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Poultry Housing Tips

Darkling Beetles...Costs and Control

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Darkling beetles, whose larvae are referred to as lesser mealworms, are a common sight in broiler houses. Though it is generally accepted that when poultry consume beetles and lesser mealworms, weight gains and feed conversions will be adversely affected, there are no scientific studies confirming this assumption. Even though a direct link between beetle infestation and weight gains and feed conversions may be in question, the fact remains that poultry should not eat darkling beetles. It is still likely that consumption of large numbers of darkling beetles will have a negative impact on broiler performance. Darkling beetles and lesser mealworms will consume feed especially in the periods prior to bird placement. There are even cases where young chicks and poults have been found with lesions from beetles biting the birds.

Darkling beetles and their larvae can also have a negative effect on bird health and food safety. Darkling beetles consume chicken feed, manure, and dead birds and as a result, can harbor a variety of avian pathogens that include but are not limited to Infectious Bursal Disease, Fowl Pox, Newcastle Disease, Marek's Disease and protozoon pathogens. In addition to this they contribute to food safety issues by serving as a source of transmission for *Salmonella* and *Campylobacter*. Bugs and beetles are a natural food source for chickens and, as a result, the birds will consume beetles that they find in the house. If beetles are infected with a virus, bacterium or protozoan, their consumption could result in the birds becoming infected or colonized.

In addition to the effect that darkling beetles can have on broiler performance, the presence of darkling beetles can lead to increased heating costs and costly building repairs. Darkling beetles burrow into insulation material as they search for a safe pupation site. Insulation board and spray polyurethane insulation appears to be most prone to beetle damage but they can also harm fiberglass batt insulation, sill sealer, as well as wood. In general, the lower the density of the insulating material the more prone it is to damage by darkling beetles. The proximity to the litter also affects the likelihood of beetle damage. The closer the insulating material is to the litter the more damage one tends to see. As a result board insulation in the side wall is more prone to beetle damage than that in the ceiling.

This of course doesn't mean that beetles will not damage ceiling insulation. Figures 2 illustrates the type of damage darkling beetles can do to polystyrene insulation in just a few years. Mice can take advantage of the damaged polystyrene insulation making a bad situation worse (Figure 3). Figures 4 and 5 are thermal images taken of beetle damaged insulation during hot weather. The bright orange spots in the thermal images show increased heat gain through the wall due to beetle damage. During cold weather the beetle damaged insulation would be significantly cooler than the undamaged insulation which would lead to increased heat loss as well as condensation problems.

Figure 2. Beetle damaged ceiling insulation.

Figure 3. Mice taking advantage of beetle damaged insulation.

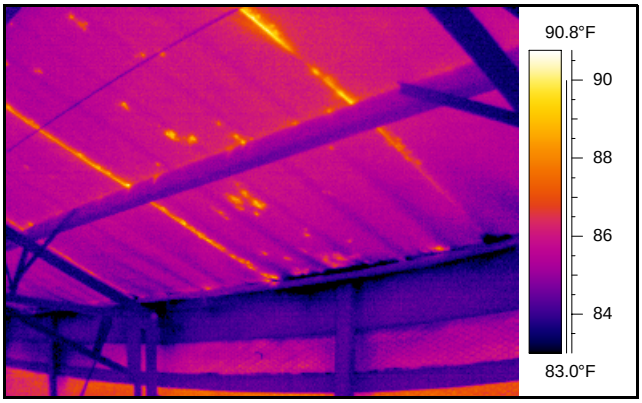


Figure 4. Thermal image of beetle damaged ceiling insulation.

