Of Mites and Hen

Controlling Northern Fowl Mites (*Ornithonyssus sylviarum*) in U.S. Poultry

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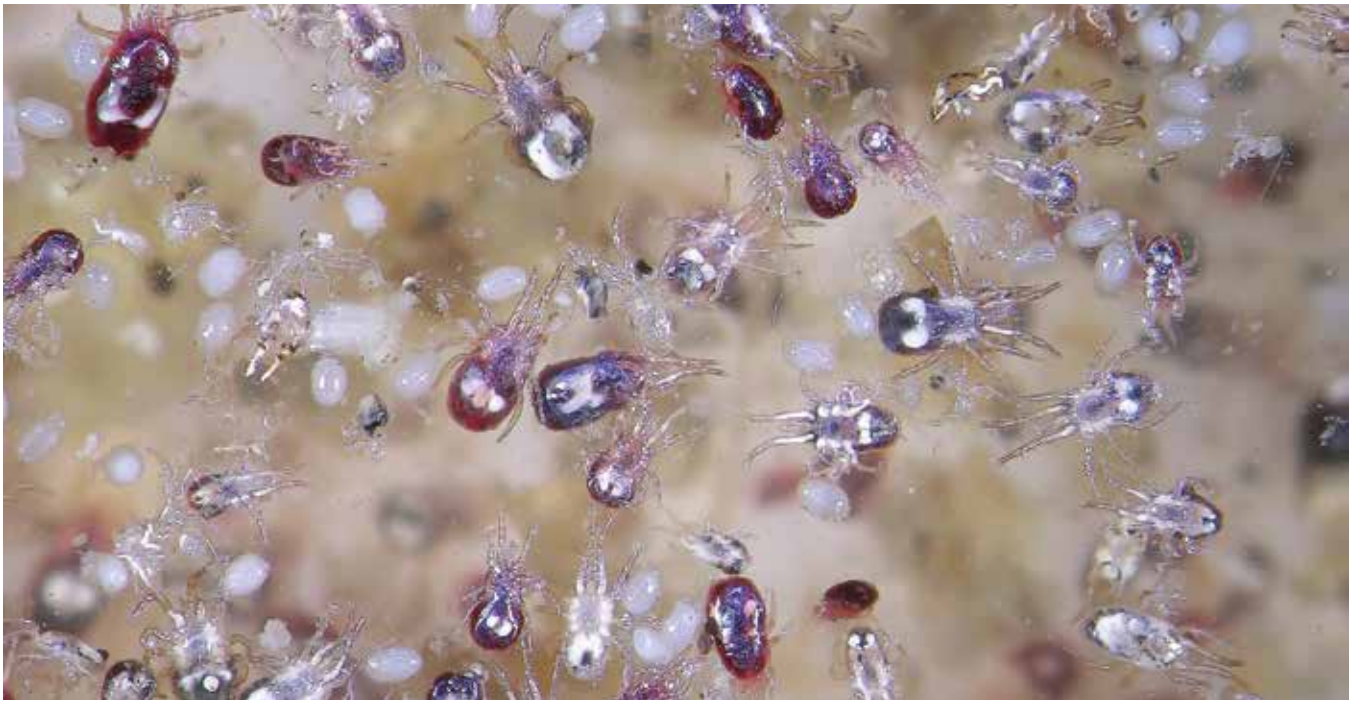

Importance

Northern fowl mites (*Ornithonyssus sylviarum*) are the dominant species of ectoparasitic mites of poultry in the United States. They feed on chicken blood, can cause severe chicken anemia, and reduce egg production by up to 15% both in egg layers (where eggs are used for direct human consumption) and broiler breeders (where eggs are hatched into pullets for broiler or poultry meat production) (Axtell, 1985). A 15% reduction in egg production in layers might mean a lost income of $22,800 per day at peak egg production (30-week-old laying hens) in a farm with 2,000,000 laying hens, 95% of the hens laying one egg per day, and an egg market value of $0.08 per table egg.

The loss in potential income might be greater in broiler breeder hen farms because of the added value when the eggs are hatched into pullets then raised for broiler chicken meat production. Northern fowl mites can also cause dermatitis and allergies among poultry farm workers; several disease-causing microorganisms had been isolated from northern fowl mites but it is currently not known if these microorganisms are vectored by northern fowl mites to poultry (fowlpox virus, Newcastle disease virus) or humans and horses (St. Louis encephalitis virus, western equine encephalitis virus) under natural settings (Axtell, 1985).

