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Nebraska Guide

ARTHROPOD PESTS

University of Nebraska Lincoln

Featuring:

Poultry
Dogs
Cats
Rabbits
Birds
Guinea Pigs
and Gerbils

John B.
Campbell
Extension
Entomology
Specialist

# of Poultry and Pets

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Elbert C. Dickey, Dean and Director of Cooperative Extension, University of Nebraska, Institute of Agriculture and Natural Resources.

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Nebraska Insecticide Guide
For Control of Arthropod Pests of Poultry and Pets

Precautions

- Always read and understand label recommendations before opening the container, including: preparation, amount to use, how to use it and special instructions or restrictions on the label.
- All insecticides can be hazardous to man, animals and birds if not used correctly.
- Note and follow label restrictions for treatment in conjunction with other insecticides or medication in treating sick or stressed poultry or pets.
- Note restrictions on age of poultry or pets to be treated.
- Never use insecticides not labeled for use on poultry or pets.
- Observe minimum time between treatment and slaughter for poultry.

Insecticide Formulations

When insecticide rates are discussed, the initials "AI" mean "active ingredient." Understand the differences in the insecticide formulations. Dusts (D) may be preferred when only a few birds or individual animals are to be treated or during extremely cold weather. Emulsifiable concentrates (EC) may be mixed with water or diesel fuel. Flowables (F) are thick fluids which are mixed with water. Soluble powders (SP), wettable powders (WP), and water dispersible liquids (WDL) are to be mixed with water. Agitation is necessary to keep SPs and WPs in suspension unless they are soluble enough to completely dissolve. Solutions (S) are used as light mist sprays or as prepared pour-ons. Soluble concentrates (SC) are to be mixed with water. Extended release is indicated by "ER" on the label and a ready-to-use product is indicated by "RTU". Piperomyl butoxide is a synergist added to some insecticides to increase toxicity and offset resistance.

Insecticides listed in this publication are considered safe when used according to label directions. Proper use will not result in illegal residues in poultry or injury to poultry or pets.

Insecticide Application Methods

Sprays: Non-systemic insecticides may be used as sprays for poultry and pets. The spray needs only to wet the feathers or hair coat which requires a spray pressure of only 40 p.s.i. Adding household detergent helps the spray stick to the feathers or hair.

Feed additives: The insecticide enters the poultry or animal digestive system either by ingestion of feed (oral larvicide), salt or mineral containing the product, or when administered as a pill. The insecticide passes through the digestive system with little absorption and is available in the manure to destroy fly larvae. The feed additives must be consumed at 24-hour intervals to assure uniform manure treatment.

Self-treatment devices: Dust boxes for poultry are considered to be self-treatment devices.

Area sprays: Short residual, quick knockdown insecticide sprays applied to an area inhabited by house and stable flies via hydraulic sprayers, mist blowers or foggers.

Residual sprays: Long residual sprays applied to surfaces which serve as house and stable fly, flea, tick, mite or darkling beetle habitats.

Baits: Insecticides mixed with an insect food source such as sugar or molasses.

Larvicides: Insecticides applied to house and stable fly breeding areas.

Dips: Dips can be used on poultry to treat the infested part of the bird (vent) or on dogs for flea control.

Injections: Insecticide is injected directly subcutaneously into the animal where it circulates in the bloodstream and tissues.

Spot-on/stripe-on: Insecticide is put directly on the animal either in one location or down the back line.

Pill: Insecticide is contained in a pill and after ingestion is circulated through the bloodstream.

Wipes: Insecticide is contained in the wipe, which is rubbed on the animal.

Shampoos: Insecticide is incorporated into animal shampoo soaps.

Insecticide Recommendations for Insect Pests of Poultry (NU NebGuide G78-391)

Poultry production in Nebraska is concentrated primarily in large intensively managed units in eastern Nebraska. Only a few farmers maintain flocks. As a consequence, the major poultry insect pests have changed in importance from those that directly affect the birds to the nuisance pests such as the house fly, litter beetle and larder beetle.

