



Control
Solutions Inc.
PRODUCTION ANIMAL

The Ultimate Guide to Litter Beetle Management

WHAT YOU NEED TO KNOW

CSI PRODUCTION ANIMAL

WE HAVE MADE IT OUR MISSION FOR THE LAST 20+ YEARS, TO MANUFACTURE INSECT CONTROL PRODUCTS USING INNOVATIVE FORMULATIONS WHILE PRODUCING THEM WITH THE UTMOST QUALITY.



WHAT ARE LITTER BEETLES?

Litter beetles (*Alphitobius diaperinus*) are an invasive species of darkling beetle and are a stored product pest commonly found in poultry barns. Originally from sub-Saharan Africa, their prevalence in poultry barns is due to an abundance of poultry feed made up of their favorite grains and harborage with temperatures and humidity consistent with their ideal breeding conditions.

They have a complete life cycle with egg, larvae, pupae and adult life stages.

They complete their life cycle from egg to adult within 45–65 days and adult beetles can live up to a year (Geden and Axtel, 1987). They are highly fecund with each adult female laying up to 800 eggs in 42 days. Their population densities peak in mid-summer and decrease during winter months. Furthermore, adults can fly between barns and even between neighboring farms and are attracted to lights at night.

LITTER BEETLES:

AN INVASIVE STORED PRODUCT PEST




WHY ARE THEY A PROBLEM?

Litter beetles cause economical damage in poultry barns when consuming feed, spreading disease, causing damage to insulation, and negatively impacting feed conversion (rate of gain) if birds consume adult beetles and larvae rather than their nutritious feed. In fact, in a study by Grogan and Arends (2008), they estimated that the return on investment of a good beetle control program, when only considering the cost of feed loss, was between \$2,650 and \$4,263 per 100,000 birds. This was when corn prices were between \$2.00 and \$4.50 per bushel.

- Aspergillus
- Avian Influenza
- Avian Leukosis Virus (Herpes Virus)
- Birnavirus (IBDV or IBD)
- Botulism
- Black Head
- Campylobacter
- Cecal Worms
- Coccidiosis
- Clostridium
- Escherichia coli
- Fowl Pox
- Marek's Disease
- Newcastle Disease
- Reovirus (REO)
- Salmonella
- Tapeworms

USEFUL TIPS FOR MANAGEMENT

- 01.** Use the highest label rate for all products; using a lower rate can accelerate resistance.
- 02.** Most premise sprays are labeled for 1 gal of solution per 1,000 ft² of application area.
- 03.** Use insect growth regulators (IGRs) such as **Tekko® 10** or **Pivot® 10** in conjunction with contact insecticides to target multiple life stages.
- 04.** Make applications as close to bird placement as possible, preferably no longer than 2-3 days.
- 05.** Cover as much of the litter as possible when applying premise sprays. Whole house treatments are more thorough, and insects can't get away from the insecticide treatment. Band application may be used if the label allows but may lead to behavioral resistance.

A large flock of white chickens is shown in a barn setting. In the background, there are red and white plastic feeders. The chickens are densely packed, and their red combs and wattles are prominent against their white feathers. A green rectangular box is overlaid on the image, containing text.

Litter beetles cause economic damage in poultry barns by consuming feed, spreading disease, causing damage to insulation, and negatively impacting feed conversion (rate of gain) if birds consume adult beetles and larvae rather than their nutritious feed.

06. Use a licensed custom applicator for premise sprays. They have access to restricted use products and will provide accurate, consistent application.

07. Make applications of long-lasting insecticides such as **Taurus® SC** to the exterior of barns (preferably following bird removal) after the last frost in early spring, and again during the peak insect populations during mid-summer.

08. Utilize mid-flock treatments when premise sprays become ineffective due to long grow outs.

09. Make an insecticide application to litter directly after bird removal to break the life cycle of overlapping generations of beetles.

10. Clean out as often as possible. Once per year would be ideal.



- 11.** Windrow litter between flocks to drive beetles out of the litter and kill any remaining pupae and eggs. Spray windrows with a contact insecticide to kill escaping adults and larvae.
- 12.** Spray used litter stacked on the farm with a combination of contact insecticide plus an IGR to keep beetles from migrating back into the poultry barn.
- 13.** Clean up unnecessary food sources such as dead birds, broken eggs, and spilled feed.
- 14.** Rotate insecticide classes every 2-3 flocks.





What Should I Expect from Insecticide Applications?

There are unique challenges associated with insect management in a poultry barn to say the least. Insecticides for managing litter beetles are typically applied 3-7 days before bird placement. There's no feed in the house, and it's cold in the wintertime. Beetles are still hiding in cracks and crevices and down in the litter, especially along sidewalls. The beetles aren't even contacting treated surfaces until feed is placed and the house is warmed up just before birds arrive. On their migration to the feed lines, beetle adults and larvae finally get a dose of insecticide, which is no longer at full strength because it

has been degrading by microbes for several days and it has often had a layer of acid litter amendment applied over it. Insecticides typically takes 3-7 days to cause significant insect mortality. Therefore, judging insecticide efficacy at bird placement isn't realistic. Give it 1-2 weeks to affect the insect population before evaluating efficacy.

