

## News and Notes on Insect Control

Mike Stringham and Wes Watson  
Department of Entomology  
N. C. State University, Raleigh, NC

The sun is shining. Toms and hens gobble happily. The whole turkey world rejoices! It's a new dawn for beetle and fly control. The past year or two has seen the introduction of seven. Count them, seven new insecticides! We should all be excited about the possibilities, right? Not so fast. Truth be told we do have seven new products, but the promise is not quite so promising. Three (Credo, Oxyfly, and Neporex) contain active ingredients that are familiar to the poultry industry (imidacloprid, lambda-cyhalothrin and cyromazine, respectively). Of these, Credo and Neporex are formulated differently and one (Neporex) has an expanded label that now includes turkeys. One of the new products (Standguard) contains gamma-cyhalothrin which is a variant of an old active. Another (Actishield) simply adds the active ingredient bifenthrin to the already crowded field of pyrethroids. Finally, two (Elector PSP and balEnce) are entirely new active ingredients (spinosyn and *Beauveria bassiana*) that also represent two new classes of insecticide. There are some differences in utility as well. Two are registered only for fly control (Neporex and balEnce) and one exclusively for beetle control (Credo). The others are labeled for both flies and beetles. Most importantly for the turkey industry, first hand information about the efficacy of the new products is limited and ranges from very good to average to poor to unknown. To be sure, I haven't looked at every new product, but there's plenty to talk about. There's a beetle control study underway, and other field trials in the wings. You'll also find a list at the end of this article that should be helpful to you. It contains the old fly and beetle control products that are still labeled, and most of the new arrivals.

We presently have a trial running at two turkey brooder hubs to evaluate the efficacy of five of the newer products: Standguard (gamma-cyhalothrin), Oxyfly (lambda-cyhalothrin), Actishield (bifenthrin), Elector PSP (spinosyn) and Credo (imidacloprid). I won't cover the details here, other than to say that Credo applied at the label rate did a very good job of suppressing adults and larvae for an entire 5 week brooder cycle. Actishield and Elector did moderately well for the same period compared to a positive control (Ravap), while Standguard and Oxyfly performed only slightly better than that control. We are finishing up the second flock now, and the results look similar. We hope to have the final results published early next year.

I have yet to look at the products for fly control, but plan trials for both Neporex and balEnce. Part of the reason for the trials is to figure out how to best plug these products into a fly management program for turkeys. The fungus in balEnce is known to be very effective against flies, and this new product is available in a granular bait and spray formulation. It has also received labeling for use in organic production. Neporex is a water soluble granule that may be used dry or applied as a spray. The active, cyromazine, has been an effective fly larvicide in layers and broiler breeders for years, and is likely to be useful in turkey production.

Now, let's talk about controlling our most persistent insect problem – the darkling beetle. It's still true that long term control in growout is not likely given the limited opportunities for treatment during the long production cycle. A single treatment with Credo will last

about 6 weeks, but what about the next 6 weeks and more? There are few products that may be used while the birds are present. Of these Elector PSP, is perhaps the most effective for larval control; Actishield and Rabon/Ravap as targeted treatments for adult control along walls and under feeders. The good news is that beetle control in brooder houses is another matter entirely. A single treatment of Credo provides excellent control for an entire brooder cycle. Other products such as Elector PSP for larvae and Actishield or Rabon/Ravap for adults and larvae may provide good larval suppression with a properly timed second application during the flock cycle. In short, there is some hope that we can effectively suppress beetle populations in brooder houses and still have some flexibility to manage insecticide resistance. Sounds simple enough, but the new products are only part of the solution. Application is just as important.

The new application paradigm is low volume these days. To be honest, I preached a “use what you’ve got” sermon for years, believing that 100 to 200 gallons of spray per house was acceptable if that was all a grower could do given the equipment at hand. I thought a goal of 100 or less gallons was certainly a good move, but didn’t push the idea very hard. Not surprisingly many companies shifted to dust application and lower spray volumes, in part to limit the amount of moisture in the turkey house. Now I’m convinced that the move to lower the volume of water used in turkey houses was a good thing for beetle control as well. Briefly, lower volume application most often requires different equipment, and that different equipment is generally able to deliver treatment more precisely. There’s an additional benefit in that droplet size can also be reduced and applied more uniformly across the litter. Better precision and smaller droplet size helps insure that beetles and larvae have the best possible opportunity for exposure to a lethal dose of the insecticide.