Litter Beetle

A noted pest problem the last few years is the lesser mealworm, also termed litter beetle, which is traditionally found in moldy wet grain. These beetles deposit eggs in clusters in the poultry manure or litter. The beetle larvae molt 6-10 times before pupating. The main economic factor from the beetle is the destruction of insulation, but there are also losses from the beetles consuming poultry feed and the fact that they may be a reservoir for fowl pox, *E. coli*, salmonella, Newcastle disease and avian leukosis. They are also the intermediate host for poultry tapeworms and cecal worms. These beetles also can become a public nuisance if they are abundant in poultry manure when it is spread on fields. They migrate to surrounding areas which may include neighboring urban housing. One favorable feature about the beetles is that they recycle manure, making it unsuitable for fly development, and may be

predators of fly larvae; however, the undesirable traits far outweigh the favorable ones. Older larvae often migrate up building walls and pupate in the building's insulation. Larval migration occurs when the worms are about 1/3-inch long and may cause considerable damage to the insulation.

The lesser mealworm beetle is about 1/4 inch long, reddish-brown to black with longitudinal grooves running lengthwise on the wing covers. Larvae are about 1/3 inch long at the migratory stage. They resemble wireworms and are tan to light brown with slender segmented bodies with three pair of legs. The life cycle from egg to adult requires about 60 days.

Control of the beetles in poultry units is quite difficult. Once noted, the numbers can be monitored either by observation or by distributing traps throughout the floor of the facility. Traps can be made from 2-inch schedule 40 PVC pipe cut a foot long. Corrugated cardboard should be rolled up inside the pipe. Traps should be checked weekly. A rapid increase in the number of beetles indicates a need for treatment.

Another control option applies to poultry houses that are vacant and can be left unheated over winter. Temperatures below 30°F will kill all stages of the beetle.

Insecticides listed as residual facility sprays are effective if used according to label directions. For best results, residual applications should be made after the house has been cleaned. Recommended applications are primarily surface sprays, dusts and baits. Dusts can be mixed with litter or applied directly to the floor after cleaning. Dusts or baits may be applied with a cyclone fertilizer spreader, particularly in highly infested areas.

Lice and Mites

Several species of lice and mites are occasionally serious pests of poultry. These include: the brown chicken louse, the chicken body louse and, less often, the large chicken louse, shaft louse, head louse and fluff louse. Poultry lice are not blood feeders but feed on dry skin scales and feathers. The feeding and movement of the lice on the chicken produces enough irritation to cause appetite loss and, subsequently, reduced weight gain and egg production and increased susceptibility to diseases.

The most common mites attacking poultry are the chicken mite, northern fowl mite and scaly-leg mite. While most chicken mites feed at night and spend the day in cracks around roosts, nests and walls, the northern fowl mites remain on the bird. The chicken and northern fowl mites feed on blood; the scaly-leg mite burrows into the skin on the lower legs and feet, sometimes crippling the bird. If left untreated, these mites increase to the point of reduced production by the birds and mortality, either directly or from increased susceptibility to diseases.

Miscellaneous Pests

Bedbugs may be pests of poultry, and workers accidentally may carry them to their homes where they become a pest to humans. Bedbugs feed on blood at night and hide during the day in insulation, wall cracks, loose boards, nests or dark areas. Indications of bedbugs in poultry facilities include fecal spots on eggs, nest boxes and wooden supports; skin lesions on the breasts and legs of birds; reduced egg production and increased feed consumption. Heavily infested birds are irritable, often anemic and morbidity may be high with young birds because of blood loss. Control is achieved best by applying residual sprays (organophosphates are the most efficient) to surfaces where bugs crawl to reach their hosts.

The section on house and stable fly control in and near livestock facilities in *"Nebraska Management Guide for Arthropod Pests of Livestock and Horses,"* (EC02-1550) is appropriate for poultry facilities as well. Larger production units, however, must develop a system of fly control based on the type of buildings and production management procedures being used. Effort must be made to prevent flies from gaining access to manure, and care must be taken to keep the manure as dry as possible or to move it out of the house to storage before flies start breeding in it.

