The ***Poultry Engineering, Economics & Management***
NEWSLETTER

Critical information for Improved Bird Performance Through Better House and Ventilation System Design, Operation and Management

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Feature article

How to Control Rats, Mice and Darkling Beetles

The worst pests in poultry houses are darkling beetles and rodents. Did you know that a single rat eats as much as 20 to 40 pounds of feed a year? Infestation of a poultry house by rats or mice can put a major dent in your feed conversion numbers. Rodents also carry and spread bird diseases, and can do serious damage to insulation and even house wiring. Beetles will eat your bird rations, bird manure and dead birds, and so are especially dangerous as bird disease spreaders. One larval stage of the darkling beetle loves to burrow into insulation, so you can count lost insulating value as another significant cost of beetle infestation.

Control of these poultry house pests is possible, and in this issue we will outline the most effective steps you can take to keep your houses pest-free.

RATS AND MICE: PROBLEM #1

Rats and mice steal bird rations, spread diseases and damage wiring and insulation.

It has been estimated that rodents can increase poultry feed usage by as much as 2%. Especially in cold weather, mice and rats are likely to see a poultry house as a great place to live and will want to move in. Mice can crawl through openings the size of a dime and rats can contort their bodies to squeeze through openings the size of a quarter.

Rodents spread diseases to flocks by contaminating feed and bird living area with urine or droppings. Rats and mice are linked to poultry diseases such as salmonellosis, colibacillosis, coryza, pasteurellosis, mycoplasmosis, hemorrhagic enteritis, hymenolepiasis, capilariasis and ascaridiasis. Because of their ability to harbor pathogens, rodents also can carry over disease organisms from one flock to the next flock, even if the facilities are cleaned and disinfected.

Since the upper incisor teeth of rodents continue to grow throughout their life, mice and rats must chew constantly to keep their teeth from becoming too long. This means they will damage insulation, wood, curtains, electrical wiring and even metal objects.

Keeping Rats and Mice Out

Maintain a minimum three-foot space around the outside of poultry houses that is free of brush, trash and weeds. Prevent rodent access to houses by plugging holes and sealing doors. Carefully check the perimeter of all buildings for potential entryways and burrows. A common entry point for mice is the unprotected end of corrugated metal sidings. Close openings around augers, pipes and wires with cement or metal collars. Burrows with signs of fresh dirt indicate new rat activity and should be addressed immediately.

For every rat or mouse you see, there will be as many as 50 you don't see.

Close monitoring for rats and mice is very important, and should be done on a strict weekly schedule. Addressing rodents when there are only tell tale signs such as droppings will be much more effective and less costly than waiting until you actually see rodents. For every rodent actually seen, there are likely to be 20 to 50 unseen. Seeing rodents during the day means the house is overrun by rodents during the prime night feeding time.

Controlling Rats and Mice

Any drastic change to their habitat may cause rodents to abandon a facility. However, they will only move to the next house, or into the woods, and wait until the coast is clear to return. Therefore, the best plan is to try to eliminate these pests before launching major exterior or interior clean-up operations, removing litter, etc.

The most common controls for rodents contain anticoagulant chemicals which disrupt the blood clotting mechanism and cause rodents to slowly bleed to death internally. Most anticoagulant baits must be consumed over several days before enough anticoagulant is built up in the rodent's system to cause an effect. However, second-generation baits can effectively kill rodents with one dose.

Rodents have a strong dislike for new objects, so it is important to keep bait stations in the environment continuously. They can smell and taste even small amounts of toxic chemicals, so overdosing baits may only discourage consumption. Rodents can learn to associate tastes with harmful effects of new foods, and they prefer fresh foods. Therefore if a heavy rodent population is suspected, frequent baiting and changing the type of bait may be helpful.

Keep rodent bait stations stocked with fresh bait. Change the type of bait if the pest problem persists.

Since rodents must consume traditional baits for several days, it is critical that bait stations be kept stocked with fresh bait and that adequate numbers of bait stations are present to supply the whole population. Bait stations are important for presenting poison to rodents because they 1) provide a dark, enclosed environment that attracts rodents, 2) keeps bait clean and away from children, pets and livestock and 3) prevents unnecessary loss of bait. Bait stations can be purchased or they can be made out of PVC pipe (see illustration on facing page).

The table on the facing page shows the baits available as well as their effects on rodents. Be aware that resistant rodent populations can develop if there are inadequate levels of bait used or baits are overused. This means that it is just as important to maintain records on what baits are used, as it is to maintain a monitoring schedule. One rodenticide company recommends that baits be switched as often as every 2 months for second generation products, but traditional products may be effective for as long as six months.

