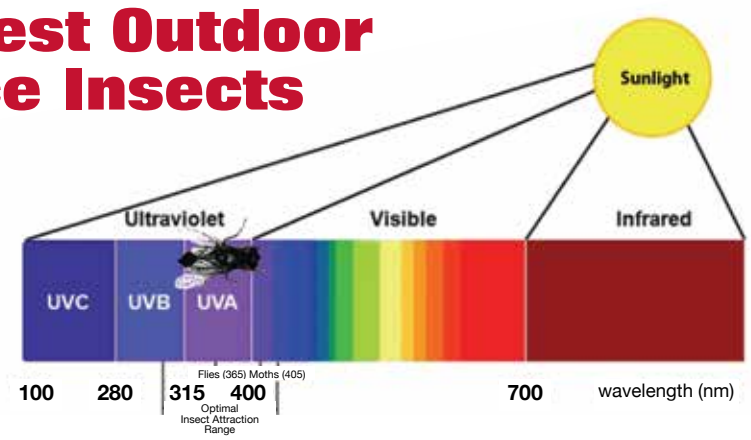
Choosing the Best Outdoor Lights to Reduce Insects

By Pat Kelley, ACE
Vice President



Like a moth to a flame, serious insect pest problems can begin with attraction to our outdoor lighting options. Most outdoor lights are going to have some insect attraction qualities, but the higher intensity (brighter) lights are more attractive than low intensity lights. The direction that a light shines can also have a big impact. An un-shielded bulb in a parking lot light will attract thousands of more insects than a shielded light that shines only downward.

From a pest standpoint, we know that the majority of light attracted insects prefer light in the spectrum between 300 – 420 nm. House flies seem to prefer a wavelength of ~ 365 nm while moths and beetles responded best to a slightly higher wavelength. The range of highest attraction encompasses a definite range on the light spectrum scale (see illustration). It is important to ask light manufacturers for the wavelength specifications for their lighting options prior to purchase. If the lights that you currently have produce a wavelength that is in the area of insect attraction, perhaps you should explore other options. In the case of outdoor lights, it pays to do your homework!

Best Options

1. **LED Lights** – In general these are much less attractive to pests than other options.
2. **High Pressure Sodium Lights** – Great for parking lots but should be shielded from above.
3. **Metal Halide Lights** – The UV output is similar to the sun, negating some of its attraction to insects. Warning – Extremely high temperatures that require Teflon lenses!

Lights to Avoid

1. **Ultra Violet (UV) Light** – Black (UV) lights are highly attractive to insects and are best kept in insect light traps or in teenager's bedrooms.
2. **Fluorescent Lights** – Produce lots of UV light that attract pests. Use only indoors.
3. **Mercury Vapor Lights** – These lights are so attractive to insects that they can be used to pull insects away from a building if they are placed 30 feet or more away!
4. **Incandescent Lights** – Common light bulbs are good for indoor use only.

Dave's Soapbox

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understand the future capabilities of instant communication devices. We thought it would help us be more efficient and help us make more money. We thought it would be the extended umbilical cord for mothers and children offering better parenting. We expected it to help our families to be safer when we travel. We thought it would be the communication tool that was convenient and affordable.

When we have a new technology, we especially need to have rules to govern it. We are good at following rules but when there are no rules, we find every advantage we can to use it even if it is dangerous. We don't need more rules to tell us what to do with our lives, but we need more self-imposed control to make a new technology safe first and improve our lifestyle second.

Ring, Ring:
"I will call you later when I get off this call while texting my wife when I expect to drive home, calling my kids, while checking my fantasy picks for the week."

D. K. Mueller

Dave Mueller

For Fumigation Training and Continuing Education Credits, go to: www.insectslimited.com

Pete Swords, pheromone chemist for Insects limited, has improved the F.A.S.T. fumigant scrubbers used to destroy fumigants and improve bystander safety. Here containers loaded with walnut logs are being fumigated before they are exported. Any remaining fumigant is being destroyed with the scrubber on the right. A workshop will be held by Pete Swords on December 13 to demonstrate how to use and maintain and build a fumigant scrubber.