Chiggers occasionally may be a pest on poultry, particularly turkeys raised under range conditions. Chiggers bore into the skin under the neck, wings and breast or around the vent and legs. Chiggers can be prevented by spraying the range and pens before the birds are pastured.

Mites and lice that leave the bird can be controlled by treating equipment and facilities with an insecticide. For those that remain on the bird, treatment can be made by spraying or dusting the birds, by treating the litter or by providing dust boxes for self-treatment.

Turkey range should be treated with malathion at a rate of 25 gallons 0.5 percent AI per acre prior to pasturing birds. Repeat range spray at two- to three-week intervals. Treat pens with chlorpyrifos (Lorsban) at a rate of 100 gallons 0.5 percent AI per acre before birds are penned. Lorsban treatment intervals are four weeks.

Insecticide Control Recommendations for Insect Pests of Pets (NU NebGuides G78-412, G84-717)

This guide does not consider the wide spectrum of pets found in Nebraska but primarily concentrates on dogs and cats. Products mentioned in the text but not listed in the tables are registered for veterinarian use only.

As is true for horses, many of the insecticides recommended for use on pets are formulated by companies specializing in pet products. Commonly used livestock insecticides are sold for pet use under a variety of trade names, but do not use the product unless the label specifically names the pet. Insecticide treatments for animals include sprays, dips, dusts, foams, shampoos, collars, pills, wipes, spot-ons, stripe-ons and injections.

Cats are sensitive to some insecticides so be sure cats are listed on the label before using. There are also a few products registered for cats but not dogs.

Fleas, mites, ticks and lice are the most common pests of pets. Mosquitoes, stable flies and house flies also are associated with pets in the summer unless strict sanitation and animal protection is provided.

Table I. Insecticide recommendations for application to poultry infested with bed bugs, chiggers, flies, lice or mites.

*Insecticide**	*Application method*	*Rate*	*Restrictions and comments*
Carbaryl (Sevin)	Dust	5% AI, 1 lb/100 birds	Dust must reach skin. Treatment-slaughter interval of seven days. Treatment interval of four weeks.
	Dust box	5% AI 2.5 lbs/50 birds	
	Spray	50% WP, 1.2 oz/1 gal water	
Cyromazine (Larvadex)	Premise	1% AI, 1 lb/ton of feed	Treatment-slaughter interval of three days.
Malathion (Cythion)	Spray	57% EC, 0.5% AI 1 fl oz/bird	
	Dust (in litter)	4% AI, I lb/500 sq ft	
Permethrin			
(Atroban)	Spray	42.5% EC 0.054% AI	Do not treat more than once every two weeks and no more than four treatments.
(Ectiban)	Spray	5.7% EC, 0.05% AI	Treatment interval of 14 days.
(GardStar)	Spray	40% EC, 0.05-0.32% AI	Spray 1 gal per 100 birds.
(Permectrin II)	Spray	10% EC, mix 1 qt/50 gal of water	Spray 1-2 oz per bird.
Stirofos			
(Rabon EC)	Spray	24% EC, 0.5% AI 1 gal/100 birds	Treatment interval of 14 days.
(Rabon WP)	Spray	50% WP, 0.5-1% AI	

*AI = active ingredient; WP = wettable powder; EC = emulsifiable concentrate.

Mosquitoes

Mosquitoes feed on dogs or any warm-blooded animals. Mosquitoes transfer a variety of diseases, including West Nile Virus, or parasites, including heartworm of dogs. Heartworm was once considered a southern problem, but recently many cases have been reported in Nebraska.

Heartworm (*Dirofilaria immitis*) is a nematode which, if left untreated, can cause death. However, dogs can be successfully treated if the disease is detected early. Symptoms of heartworm infestation may include difficulty in breathing, coughing, tiring easily, listlessness and weight loss.

Mosquitoes transmit immature heartworms by feeding on an infested dog and then feeding on a non-infested dog. In the initial phase of infection, larvae migrate through body tissues for about three months, then enter the heart valve where they develop into adults.