Poultry red mites (*Dermanyssus gallinae*), although considered the dominant poultry mite species in Europe, are usually not considered a significant problem of poultry production in the United States at this time. Poultry red mites may be found in broiler breeders in the southern United States (Axtell, 1985), but they are usually not found in significant numbers in layer and broiler production farms in this country. The exact reason why poultry red mites are dominant in Europe but not in the United States, while the opposite is true for the northern fowl mite, may be related to the so-called ecological niche concept (the way an organism makes its living in the ecosystem) (Keeton and Gould, 1986). Changes in poultry production practices (e.g., poultry housing conversion from caged to cage-free laying hens) may alter the niche and favor the proliferation of

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poultry red mites (Flochlay et al., 2017) over other species of mites and insects associated with poultry production. This current article will focus mainly on the northern fowl mite; readers who are interested in the importance, biology, and control of poultry red mites can refer to Flochlay et al. (2017).

Biology

Fully-grown northern fowl mites are only about one millimeter in length but they are still visible with the naked eye **[Fig. 1]**. The best way to visualize northern fowl mites is to pluck several feathers from the vent or cloacal area **[Fig. 2]** of an infested hen, place these feathers in a sealable plastic bag **[Fig. 3]**, and observe the mites moving away from the feathers. A microscope or magnifying lens might be needed to better see the mite eggs **[Fig. 4]** and small immature stages on the infested feathers **[Fig. 5]**. Northern fowl mites can complete their five developmental life stages (eggs, larvae, protonymphs, deutonymphs, adults) within five days (Axtell, 1985). Development is usually completed on the host chickens.

Peak northern fowl mite infestation level usually coincides with peak egg production when the laying hens are 20-30 weeks old. Blood (from chickens, wild birds, and even rodents) is the main food of northern fowl mites. Infested chickens become anemic, restless and agitated when thousands of mites try to bite and withdraw blood resulting in significantly lowered egg production, feed conversion and weight gain.

An average (from 20 or more randomly selected chickens) mite infestation level of 10-15 mites in the vent area per chicken may warrant control intervention in 20- to 30-week-old laying hens (Axtell, 1985). Northern fowl mites can multiply very quickly from a few individuals to over 20,000 mites per chicken within 10 weeks; infestation levels of over 50,000 mites per chicken can result in the loss of 6% of the total chicken blood volume per day (DeLoach and DeVaney, 1981). Uncontrolled heavy infestations with over 50,000 mites per chicken can cause mortalities due to blood loss. Adult mites can survive for up to a month away from the host (Axtell, 1985); during heavy infestations they can be seen crawling around on eggs in the conveyor belts that connect the poultry houses to the egg processing areas.

Prevention

Northern fowl mites can be very hard to eliminate once established on the farm; it is best to avoid infestations in the first place. Infestations can be prevented by only using pullets from reputable farm sources that are guaranteed free of existing northern fowl mite infestations. Because northern fowl mites can also use rodents and wild birds as alternate hosts, every effort must be made to control and exclude these potential infestation sources from the chickens being raised on the farm.

Control

On-animal insecticides labeled for use against northern fowl mites on infested chickens are listed in **Table 1**; these insecticides can be applied directly on, or in the presence of, live chickens that are infested with northern fowl mites. Controlling northern fowl mites on infested chickens can be challenging because of the location of the infestation (at the base of feathers close to the skin) and position (in the vent area) in the chicken body. Thus, although there are currently many insecticides to choose from **[Table 1]**, these products will still need to reach the mites by penetrating the feathers in the vent area of the chicken body to be effective.

Chicken feathers are biologically designed to repel water and dust; but feathers appear to readily absorb oil and oil-based products. Based on my laboratory research in our MWI Animal Health Entomology Laboratory in 2014, oil-based products **[Fig. 6]** appear to penetrate feathers better than water-based **[Fig. 7]** or dust-formulated **[Fig. 8]** products. Thus, miticidal products formulated as dusts or water-based mixtures **[Table 1]** may need to be applied with more effort than oil-based products to penetrate the feathers and reach the mites located close to the skin in the vent area of the infested chickens.

Consult with your MWI Animal Health Territory Manager on how to choose the right product to effectively control northern fowl mites on your poultry farm. Rodents and wild birds will also need to be controlled as they are alternate hosts of northern fowl mites on the farm. I would like to thank Curtis Carey (MWI Territory Manager for Poultry Sales in Florida) for sending in the infested feather samples for testing.

References

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DeLoach, J.R. and J.A. DeVaney 1981. Northern fowl mite, Ornithonyssus sylviarum, (Acari: Macronyssidae) ingests large amounts of blood from White Leghorn hens. *Journal of Medical Entomology* 18:374-377.

