Litter beetles, also called darkling beetles, lesser mealworms, or black beetles, can be a serious pest. While they can be found in several types of poultry production systems, these insects are most troublesome in turkey, broiler, and pullet houses where deep litter and open-floor housing provide an ideal habitat for the beetles to survive and reproduce.

Why Manage Litter Beetles?

These beetles have a high reproductive rate, are vectors of pathogens that cause disease in poultry, and can significantly damage building structures. They can also be difficult to control, may migrate from litter disposal sites to urban housing where they are a nuisance, and when numerous may consume poultry feed.

Litter beetles can carry pathogens that cause disease in poultry, including fowl pox, E. coli, Salmonella spp., Marek's disease, botulism, coccidiosis, New Castle disease, avian leukemia virus, and infectious bursal disease virus. Beetles may also be intermediate hosts of Choanotaenia infundibulum (chicken tapeworms) and cecal worms. Consumption of large numbers of beetles may have adverse health effects on birds, especially young birds.

In addition to potential pathogen transmission, litter beetles cause extensive damage to building insulation in poultry houses. This occurs when larvae bore into the insulate to pupate while avoiding subsequent predation by adult beetles and vertebrate predators like mice.

Like other poultry pests, such as flies, litter beetles are also known to invade neighboring homes, especially if litter is removed from heavily infested houses. Lawsuits against poultry operations relating to litter beetle infestations have been filed in response. Care must be taken to properly control these pests to protect not only the birds but also the environment and neighboring areas.
Biology and Behavior

Beetles have four life stages: egg, larvae, pupae, and adult. The life cycle from egg to adult is dependent on environmental conditions (such as humidity and temperature) and farm conditions (such as food and water availability) but generally ranges from 35 to 90 days.

Larvae are yellowish brown and resemble centipedes or wireworms. Larvae can be found clustering together under manure or litter, feed sacks, or feed storage areas. Pupae are ¼ inch long and an off-white to light-brown color as they age. While larvae and adults are generally found together, pupae are in lower, compressed litter, dry manure, soil, or insulation. Adults are ¼ inch in length, elongate, and a shiny black or brown depending on age. Adults may be found with larvae or actively crawling on walls, edges of doors or windows, or beams. A female beetle has the potential to lay more than 2,000 eggs in the manure and litter, especially under feed and water lines. Adults can live more than three to 12 months and will continue to produce eggs throughout most of their lifetime at one-to-five-day intervals.

Monitoring

Litter beetle populations should be monitored to evaluate when to control and to provide feedback on how well implemented control practices are working.

Visual Inspection

Visual inspection can begin when birds are placed in the house until they are removed. Beetle numbers can be counted by digging 2 to 3 inches into the litter; under feeders, cracks, and crevices; around equipment; in insulation; and under dead birds.

Cup Sampling

Cup sampling is an alternative method of monitoring. In this case, six one-cup samples from under feeders and six one-cup samples from by walls are taken. Sampling should occur when flocks have been in buildings for two to three weeks and again between three and five weeks. If greater accuracy is needed, samples can be taken more frequently (weekly or biweekly). Beetles from these samples should be counted and recorded, and if numbers significantly increase between the first and second samples or consistently over time with more frequent sampling, control should be considered.

Trap Sampling

Traps can be used to monitor litter beetles. These are made
of 2-inch-diameter PVC pipe. Each trap should be 10 to 12 inches long with a roll of 8-by-11-inch corrugated cardboard inside. Traps should be staked down to prevent birds from moving them. At least three traps should be evenly distributed throughout the house, avoiding wall edges or other areas of densely packed litter. As with hand counting and the cup method, ideally, the traps should be removed or replaced, and beetles counted weekly or biweekly. If beetle and larvae counts cannot be made at the time that the traps are collected, the cardboard can be placed in a plastic bag and examined later.

Management and Control

An integrated pest management (IPM) plan should be used for effective litter beetle control. IPM control plans can be developed after identifying and understanding the pest life cycle and establishing a monitoring plan. Control plans include a combination of cultural (prevention), mechanical or physical, biological, and chemical methods to improve control based on the pest’s life cycle and reduce harm to animals, people, and the environment.