The adult heartworm is slender, white and may be six or more inches long. It lives in the right side of the heart and in adjacent blood vessels. There may be 100 or more infesting the dog, impairing blood circulation and damaging the dog's heart, lungs, liver and kidneys.

Veterinarians treat dog heartworm with carefully administered injections of an organic arsenical drug. The worms die and are carried in the blood to the lungs where they lodge in small blood vessels. In time, they decompose and are absorbed. In areas where heartworm is prevalent, veterinarians may implement preventive measures during the mosquito season with either a daily dose of diethylcarbamozine (Filaribits, Pet Doc) or a monthly dose of ivermectin (Heartgard).

Mites

Mites (usually host specific) parasitize almost all species of animals. The infestation site is termed "mange." The site is unkempt, painful and irritated as a result of mites burrowing and feeding. Mites are spread by animal contact.

Some species of mites burrow deep into the ear canal near the eardrum. Infested animals scratch or rub their ears and may run in circles or show other evidence of nervous disturbance. The ear mite may require removal of debris from the inner ear before treatment is successful. The hair follicle mite burrows into hair follicles and causes lesions at the infestation site from secondary bacterial infection. Control of burrowing mites usually requires repeated insecticide applications.

Fleas

Fleas attack pets, including birds, livestock and people. There are several species of fleas with similar life cycles, but the most common is the cat flea. A generation of this species may be completed in a month. The larvae are white, legless and worm-like. Pupation occurs in a silken cocoon. Adult fleas are small, wing-

Table II. Insecticides recommended for control of poultry insect pests in and around poultry facilities.

*Insecticide**	*Application method*	*Rate*	*Restrictions and comments*
Carbaryl (Sevin)	Spray	50% or 80% WP , 0.5% AI	Treat surface indicated by label for pest to point of run-off.
Cyfluthrin (Temp SC)	Spray	11.8% SC, 0.025-0.05% AI	Do not apply to interior of building when birds are present.
Dichlorvos (Vapona)	Mist/spray	40.2% EC, 0.5% AI	
Imidacloprid (QuickBayt)	Bait	0.50% AI, 5.7-6.3 oz/ 1,000 sq. ft.	For fly control around the outside of poultry facilities. **Do not apply where poultry may eat it.**
Lamda-cyhalothrin			
(Grenade ER)	Spray	0.7% ER, 0.03-0.06% AI	Premise spray applied to livestock buildings. Do not treat birds. Can be re-applied every 21 days.
(Grenade WP)	Spray	10% WP, 0.03-0.06 AI	
Methomyl			
(Blue Streak Fly Bait)	Bait	1.0% AI + 0.025% Z-9 Tricosene	For fly control around the outside of poultry facilities. **Do not apply where poultry may eat it.**
Golden Malrin)	Bait	1.1% AI + 0.049% Z-9 Tricosene	
Malathion	Spray	57% EC, 1% AI	
Permethrin			
(Atroban)	Spray	42.5 EC, 0.128-0.256% AI	Do not apply premise treatment to poultry.
(Ectiban, Insectiban, Insectrin, HardHitter)	Spray	5.7% EC 1 qt/10 gal water	
(GardStar)	Spray	40% EC, 0.5-0.32% AI	
(Permectrin II)	Spray`	10% EC, 1 qt/25 gal water	
Stirophos (Rabon)	Spray	24% EC, 0.5AI 50% WP, 0.5% AI	Repeat treatment every 7-10 days.

*AI = active ingredient; WP = wettable powder; SC = soluble concentrate; ER = extended release; EC = emulsifiable concentrate.

less, hard-bodied and compressed from side-to-side. Their jumping ability makes them highly mobile.

The flea bite is painful, and some flea species are reservoirs for transmission of bacterial, viral and protozoan diseases and tapeworms. Flea control is best achieved by targeting both the premises occupied by the pet and the pet itself, in conjunction with sanitation.