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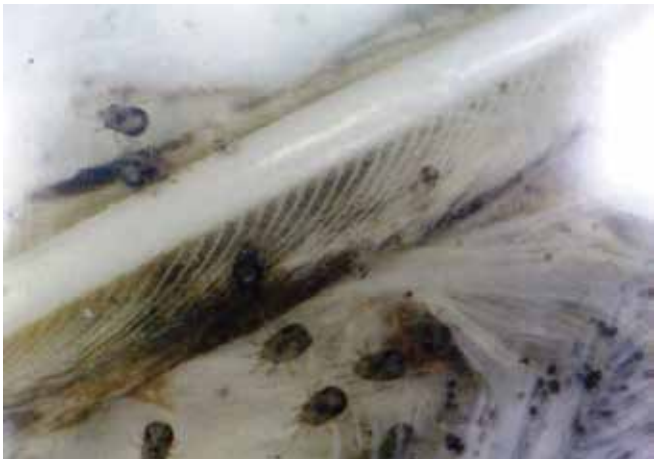

Fig. 1. Northern fowl mite (*Ornithonyssus sylviarum*) adults (about 1 mm long) on feathers plucked from the vent region of a laying hen. (Photo: Dr. Mike Catangui)

Fig. 2. Vent or cloacal region of a laying hen showing discolored or "scabby" feathers infested with northern fowl mites. (Photo: Dr. Mike Catangui)

Fig. 3. Northern fowl mites migrating away from a feather plucked from the vent region of a laying hen (placed inside a sealable plastic bag). (Photo: Dr. Mike Catangui)

Fig. 4. Northern fowl mite (*Ornithonyssus sylviarum*) nymph (about 0.5 mm long) and egg on the feather plucked from the vent region of a laying hen. (Photo: Dr. Mike Catangui)

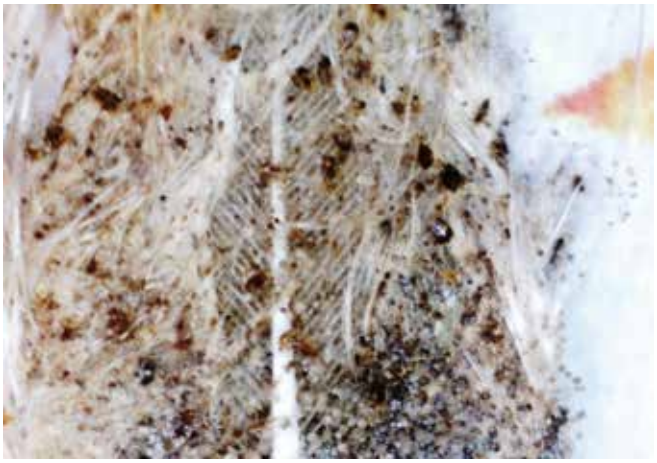

Fig. 5. A feather plucked from the vent region of a laying hen showing heavy infestation with northern fowl mites. (Photo: Dr. Mike Catangui)

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Fig. 6. An infested feather showing dead northern fowl mites after being treated with a fine mist of an oil-based insecticide. (Photo: Dr. Mike Catangui)

Fig. 7. Infested feathers after being treated with a water-based insecticide spray mixture. (Photo: Dr. Mike Catangui)

Fig. 8. Infested feathers after being treated with an insecticide formulated as a dust. (Photo: Dr. Mike Catangui)

TABLE 1. ON-ANIMAL INSECTICIDES FOR USE AGAINST NORTHERN FOWL MITES IN POULTRY BARNS WITH LIVE BIRDS PRESENT

MFR.	BRAND NAME	ACTIVE INGREDIENTS	INSECTICIDE CLASS	FORMULATION TYPE	RATE (SEE LABEL FOR DETAILS)
BASF	ULD® BP-100	natural pyrethrins (1.0%) + piperonyl butoxide (5.0%)	natural pyrethrins	oil-based spray	Apply undiluted at the rate of 1.0 fluid ounce per 1,000 cubic feet of space
BAYER	Beetle Shield® 6	tetrachlorvinphos (6.0%)	organophosphate	dust	For birds in wire cages, apply approximately 1.0 pound per 600 birds (see label for directions for breeder/broiler facilities and other details)
	Rabon™ 50 WP	tetrachlorvinphos (50.0%)	organophosphate	water-based spray	1.3 ounces per gallon water; apply directly to birds (1 gal. mixture per 100 birds)
	Ravap® EC Livestock, Poultry & Premise Insecticide Spray *	tetrachlorvinphos (23.0%) + dichlorvos (5.3%)	organophosphate	water-based spray	2.5 fluid ounces per gallon water; apply 1 gallon of dilution per 100 birds under high pressure (no less than 100-125 p.s.i.) to the vent and fluff areas of the birds
CONTROL SOLUTIONS	Stryker® 100	natural pyrethrins (1.0%) + piperonyl butoxide (5.0%)	natural pyrethrins	oil-based spray	Apply undiluted at the rate of 1.0 fluid ounce per 1,000 cubic feet of space
	Stryker™ Insecticide Concentrate	natural pyrethrins (6.0%) + piperonyl butoxide (60.0%)	natural pyrethrins	water-based spray	2.0 to 3.0 fl. oz. per gallon of water; spray crevices of roost poles, cracks in walls and cracks in nests where the mites hide, followed by spraying a fine mist over the birds
	Martin's® Permethrin SFR	permethrin (36.8%)	pyrethroid	water-based spray	0.3 to 1.1 fluid ounces per gallon water; one gallon of coarse spray mixture per 100 birds, paying particular attention to vent area
	Vector-Ban™ Plus Multi Purpose Insecticide	permethrin (10.0%) + piperonyl butoxide (10.0%)	pyrethroid	water-based spray	1.3 fluid ounces per gallon water; one gallon of coarse spray mixture per 100 birds, paying particular attention to vent area
ELANCO	Elector® PSP Premise Insect Control Agent	spinosad (44.2%)	spinosyns	water-based spray	0.3 fl. oz. per gallon water; apply no more than 1 gallon of coarse spray mixture per 100 birds to ensure adequate coverage, directed toward the vent area
MERCK	Atroban® 11% EC	permethrin (11%)	pyrethroid	water-based spray	1.2 fluid ounces per gallon water; one gallon of coarse spray mixture per 100 birds, paying particular attention to vent area

