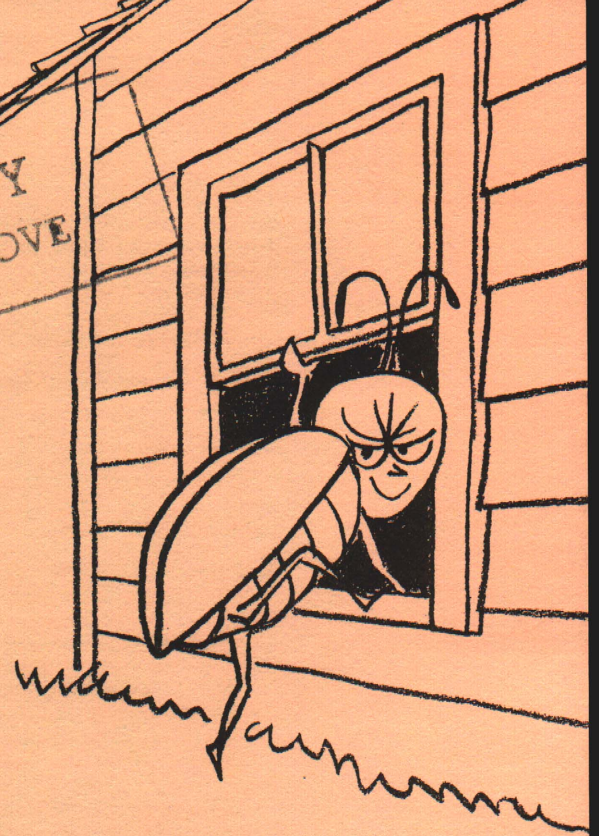


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# Casual HOME-INVADING PESTS

COOPERATIVE EXTENSION SERVICE • MICHIGAN STATE UNIVERSITY

by MICHAEL SHINKLE  
Department of Entomology



MICHIGAN HOMES MAY occasionally be invaded by such unwelcome guests as certain forms of beetles, centipedes, millipedes, sowbugs, pillbugs, field crickets, wood cockroaches, mites, spiders, mole crickets, camel crickets and springtails. To rid premises of these casual pests, follow the control instructions given below in regard to the particular pest which has entered your home. (If a wood-damaging insect such as bark beetles, carpenter ants, household and lawn ants, powder post beetles or termites is causing your trouble, consult instructions in F-293, Household Insect Control Publication 1—Wood Damaging Insects.)



## BEETLES

*Strawberry Root Weevil*

A few beetles may cause annoyance in homes by entering at certain times of the year, either for protection or by accident. So far as is known, those commonly found in homes do no damage other than cause a nuisance. Some species, in fact, are beneficial and should not be controlled unless necessary. While ground, darkling, click, and other beetles are often found in buildings, only four types—the lady beetles (or “ladybugs”), the strawberry root weevil, the *Sciaphilus muricatus* (a snout beetle which is similar to the strawberry root weevil), and the elm leaf beetle—are occasionally important for the homeowner to recognize. These can be controlled in about the same

### CONTROL SUGGESTIONS FOR

- Beetles
  - Lady beetles (“ladybugs”)
  - Snout beetle (*Sciaphilus muricatus*)
  - Strawberry root weevil
  - Elm leaf beetle
- Centipedes, millipedes, sowbugs
- Field crickets and wood cockroaches
- Mites
- Spiders

manner by using the same chemicals. Thus chemical and other control information has been included for all in the section on strawberry root weevil.

### Lady Beetles

Several species of lady beetles\* (“ladybugs”), including the 2-spotted lady beetle, enter homes in the fall and spring, or during warm periods in the winter. They do not damage food, clothing, or household furnishings, although their presence is unwanted and they are often mistaken for much more troublesome insects.

Adults are almost hemispherical in shape, usually

\* Perhaps the most prevalent “household” lady beetle is *Ceratomegilla maculata*, a species without a common name. It seeks overwintering places on or near buildings and hibernates in groups which may contain hundreds.

red or yellow, with black spots on the back and sides of the body (or black with red, yellow or white spots). They overwinter under the bark of trees, under piles of leaves, and sometimes within buildings. The outdoor overwintering places may be near buildings, making it convenient for them to enter your house.

Lady beetles are useful because both the adults and larvae, which resemble miniature alligators, feed on plant lice (aphids), other small insects, and eggs of many kinds of insects. They should not be destroyed unless it is absolutely necessary. If control is needed, which is usually when they get inside buildings, follow instructions as given for the strawberry root weevil.

#### Snout Beetle (weevil)

Another beetle, *Sciaphilus muricatus* Fab., (a snout beetle) is also a household pest, especially in Michigan's Upper Peninsula. It is longer than the strawberry root weevil, (about  $\frac{5}{16}$  inch long) and also more slender. Its mouth parts are at the tip of a short, stout beak.

