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Michigan State University Extension Service
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Issued April 1939
12 pages

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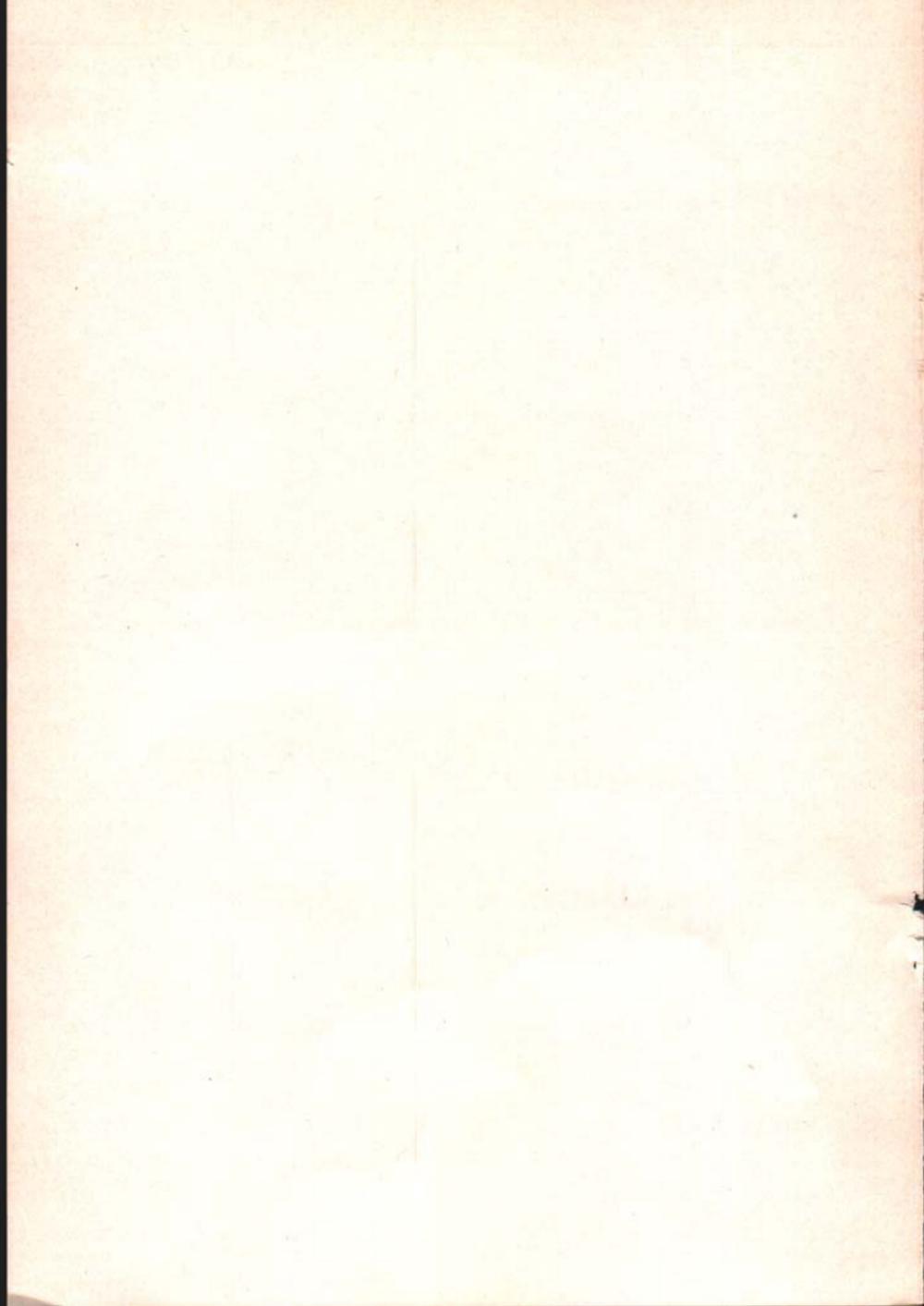


Controlling **PLANT LICE**
on
FIELD and GARDEN CROPS

By Ray Hutson

MICHIGAN STATE COLLEGE :: EXTENSION DIVISION
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Michigan State College and the U. S. Department of Agriculture Cooperating.



CONTROLLING PLANT LICE ON FIELD AND GARDEN CROPS

RAY HUTSON

Plant lice or aphids are among the most annoying and destructive insect foes of field, truck and garden crops. The injuries inflicted by aphids consist of withdrawing sap, injection of materials causing malformation of the plants, carrying diseases, and the befouling of plants by honeydew. At times, aphids completely cover plants upon which they are feeding. The net result in many cases is heavy crop loss.

