

Balancing Beetles with the Bottom Line

2021 Midwest Poultry Federation Convention

Proceedings

Cassie Krejci, Ph.D.
Veterinary Entomologist | Technical Specialist
MGK
Cassie.Krejci@MGK.com

Darkling beetles, commonly referred to as litter beetles, are a widely encountered pest for those in the broiler production industry. Litter beetles are holometabolous insects that have 4 life stages: eggs, larvae (mealworm), pupae, adults. After hatching from an egg, litter beetles will spend an average of 5 weeks in the immature mealworm stage, pass through a short 7-day stage as an immobile pupa, and then emerge and spend up to 1 year in the adult stage. When left uncontrolled, darkling beetles can multiply quickly and result in high population numbers that have many negative implications to poultry production objectives. Beetles have chewing mouthparts, so the damage they cause is two-fold. Instead of transmitting disease-causing pathogens through a bloodmeal like a mosquito would, beetles are mechanical vectors of pathogens. These types of vectors are insects that carry pathogens between hosts without becoming infected themselves, usually moving the pathogen on their bodies, feet, or hair. In poultry production, litter beetles may vector bacteria (*Salmonella*, *E. coli*), viruses (avian influenza), and intestinal parasites (cecal worms, tapeworms), among others.

In addition to their capacity to cause damage as vectors, litter beetles will cause damage to poultry facilities as they bore holes to pupate into the walls of the buildings. Over time, this causes reduced housing efficiency as it takes more to keep the house environmentally stable with a honeycomb of holes releasing heat. Finally, chickens that are grown among high populations of litter beetles suffer from agitation, reduced efficiency, and increased feed conversion. In an economic climate such as that we are currently experiencing, we strive to evaluate how producers can get the most out of essential insecticides and improve overall beetle control.



Honeycombing of insulation caused by litter beetle pupation behavior.

Litter Beetle Best Practices

Using integrated pest management (IPM) and facility best practices alongside insecticide rotation and resistance management is the key to getting the most out of a pre-placement insecticide application. Simply put, IPM is the combination of several insect control measures to combat a pest population, including sanitation, physical barriers, cultural control methods, and insecticides.

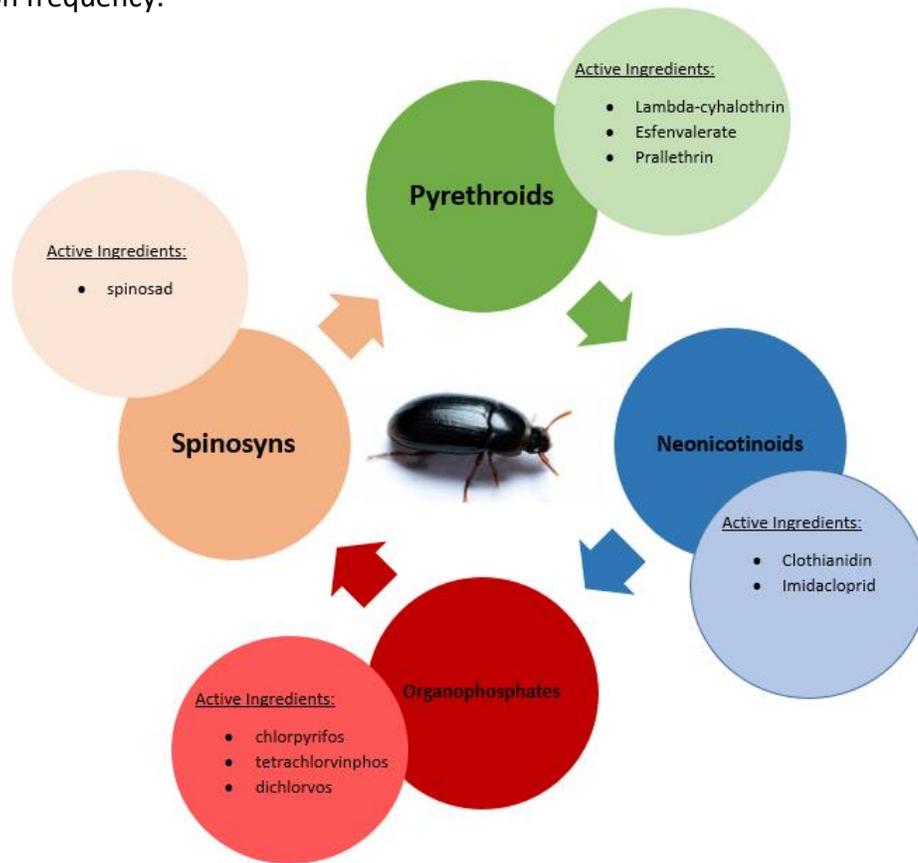
CULTURAL CONTROLS are practices that reduce insect establishment or survival. Keeping litter dry will reduce darkling beetle success. Eliminate leaks in water lines and improve ventilation to reduce moisture content in litter. If cultural control is not an option in a specific area of the production facility, that may indicate a target area for insecticide application.