The body is tannish-gray with the head tending to be slightly lighter. Under a microscope the body surface appears rough, with the upper wings slightly lined with longitudinal rows of small pits.

The snout beetle (weevil) is usually found on strawberries (both cultivated and wild), but it may travel to nearby buildings.

For control, follow instructions for the strawberry root weevil. (Although these controls have not done quite as well on *Sciaphilus muricatus*, they are the best available to date. Apply an insecticide when the insects are first seen, early May in some years. Destroying wild strawberries in the vicinity of houses will also help control them.

#### Strawberry Root Weevil

Strawberry root weevil adults are about  $\frac{1}{4}$  inch long and blackish-brown. They have short, blunt snouts protruding from the front of the head. Their bodies are hard-shelled when fully mature, and the hard-shelled wings are pitted with small depressions. The adults cannot fly because their upper wings are joined together.

They usually begin migrating into buildings in July, and for a month or two may be found singly or in groups in bathtubs, cupboards, or even hanging from ceilings. As far as is known, they do not damage clothes or food. Sometimes they cause trouble by getting into the working parts of household equipment. They are important because the householder may mistake them for much more troublesome insects such as bedbugs.

The immature form (grub) of the strawberry root weevil feeds on the small roots of wild and cultivated

strawberries, brambles, and evergreens such as pines and yew.

#### Control

1. **Outside buildings:** At the first sign of strawberry root weevil adults or, preferably, by June 20th, treat foundations thoroughly with a spray composed of any of the following — to *one gallon of water*:

- 1) 4 tablespoons of 40 percent wettable chlordane powder or 2 teaspoons of 72 percent chlordane emulsion
- 2) 2 tablespoons of 50 percent wettable dieldrin powder or 2 tablespoons of 15 percent dieldrin emulsion
- 3) 3 tablespoons of 25 percent wettable lindane powder or 2 teaspoons of 20 percent lindane emulsion

Dusts of these same materials can be used instead of sprays. Use either 5 percent chlordane, or 1 percent dusts of either dieldrin or lindane.

Take special care to thoroughly spray or dust the sides and base of steps. Also, spray or dust the grass for 10 feet AWAY FROM THE FOUNDATION. Repeat the treatment again around July 10, and after that if the insects reappear. Avoid applying emulsion type sprays to tender flowers and shrubs.

#### Supplemental treatments

When these beetles are exceptionally numerous and extra treatments are needed, use Diazinon, malathion or malathion plus methoxychlor as a *supplemental* treatment to the regular chlordane, dieldrin, or lindane applications. Use 4 tablespoons of 25 percent wettable malathion powder or 2 teaspoons of 57 percent malathion emulsion to 1 gallon of water. A mixture of 4 tablespoons of 50 percent wettable methoxychlor plus 4 of 25 percent wettable malathion powder will also help. Diazinon is used at the rate of 16 teaspoons ( $5\frac{1}{2}$  tablespoons) of the 2 pounds per gallon emulsifiable concentrate, or 8 teaspoons of an emulsifiable concentrate containing 4 pounds of actual chemical per gallon — either formulation to 1 gallon of water. To be effective the treatment MUST BE APPLIED ONCE A WEEK.

If wild strawberries and brambles or pine trees or evergreens grow within several hundred feet of a house, apply *where these plants grow*,  $\frac{1}{4}$  pound of actual chlordane or  $\frac{1}{8}$  pound of actual dieldrin to 1000 square feet of soil surface. If possible, work it 4 inches into the soil. Destroying strawberry and brambles with a herbicide or by other means will help control strawberry root weevil and *Sciaphilus muricatus*.

NOTE: Once strawberry root weevils, lady beetles, elm leaf beetle adults and *Sciaphilus muricatus* get into a building, they are hard to control. Preventive

and continuous outdoor treatment is the best control remedy, since they will not breed inside buildings and must enter from the outside.

**2. Inside buildings:** No insecticide is entirely satisfactory once the insects are protected by the building. A good fly spray containing  $\frac{2}{10}$  percent pyrethrum plus 2 percent piperonyl butoxide plus 5 percent methoxychlor will give some control. The same may be said of  $\frac{1}{2}$  percent Diazinon oil solution, or 2 or 3 percent malathion oil solution. Perhaps the best approach is to gather them up with a vacuum cleaner.

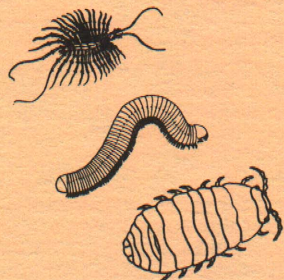
### Elm Leaf Beetle

The adult is  $\frac{1}{4}$  inch long, and olive-green with an indistinct black line (stripe) on the outer side of each wing.

In southern Michigan, the elm leaf beetle invades homes, especially in the fall. It is a pest of elms, and is only a nuisance in the home. Control indoors is the same as for lady beetles and strawberry root weevil.

