

Spinosyns Increase Efficacy of Pyrethroids and Organophosphates

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The litter beetle (*Alphitobius diaperinus*), also known as the lesser mealworm, is a sub-Saharan African native that has made its way on to every continent with the exception of Antarctica (Axtell and Arends, 1990). The litter beetle is a major arthropod pest of broiler facilities spreading diseases such as avian influenza, Maerk's disease, *Salmonella sp.*, and *E. coli* just to name a few (Adams 2003 and Tomberlin and Drees, 2007). They cause structural damage when they tunnel through insulation for harborage, they reduce feed conversion of broiler chickens, and are a general nuisance when they reach high population densities.

For those reasons, it is important to develop an integrated pest management (IPM) approach to mitigate the negative effects of this invasive species. IPM is using a combination of all of the best parts of control methods applicable to a pest problem (Whitacre and Ware, 2004). The goal is to use sound ecological principles to keep pests below the economic injury level. Rotation of pesticide classes is an integral part of an IPM program to combat the development of pesticide resistance.

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In poultry facilities, we have access to only a handful of insecticide classes that include contact insecticides (pyrethroids, neonicotinoids, organophosphates and spinosyns) and insect growth regulators (juvenile hormone analogs and chitin synthesis inhibitors). It is common practice to use a combination of one of the contact insecticides (all neurotoxins) and one of the insect growth regulators.



Litter beetles, also known as lesser mealworms.

Pyrethroids and neonicotinoids are the most commonly used insecticide classes in poultry facilities because of their availability to non-licensed professionals and their relative low cost. Organophosphates are a potent class of insecticides that provide long residual control but require a pesticide license for application. Spinosyns are an excellent chemical class often overlooked by the poultry industry, and there are several reasons why that should change.

Like the other contact insecticides, spinosad (an active ingredient within the spinosyn chemical class) is a neurotoxin that blocks the nicotinic acetylcholine receptors (Whitacre and Ware, 2004). These receptors are responsible for muscle contractions. Therefore, spinosad causes paralysis and eventual death of arthropods. Spinosad is a product of a soil-inhabiting actinomycete bacteria called *Saccharopolyspora spinosa*. It is considered a reduced risk pesticide by the Environmental Protection Agency (EPA) due to its very low toxicity to non-target animals, including humans.

There's even an added bonus to applications of products containing spinosad! In a 2014 article published in the *Journal of Economic Entomology* (a high-profile journal in the entomological world), Lambkin and Furlong write about how applications of spinosad increases the susceptibility of

resistant litter beetles to pyrethroids and organophosphates. Their laboratory and field study found that pyrethroid-resistant populations of litter beetles exhibited a 3.6x increase in susceptibility to pyrethroids following an application of spinosad. They believe there is a synergy between spinosad and pyrethroids, and suggest that spinosad be rotated with pyrethroids in order to overcome pyrethroid resistance.

Elector[®] PSP (MWI Item # 045949) contains 44.2% spinosad and can be used in beef cattle, dairy, horse, poultry and swine facilities. It is labeled for the management of darkling and hide beetles, house and stable flies, and northern fowl mites. It can even be used with animals present as a premise spray and on or over animals with no withholding periods. Eggs do not need to be removed in order to treat layer hens for northern fowl mites.

As a litter treatment for darkling beetles, it can be used as a coarse spray at 0.8 oz/gal of water. It is recommended that a full-floor application be made and at least two feet up side walls. Flies can be treated at 0.2 oz/gal of water where flies rest such as on side walls, posts, crossbeams and manure. Reapplication for flies can be made every seven

days. When treating litter for beetles or making premise spray applications for flies, 1 gallon of solution will cover 1,000 ft². For northern fowl mites, make applications at 0.3 oz/gal of water as a coarse spray to the vent area of birds. One gallon of solution will cover 100 birds. Reapplications for fowl mites can be made every 14 days.

References

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