Cultural Control (Prevention) and Mechanical/Physical Practices

Moisture and a food source are required for beetle development. Leaks in waterers should be quickly repaired or water pressure checked and adjusted if necessary. Other measures, such as increased ventilation or installation of fans to keep litter dry, should be put in place. Feed storage areas should be kept clean and spilled feed quickly removed. Move feeders and waterers to different positions when practical, ideally raising feeders and waterers off the ground when not in use.

Removing litter from the house as soon as possible after flock removal can eliminate large numbers of beetles. It is best to do this when temperatures are near or below freezing to kill most of the insects. Most beetles can be eliminated from poultry housing by opening the building and exposing them to subfreezing temperatures for a week or more. Completely removing litter and replacing it with fresh litter greatly reduces beetle populations compared to the practice of topdressing old litter with fresh shavings between flocks.

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Complete removal of litter after each flock can greatly reduce litter beetle populations.

Litter additives may also help reduce litter beetle populations. Surface dressing litter with diatomaceous earth at a rate of 280 g/m² before first birds has been shown to reduce infestations up to 80 percent. Diatomaceous earth used must be amorphous silica dioxide (85 percent) that is 10 μm or large in size. Reapply before each new flock. Another option is the commercial product Poultry Litter Treatment (PLT). This product is sodium bisulfate that can change the pH of litter, making it less habitable for litter beetles.

If fresh manure or litter is spread on cropland and fields, incorporating it immediately into the soil will limit beetle migration. Avoid spreading beetle-infested manure near neighboring fields and residences. Turn stockpiled or composed litter every two weeks to promote multiple heating, which will kill the

IPM is a commonsense approach to pest management that uses several methods of control for greater results while minimizing risks to people, animals, and the environment.

[Diagram of IPM flower with Cultural, Chemical, Biological, Mechanical, and Physical sections]

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beetle life stages. Covering manure piles with tarps and black plastic sheets effectively kills these insects by increasing the heat to intolerable levels.

**Biological Control Practices**
Currently there are limited options for biological control of litter beetles. An entomopathogenic fungi, *Beauveria bassiana*, is currently registered for use in poultry facilities under the trade name balEnce™. This product may aid in beetle reduction, but it needs to be applied more than once to walls, frames, and posts. The idea is for the residual spray to come in contact with the beetles so they become infected with the fungus, which will kill them.

**Chemical Control Practices**
Chemical control methods can be divided into residual and contact sprays, baits, and traps. In the case of chemical control, options can be used in addition to other practices, but they should not be relied on exclusively for control of any pest. Insecticides will not be 100 percent effective as long as breeding sites exist and resources such as food and water are available, and control will be more difficult if beetle populations are already high. In addition, overuse of insecticides may also contribute to a resistance buildup by the pests and make control even harder.

Treatment timing and method of chemical application are important. Insecticides used for beetle control are not designed to remain active for much more than a week under conditions in a typical poultry house. Chemical treatments applied to the litter cannot be expected to provide effective residual control over a long period of time since most insecticides readily combine with the high organic content of the litter. In addition, most of the registered insecticides are intended for use while houses are empty. It can be difficult for beetles to come in contact with the compound before it loses its effectiveness since beetles will actively migrate to different areas once birds are removed. The solution to this is to apply insecticides within 48 hours after flock removal (ideally, cleaning the houses the day after flock removal and treating houses the second day).

With any chemical application, be aware that consistent use of any active ingredient may cause resistance problems in insect pests. Insecticides should be rotated periodically; alternating synthetic pyrethroids such as cyfluthrin with organophosphates such as tetrachlorvinphos and carbamates such as carbaryl or with boric acid will delay or inhibit the onset of resistance (to both the beetles and the filth flies). For more information, see [www.irac-online.org/modes-of-action](http://www.irac-online.org/modes-of-action).

Always refer to the insecticide labels for current and specific instructions for use and application. It is important to read, understand, and follow all insecticide label precautions. Before applying any product (including natural or biological control products), read the label and note application rates. In addition, only apply products that are labeled for use in the state of application. Check with local, county, or state regulations before using any product.

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Adults migrate away from floor areas and onto walls, beams, and other areas after birds leave the house. Therefore, it is more efficient to clean out and treat facilities within two days of flock removal.

![Photo Credit: Erika Machtinger](image)