**Methods of Application:** I personally favor pull type sprayers that have a 7 – 8 foot boom (articulated is helpful for wall coverage, but not necessary), 5 or 6 small bore, flat fan nozzles, a 25 – 30 gallon tank, a roller pump and gasoline engine sufficiently large to power the sprayer. An auxiliary spray wand can be attached to treat corners. Such a sprayer should be able to hold 30 to 60 psi pressure in operation and be towable behind a small tractor or ATV. The goal of such a sprayer is to put 25 or fewer gallons of spray exactly where you want it. Variations of this design will do just as well so long as a fixed arrangement of wide coverage, fine spray nozzles is at the center of the design.

Other approaches can work nearly as well, but are often less precise. Air blast sprayers or powered backpack misters/foggers are ULV applicators that can quickly deliver ultrafine droplets throughout the house. The volume of water can be as low as 2 – 6 gallons. A variation on this approach is to use a house washer equipped with misting nozzles. This approach still uses a considerable amount of water, however. The main drawback of mists or fogs is that a fine aerosol is more difficult to control. A fair amount finds its way to walls, curtains and ceilings. That’s ok, but that insecticide is of more use on the litter. Further, if you’ve calculated your rate of application based on the square footage of the floor, your actual rate per unit of area could be considerably lower than intended. In short, just be sure to do the math before you fill the tank. One final thought about ULV application. There may be an opportunity to move treatment closer to the time of placement using a powered backpack mister. Treating within a day or two of placement will extend the period of control by almost a week. The application could be made after brooder guard went up but before poult feeders were put in place.

Wand sprayers of any kind, but especially small pump sprayers (backpack or canister) should only be used to apply material over relatively small areas. They are well suited for treatments along feed lines, around posts and along interior walls. However, attempts to treat an entire house with such sprayers are a gamble. It is very difficult to insure uniform coverage throughout the house, and wherever coverage is shorted or absent it's a pretty safe bet the beetles will proliferate.

**Zones of Application:** What about maximizing efficacy while limiting the area of application? The current field trial demonstrates that by applying an effective treatment to areas where we know beetle activity ramps up early in the flock cycle, we can dramatically reduce the population in untreated areas as well. The zone of maximum beetle activity in turkey brooder houses extends from the walls to the feed lines, with the greatest activity occurring beneath the brooders within a few weeks of placement. The Credo treatment appeared to have not only suppressed beetle activity in this zone, but the untreated area down the center of the house as well. Can we do the same with less persistent insecticides by timing a secondary application when birds are around 3 weeks of age? Maybe. Other data suggest that it just might be possible, but there's work to do in fine tuning this approach.

**Seasonal Considerations and Managing Insecticide Use:** Darkling beetle populations typically decline somewhat with the onset of cold weather. The magnitude of that decline is largely dependent on the type of housing (curtain sided vs. solid wall construction) and the age of the building. I'm a big fan of halting beetle treatments in late summer/early fall and letting the cold weather suppress their numbers naturally. There may be added benefits from cold season treatments. Treatments while numbers are naturally suppressed might prove very effective in delaying the onset of and reducing the size of beetle infestations coming into the spring and early summer. Credo could be especially effective in that respect. Consider treating for two brooder flocks in the February – April window to reduce beetle populations as far as possible. Follow up treatments might then be delayed for one or more flocks, and allow the use of other registered products to control infestations for the remainder of the year. For example, if beetle populations were very low after two Credo treatments, Elector PSP or Durashield might extend satisfactory control for additional flocks. Two late summer/early fall Credo treatments might work equally well, suppressing beetles without further treatments for the rest of the winter. Come spring another active ingredient could be used once the beetle population begins to surge. Both approaches should be evaluated to see which approach works best. Regular monitoring (visual or with traps) will be necessary to assess the affect of winter treatments and determine when to begin warm season treatments.

