FESTMONITOR

BECAUSE PEST PREVENTION MATTERS TO FOOD SAFETY

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THE IMPORTANCE OF STORED FOOD PROTECTION

It is well-known that insects can cause a great deal of damage to crops in the field, but did you know that stored product pests can cause even more damage and economic loss after harvest? This can occur in on-farm storage, during transportation – or in the food processor's warehouse. While the insects can damage grain and other stored foods by direct feeding, their presence, webbing, and feces also can contaminate and deteriorate food and its packaging.



Thus, prevention is critical for stored food protection, making proactive procedures, such as good sanitary practices, first-in/ first-out product rotation, and incoming goods inspection, essential. But because stored product pests can be brought in or be "hidden" within a commodity and quickly grow into an infestation, it is just

as essential to monitor stored goods for signs of insect invasion and activity, and be prepared to intervene with control and elimination measures.

Depending on the product, storage space, and amount of insect activity, this intervention can be professional fumigation. A fumigant is "a chemical vapor or gas that, when released, penetrates objects or enclosed areas in concentrations that are lethal to pest organisms." (Utah Department of Agriculture) Because the gas diffuses as separate molecules, it is able to penetrate the commodity, as well as cracks and crevices, to kill interior-feeding, breeding, or harboring pests. The gas then diffuses away, so it does not leave a harmful residual in the commodity.

The efficacy of a fumigant is based primarily on its concentration, longevity in the air, and air temperature and humidity. Fumigants are generally quick-acting and provide for complete elimination. However, fumigation can be hazardous if not correctly performed, so it is essential that it be conducted only by experienced, knowledgeable professionals.

A New Service for 2018

In December 2017, Ecolab Pest Elimination announced its acquisition of three premier pest services providers to increase its capability to provide a full range of stored food protection, particularly related to grain and import/export fumigation.

"We were seeing an increase in customers wanting to work with a full-service provider in the area of stored food protection. After conducting a complete assessment, we determined that our customers would be better served through our acquisition of those already expert in the area than by building out capability from within," said Vice President of Operations for North America, Paul Rawding. Although Ecolab had provided some fumigation and other stored food services, it did not have national coverage and was operating in only one of the six primary fumigation areas. (See Six Types of Fumigation, page 2, for more information.)

The acquisition was that of three strategically aligned companies: Food Protection Services LLC (FPS), which operates in the Pacific Northwest, Great Lakes, Midwest and the Mississippi Delta; Royal Pest Solutions, Inc., operating in the Mid-Atlantic region from New Jersey to South Carolina; and Research Fumigation Company, LLC, serving customers in the Gulf Coast states of Texas, Louisiana, Mississippi, Alabama and Florida.

In addition to the companies' alignment with Ecolab's philosophy, customer service focus, safety record, and business structure and culture, the three had an existing partnership as founding members of the Food Protection Alliance (now dissolved). Ecolab also had experienced their depth of service, having previously subcontracted their fumigation work. "These acquisitions will complement our already strong offerings in the food and beverage markets," said Bobby Mendez, executive vice president and president of Ecolab's Global Services and Specialty business. "Through the addition of their expertise in food storage treatment, we can further strengthen our pest services offering to food and beverage customers – and play a bigger role in protecting the safety of food and our customer's operations across the food chain."

Having acquired the companies for their talent and skills, Ecolab intends to generally maintain the current brand for at least the short term, after which there will be a soft reset, so as to not create confusion.



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SIX TYPES OF FUMIGATION

Defined as the literal act of exposing a sealed area to gasses or fumes for disinfection or the extermination of pests, fumigation can be a very effective means of protecting stored foods. It also is a complex application that involves a number of efficacy and safety steps and should be conducted only by trained personnel. But with pre-fumigation air-tight sealing; along with professional application, monitoring, and site security; and post-fumigation ventilation, aeration, and verification, fumigation can be a very effective form of pest management in six key areas:

Grain. The longer grain is stored, the more susceptible it is to insect damage and contamination. As such, fumigation is the primary form of grain protection. Additionally, residual insecticides can be used to treat empty bins or other storage units to prepare the storage for the next harvest.

Milling. As grain is milled into its separate physical components, it becomes even more susceptible to stored product pests, as an easy, convenient source of food. Protection can be attained through the installation of permanent fumigation application and monitoring systems enabling fumigation readiness and balanced, precise gas application when needed.

Seed. Indian meal moths, weevils, and rodents are common pests of stored seed and can cause serious economic damages. Thus, fumigation and other pest management practices are critical to its protection.

Food Processing. While virtually any stored food product can be subject to pest infestation, bakeries, cereal plants, pasta plants, pet food facilities, spice operations, and snack food plants are often the most susceptible. A variety of options are available for food processing warehouse protection from monitoring to one-time fumigation applications to permanent installations.

Transportation. In-transit grain, seed, and other foods are just as susceptible to pest invasion as that same product in a storage bin or warehouse. But fumigation of ships and other transport containers require specialized experience, skill and knowledge. For example, the most effective ship-hold application could be a solid phosphine fumigation through direct application, dust retained, or recirculation method and could be required in a variety of ports.

Import/Export. Similarly, import and export fumigation requires registration and compliance with USDA regulations and site requirements. Whether needed for an exported grain, an import quarantine, or an inbound shipment that received a USDA Emergency Action Notice, an effective but rapid turn-around can get your container back in transit as quickly as possible.









STORED PRODUCT PESTS

PEST OF THE QUARTER: THE BUSINESS IMPACT OF STORED PRODUCT PESTS



Three common insect pests of stored products are the (left to right):

Warehouse beetle (*Trogoderma variable*). This cold-tolerant beetle is a voracious feeder. It feeds on seeds and broken kernels in grains.