The cat flea is by far the most important flea species infesting cats, dogs and other pets in Nebraska. Some pet owners complain that regardless of the product or treatment methodology used, they can't seem to get rid of fleas. Usually infested animals roam outdoors and may become reinfested from raccoons, opossums or other wildlife, which may be present even in city environments.

Because flea infestations have been difficult to control, veterinarians and entomologists have developed an integrated pest management program. The program includes treatment of the animal and its environment. If the pet is indoors, sanitation is vital to the success of a control program. Vacuuming carpet, rugs or other cloth areas will help control fleas by removing eggs and dried blood on which the larvae feed. This opens the nap of the carpet for more effective insecticide treatment. Studies indicate that a flea population consists of 5 percent adults, 10 percent pupae, 35 percent larvae and 50 percent eggs so a control or prevention program should include daily vacuuming in addition to insecticide treatments. Vacuuming collects some of the immature stages of fleas, but insecticide applications also are needed for heavy infestations.

Flea and tick control for pets is a big business with many animal health companies developing pest control products. These products are applied as pills, dusts, sprays, dips, spot-ons, stripe-ons, wipes, injections and in animal collars. Sprays, dusts and aerosols are used to dispense the products in carpets and in the outside environment.

In recent years, several new products have been labeled for flea or flea, tick and mosquito control. Several are available only through veterinarians; some can be used only on cats and others only on dogs. A product may include both a standard insecticide and an insect growth regulator (IGR). IGRs are either chitin inhibitors or juvenile hormone mimics. Chitin inhibitors prohibit chitin formation, which hardens the insect skin either in the egg stage of flea development or when the larvae molt, which kills the organism. Juvenile hormones affect the insect primarily in the pupal stage when the insect is supposed to change from the larval form to an adult. Since IGRs do not kill adult insects, a standard

insecticide which will kill adults may be added to the formulation. Trade names for new insect growth regulators include Farnam Bio Spot, Zodiac Powerspot, Hartz Onespot and Novartis' Program. Chemical names of these IGRs are methoprene, fenoxycarb and pyriproxyfen.

Several new insecticides have modes of action different from the standard choline esterase inhibitors of the phosphate and carbamate insecticides. These include fipronial (trade name, Front Line – Top Spot) and imidadoprid (trade name, Advantage). Fipronial interferes with the passage of chloride ions, which disrupts the central nervous system, killing the insect. Imidocloprid is a new synthetic formulation similar to an old insecticide, nictitene (chloronicotinyl), which although not an acetylcholine inhibitor, acts on nerve ganglia and synapse much as do the insecticides that are acetylcholine inhibitors.

The pet should be treated with some flea product in conjunction with the indoor habitat treatment. Ideally, the treatment could consist of a mixture of an insect growth regulator (IGR) to kill the egg or immature forms and an insecticide that kills adult fleas. Several of these products are available. If pets are allowed outdoors, steps may need to be taken to reduce flea numbers in the outdoor environment. Trim lawns and weeds, fence yards, discourage nesting of rodents and treat areas inhabited by the pets with an insecticide.

In addition to the products listed in the tables or discussed, there are many containing pyrethrins that can be used as room or pet sprays; several containing the synthetic pyrethroid permethrin which often is used in conjunction with an insect growth regulator for animal treatment or room or premises treatment; and several other pyrethroids of a similar nature. The organophosphates include stirofos (Rabon) and amitraz (Preventic), which are available as collars. Carbaryl (Sevin) can be used as a powder on animals and as a premise treatment primarily for tick control.

Ticks

Three tick species feed on pets in Nebraska: the Rocky Mountain wood tick, which transmits Rocky Mountain spotted fever and may cause tick paralysis; the American dog tick, which also transmits Rocky Mountain spotted fever; and the brown dog tick. All of these species are three-host ticks. They start with small rodents or pets and eventually parasitize cattle, horses or other large animals. Lyme disease (a bacterial spirochete) is transmitted to humans, dogs, cats, cattle, horses and other animals by ticks, but the major U.S. tick vector *Ixodes scapularus*, the black-legged or deer tick, is not found in Nebraska. The lone star tick *Amblyomma americanum* is suspected of being a vector of lyme disease and is found occasionally in Nebraska.