DARKLING BEETLES: PROBLEM #2

The lesser mealworm or darkling beetle, as it is commonly called, has proven to be a costly pest for the poultry industry. Beetles and larvae feed on dead birds and then become contaminated with disease organisms. Beetles have been found to be a source of transmission for *Salmonella*, Marek's Disease, *E. coli*, Infectious Bursal Disease, Newcastle Disease, *Clostridium* and numerous other diseases. Chicks and poults consume beetles, exposing them to a direct inoculation of diseases. A good biosecurity plan should include measures for beetle control.

Darkling beetles not only spread disease. One of its larval stages damages wood structures and insulation.

The adult beetles are dark brown to black in color and are about one-fourth inch long. The wire worm-like larvae are yellowish brown and up to three-fourths inch long. The life cycle is temperature dependent with nine life stages occurring in roughly 42 days under ideal conditions. Hence the beetle and typical broiler flock life spans track closely. Adults live 3 to 12 months and a single female can lay over 2,000 eggs. One life stage, the pupating larvae, burrows into insulation and wood, thus destroying the R-value of insulation.

Controlling Darkling Beetles

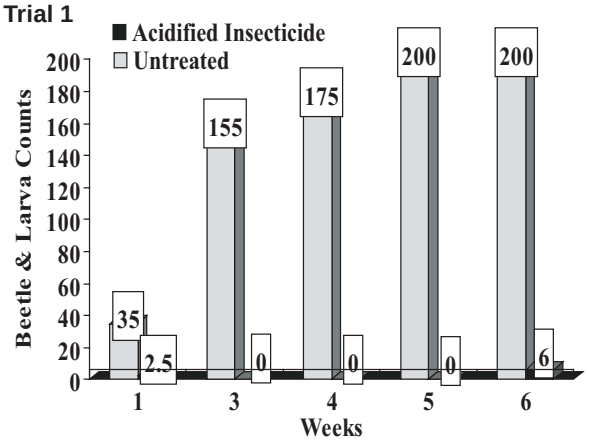
Most insecticides lose their effectiveness against beetles within days or a few weeks after application.

Currently approved insecticides are used after house clean out for beetle control. Some producers also apply insecticides on built-up litter between flocks. Unfortunately many of the approved insecticides decompose rapidly in an alkaline (high pH) environment (see table on facing page). Since poultry litter typically has high pH (8.3 to 8.5), these insecticides do not maintain their effectiveness very long, especially on built up litter. In addition, spraying the poultry house with an insecticide may not be effective against the larva since its burrowing activity protects it from direct exposure to the insecticide. If the insecticide does not provide residual killing power, when the poultry house is warmed for a new flock of birds, the burrowing larvae will migrate out and continue to live.

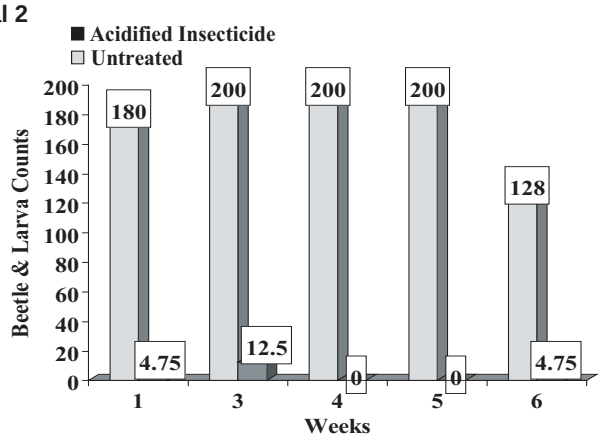
Research has shown that applying an approved insecticide in combination with an acidic solution to bring pH down can greatly improve the residual killing power of the insecticide. The research trials used a commercially marketed poultry litter acidifier containing acetic acid (vinegar) and other acidic elements (trade name ULT). The product has a pH of 2.4-3.0 and was mixed following the manufacturer's recommendations. This solution was blended with an approved insecticide (active chemical cyfluthrin, trade name Tempo), which was mixed at one half the strength recommended by the manufacturer. This product was then applied to floor pens which had new kiln dried pine shavings. Untreated floor pens served as the controls.