Outdoors, treat the trees with carbaryl (Sevin), 2 pounds, 50 percent wettable powder, or one quart of four flowable, or  $1\frac{1}{2}$  pounds of 85 percent wettable powder—any of these amounts to 100 gallons of water. DDT may be used instead of carbaryl as follows: two pounds of 50 percent wettable powder, or two quarts of 25 percent emulsion—either material to 100 gallons of water. If use of a mist blower is desired, apply one gallon of 25 percent DDT emulsion to two gallons of water.

## CENTIPEDES MILLIPEDES AND SOWBUGS



Centipedes, millipedes, sowbugs, and pillbugs have similar habits, and the same chemicals and control methods may be used for each. Follow control suggestions given in the section on sowbugs and pillbugs.

### House Centipede

While centipedes are not insects, they belong to the arthropod phylum or division along with the insects and millipedes, that is, animals with articulated body and limbs. Most important classes of this group are the insects, the arachnids (spiders, mites, ticks), the diplopods (millipedes), the chilopods (centipedes) and the crustaceans (lobsters, shrimps, crabs, sowbugs and pillbugs).

The house centipede has a flattened, wormlike body. It is about 1 inch long when mature and has

2 long jointed legs on each of 15 body segments (or 30 legs). The head has a very long pair of slender feelers or antennae. Other centipedes may have as many as 150 body segments.

The slender grayish-yellow body has three dark lines running lengthwise of the back. The legs are characteristically circled with alternating white and dark bands.

The house centipede lives both indoors and outdoors. Indoors, it prefers moist places such as basements, closets, and bathrooms. Outdoors, it likes damp places such as piles of leaves, underneath stones and boards, or any soil high in organic material.

House centipedes are useful since they eat insects and spiders. When seen running on walls they are usually hunting such food. They have poison glands but most persons are only mildly poisoned when bitten by our Michiganian species, the most susceptible probably no more affected than if stung by a bee.

### Millipedes

Millipedes and centipedes along with the insects belong to the phylum Arthropoda. The millipedes belong to the class Diplopoda and are often referred to as the thousand-legged worms. Millipedes have from 25 to over 100 body segments depending on the species, with 2 pairs of legs on most of the body segments, except the head and tip of the abdomen. The antennae are short and similar to the legs. Those that cause householders the most trouble are from 1 to  $1\frac{1}{2}$  inches long when mature, tubelike in body, smooth and brown.

Millipedes live indoors and outdoors, but usually migrate in. Once inside, they seek damp places, usually the basement. However you may find them on the first floor.

Outdoors they live in damp areas, liking soils high in organic materials such as plants, humus, and manure, or under boards resting on damp soils. They feed on damp and decaying plants and wood, and some species damage plants by feeding on the small tender roots. Millipedes are normally harmless, except for the annoyance created mainly by their invasion of buildings.

### Sowbugs and Pillbugs

Sowbugs and pillbugs belong to the crustaceans, like the lobsters and shrimps, and are less closely related to the insects than the centipedes and millipedes. Sowbugs can live as long as two years.

Sowbugs, light gray to slate-brown in color, are thick-bodied, hump-backed, and noticeably segmented. The common forms have seven pairs of legs and are about  $\frac{1}{2}$  inch long when grown. Pillbugs roll into a ball when disturbed or annoyed, whereas sowbugs do not. Sowbugs have two tail-like appendages which further differentiates them.

Both occasionally infest gardens where they are found under shrubbery and in soil of flower beds. They may feed on roots and stems of a variety of plants, with the feeding done on or near the surface.

Both need damp conditions in which to live, generally being found in damp basements, or outdoors in moist, shaded soil high in organic matter. Both are normally harmless.

### Control

#### 1. Preventive Measures (including centipedes and millipedes):

a. Keep foundations and foundation sills tightly calked.

b. If centipedes, millipedes, sowbugs, and pillbugs are a problem in buildings, do not allow manure and piled and decaying plants close to the foundations. Difficult control situations are set-up WHEN ORGANIC SOILS OR MANURES ARE USED TO FILL UNDER CEMENT SLABS FOR GARAGES, or as fill dirt under houses without basements, or basementless sections of houses.

c. Plant shrubs and flowers far enough away to permit sunlight and wind to penetrate between plants and building, thus reducing moisture and shade next to foundation and walls.

2. **Outside Treatment:** Dust or spray the foundation and ground for 10 feet away from the foundation. If your house is set on a cement slab, carefully treat the area between the soil and slab. For dusts use 5 percent DDT or 5 percent chlordane. For sprays use 4 tablespoons of either 50 percent wettable DDT powder or 40 percent wettable chlordane powder — TO 1 GALLON OF WATER. Recently a combination of carbaryl (Sevin) and chlordane has given good control. Use 2 tablespoons of 50 percent carbaryl wettable powder plus 4 tablespoons of 40 percent wettable chlordane powder — to 1 gallon of water. Carbaryl is not be used inside buildings by home owners, nor should it be used on cement or concrete blocks as it may discolor alkaline surfaces. Repeat the treatment in 10 days, if needed.