Red flour beetle (*Tribolium castaneum*). Depositing its eggs in foods or on the surface of a container, this insect feeds on a variety of broken grains, flour, cereals and other foods.

Indian meal moth (*Plodia interpunctella*). Probably the most common, important, and troublesome pest of stored food, this moth can infest commodities very quickly, both feeding on the foodstuff and leaving contaminating webbing throughout.

A single female Indian meal moth can deposit up to 300 eggs within a few weeks. The entire life cycle of a warehouse beetle spans little more than a month, but in this period the female can lay up to 100 eggs, which hatch within a week or two. A female flour beetle deposits a few eggs each day as she feeds, laying an average of 450 eggs, which can mature within 30 days.

While the life cycles and reproductive capabilities of stored product pests will vary, the characteristics of these three insects illustrate how rapidly a sizable infestation can build. Of greatest susceptibility to stored product pests are dry food products, such as processed and non-processed pasta, flour, cereal, pet foods, dry milk, grains, spices, baked goods, spices, and even dried fruits.

Often the first sign of infestation is the sudden presence of a few beetles, weevils, or moths in or around stored food, with sightings becoming more persistent or continuous if the infestation is left to build. Some insects, such as the Indian meal moth will feed on the surface of the stored food, producing a dense, silken webbing over and through the commodity as it feeds. Other stored food insects will bore into a grain kernel or seed to lay its eggs, with the hatching larvae feeding on the starchy interior and destroying it. Certain beetles will even chew holes through packaging, making their way into foods thought to be protected. Thus, although the Indian meal moth is considered to be the most common and destructive, the insects that feed and breed within the grains or seeds, or chew their way inside packaging, can be just as detrimental – damaging and destroying stored commodities from the inside out with little initial evidence.

In this way as well, the stored product beetles, weevils, and moths that infest stored products can have a major impact on your business. In addition to product loss, they can cause consumer complaints leading to loss of brand reputation, audit score deductions or federal inspection write-ups, along with the expense of treatment and resulting production downtime.



DID YOU KNOW

- As much as 10% of food produced in the U.S. can be lost from stored product pest damage, contamination, or consumption. That rate can increase to 50% or more in developing countries. (University of Wisconsin/USDA)
- Although less than 0.5 percent of the world's known insect species are considered pests, and even fewer are a serious menace to people, herbivorous insects are said to be responsible for destroying 1/5 of the world's total crop production each year. (FAO)
- Imported foods come to the United States from nearly 200 countries, none of which have exactly the same pesticide approval systems as the U.S. (National Research Council)

The Global Supply Chain

In 2015, the U.S. imported about 80% of its seafood, 50% of fresh fruit, 20% of fresh vegetables, and more than 60% of its spices, and those figures continue to rise. With such extensive amounts of raw goods being imported, very few food processors can source all ingredients from the U.S.

Thus, to help ensure safe food for American consumers, the new rules of the Food Safety Modernization Act (FSMA) make it obligatory for processors to have supply chain controls in place that ensure imported foods are held to the same standards as domestic foods, and that importers have Foreign Supplier Verification Programs (FSVP) through which they perform risk-based activities to verify that the imported food has been produced in a manner that meets applicable U.S. safety standards.

One of those standards is the requirement that pest management be included as a preventive control in the facility's food safety plan. So, whether your facility sources its nondomestic ingredients from a company-owned foreign facility, or from a foreign supplier, it is important to ensure the pest control in that facility is as extensive as that of your own.

One of the best ways to do that is to partner with an international pest management provider who can service your facilities, and those or your suppliers, on a multi-national basis – providing consistent, trusted service in each facility. Your supply chain is global, shouldn't your service providers be too?

ASK THE PEST EXPERT

QUESTION: I know there are many different terms for insect pest treatments. Can you help me understand what each of these mean and how they work? When do I have to cover food-contact surfaces and/or evacuate personnel?

ANSWER: There are five basic types of insecticide treatments:

- **1. Residual.** In a residual treatment, a wet spray is applied to a surface that flying or crawling insects will contact. Usually applied by a compressed air sprayer, a residual, by definition, lasts for a period of time, but generally not more than 30 days.
- 2. Fogging/Space Spray. In this treatment, a pesticide is applied into the air by specialized equipment which produces 5- to 30-micron particle-sized droplets. The droplets drift into areas where stored product pests and other insects may reside. These treatments have short residual life, generally up to one hour, and have limited ability to penetrate insect harborages.
- **3.** Flushing. When a fogging/space spray is directed into cracks and crevices, it is called a flushing treatment because it "flushes" out insects from their harborages into open spaces. So flushing that follows a residual treatment can be very effective, as crawling insects (e.g., cockroaches) are driven into the wet residual deposit, resulting in a high kill rate.
- **4. Fumigation.** Fumigation completely fills an area with gaseous pesticides to kill the pests within. This highly specialized application requires sealing of the area or building to contain the gas and allow for thorough penetration of pest harborages. Since these gases are highly toxic, specific safety precautions must be in place and only licensed service personnel may be present during the application.
- **5. Baiting.** In a baiting application, toxic baits (the liquid, gel or granular formulation of a food containing lethal active ingredients) are placed where insect pests will find and consume them, but where humans and other non-targets will not contact them.



About the Expert

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Dr. Barcay is a member of the National Pest Management Association, Entomological Society of America, American Mosquito Control Association, Gamma Sigma Delta (the honor society of agriculture), Society for Vector Ecology and Pi Chi Omega, a professional fraternity for urban pest control, and Independent Organic Inspectors Association.

Dr. Barcay received his bachelor's degree in entomology from Colorado University. He also received his master's degree and doctorate in urban entomology from Colorado University.

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