Where one looks at a single aphid, it is hard to believe the insect is harmful, for an individual plant louse is a fragile, slowly moving insect about one-tenth inch in length. The possibility of rapid increase in numbers is the explanation of the importance of aphids. Fortunately, parasites, disease, and weather unite in destroying aphids enough to keep them from reaching such numbers. Heavy, dashing rains, for example, knock many aphids to the ground and prevent them from regaining their food plants. Hot, dry weather is not so favorable to aphids as to their enemies.

Frequent inspection of susceptible crops and prompt insecticidal treatment is the best means of combating aphids successfully.

Nicotine, rotenone (derived from derris, cube, timbo) and pyrethrum products are all effective when properly used.

It is an impossibility to discuss all the various species of plant lice. However, those selected are representative of the common forms encountered on garden and truck crops. The control measures detailed are not necessarily the only means of fighting aphids but those most commonly successful.

CABBAGE APHIDS

Generally speaking, the cabbage aphids are covered with whitish or grayish waxy covering. They increase rapidly, at times completely covering the plant. The same species are commonly found on cabbage, cauliflower, rape, turnip and other plants of the mustard family, both cultivated and wild. They go through the winter in the egg stage in cold climates and on plant remnants and wild plants in warmer climes.

Control—Controlling cabbage aphids is difficult because of the waxy bloom or coating on the bodies of the insects which prevents insecticidal materials from reaching vital parts.

On cabbage, nicotine sulphate (40 per cent) used at the rate of 1 pint to 100 gallons of water in which 5 pounds of cheap laundry soap



Fig. 1. Cabbage dusted for aphid control and covered with light cloth to confine fumes.

has been dissolved, is effective if applied under pressure by means of a power sprayer. (Sulphated alcohol spreaders, according to manufacturer's directions; summer oil emulsion, one-half gallon; or liquid soap, one-half gallon, may be used in place of laundry soap.) Freshly prepared, hot, 4 per cent nicotine dust, applied through a large tin, funnel-shaped chamber, which is set down over the plant for a brief interval and which confines the fumes, has been successfully used by market gardeners in Michigan on cauliflower and cabbage. Covering plants with a light cloth trailer for a few minutes immediately after dusting with an ordinary hand crank duster confines the nicotine fumes and is a great aid in control.

Derris, or cube, 4 pounds, plus one-half gallon of summer oil, or a sulphated alcohol spreader in 100 gallons of water sometimes give excellent control.

Pyrethrum or rotenone-containing sprays or dusts may be used. If a pyrethrum or rotenone-containing spray is used, it will probably be wiser to buy a prepared spray and use it strictly according to the manufacturer's recommendations. It is very difficult to get satisfactory results with a hand sprayer.

Rotenone-containing and pyrethrum dusts have been successfully used against cabbage aphids. Rotenone dusts to be effective should contain about three-quarters of one per cent rotenone. The specifications for pyrethrum dusts cannot be so clearly drawn, but in general dusts containing one-fourth of one per cent pyrethrins (active principles of pyrethrum usually stated on package) are effective. The proper rate of application is 15-25 pounds per acre with a crank duster.

Finely ground rotenone and pyrethrum dusts, specially prepared to make them stick better, are commercially available.

APHID ATTACK ON CUCUMBERS OR MELONS

*Aphis gossypii**

Everyone who grows cucumbers, squash, or melons in Michigan may expect, sooner or later, an attack by aphids. In the South, this same insect is known as the cotton louse. This insect multiples so rapidly that the necessity for effective control measures is at once apparent. Aphids usually start working in a cucumber or melon field in a more or less restricted area, and then spread over the entire field.

Control—Many growers hesitate to use power machinery on cucumbers and melons for fear of injury to the vines. There is no reason why vines should not be thrown into windrows. Some growers leave a road down through the planting and spray on either side with a long hose. A close watch on cucumber and melon plantings with prompt use of a shovel to bury the first plants infested has destroyed many an infestation before it got started. Prompt insecticidal treatment of the first few infested plants may do the same thing.

Aphids on cucumbers or melons may be controlled by spraying with nicotine 1 pint in 100 gallons of water plus 5 pounds of thoroughly dissolved laundry soap or other spreader. The only machine suitable for a spray application is a power sprayer. Plenty of pressure directed toward the plants from any direction except straight down will insure hitting the undersides of the leaves. A hand sprayer is useless.