MECHANICAL CONTROL options include those that remove or block out insect pests. Clean out and de-cake litter as often as possible. By removing old litter and replacing with fresh litter between flocks, you are not only removing most beetles from the facility, but also reducing the moisture in the litter. Additionally, installing screens to the windows or vents of houses can eliminate large areas of beetle intrusion as they migrate from house to house.

LITTER MANAGEMENT. If replacing litter between grow outs is not feasible, windrowing litter can drastically improve your beetle management program. Your goal should be to heat litter to 150° in 5 days. During this time, beetles in the litter will be driven to the top of the litter to escape heat. Treat the top of the litter rows with the insecticide currently in rotation. By forming a chemical barrier on top of the windrows and driving beetles across it with heat, you will increase kill and overall control of beetles going into the next flock.

INSECTICIDES applied to the exterior premise or interior litter areas around a poultry facility are intended to provide relief from litter beetles in areas where they most frequent. Premise treatments can be applied in areas where birds are not present and are designed to have longer residual effects. Formulations that include microencapsulated insecticides provide longer residual effects, as the active ingredients are released into the litter over an extended period. Premise treatments can also contain quick-knockdown insecticides (insecticides targeted for a quick kill) or IGRs that will help reduce the number of beetles in future generations. **Insect growth regulators** (IGR) are insecticides that target immature stages of insects by inhibiting their development into adulthood. These are available in many formulations, such as granules and liquid premise applications. Insect growth regulators help control future populations of litter beetles by reducing the number of beetle eggs, larvae, and pupae that make it to adulthood. In extreme beetle infestations, you may choose to apply insecticides **over-animal** to get relief before applying premise insecticides between flocks. Natural pyrethrin insecticides are excellent options for beetle control over-bird due to their low toxicity and flexible reapplication rates. Pyrethrins deliver a fast knockdown in a water- or oil-based concentration and often contain a synergist, such as piperonyl butoxide (PBO). Over-bird insecticides are usually applied through a mist or fog applications.

One of the most important factors in insecticide success is the rotation – or intentional change – in insecticide class. Insecticides are structured into classes that share common chemical structures and modes of action, or the way they kill an insect. Organophosphates, neonicotinoids, and pyrethroids are examples of insecticide classes. Continual use of the same insecticide class to control beetles can quickly lead to resistance, or the reduced ability of that insecticide to kill insects. Rotating the insecticide class is important to continued control of beetles. It is important to note that even if active ingredients are different, the mode of action could be the same. For example, use a pyrethrin or pyrethroid product then a neonicotinoid, rather than Clothianidin then Imidacloprid, which are both neonicotinoids. For beetle control, it is recommended that insecticide classes be rotated 2 -3 times per year depending on application frequency.



Darkling Beetle Insecticide Rotation Guide

Litter beetle management plans are often better communicated when they are written down and posted at a facility. Outlining the practices you hope to implement, such as windrow practices, litter management and insecticide rotations can help make sure everyone who maintains the boiler facility is focused on the same goal. By developing a well-rounded litter beetle management program, you can reduce your insecticide use, increase bird efficiency, and see bump in your bottom line.