NOTE: Spraying or dusting the surface of the soil is generally less effective than the following special soil treatment:

3. **Special Soil Treatment:** Mix with the top 4 to 6 inches of 100 square feet of soil one of the following:

1 ounce (6 tablespoons) of 40 percent wettable chlordane or 1½ ounces (9 tablespoons) of 50 percent wettable DDT powder. Wettable powders can be applied either as a spray with water or as powder, mixed with sand to give bulk. Apply in either case to the surface of the ground before mixing them in the soil. If it is impossible to mix the chemical with the soil, soak it into the ground with the watering hose.

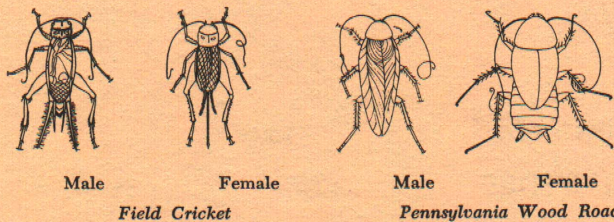
Dusts can also be used in the same way as wettable-powdered materials. Apply ½ pound of 5 percent chlordane dust or 1 pound of 5 percent DDT dust. Normally dusts cannot be used with water.

Chlordane is preferred to DDT as a soil treatment for centipede, millipede, and sowbug control. Emulsions tend to injure plants more than wettable powders and dusts, so are not suggested for extensive use around flower or plant beds.

NOTE: Centipedes, millipedes, sowbugs, and pillbugs normally do not infest lawns unless they are high in organic matter. If they do, use suggestions for special soil treatment. It is important in long-range control of these pests, to recognize their relationship to abundant soil organic matter and high moisture. Reducing the amount of fertilizer used on your lawn and around shrubs may be worth considering.

4. **Inside Houses:** Spot spray, or dust, where centipedes, millipedes, sowbugs, or pillbugs are seen. For spraying, use either 2 percent chlordane oil solution, or ½ percent dieldrin oil solution, or 5 percent DDT oil solution. For dusting, apply either 5 percent chlordane dust, or 1 percent dieldrin dust, or 5 to 10 percent DDT dust. Before using any of these indoors, however, read the later section on warnings.

## FIELD CRICKETS AND WOOD COCKROACHES



The common field cricket is blackish-brown and three-fifth inch long, with antenna about 1½ times as long as the body, and has thick or "jumping-type" hind legs.

The wood cockroach, unlike domestic varieties of roaches, is not a year-round inhabitant of buildings. Male adults are two-thirds to one inch long. Wings of the female are shorter than her abdomen, while the male's wings are longer than the tip of the body and he can fly long distances. The female abdomen is blackish on top.

Both field crickets and wood cockroaches get into buildings, especially those near fields and woodlots, usually during late summer and early fall. The roaches may enter on wood taken into basements, through cracks in the foundation, or open doors. Both are mainly nuisances, although crickets may occasionally feed on fabrics such as nylon. If there are many in

the house they may get into clothes closets where, if entangled in folds of a garment, they may chew their way out.

### Control

1. **Outside buildings:** Spray the outside of the foundation with either 4 tablespoons of 40 percent wettable chlordane powder or 2 teaspoons of 72 percent chlordane emulsion, or 2 tablespoons of 50 percent wettable dieldrin powder or 2 tablespoons of 15 percent dieldrin emulsion — to 1 GALLON OF WATER. Also, spray the grass for 10 feet away from the foundation. Pay special attention to areas around doorsteps, poor fitting foundation sills, and other places where they may enter. If needed, repeat the treatment in 5 to 10 days. Avoid applying emulsion type sprays to tender flowers and shrubs.

2. **Inside buildings:** Apply 2 percent chlordane solution or ½ percent dieldrin solution to areas where field crickets and wood cockroaches are present. See Warning section before applying any solution. In no case apply these materials to an entire room. Spot treat only. Take cockroach-infested wood outdoors for storage and clean up areas where wood was stored. NOTE: If either crickets or wood cockroaches are sluggish, they can be picked up with a vacuum cleaner, then destroyed.

3. Calking cracks around foundations, doors, and windows will help keep them out of the house.

## MITES



Mites, which are arachnids, cause varying degrees of trouble. Some injure plants, others carry disease, some are animal parasites. Still others are more of a nuisance than anything else. "Nuisance" mites include those that invade buildings, usually in the spring and fall. The clover mite is such a pest.\*

Adult clover mites are about the size of a blunt pin point ( $\frac{1}{25}$ th inch long). They have eight legs; with the front two much longer than the others and extending forward well beyond the head. Larger ones are dark to brownish-red; the smaller (immature) can be bright red.