Fig. 2. Dusting cucumbers for aphids with hand duster and light cloth trailer.

*Scientific names when used are those employed by the American Association of Economic Entomologists in their list of approved common names.

Good control of aphids on melons has been accomplished with a power duster with a trailer as for pea aphids (p. 7).

Small plantings can be effectively treated by using a hand duster, while the operator walks slowly and drags a light cloth trailer. A nicotine dust (p. 8) has given satisfactory results. Rotenone-containing and pyrethrum dusts will control cucumber aphids, but must be applied in such a manner as to reach the undersides of the leaves.

POTATO APHID

Illinoia solanifolii

Among the plant lice found on potatoes and tomatoes, the true potato aphid is the most serious. The females sometimes attain one-sixth of an inch in size, and in color they vary from green to pink. Both winged and wingless individuals occur on potatoes.

The direct effect of an attack of the potato aphid is serious. When hordes of the tiny creatures suck the juice of the potato or tomato plants and concentrate on the new growth, a marked loss of vigor in the plant is certain to result if, indeed, the plants are not killed outright. Aside from this injury, the potato aphid is capable of transferring the virus of disease from a sick plant to a healthy one. Mosaic is an example of a disease transported by aphids.

Control—Use 40-per cent nicotine sulphate at the rate of 2 pints to 100 gallons of bordeaux; or use one of the other similar sprays with bordeaux, applying thoroughly so as to hit each louse; or else use nicotine dust whenever the lice appear in large numbers (p. 8). Rotenone-containing and pyrethrum dusts will kill potato lice, but experience with them is limited on this insect. Repetition of sprays or dusts will be necessary in most cases.

PEA APHID

Illinoia pisi

The pea aphid is an insect that is the cause of severe losses to the pea canning industry and to growers of garden peas.



Fig. 3. Pea vines showing the effect of pea-aphid.



Fig. 4. Duster equipped with trailer in pea field.

Like many other aphids, it feeds on a variety of plants, preferring alfalfa or red clover for winter quarters and migrating to a variety of legumes or other plants for the summer. Each female is capable of giving birth to a large number of young, the record number being 147. The average number of young born to each female is, however, less than 70, and the number of annual generations in Michigan about 10 or 12.

In the autumn, the lice are attracted to clover and alfalfa and possibly, in lesser numbers, to other legumes as well; and here eggs are laid after mating. The eggs hatch the following spring, producing females which do not lay eggs but give birth to living young—all females—at the astounding rate already mentioned. It may interest the reader to know that during the summer only females are produced but at the approach of winter both sexes occur.

The character of the weather during the opening of spring exerts a very great influence on the magnitude of the pea aphid attack later in the season. At the approach of spring the eggs of the plant lice on clover and alfalfa hatch, producing females, which, if unhindered, soon begin to bear young. Multiplication is rapid, and if nothing interferes, their numbers become noticeable in late May in Michigan.

If the season remains cool and the spring is "late," many plant lice are produced. On the other hand, if the spring opens warm and fairly dry with rains of the heavy, dashing kind; then, parasitic diseases and insects start work almost as soon as the plant lice, and the plant lice never have a chance to become plentiful.

Control—The method of killing pea aphids in most common use in Michigan at the present time is by use of a self-mixing duster delivering a freshly mixed hot nicotine dust beneath a cloth trailer 100 feet long. 40 to 50 pounds of dust per acre is usually applied when the aphids become noticeable, which usually occurs soon after June 1.

The formula in general use is 50 pounds hydrated spraying lime, 3-5 pounds monohydrated copper sulphate, and 4 pints 40-per cent nicotine sulphate.

The hydrated lime and the monohydrated copper sulphate are thoroughly mixed and the nicotine sulphate added. The mixing is then continued until sufficient heat is generated that one can no longer hold his hand upon the mixer.

Another method of using nicotine employs a vaporizer. This machine, utilizing uncombined nicotine in concentrated solution, effects a kill by subjecting the aphids to nicotine fumes beneath a trailer. Derris dusts and nicotine dusts have been widely tested against pea aphids.

Home gardeners commonly do not have so much trouble with pea aphids as canners do because of the earliness of the more popular garden varieties. This is a fortunate condition because the insecticides applicable to the control of pea lice are not effective when applied by hand.

GREEN PEACH APHID

Myzus persicae

The green peach, sometimes called the spinach aphid, may attack any crop. It may be distinguished from other plant lice usually occurring on truck and garden crops by the presence of three black lines on the back.