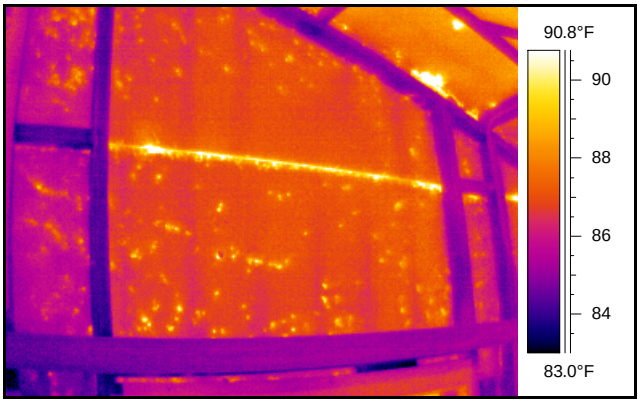
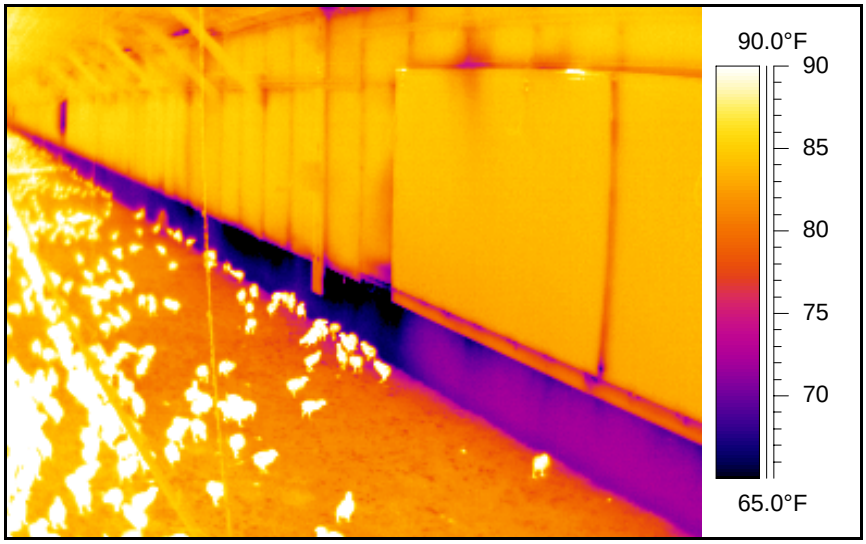


Figure 5. Thermal image of beetle damaged end wall insulation.

Figure 6. Beetle damaged sill sealer.

One building material that is especially prone to beetle damage is polyethylene foam sill sealer. In many houses a 6" X 1/4 thick polyethylene foam sealer is placed on top of the concrete stem wall before the stud wall is constructed to eliminate air leakage. If the sill sealer is damaged by beetles cold air will be drawn through the crack when exhaust fans operate during cold weather, which can lead to decreased bird performance as well as increased likelihood of litter caking. Figure 6 provides an excellent illustration of just how quickly darkling beetles can damage polyethylene sill sealer. The sill sealer was retrieved from a two-year-old house that was two years blown down by a tornado. Figure 7 is a thermal image of the side wall in another house where the sill sealer was damaged by darkling beetles. In the foreground of the picture the joint was caulked eliminating the leakage of cold outside air between the stud wall and the concrete stem wall.



Air leakage due to beetle damaged sill sealer in background. The sill in the foreground was caulked to eliminate leakage.

With recent high fuel prices most broiler producers spent a fair amount of time and money making sure their houses are as tight as possible. One of the most commonly used tools to reduce air leakage is spray polyurethane foam. Though spray polyurethane insulation is extremely effective the problem is that if beetles are not controlled they can burrow into the insulation reducing its ability to seal cracks in just a few of years.

Beetle damage to “foamed” crack.

Control of darkling beetles is a constant struggle with no magic bullets or 100 percent effectiveness. This is largely because of the beetles' behavior and ability to avoid contact with insecticides. Because the floors are packed dirt, the beetles can conceal themselves in the floor, preventing exposure to lethal doses of insecticide. Resistance to insecticides is a growing issue and will likely become a large problem as additional insecticides are removed from the list approved for use in poultry operations. In the past multiple insecticides have been available to the industry for control of darkling beetles. The 2005 Georgia Pest Management Handbook (http://www.ent.uga.edu/pmh) currently lists the following insecticides that are approved for use in poultry operations for darkling beetle control. This publication should be checked each year for products that may have been added or removed from the approved application list.