Because of their small size, clover mites are usually overlooked until they become pests. They spend the

\* Occasionally mites which normally affect animals and birds are found in homes. When this occurs look for a bird's nest in the eaves or in similar places, or for an animal such as a rodent which may be carrying them into the house accidentally. For control, destroy the bird's nest, or trap the rodent. If you need to control mites indoors, use suggestions given for clover mite.

winter as small pinkish or red eggs on clover and other host plants, or under siding and in the cracks of houses. Brick and newly built frame houses are much more likely to become infested than older frame buildings.

### Control

Continue clover mite control until you are satisfied with results. If needed, use all the control suggestions given. Remember for best mite control, *keep them out of buildings.*

### Control Without Chemicals:

1. An 18 inch or wider strip of grass-free and weed-free soil around the foundation usually keeps clover mites out of the house. Flowers and shrubs can be planted in the strip. Usually they need not be sprayed unless clover mites are numerous.

2. Calking cracks around foundations, doors, and windows will also help control them. Remember, however, that being small, they enter through the smallest of openings.

**Chemical Control Outside:** NOTE: Sulfur and any ONE of the lawn and foundation spray treatments should be used at the same time. However, when using a spray, the sulfur band treatment need not be applied. Sometimes all methods must be used to get satisfactory control of this pest. Before applying one of the suggested sprays to the lawn for clover mites, CUT AND COLLECT THE GRASS. Dispose of the cut grass as far as possible from the house.

1. When using sulfur, apply a 6 to 10 inch band of dusting (powder) sulfur on the ground next to the foundation. Sulfur should not be applied to flowers and shrubs as it will burn them. Every 3 or 4 days, or more often if the mites are numerous, stir or rake the sulfur lightly to keep it fresh and effective.

2. Thoroughly treat foundations and a 20-foot strip of grass with 4 teaspoons of 57 percent malathion emulsion, or 3 tablespoons of 25 percent wettable Chlorobenzilate powder, or 3 teaspoons of 18½ percent Kelthane emulsion — TO 1 GALLON OF WATER. Repeat if mites are not controlled within 5 to 7 days. Other miticides such as Diazinon are also available, as are other prepared formulations of the materials listed. For instructions always follow directions on the package.

NOTE: Avoid applying emulsion type sprays to tender flowers and shrubs.

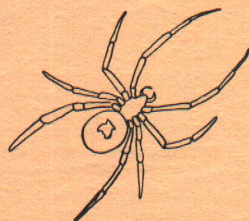
**Control Inside:** When mites are inside buildings, not much can be done with sprays or dusts. However, some relief will result from treating as follows:

1. *Fly Sprays:* A good household fly spray or aerosol containing rotenone or pyrethrum will help control them. If possible, get a spray containing  $\frac{2}{10}$

percent pyrethrum plus 2 percent piperonyl butoxide plus 5 percent methoxychlor. Also a ½ percent DDVP (Vapona) plus ½ percent dieldrin spray will kill these pests. Apply as a coarse spot treatment around door sills and window frames. Be careful when using these materials since they may stain wallpaper, curtains, and other household articles.

2. *Vacuum Cleaning*: Use the vacuum cleaner to pick up large numbers of clover mites either in the house or on the foundation and sills in the basement. After collecting, empty the bag into hot water, crankcase oil, or kerosene, or dispose of contents as far away from the house as possible.

## SPIDERS



Spiders are not insects. Together with scorpions, harvestmen (daddy longlegs), ticks, and mites they belong in the class Arachnida. They differ from insects by having two body regions, a united head and thorax, and an abdomen (insects have a head, thorax, and abdomen — three distinct regions). Spiders have eight legs, insects six.

Two things are usually associated with spiders in the minds of many people — webs and spider bites. The web may serve to support spiders or their egg cases. It may be used to trap the prey; since spiders are exclusively carnivorous, they generally seize only live animals such as insects. The web may also be used as a parachute to transport them from one location to another. Spider bites sound more ominous than the facts support; contrary to popular belief, spiders do not often bite. The only poisonous spider in

Michigan to date is the black widow. However, other spiders may bite, leaving a small reddened dot or wheal on an arm or leg. Unfortunately, the fancied threat of bites, spider webs, and the general presence of these creatures present an annoyance to most people.