Controlling ticks is difficult and generally requires a combination of cultural, preventive and pesticide methods specific to the tick species in question. Ticks are found in vegetation around the home or outlying areas. To reduce infestations, use a contact residual insecticide in the spring when ticks are most abundant. Apply it on the fringe areas of the yard to reduce tick infestation of pets, children and adults. Insect repellents for humans and shampoos or collars with insecticides for pets will help control or reduce tick infestations. See the NebGuide *"Controlling Ticks"* (G94-1220), for specific information.

Flies

Flies are pests of pets kept outdoors. The same control measures listed for livestock facilities, *"Nebraska Management Guide for Arthropod Pests of Livestock and Horses,"* (EC02-1550) will help reduce fly populations around kennels or other pet facilities. Stable flies feed on the ears of dogs, particularly German shepherds and greyhounds. Treating ears with insecticide or a healing salve at least weekly will provide some protection for dogs.

Table III. Insecticides recommended for insect control on pets.

*Insecticide**	*Application method*	*Rate*	*Restrictions and comments*
Carbaryl (Sevin)	Dust or powder	3.9% AI, dust 5% AI, powder	Dust entire animal. Do not use dust on nursing puppies. or puppies under four weeks of age.
	Collar	16% AI	Do not use on puppies under six weeks of age or on sick animals.
	Aerosol can	0.5% AI + 0.05% AI pyrethrin	Do not let spray contact eyes or scrotum. Treatment interval of one week. Spray 20-30 seconds for 25 lb. dog.
Diazinon	Dip	0.15% AI, 5% EC	
Fipronil (Frontline)	Spray	0.29 AI	For dogs and cats eight weeks and older. For flea and tick control. Treat every 30 days.
	Spot-on	9.7% AI	For control of fleas and ticks on cats 12 weeks or older. Apply every 30 days.
(Front Plus)	Spot-on	9.8% AI + 11.8 methoprene	For control of fleas and ticks on cats eight weeks or older. Apply every 30 days.

*Insecticide**	*Application method*	*Rate*	*Restrictions and comments*
(Frontline Plus)	Spot-on	9.8% AI + 8.8% methoprene	For control of fleas and ticks on dogs eight weeks or older.
(Front Top Spot)	Spot-on	9.7% AI	Do not reapply within 30 days. For flea and tick control on dogs and puppies 10 weeks or older. Do not reapply within 30 days.
Imidacloprid (Advantage)	Topical	9.1% AI	For control of fleas on cats and dogs. For cats and kittens eight weeks old or older and for dogs and puppies seven weeks or older. Once-a-month treatment.
Ivermectin (Heart Guard Plus)	Chewable	68 mcg AI + 57 mg pyrantel	For the control of heartworm in dogs six weeks or older. Two applications per season.
Iufenuron (Program)	Tablet	4.5 mg/lb. body weight	Once-a-month flea control for dogs.
(Sentinel)	Tablet	4.55 mg + 0.23 mg milbemycin	Once-a-month flea and heartworm control for dogs.
Malathion + Methoxychlor	Spray	0.5% AI, 40.8% EC	Do not use on cats.
Methoxychlor + Pyrethrins + piperonyl butoxide	Powder/dust	3.16% AI	Do not use on nursing kittens or kittens under four weeks old.
moxidectin (Pro Heart 6)	Topical	0.17 mg/lb. body wt.	For heartworm protection. Should not be used on dogs less than six months old.
nitenpyam (Capstar)	Oral tablet	Dog 57.0 mg Cats 11.4 mg	Dogs, puppies, cats and kittens should be at least four weeks old and weigh 2 lb. or more. For control of fleas.
Permethrin	Spray	1% Ready to use	For flea and tick control on dogs and puppies.
	Shampoo	1% + 0.05% AI pyripoxyfen	For flea and tick control on dogs and puppies.
(Permectrin II)	Spray	10% EC, 0.5% AI	For direct animal spray of cats and dogs to control fleas, lice and ticks.
(Gardstar)	Spray	40% EC, low pressure spray, 0.64% AI	30-60 ml spray per animal. Spot treat back, face, legs, tail and ears. **Do not apply to cats.**
	Dip wash	0.026-0.67% AI	Wet animals with sponge or rag. Do not treat face. **Do not apply to cats.**
	Dip	0.64% AI	For dogs only. Do not treat puppies less than 12 weeks old.
(Proticall)	Topical	65% AI Dogs < 33 lb., 1 cc. Dogs > 33 lb., 2 cc.	For flea and tick control. Do not apply at intervals of less than seven days. **Do not use on cats.**
(Freedom)	Spot-on	65% AI	For control of fleas, lice, mosquitoes and ticks on dogs. **Do not use on cats.**
Propoxur	Collar	9.4% AI	Do not use on sick dogs in conjunction with other insecticides.
Pyrethrin + piperonyl butoxide	Spray/mist	0.15% AI + 1.5%	For control of fleas, flies, lice and ticks on dogs and cats. Do not apply to animals less than 12 weeks old.
	Spray/mist	0.15% AI + 1.5% AI PBO + 0.15% nylar	For flea and tick control on dogs and cats. Do not treat animals less than 12 weeks old.
	Dip	0.97% AI + 3.75% AI PBO	Do not use on kittens and puppies less than 12 weeks old.