There is an apparent inconsistency with this approach relative to insecticide rotation and resistance management. However, limited use of Credo followed by a rotation to other classes of compounds is acceptable so long as the treatment program remains with the alternate class until the next Credo window. To illustrate, if Elector PSP follows the initial treatments until it is again time for the two Credo treatments, the next rotation should come from a third class of chemicals (the organophosphate, Durashield, for example). Such an approach insures a period of rotation for all the products that is sufficiently long (nine months for Credo; more than a year for Elector and Durashield). Remember too that successful suppression of beetles during the winter might well eliminate the need for one or more treatments during the warm season.

**Pesticides For *Lesser Mealworm (Darkling Beetle)* Control In Poultry Houses**

<b>CLASS &amp; COMMON NAME</b>	<b>BRAND NAMES</b>	<b>COMMENTS</b>
<b>Pyrethroids</b>		
Cyfluthrin	Tempo 1 D, Tempo Ultra 11.8 SC, Tempo Ultra 10 WP, Tempo 20 WP, Optashield 6 CS	Optashield CS is microencapsulated and may be slower acting. WP (wettable powder) formulations may be more effective on porous surfaces (wood, concrete block, etc.). Documented resistance in some locales.
<i>lambda</i> -Cyhalothrin	Grenade 9.7 ER, Oxyfly 9.7, Demand 9.7 CS	All of these products are microencapsulated and may be slower acting
<i>gamma</i> -Cyhalothrin	Standguard 5.9	
Permethrin	Tengard 36.8 SFR	Other products such as Permethrin Pro 36.8, Ectiban 5.7 EC, Permethrin 10 EC are specifically labeled for poultry pests other than beetles, but may be used as premise treatments.
Esfenvalerate	Clear Zone 10 CS, Crossfire 10 MC, ValorShield 35 WP	Clear Zone CS and Crossfire MC are microencapsulated and may be slower acting. WP (wettable powder) formulation may be more effective on porous surfaces (wood, concrete block, etc.)
Bifenthrin	ActiShield 7.9 L	May be applied as crack and crevice treatment with birds present.
<b>Organophosphate</b>		
Tetrachlorvinphos	Rabon 50 WP, Beetle Shield 3 D	Documented resistance in some locales.
Tetrachlorvinphos + Vapona	RaVap 23/5.3 EC	
Chlorpyrifos	Durashield 20 CS	<b>Restricted Use Insecticide.</b> Microencapsulated, slow acting formulation with good persistence.
<b>Macrocyclic Lactone</b>		
Spinosyn, Spinosad	Elector 44.2 PSP	Slower acting than some other insecticides, but better persistence than most. Label specifically allows beetle treatments while birds are present. Most effective in alkaline spray solution (pH ≥ 8). Most effective against beetle larvae.
<b>Neonicotinoid</b>		
Imidacloprid	Credo 42.8 SC	New Release (2008). Persistent, providing control up to 6 weeks
<b>Borates</b>		
Orthoboric Acid	Boric Acid, SafeCide IC 99 D	Best applied dry, although may be mixed as a spray.
<b>Insect Growth Regulator (IGR)</b>		
Pyriproxyfen	Pyri-Shield 1.3 EC, Archer 1.3 EC	Affects larvae only. Mix with other insecticides.