All the neurotoxic insecticides (i.e., neonicotinoids, organophosphates, pyrethroids, spinosyns) affect the insect nervous system at various locations depending on their mode of action. However, the symptoms of



neurotoxicity include restlessness, hyper excitability, tremors and convulsions, and eventually paralysis and death. The two IGR classes available for use in animal production are juvenile hormone (JH) mimics and chitin synthesis inhibitors. JH mimics imitate immature insects' juvenile hormones, preventing them from successfully reaching the adult (reproductive) stage.

JH mimics, like pyriproxyfen (**Pivot® 10**), disrupt the metamorphosis (change in form) that normally occurs between the pupal and adult stages of an insect. After a JH mimic application you may

still see many larvae in the treated environment. Do not be alarmed! Although the IGR did not kill the larvae, they won't be able to reach the adult stage and reproduce. Therefore, the benefits of JH mimics, a reduction in adult beetle numbers, won't be seen until after the second application. For best results, tank mix IGRs with contact insecticides.

Chitin synthesis inhibitors, like novaluron (**Tekko® 10**), interrupt the molting process by preventing the insect from making a complete new exoskeleton. Unlike JH mimics, they kill larvae



the next time they molt. If they even complete their molt, they will often be deformed and unable to reproduce.

There are no distinct generations of litter beetles in a poultry barn. They continuously overlap, and new eggs are constantly being laid. Insecticides applied before bird placement will most likely result in adequate kill of adult and larvae present at bird placement. However, waves of larvae can hatch from eggs hidden in cracks and crevices, and new adults can emerge from pupae buried deep in the pad. It

may be necessary to make a second insecticide application as soon as birds are removed from the barn to break the life cycle of the beetle population.

APPLICATIONS

Insect Growth Regulator Options:

Trade Name	Active Ingredient	Percent of Active	Insecticide Class	Rate	Volume
Tekko® 10	Novaluron	9.3%	Chitin Synthesis Inhibitor	1.5 - 3 oz/gal	1 gal/1,000 sq.ft.
Pivot® 10	Pyriproxyfen	10%	Juvenile Hormone Analog	8 mL/gal	1 gal/1,000 sq.ft.

Interior Premise Spray Options:

Trade Name	Active Ingredient	Percent of Active	Insecticide Class	Rate	Volume
Cyzmic® Synergized	Lambda-Cyhalothrin Piperonyl Butoxide	9.7% 19.4%	Pyrethroid	1.6 oz/gal	1 gal/1,000 sq.ft.
Dominion® 4L	Imidacloprid	42.3%	Neonicotinoid	3 oz/gal	1 gal/1,000 sq.ft.
Cyzmic® CS	Lambda-Cyhalothrin	9.7%	Pyrethroid	0.8 oz/gal	1 gal/1,000 sq.ft.
Bifen I/T	Bifenthrin	7.9%	Pyrethroid	1.0 oz/gal	1 gal/1,000 sq.ft.
Permethrin CS	Permethrin	23.6%	Pyrethroid	5.33 oz/gal	1 gal/1,000 sq.ft.

Exterior Premise Spray Options:

Trade Name	Active Ingredient	Percent of Active	Insecticide Class	Rate	Volume
Taurus® SC	Fipronil	9.1%	Phenylpyrazole	0.8 oz/gal	1.5 gal/1,000 sq. ft.

REFERENCES CITED:

Geden, C.J. and Axtell, R.C., 1987. Factors affecting climbing and tunneling behavior of the lesser mealworm (Coleoptera: Tenebrionidae). *Journal of Economic*, 80(6), pp.1197-1204.

Grogan K, Arends J. Darkling Beetles and Their Economic Impact. *Poultry Times*. August 2008. pp. 17-18.

PRODUCT INDEX

Insect Growth Regulator Options:

Tekko® 10



A larvicide with specific properties developed for the control of litter beetle, soldier fly, and dump fly larvae in poultry operations.

[Product Page ►](#)

Pivot® 10



Controls beetles and other listed pests. Can be used indoors, outdoors, and in food areas. Disrupts their life cycle preventing them from developing into adults.

[Product Page ►](#)

Interior Premise Spray Options:

Cyzmic® Synergized



A microencapsulated, synergized pyrethroid that can be used to kill pyrethroid-resistant insect populations.

[Product Page ►](#)

Dominion® 4L



An insecticide used to provide premise control of adult Darkling beetles and larvae. Dominion 4L is specifically formulated for the poultry industry.

[Product Page ►](#)

Cyzmic® CS



A micro-encapsulated suspension containing Lambda-Cyhalothrin and CapVantage™ technology. The broad use label includes structural and perimeter pest control.

[Product Page ►](#)

Bifen I/T



Contains 7.9% bifenthrin, provides excellent control of over 75 insect pests, leaves a long-lasting residual, is odorless, non-staining, and dries clear.

[Product Page ►](#)

PERMETHRIN CS



A flexible insecticide concentrate used indoors and outdoors in both residential and commercial settings to kill over 50 different kinds of insects.

[Product Page ►](#)

Exterior Premise Spray Options:

TAURUS® SC



A water-based suspension concentrate of 9.1% Fipronil, non-repellent insecticide. Undetectable to litter beetles, allows them to touch, ingest, and spread the insecticide throughout the colony.

[Product Page ►](#)



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*CSI Production Animal
provides highly effective
insecticides for use in
and around production
animal farms.*

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Control Solutions Inc.
5903 Genoa Red Bluff,
Pasadena, Texas, 77507, USA

Toll Free: 800.242.5562
csi-customer-service@controlsolutionsinc.com