Darkling Beetle Control: Acidified Insecticide vs Untreated

Trial 1



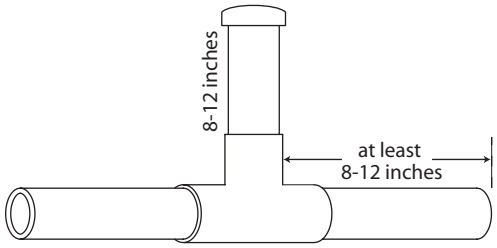
Trial 2



Decomposition Rates of Insecticides

- **Chloropyrifos (Dursban) at pH 10 – 7 days**
- **Tetrachlorvinphos (Rabon)**
  - **at pH 7 – 44 days**
  - **at pH 10 – 3 days**
- **Dichlorvos (Vapona) at pH 7 – 8 hours**
- **Carbaryl (Sevin) at pH 8 – 2 to 3 days**
- **Cyfluthrin (Tempo)**
  - **at pH 5 – stable, no decomposition**
  - **at pH 9 – 30 to 60 minutes (half-life)**

Source: Dr. Dayton Steelman



To make a rodent bait station use 1.5 inch diameter PVC pipe for mice or 2.5 to 4 inch diameter for rat stations. Construct an upside-down T as shown above, using 8- to 12-inch PVC pipe sections. Provide a removable cap for the vertical tube. Attach bait stations permanently to side walls along footings using pipe straps.

Commercially Available Rodenticides

Generic Name	Type	Dose	Trade Names
Brodifacoum	Anticoagulant	Single feeding; slow acting death 5-7 days post feeding.Rodent continues to feed after lethal dose has been ingested.	Attack, Havoc, Talon, Ropax Just One Bite, Jaguar, Weather-Blok
Difethialone	Anticoagulant	Single feeding; slow acting death 5-7 days post feeding. Rodent continues to feed after lethal dose has been ingested.	Generation, D-Cease, Hombre
Bromadiolone	Anticoagulant	Single feeding; slow acting death 5-7 days post feeding. Rodent continues to feed after lethal dose has been ingested.	Boothill, Hark, Maki, Contrac, Trax-one, Terminator
Chlorophacinone	Anticoagulant	Multiple feedings; slow acting death 5-7 days post feeding. Rodent continues to feed after lethal dose has been ingested.	Rozol, Rozol Laq-Berrry
Diphacinone (rats only)	Anticoagulant	Multiple feedings; slow acting death 5-7 days post feeding. Rodent continues to feed after lethal dose has been ingested.	Ramik Green, Ditrac, Liqua, Trap-N-A-Sak, Tox II, Tomcar, Contrax-D
Warfarin	Anticoagulant	Multiple feedings; slow acting	Ferret, Final, Contrax, Rax, Co-Rax
Bromethalin	Metabolic inhibitor	Single feeding; quick acting-death 2-3 days post feeding.	Clout, Assault, Trounce, Rampage, Vengeance
Cholecalciferol	Vitamin D	Single-multiple feedings; death 3-5 days post feeding.	Quintox
Zinc phosphide	Stomach poison	Single feeding; death immediately	Eraze, Ridal-Zinc, ZP, Squirrel & gopher pellets

Source: Leslie Hinkle, AgriLynx Corporation, Rodent Management on Poultry Farms

Note: Trade or brand names are shown strictly for information purposes, and no recommendation or endorsement of any commercial product is intended or implied.

In the first trial, birds were placed in the pens and then grown to 42 days of age. After the first grow-out the treated pens were then retreated for a second trial, with birds again grown to 42 days. In all the evaluations, weekly litter samples were taken from the same location in each pen and beetles and larvae were counted. It is important to note that the floor pens are only separated by a wire barrier and beetles could migrate from pen to pen.

Even though in the first evaluation, the facility had been cleaned and new litter added, beetles and larvae were found to be present the week birds were placed in the pens. This indicates how difficult control of these beetles can be. However, beetle and larvae counts dropped drastically as soon as the acidified insecticide mixture was applied. Results from the first two evaluations showed that when compared to untreated pens, the acid-insecticide mixture was very effective in keeping the beetles out of the treated pens even though beetles could have easily migrated from the untreated pens to the treated pens. (See bar charts on page 3.)

Mixing an acidifying solution with insecticide has been shown to give excellent darkling beetle control.

In a third evaluation, floor pens which had one flock on old litter were treated with the acidified insecticide mixture and additional pens were treated with the insecticide only (at full strength). In this trial, both treatments were effective against the beetles and larvae until week 5. In the last two weeks of this growout, beetle and especially larvae counts were up drastically in the insecticide-only pens, while the acid-insecticide mixture continued to provide effective protection.

In conclusion, it appears that combining an acid solution with an approved insecticide can provide effective control of these beetles for an extended period of time. Although the research trials used only one commercial acidifying product and one insecticide, it seems reasonable to assume that the method could give improved control using other similar products. However, further research is needed to determine effectiveness of treatments using other products.

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