<b>Pesticides For <i>Fly Control</i> In Poultry Houses</b>		
<b>CLASS &amp; COMMON NAME</b>	<b>BRAND NAMES</b>	<b>COMMENTS</b>
<b>Carbamate</b>		
Methomyl	Golden Malrin 1 B, BlueStreak 1 B	Scatter bait or in stations for adult fly control
<b>Pyrethroid</b>		
Bifenthrin	ActiShield 7.9 L	Adult fly control and as a spot treatment larvicide.
Cyfluthrin	Tempo 1 D, Tempo Ultra 11.8 SC, Tempo Ultra 10 WP, Tempo 20 WP, Optashield 6 CS	Spray resting surfaces (walls, support posts, cabling, etc.) for adult fly control; generally quick knockdown. <b>NOT</b> labeled as a fly larvicide. Adult resistance likely in some locales.
<i>lambda</i> -Cyhalothrin	Grenade 9.7 ER, Oxyfly 9.7, Demand 9.7 CS	All are microencapsulated and may be slower acting. Spray resting surfaces (walls, support posts, cabling, etc.) for adult fly control. <b>NOT</b> labeled as a fly larvicide.
<i>gamma</i> -Cyhalothrin	Standguard 5.9	
Permethrin	Tengard 36.8 SFR, Permethrin II 10 EC, others	Spray resting surfaces (walls, support posts, cabling, etc.), space spray (fog) for adult fly control. <b>NOT</b> labeled as a fly larvicide.
Pyrethrin (-um)	Riptide 5ULV, Pyronyl EC, others	Space spray (fog) to control adult flies; very quick knockdown
<b>Organophosphate</b>		
Tetrachlorvinphos	Rabon 50 WP	May be used for adult fly control and as a spot treatment larvicide
Tetrachlorvinphos + Vapona	RaVap 23/5.3 EC	May be used for adult fly control and as a spot treatment larvicide
Chlorpyrifos	Durashield 20 CS	<b>Restricted Use Insecticide.</b> Microencapsulated, slow acting formulation with good persistence. <b>NOT</b> labeled as a fly larvicide.
<b>Macrocyclic Lactone</b>		
Spinosyn, Spinosad	Elector 44.2 PSP	Slower acting than some other insecticides, but effective. Most effective in alkaline spray solution (pH ≥ 8). Label specifically allows fly treatments while birds are present. <b>NOT</b> a fly larvicide.
<b>Neonicotinoid</b>		
Imidacloprid	QuickBayt 0.5 B, QuickBayt 10 SS	Bait, spray, paint on for adult fly control; quick knockdown. <b>NOT</b> labeled as a fly larvicide.
Nithiazine	QuikStrike 1 BS	Bait strip for adult fly control
<b>Insect Growth Regulator (IGR)</b>		
Pyriproxyfen	Pyri-Shield 1.3 EC, Archer 1.3 EC	Primarily a larvicide. Mix with other insecticides.
Cyromazine	Larvadex 2 SL	Larvicide as a spray; layers and pullets only
	Larvadex 1 FAP	Larvicide in feed; layers and pullets only
	Neporex 2	Larvicide for granular or spray application; all poultry