INSECTICIDE[1]	FORMULATION AND MIXING INSTRUCTIONS	APPLICATION INSTRUCTIONS AND SAFETY RESTRICTIONS[2]
LITTER BEETLES (Darkling beetles, black bugs, black poultry bugs, lesser mealworms)		
1. Cyfluthrin (Tempo SC Ultra) 11.8% WP, SP	Mix 16 ml in 1 gal. water.	Apply as a general surface and/or a crack and crevice spray. Do not make applications when birds are present. Do not make applications to feed, water and feeding and watering equipment.
2. Cyfluthrin (Tempo) 1% Dust	Ready-to-use	Remove all animals from facility. Apply dust using hand or power dusters or other suitable equipment. Apply uniformly at 0.5 to 1 pound per 1,000 sq. ft. Do not apply to feedstuffs or watering equipment. Repeat treatment as necessary.
3. Cyfluthrin (Tempo) 20 WP Insecticide	Add 9.5 g (1 scoopful) Tempo 20 WP to adequate water to cover 1,000 sq. ft. (based on label chart)	Remove all animals from facility. Based on label chart, spray adequate material to adequately cover area but not allow dripping or run-off to occur. Do not apply to feedstuffs or watering equipment. Do not re-apply more frequently than every 10 days.
4. Lambdacyhalothrin Grenade (9.7% lambdacyhalothrin Insecticide	Mix 0.8 fl. oz. (24 ml) per gal. of water.	To control litter beetles, apply to walls and floors at cleanout, before reintroduction of animals. To help control flies, apply to fly resting areas, and allow to dry before animals are readmitted. Do not make applications when animals are present; do not apply to feedstuffs, water, or watering equipment; do not contaminate food, feed, or water.
5. Rabon (stirofos, tetrachlorvenphos) 50% WP, OP	0.5% spray or 50% WP. Mix 2 lbs. WP in 25 gals. water or use 50% WP undiluted.	Apply 1 to 2 gals. per 1,000 sq. ft. of litter, walls, center posts and foundation walls. Apply undiluted dust using 3/4 oz. per 100 sq. ft. of litter using rotary or mechanical duster. Do not make applications to feed, water and feeding and watering equipment.
6. Tetrachlorvinphos + dichlorvos Ravap E.C. (23% tetrachlorvinphos + 5.3% dichlorvos)	1 gal. in 25 gal. water (for extreme infestations dilute 1 gal. in 12.5 gal. water)	Apply 1 gal. of spray per 500 to 1,000 sq. ft. to cover walls, floors, and other sites where beetles congregate.

Footnotes

[1] Abbreviations used: CR - carbamate; NP - natural pyrethrum; OP - organophosphate; SP - synthetic pyrethroid; WP - wettable powder E.C. - emulisifiable concentrate.

The insecticides listed in the table above are not restricted and do not require a pesticide applicators license. An insecticide that is restricted, but that can be applied by people with a pesticide applicators license is Duratol and Durashield. For information on obtaining a pesticide applicators license contact your county agent. Another pesticide option is the use of Pyriproxyfen, which is in the pesticide class of IGR's. Pyriproxyfen will prevent the beetle larvae from maturing but will not kill. It should not be used as a primary means of beetle control but should be used in conjunction with other materials. The effectiveness of this pesticide is increased with applications in between two successive flocks. One treatment that is not listed as an insecticide is the use of boric acid. Boric acid is currently being used in poultry operations and applications may vary among operations. In some cases boric acid is applied between the feeders and the walls on the floor or on used litter before new shavings are added to the house. The label on boric acid allows for 1.5 to 2 lbs per 100 ft^2. There are a couple of other insecticides that may be approved for use in poultry in the upcoming years but for now options are limited.

To develop an effective darkling beetle control program consider these points:

1. Identify darkling beetle infestation sites (i.e., feed bins, spilled feed, compost pits and exterior house perimeters).

2. Keep litter moisture low. Not only will high litter moisture result in high ammonia, but it is also a key nutrient for larvae and beetles. Regular water line maintenance in between flocks and during growout will prevent leaking and will help reduce beetle numbers.

3. Use a pesticide that is suitable for the type and location of treatment.

4. Follow label instructions for application procedures and rates.

5. Assess insecticide use patterns and plan on rotating insecticides and the use of boric acid to prevent insecticide resistance buildup in houses.

6. Spot treat areas where darkling beetles prefer such as under feed lines, water lines and interior wall areas along the floor.

7. Treat within 24 to 48 hours after birds are removed from the house. Treatments made immediately after birds have been removed from the house will kill higher percentages of beetles than a treatment made after the first 48 hours.

8. Apply treatments in a manner that can reach beetles and larvae that may be several inches under the litter. Many farms have rotary tillers that can be used to mix the insecticide into the litter, ensuring contact with more beetles and larvae. When performing applications of this type use the highest permitted rate of application and only mix it within a 2 to 3 inch depth.

9. In some cases treating the house twice between flocks will ensure that the beetle population is reduced significantly. A program in that case could be using one insecticide within 48 hours of the birds leaving the house following by re-treatment prior to birds being placed in the house and after preheating has begun. The insecticide used during the second treatment could be the same used during the first treatment or a second and different insecticide.

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