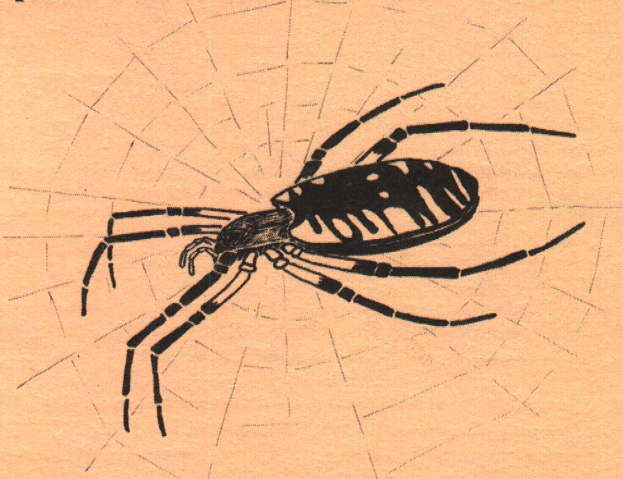
Spiders may be found almost everywhere: on or near water, in or on the ground, from underground covers to the tops of mountains. The black widow is found under wood piles and in other sheltered places (garages, cellars, under porches, in ventilators and rainspouts, and behind gas and electric meters). The female is about ¾ inch long and marked by a red hour glass-shaped spot on the underside of the abdomen (the abdomen has the appearance of a round, jet black shoe-button). The name "black widow" comes from the female's behavior of killing and feeding upon her smaller mate immediately after mating.

### Outside Control Measures

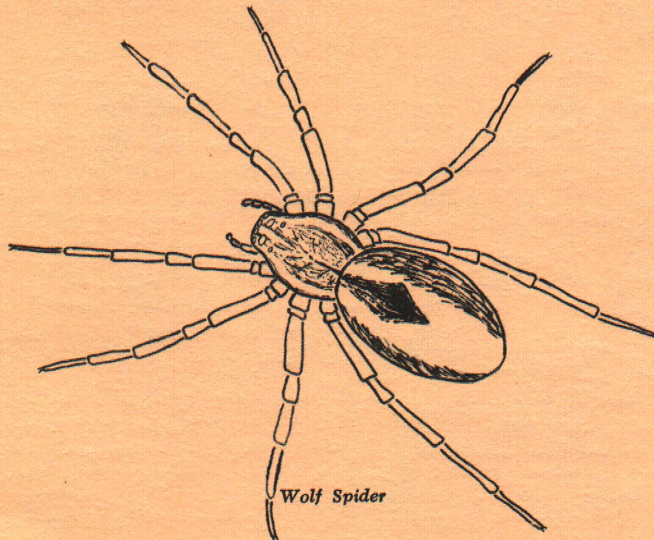
1. Plant shrubs and flowers far enough away from the foundation to allow sunlight and wind to penetrate next to the building.
2. If possible, dry out basements and under porches to make them less attractive.
3. Calk or otherwise tighten the foundation so that spiders cannot get under buildings and so into living quarters.

When buildings have a full basement, including porches, insect and spider problems are often less annoying. This is a feature one might consider when planning a new home.

4. To control spiders under buildings, use either 2 tablespoons of 40 percent wettable chlordane powder or 1 teaspoon of 72 percent chlordane emulsion, or 1 tablespoon of either 50 percent wettable dieldrin powder or 15 percent dieldrin emulsion — any one of these formulations TO 1 GALLON OF WATER. Also effective are 5 percent chlordane dusts, or 1 percent dieldrin dusts, or ⅔ percent solutions of pyrethrum



Orange Garden Spider



Wolf Spider

containing 2 percent piperonyl butoxide plus 5 percent of methoxychlor. Solutions of 5 percent DDT or DDD (TDE), and aerosols containing DDVP (Vapona) or malathion (3 percent) are also effective. See the section on warnings for safe use of chemicals.

#### Inside Control

If spiders are getting into living quarters, use 2 percent chlordane solution, or 1/2 percent dieldrin solution. Also effective but less dangerous to use are malathion, or DDVP (Vapona), or 2/10 percent solutions of pyrethrum containing 2 percent piperonyl butoxide.

Apply around baseboards where spiders are likely to get into rooms, and treat webs (nests) if they are present. See Warning Section before applying any material.

### MOLE AND CAMEL CRICKETS



*Mole Cricket*

The mole cricket is 3/4 to about 1 1/4 inches long. It has spade-like front feet. Note these and other characteristics in the picture.

The camel crickets (also called cave-crickets) have a high arched back. These insects are wingless, and have long antennae (feelers on top of the head). They have thick, short bodies, and heavy femora on their hind legs for jumping. Color is usually light brown or dirty-white, with lighter or darker mottled spots.

Mole and camel crickets occur only occasionally in Michigan homes. Control is similar to that for field crickets, (using the same insecticides). To be successful, however, apply the treatment in the burrows of the mole cricket or where either insect hides under objects.

### SPRINGTAILS

Springtails belong to the order Collembola. These tiny wingless insects can be very numerous in or near moist organic materials. Most species remain outdoors under debris on the soil, but a few occur as pests in structures. Indoors they do no damage, except

possibly to plants, but they may be a nuisance because of their great numbers, especially during wet seasons.

Most springtails are about 1/32 of an inch long and more or less spindle-shaped. They may be gray, black, white, brown or yellow. Like other insects, they have six legs with which they move by short runs. All species are wingless. The next to the last segment of the body bears a spring-like, forked appendage which may be extended outward. This enables springtails to jump several inches.