"Quotable Quotes"

"We see, but do we observe?"
— Sherlock Holmes

"All pest management visits need to be seen as a transfer of knowledge."
— Kim Kemp, Next Generation, Nestle Purina

"One must change one's tactics every ten years if we are going to maintain our superiority."
—Napoleon Bonaparte

"People should be familiar with strategy, those who do not understand this will perish"
— Sun Tzu's the Art of War

Fumigation Emergencies

By Jeff Waggoner,
FSS General Manager

Product recalls get more complicated when product is pulled from the shelves of regional, national, or international retail operations. One recall from an emergency fumigation was estimated at $250,000,000. The recalled product needed to be consolidated in a large warehouse where it too needed to be fumigated. The follow up to an emergency fumigation can take several years to completely understand the issues, make corrections and gain confidence that the pest issue will not happen again.

From 2010 – 2013 Fumigation Service & Supply performed 24 emergency fumigations. An emergency fumigation is when a phone call comes to our attention with an immediate fumigation service requested, and often production is threatened and loss of sales imminent. Often these unplanned shutdowns stem from a federal inspection, another third party audit, or a pest related complaint(s).

Fumigant inventory is needed to offer a fast fumigation service response. Fumigants are manufactured in China, India, Canada, or Northern California. Heavy cylinders of fumigant that are highly restricted by DOT can be a logistic challenge. Otherwise it could be like a firefighter running to a fire without water. FSS has a licensed box truck to move fumigant to locations in hours and return empty cylinders promptly. FSS is licensed to perform work in states throughout the Midwest and maintains an inventory of fumigants to react quickly when the need arises.

Equipment for monitoring human safety and fumigation efficacy is important to have available for emergency fumigation. You need backup equipment to ensure you are able to maintain levels within the facility should a unit fail. Also to ensure employees and bystanders are working in a safe environment.

FSS has the capability to perform emergency fumigations. We can offer our fumigation crews or consult directly with your certified fumigation applicators to perform successful fumigations. Our expectations are high for our fumigators. We place emphasis on safety and effectiveness. Our fumigators must be diverse in their capabilities to be able to balance the safety of people, products, and facilities when reacting with urgency. Contact your regional FSS manager. The Fumigation Service & Supply regional managers can be contacted by calling 1.800.992.1991.

Like a crew of firefighters going to a fire, fumigators are ready to go to emergency shutdown fumigations with trained crews, equipment, and experience. It is not uncommon that it may cost over $1,000,000 per day to close plant operations and send everyone home for days due to a pest related outbreak.

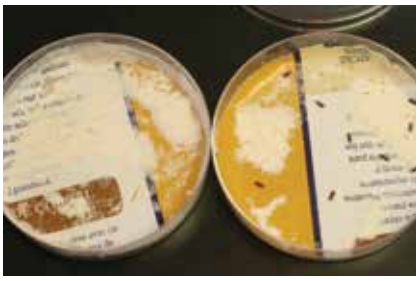
Smart Packaging

continued from page 1

outside of the bags for both the treated bags and the untreated control bags. The criterion for assessment was the emergence of morphologically normal adults of all species. Methoprene can cause physical deformities in insects (like twisted wings and missing segments).

Results The outside and the inside of the treated bags showed activity of the Red flour beetle larvae and the Confused flour beetle larvae in the time trials. No adult RFB emerged from the larvae that were exposed on the treated packaging. There was some emergence of normal adult CFB from larvae exposed on the inside and outside of the bags. This is consistent with previous tests with methoprene that indicate that the CFB is less affected by methoprene compared to the RFB.

For more information about this new IPM packaging tool, go to www.pvgard.com and watch a video. Insects Limited has a stored product research laboratory to help you evaluate the effectiveness of new pest management technologies.



Treated on left, untreated packaging on right

Can Phosphine-Resistant Lesser Grain Borers and Red Flour Beetles Still Thrive in the Absence of Phosphine Use?

By Dr. G. P. Opit and N. S. Bajracharya; Oklahoma State University

In 2012, strong phosphine resistance was reported in Oklahoma populations of lesser grain borer (LGB) and red flour beetle (RFB). Phosphine resistance management is a strategy that can be implemented to ensure that there are high percentages of susceptible (non-resistant) insects in the U.S., so that phosphine can be used effectively to kill high percentages of insect pests and prevent widespread resistance. In cases where resistance occurs, this strategy could involve suspended use of phosphine for a period of time to mitigate resistance or applying it as infrequently as possible in order to delay resistance development in cases where there is no resistance or resistance is weak (low). However, these two approaches will only work if resistant insects (insects with resistance genes) are negatively affected by having these genes in the absence of phosphine use. Examples of negative effects of having resistance genes are female insects laying fewer eggs and eggs laid taking much longer to develop to adults compared to those of the susceptible insects. If this is the case, populations of resistant insects will grow significantly much more slowly compared to those of susceptible insects. Under these circumstances phosphine resistance affects insects in a costly way, i.e. resistance exerts a fitness cost and populations of resistant insects will most likely decline over time in the absence of phosphine use. However, in some cases, having resistance genes makes insects to reproduce faster than those without these genes in the absence of the insecticide. In such circumstances phosphine resistance affects insects in a beneficial way, i.e. resistance confers a fitness benefit, and populations of resistant insects will probably not decline over time. **Stated differently, where resistance confers a fitness benefit, resistant insects thrive both in the presence and absence of phosphine use**.