*Insecticide**	*Application method*	*Rate*	*Restrictions and comments*
	Shampoo	0.15% AI + 1.5 AI PBO	Do not treat cats less than 12 weeks old.
	Dust	0.10 AI + 1.0% AI PBO	
Resmethrin	Animal spray	0.20% AI + 0.15% AI D-trans allethrin	For control of flies and ticks on cats and dogs. Direct animal spray.
Selamectin (Revolution)	Topical	2.7 mg/lb body wt. Applied monthly	For control of fleas, heartworm, ear mite sarcoptic mange and dog tick (American). For control of cat flea, heartworm and ear mite. For dogs six weeks and older and for cats eight weeks and older.

*AI = active ingredient; EC = emulsifiable concentrate; PBO = Piperomyl butoxide, a synergist.

Table IV. Insecticides recommended for outdoor premise treatment for pets.

*Insecticide**	*Application method*	*Rate*	*Restrictions and comments*
Carbaryl (Sevin)	Dust	5% AI	Do not expose kittens less than four weeks old to treated areas.
	Spray	50% WP, 1.2% AI	Keep pets and children away until spray is dry.
Cyfluthrin (Tempo SC)	Spray	11.8% SC 0.025-0.05% AI	Premise spray for control of fleas, flies, mosquitoes and ticks.
Diazinon	Granules	2% AI	For residual control of flea and ticks.
	Spray	25% EC	For flea and tick control.
Lamda-cyhalothrin (Grenade ER)	Spray	9.7% ER 0.03-0.06% AI	Premise spray for control of fleas, flies and ticks.
(Grenade WP)	Spray	10% WP 0.03-0.06% AI	Do not treat pets.
Malathion	Spray	57% EC, 2% AI	Control of fleas and mosquitoes.
Permethrin (GardStar)	Spray	40% EC 0.64% AI	Premise spray for control of flies, fleas, mosquitoes and ticks.
(Premectrin II)	Spray	10% EC, 1 qt/25 gal of water	Premise spray for control of flies, fleas, mosquitoes and ticks.
Propoxur	Aerosol	0.5% AI	Residual control of fleas.
	Spray	1.0% AI, RTU	Residual spray for fleas.
Resmethrin	Spray	3%	Premise spray for control of fleas and ticks.

*AI = active ingredient; WP = wettable powder; SC = soluble concentrate; EC = emulsifiable concentrate; RTU = ready to use.

This publication does not supersede label information. Always read and carefully follow the instructions on the container label. For current information, contact your local Cooperative Extension Office.

The use of trade names in this circular is not an endorsement by Nebraska Cooperative Extension.