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TABLE 1. ON-ANIMAL INSECTICIDES FOR USE AGAINST NORTHERN FOWL MITES IN POULTRY BARNS WITH LIVE BIRDS PRESENT (CONTINUED)

MFR.	BRAND NAME	ACTIVE INGREDIENTS	INSECTICIDE CLASS	FORMULATION TYPE	RATE (SEE LABEL FOR DETAILS)
MGK	EverGreen® 100 Synergized ULV Concentrate	natural pyrethrins (1.0%) + piperonyl butoxide (5.0%)	natural pyrethrins	oil-based spray	Apply undiluted at the rate of 1.25 fluid ounces per 1,000 cubic feet of space
	EverGreen® Pro 60-6	natural pyrethrins (6.0%) + piperonyl butoxide (60.0%)	natural pyrethrins	water-based spray	0.21 fl. oz. per gallon of water; spray crevices of roost poles, cracks in walls, and cracks in nests where the mites hide, followed by spraying over the birds with a fine mist
	EverGreen® Pyrethrum Concentrate	natural pyrethrins (5.0%)	natural pyrethrins (certified organic)	water-based spray	2.5 to 4.0 fl. oz. per gallon of water; spray crevices of roost poles, cracks in walls, and cracks in nests where the mites hide, followed by spraying over the birds with a fine mist
	Riptide® Waterbased Pyrethrin ULV	natural pyrethrins (5.0%) + piperonyl butoxide (25.0%)	natural pyrethrins	water-based spray	Dilute 1 part to 25 parts water; spray crevices of roost poles and cracks in walls and nests where mites hide
NEOGEN	Prozap® Insectrin X Concentrate	permethrin (10.0%)	pyrethroid	water-based spray	Dilute 1.28 fl. oz per gallon of water; spray at the rate of 1 gal. mixture per 100 birds with a fine mist; spray roosts, walls, and nests or cages
STARBAR	Attack-All® Livestock & Premise Fly Spray	natural pyrethrins (0.05%) + permethrin (0.10%) + piperonyl butoxide (0.50%)	natural pyrethrins + pyrethroid	water-based spray	(See label for rates and restrictions)
	E-Pro Adulticide Spray	permethrin (36.8%)	pyrethroid	water-based spray	0.3 to 1.1 fluid ounces per gallon water; one gallon of coarse spray mixture per 100 birds, paying particular attention to vent area
	Pyronyl™ Crop Spray	natural pyrethrins (6.0%) + piperonyl butoxide (60.0%)	natural pyrethrins	water-based spray	0.21 fl. oz. per gallon of water; spray crevices of roost poles, cracks in walls, and cracks in nests where the mites hide, followed by spraying over the birds with a fine mist
TYRATECH	PureScience™ Poultry Mite Dust	geraniol (3.75%) + cinnamon oil (3.75%)	essential oils	dust	For caged layer facilities, apply approximately 1.0 pound per 1,200 birds (see label for directions for breeder/broiler facilities and other details)
Y-TEX	Gardstar® 40% EC	permethrin (40%)	pyrethroid	water-based spray	0.3 to 1.1 fluid ounces per gallon water; one gallon of coarse spray mixture per 100 birds, paying particular attention to vent area

Prior to using any product mentioned in this article, carefully read and follow all available instructions, warnings and safety information made available by the product's manufacturer. *Restricted use insecticide

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