We have conducted experiments to compare population growth rates and developmental rates (egg to adult development time) of Oklahoma populations of LGB and RFB with strong phosphine resistance with phosphine-susceptible populations of these species. Our goal was to determine whether there was a disadvantage (a fitness cost) or an advantage (a fitness benefit) to having phosphine resistance genes in the absence of phosphine use. Altogether, six populations were used (one susceptible and three resistant populations of LGB and one population each of susceptible and resistant RFB). For the cumulative population growth study, our results for LGB showed that the cumulative population growth for the susceptible population was higher than those of resistant populations after 110 days (Figure 1A). For RFB, the cumulative population growth for the resistant population was much higher than that for the susceptible population (Figure 1A). In the developmental rates study, we wanted to determine whether differences existed in how long it took eggs of resistant and susceptible LGB and RFB to develop to adults. Groups of insects were allowed to lay eggs on their respective diets for 2 weeks after which these parents were removed. We then determined the time it took for half of all eggs laid to emerge as adults starting from the time the first adult offspring emerged. Our results for LGB showed that emergence was faster in the susceptible population than in all the three resistant populations, i.e. eggs of susceptible insects took a shorter time to develop to adults than those of the resistant insects (Figure 1B). Stated differently, emergence of offspring was completed faster in the susceptible LGB population than in the resistant populations. In RFB, emergence was faster in the resistant insects compared to the susceptible insects (Figure 1B).

The information we have presented for resistant LGB and RFB populations from Oklahoma indicates that phosphine resistance exerts a fitness cost in LGB but confers a fitness benefit in RFB. This suggests that withholding phosphine use for long periods of time could mitigate phosphine resistance in the LGB populations whereas doing the same may not mitigate phosphine resistance in RFB populations. This information is important for the development of phosphine resistance management strategies in the U.S.

Dr. George P. Opit (b); george.opit@okstate.edu and Nisha Shakya Bajracharya (f); nisha.shakya10@okstate.edu.

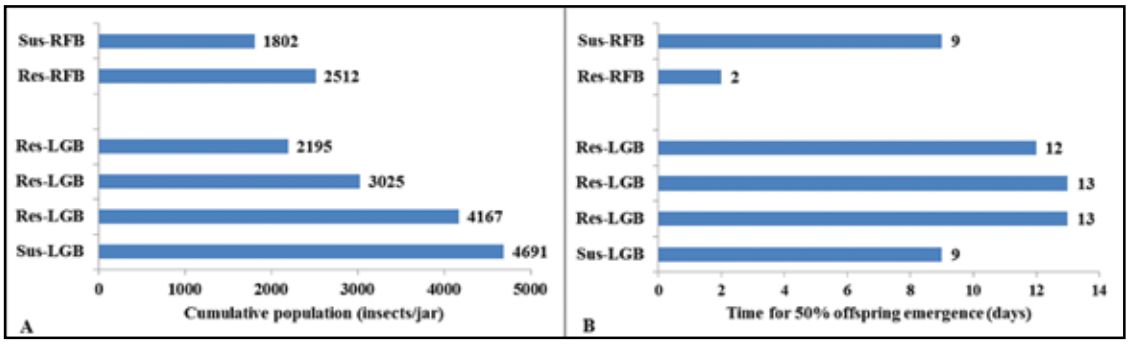


Fig. 1. Cumulative population after 110 days (A) and time for half of all eggs laid to emerge as adults starting from the time the first adult offspring emerged (B) for phosphine-resistant and –susceptible LGB and RFB.

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.

Insects Limited INCORPORATED

Fumigation Service & Supply, Inc.
16950 Westfield Park Road
Westfield, IN 46074-9374 USA
(1) 317-896-9300
email: insectsltd@aol.com
websites: www.insectslimited.com
www.fumigationzone.com

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