Springtails have three stages: egg, nymph, and adult. The latter two closely resemble each other. Development can be extremely rapid under favorable circumstances. The sudden appearance of a population is characteristic of the insect.

Springtails may be nuisance pests under a variety of conditions such as in newly constructed masonry buildings, in planting boxes, or flower pots, in industries using food in a moist environment, in basements, especially during damp summer weather, and in wet outdoor areas. The water sources may be plumbing leaks, condensation on pipes and masonry walls or merely irrigation or rain water.

Almost all moist decaying materials provide suitable shelter. Temperatures for springtail activity and reproduction can be as low as 40° F. for some species.

Great numbers of some springtails emerge in very early spring. Those seen "hopping" on melting snowbanks are known as snow fleas. Others, called water fleas, are found on water, either fresh or salt.

#### Control

Prevention and control of springtails can often be accomplished by removing the source of moisture they require. Any practical method to eliminate moisture is worthwhile. Control plumbing leaks. Insulation may correct condensation problems and ventilation can almost always be improved. The use of fans and dehumidifiers are often justified. Any moist organic matter should be removed or dried.

Insecticidal treatments help control springtails, but probably cannot provide more than a partial solution to the problem. Useful insecticides include: DDT, chlordane, lindane, malathion and synergized pyrethrins. Where residual (long lasting control is safe and desirable, emulsions or oil solutions containing 5 percent DDT, 2 percent chlordane, or 0.5 percent lindane can be used. For fast knockdown and where food contamination problems exist, use synergized pyrethrin space and contact sprays but these will require frequent application. Dusts of 5 to 10 percent DDT or 1 percent lindane are useful in many basement and outdoor areas, as well as for treating wall voids that cannot be sprayed. The emulsions and dusts listed above and 4 percent malathion dust may be used for outdoor infestations.

## INSECTICIDES

For good insect control, learn how to use insecticides (chemicals) effectively. Most are available in several formulations, each with its own use for control in and around houses.

Those discussed are the more common formulations. For others, read the label on the container for instructions on use.

### Emulsifiable Concentrates

Emulsifiable concentrates are liquids. They must be mixed with water, turning it milky (the emulsion). They are generally not used inside buildings. Apply them only outdoors to both plants and foundations. Be careful when applying to tender flowers and shrubs as they may injure these plants. In concentrated form, emulsions are dangerous if spilled on clothing and skin. If spilled, change clothing at once and wash skin areas with soap and water. Use masks and protective clothing while spraying, especially if applying dangerous materials over a long period of time.

### Solutions

Solutions are also liquids. They differ from emulsions in that they are used as bought and ARE NOT MIXED WITH WATER. They are made with refined (deodorized) kerosene or similar materials, plus an insecticide.

Use them indoors to control household insects. Do not apply to plants since they cause severe injury. Like emulsions, solutions are dangerous if spilled on clothing and skin. Immediately wash off with soap and water. Change clothing. For other instructions, see emulsifiable concentrates above and the last page for a special warning.

### Wettable Powders

These are similar to dusts. (See below.) However, they contain a high percentage of chemical. For some purposes they are used as bought in place of dusts. Wettable powders are usually mixed with water and applied as sprays. The spray is seldom used indoors, but is useful when applied outdoors. Avoid breathing or getting powder (or spray) on the skin. Use masks and protective clothing, especially if applying dangerous materials over a long period of time.

### Dusts

Dust are dry powders which normally contain a lower percentage of insecticide than wettable powders.

They are used as bought and ARE NOT MIXED WITH WATER. Use them both indoors and outdoors where effective.

### Aerosols

Aerosols are liquids held under pressure in a container. When released, usually by pressing a button, some kinds form a gas, others a spray. Gas-producing types are for control of flying insects (such as flies), liquid for those that crawl or run on floors (such as ants). Choose to fit your needs, keeping in mind that gas forming aerosols are not normally satisfactory for hard to control non-flying type insects.

## EQUIPMENT

The compressed air sprayer, the quart-sized sprayer, the aerosol, and the paint brush are probably the best kinds of equipment for the home owner to use for household insects.

Each type of equipment has good features and disadvantages. Careful study of your insect control jobs will help you buy and use equipment effectively.

### Compressed Air Sprayer

The water capacity of a compressed air sprayer is usually 1 to 4 gallons. Air is pumped into the tank, forcing the spray out when the nozzle is opened. It is ideal for outdoor application of wettable powders and emulsions. Its use indoors is limited if a lot of water is applied with the insecticide. Shake the sprayer when you use wettable powder.

### Quart-sized Sprayer

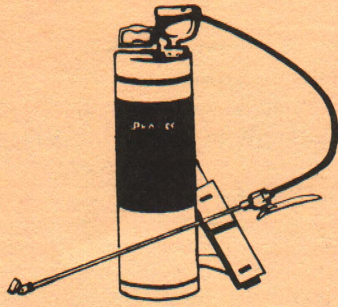
The quart-sized sprayer is also a compressed air type, but air must be pumped into it continuously while in use. It can be used satisfactorily with emulsions and solutions but not wettable powders. Use it both indoors and outdoors for treating small areas.