## Application Guide For Lesser Mealworm (Darkling Beetle) and Fly Control In Poultry Houses (Part 1)

PRODUCT	<i>Formulated Product / Unit of Treated Area</i>	
	Lesser Mealworm (Darkling Beetle)	Manure Breeding Flies
<b>BIFENTHRIN</b>		
ActiShield 7.9% L	0.33 – 1 fl. oz./1,000 ft <sup>2</sup> (6.6 – 20 fl. oz./20,000 ft <sup>2</sup> ) of litter, fly resting surfaces	
<b>BORIC ACID</b>		
SafeCide IC 99% D Boric Acid 99.6% D	1 – 2 lbs / 100 ft <sup>2</sup> (200 – 400 lbs/20,000 ft <sup>2</sup> )	limited use for fly control
<b>CHLORPYRIFOS</b>		
Durashield 20 CS	<b>restricted use;</b> 2 – 5 fl. oz./1,000 ft <sup>2</sup> (40 – 100 fl. oz./20,000 ft <sup>2</sup> ) of litter, fly resting surfaces	
<b>CYFLUTHRIN</b>		
Tempo 1% Dust	0.5 – 1 lb/1,000 ft <sup>2</sup> (10 – 20 lbs/20,000 ft <sup>2</sup> ) as dust application to entire structure	
Tempo Ultra 11.8% SC	8 – 16 ml/1,000 ft <sup>2</sup> (5.4 – 10.8 fl. oz./20,000 ft <sup>2</sup> ) of litter, fly resting surfaces	
Tempo Ultra 10% WP	10 – 20 grams/1,000 ft <sup>2</sup> (200 – 400 grams/20,000 ft <sup>2</sup> ) of litter or fly resting surfaces	
Tempo 20% WP		
Optashield 6% CS	30 – 60 ml/1,000 ft <sup>2</sup> (20 – 40 fl. oz./20,000 ft <sup>2</sup> ) of litter or fly resting surfaces	
<b>GAMMA-CYHALOTHRIN</b>		
Standguard 5.9%	10 – 20 ml/1,000 ft <sup>2</sup> (13.5 – 27 fl. oz. /20,000 ft <sup>2</sup> ) of litter, fly resting surfaces	
<b>LAMBDA-CYHALOTHRIN</b>		
Grenade 9.7% ER, Oxyfly 9.7%, Demand 9.7% CS	12 – 24 ml/1,000 ft <sup>2</sup> (8 – 16 fl. oz./20,000 ft <sup>2</sup> ) of litter, fly resting surfaces	
<p>The <i>Formulated Product / Unit of Treated Area</i> section is taken from product labels and standardized for a specific area of treatment where possible. The values should not be taken as exact recommendations. Applicators are advised to read and follow the specific label instructions for each product. Applicators should also refrain from tank mixes of insecticides with disinfectants or detergents unless product labels state otherwise. Chemical interactions that reduce the efficacy of one or all tank mixed components may occur. Finally, no claim is made that all products for use in poultry production are listed here. Other brands, formulations and chemistries may be available worldwide. Those listed here may be the only products available or are representative of all formulated products of a particular active ingredient. No endorsement is implied for those mentioned specifically by name.</p>		

## Application Guide For Lesser Mealworm (Darkling Beetle) and Fly Control In Poultry Houses (Part 2)

PRODUCT	<i>Formulated Product / Unit of Treated Area</i>	
	Lesser Mealworm	Manure Breeding Flies
<b>CYROMAZINE</b>		
Larvadex 1% FAP	<i>these products not labeled for beetle control</i>	500 grams/t in feed as fly larvicide (layers only)
Larvadex 2% SL		6.5 fl. oz./100 ft <sup>2</sup> as fly larvicide (layers only)
Neporex 2% SG		1 lb./200 – 250 ft <sup>2</sup> as dry or spray larvicide
<b>ESFENVALERATE</b>		
Clear Zone 10% CS Crossfire 10% MC	12 – 24 ml/1,000 ft <sup>2</sup> (8 – 16 fl. oz./20,000 ft <sup>2</sup> )	not generally as effective for flies
ValorShield 35% WP	2.8 – 5.6 grams/1,000 ft <sup>2</sup> (0.12 – 0.25 lbs/20,000 ft <sup>2</sup> )	
<b>IMIDACLOPRID</b>		
Credo 42.8%	90 ml/1,000 ft <sup>2</sup> (2 qt./20,000 ft <sup>2</sup> )	<i>this formulation not labeled for fly control</i>
Maxforce 0.5% B	<i>these products not labeled for beetle control</i>	1.5 oz./250 ft <sup>2</sup> as scatter bait or in bait station
QuickBayt 0.5% B		1.5 oz./250 ft <sup>2</sup> as scatter bait or in bait station; 3 lb./qt water as paint on
QuickBayt 10% Spot Spray		8 fl. oz./1,000 ft <sup>2</sup> of fly resting surfaces
<b>METHOMYL</b>		
Golden Malrin 1.1% B, BlueStreak 1 B	<i>these products not labeled for beetle control</i>	4 oz./500 ft <sup>2</sup> as scatter bait or in bait station
<b>NITHIAZINE</b>		
QuikStrike 1% Fly Strip	<i>this product not labeled for beetle control</i>	1 strip/100 – 300 ft <sup>2</sup>
<p>The <i>Formulated Product / Unit of Treated Area</i> section is taken from product labels and standardized for a specific area of treatment where possible. The values should not be taken as exact recommendations. Applicators are advised to read and follow the specific label instructions for each product. Applicators should also refrain from tank mixes of insecticides with disinfectants or detergents unless product labels state otherwise. Chemical interactions that reduce the efficacy of one or all tank mixed components may occur. Finally, no claim is made that all products for use in poultry production are listed here. Other brands, formulations and chemistries may be available worldwide. Those listed here may be the only products available or are representative of all formulated products of a particular active ingredient. No endorsement is implied for those mentioned specifically by name.</p>		