(Note: Where higher pressure is needed for good application, it has limited use.)

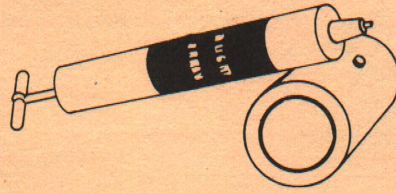
### Aerosol

Aerosols (canned liquid under pressure) are discussed earlier under the section on insecticides and can usually be bought to fit your need. For a general rule, buy as either gas producing for flying insects, or liquid types for crawling pests.

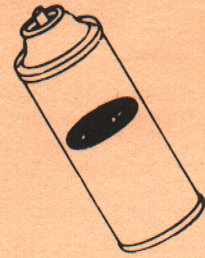




Compressed Air Sprayer



Quart-Sized Sprayer



Aerosol

### Paintbrush

Use an inexpensive paintbrush to apply insecticide solutions to baseboards, screens, and similar areas inside buildings. A light film is usually sufficient. Read the section on solutions under the heading "Insecticides" for information about this type of pesticide formulations.

### WARNINGS

1. Inside buildings, use household insecticides with caution for insect control. Do not apply to entire rooms or buildings (only to baseboards, etc.), unless the package label says that it is safe to do so. Weak preparations of a given insecticide normally can be applied more safely over a larger area than stronger ones, but different insecticides vary widely even in this respect. Also some insecticides are more dangerous to use than others. **So read the label on the container before using any pesticide.**

2. Avoid using materials suggested in this folder around food or where children can get into them. Do not allow children on insecticide treated grass until 3 days after applying. For further information, see the specific instructions for each insect.

3. Avoid breathing sprays or dusts. A handkerchief fitted to the face will help prevent excessive breathing of these materials. However, if there is a chance of breathing highly poisonous materials, special masks should be used. Some insecticides such as pyrethrum or rotenone may be harmful to persons with asthma, although the chemicals are generally quite safe otherwise.

4. If emulsions or concentrated wettable powders are spilled on the skin, wash immediately with soap and water.

5. Do not use insecticides in oil (kerosene) around open flames, electrical wiring, or on asphalt floor coverings. Avoid the use of insecticides which may stain or spot fabrics.

6. Outdoors, avoid heavy applications to tender flowers and shrubs, especially emulsions, never solutions. Read labels to avoid using any material specified as damaging to certain plants.

7. Do not apply any insecticide listed in this folder to vegetables and fruits, or to garden soils unless the label or up-to-date Michigan State University Cooperative Extension literature says you can safely do so.

8. *Read the label for each insecticide used. Follow directions.*

**SPECIAL WARNING:** For indoors, apply those insecticides manufactured especially for the purpose. Formulations suitable for treating livestock and plants of all kinds outdoors **ARE NOT GENERALLY** the best types for use in buildings (homes). For example: formulations for indoor application should contain only the purified grade of the chemical, not the commercial agricultural product. There is less objectionable odor to purified grades than to the agricultural grade. In addition to the kind of insecticide used in household preparations, the carrier (often an oil) should be specifically processed (refined) to reduce or eliminate objectionable odors.

Another point to consider: When a household pesticide is applied behind quarter round or any other like situation, or where there may be excessive heat, odor from the chemicals may be more noticeable and consequently more objectionable than the pest.

### Pesticide Storage and Container Disposal

Store all pesticide chemicals away from the reach of children (preferably locked up). A separate storage area (well marked with an appropriate sign) is recommended.

Carefully dispose empty containers. The label for each pesticide can be a source of directions for proper and safe disposal of pesticide chemicals. Your county agricultural agent also has literature concerning this

problem. For still further information, get United States Department of Agriculture's publication, entitled "Safe Disposal of Empty Pesticides Containers and Surplus Pesticides."

**DO YOU READ THE PACKAGE LABEL FOR INSTRUCTIONS ON HOW TO USE INSECTICIDES SAFELY? IT IS BETTER TO READ THIS INFORMATION TODAY THAN TO WORRY ABOUT MISTAKES TOMORROW.**

PUBLICATIONS such as this are one of the educational services provided by the Cooperative Extension Service of Michigan State University. These services to

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RECORD OF HOUSEHOLD INSECT CONTROL TREATMENTS

INSECT	DATE OF APPEARANCE	DATE OF TREATMENT	CONTROL MATERIAL	RESULTS OF TREATMENT

*Issued in furtherance of cooperative extension work in agriculture and home economics, acts of May 8, and June 30, 1914, in cooperation with the U. S. Department of Agriculture. George S. McIntyre, Director, Cooperative Extension Service, Michigan State University, E. Lansing, Mich. 48823*

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