## Application Guide For Lesser Mealworm (Darkling Beetle) and Fly Control In Poultry Houses (Part 3)

PRODUCT	<i>Formulated Product / Unit of Treated Area</i>	
	Lesser Mealworm	Manure Breeding Flies
<b>PERMETHRIN</b>		
Tengard 36.8% SFR	9.5 ml/750 ft <sup>2</sup> (8.5 fl. oz./20,000 ft <sup>2</sup> ) of litter, fly resting surfaces; 0.7 – 0.9 ml/1,000 cu. ft. as a fog for fly control	
Permethrin II 10% EC	labeled for poultry pests other than darkling beetles, but may be used as premise treatment	40 ml/750 ft <sup>2</sup> of fly resting surfaces; 1.2 ml/1,000 cu. ft. as a fog,
<b>PYRETHRIN (-UM)</b>		
Riptide 5% Waterbased ULV	not generally effective for beetle control	0.25 – 1 fl. oz./1,000 cu. ft. as a fog
Pyronyl 303 3% EC		1.9 ml/1,000 cu. ft. as a fog
<b>PYRIPROXIFEN</b>		
Pyri-Shield 1.3% EC Archer 1.3% EC	29.6 ml/1,000 ft <sup>2</sup> (20 fl. oz. / 20,000 ft <sup>2</sup> ) as a beetle larvicide; no activity against adult beetles	29.6 ml/1,500 ft <sup>2</sup> (13.3 fl. oz./20,000 ft <sup>2</sup> ) as a fly larvicide; some activity against adult flies
<b>SPINOSYN, SPINOSAD</b>		
Elector 44.2% PSP	6 – 12 ml /500 ft <sup>2</sup> (8 – 16 fl. oz./20,000 ft <sup>2</sup> )	6 – 12 ml/1,000 ft <sup>2</sup> (4 – 8 fl. oz./20,000 ft <sup>2</sup> ); requires alkaline spray solution (pH ≥ 8)
<b>TETRACHLORVINPHOS</b>		
Rabon 50% WP	37 grams/100 ft <sup>2</sup> ; as a dust 21 grams/100 ft <sup>2</sup>	75.5 grams/500 ft <sup>2</sup> of fly resting surfaces; 75.5 grams/100 ft <sup>2</sup> as fly larvicide
Rabon Beetle Shield 3% D	113 – 226 grams (4 – 8 oz.)/100 ft <sup>2</sup>	<i>this product not labeled for fly control</i>
<b>TETRACHLORVINPHOS + VAPONA</b>		
RaVap 23/5.3% EC	5 – 10 fl. oz./1,000 ft <sup>2</sup> (3.125 – 6.25 qt./20,000 ft <sup>2</sup> ) of litter, fly resting surfaces; 5 fl. oz./100 ft <sup>2</sup> as fly larvicide	

The *Formulated Product / Unit of Treated Area* section is taken from product labels and standardized for a specific area of treatment where possible. The values should not be taken as exact recommendations. Applicators are advised to read and follow the specific label instructions for each product. Applicators should also refrain from tank mixes of insecticides with disinfectants or detergents unless product labels state otherwise. Chemical interactions that reduce the efficacy of one or all tank mixed components may occur. Finally, no claim is made that all products for use in poultry production are listed here. Other brands, formulations and chemistries may be available worldwide. Those listed here may be the only products available or are representative of all formulated products of a particular active ingredient. No endorsement is implied for those mentioned specifically by name.