This aphid migrates from peach, plum and cherry trees where it spends the winter as a tiny black egg.

The control of spinach aphid can be accomplished by contact sprays and dusts, which must hit the insect to kill it. On some curly-leaved plants this is difficult; hence, thorough application is necessary.

DUSTS AND SPRAYS

Nicotine

Nicotine sulphate 40 per cent is the best known contact spray. Nicotine sulphate is usually used at the rate of 1 pint in 100 gallons of spray, which is sufficient for about one acre. Small quantities are commonly mixed at the rate of 1 ounce in 5 gallons or, for a few plants, 1 teaspoonful to a quart of water.

Nicotine sulphate in solution always works better if some spreader is dissolved in the solution. Soap and other materials, such as oil emulsions, rosin residue emulsion, and sulphated alcohols, have the spreading effect. Any material used as a spreader must be completely dissolved or mixed in the spraying solution.

SPREADERS FOR NICOTINE

	Pounds Amt. per 100 gal.	Amt. per 3 gal.
Soap	3	1 oz.
Liquid soap (40%)	3 quarts	3 oz.
Summer oil emulsion	2 quarts	1 oz.
Sulphated alcohol spreaders	3-5 oz.	

The most commonly used nicotine dusts have been made from nicotine sulphate and lime. The usual way of making such dusts in small quantities is by placing 25 pounds of lime in a drum with some round stones and the required amount of nicotine sulphate and rolling the drum back and forth until the materials are thoroughly mixed. Rolling the drum completely over about 50 times is necessary for a good job of mixing. Two pints of nicotine sulphate in 25 pounds of dust is commonly referred to as a 4-per cent strength. Such a dust probably best for small operations with hand dusters.

Nicotine dust made with lime works best when freshly made. It must be kept, if at all, in air-tight containers.

An improved nicotine dust markedly different in character in that a finely ground base of plant material is used instead of a clay or mineral base has been perfected. Where available, this dust can be used profitably. Repeated applications are usually necessary.

Pyrethrum

Pyrethrum sprays for aphids have never been popular under our conditions. There are so many different brands, the only advice regarding their use is that the manufacturer's directions be followed. At least 100 gallons of spray per acre is necessary per application. Repeated applications are usually necessary. Dusts containing 0.2 to 0.3 pyrethrins have been used against aphids in gardens successfully. Locally mixed pyrethrum dusts are efficient only when a finely ground source of pyrethrum is available. Talc, chalk, tobacco dust, clay, bentonite, flour, or sulphur are suitable diluents for pyrethrum. Various distributors buy pyrethrum and mix dusts that have been used against aphids successfully. Pyrethrum dusts should be used at the rate of 20-30 pounds per acre. Repeated applications are usually necessary.

Rotenone

Rotenone may be derived from cube, derris, timbo, barbasco or other sources. It is deadly to most insects, but much confusion as to its value has resulted through careless preparation and handling. Present information indicates that rotenone and its associated substances, when properly applied, constitute good aphicides.

Ground derris or cube containing 4 per cent rotenone used as a spray at the rate of 3 pounds per 100 gallons (1 ounce in 2 gallons) with a sticker and spreader, such as rosin residue, oil; soap; sulphated alcohols, or skim milk, is an easily prepared efficient aphid spray. Numerous proprietary rotenone sprays are marketed and should be used according to the manufacturer's recommendations. Remember it requires at least 100 gallons of spray per acre for coverage. A rotenone dust may be prepared by thoroughly mixing 1 pound of derris, cube, or other material containing 4 per cent rotenone with 7 pounds of sulphur, tobacco dust, flour, chalk, clay, bentonite, or other non-alkaline carrier. This will give a dust containing one-half of one per cent rotenone which has been effective. Many commercial dusts now on the market have been "conditioned" by the addition of materials which have the property of making them adhere to the leaves, but this is not feasible in ordinary mixing.

Some prepared rotenone dusts are distributed by companies specializing in the sale of spray materials, which can be purchased at very reasonable prices. These dusts are efficient when used at the rate of 20-25 pounds per acre with a hand crank or power duster. Repeated applications are usually necessary.

INFLUENCE OF PARASITES UPON APHIDS

As already mentioned, various parasites influence aphid population. However, under Michigan conditions one cannot depend upon these small beneficial insects for help as much as do people in some climates. The conditions necessary for parasitic control of aphids in Michigan are fulfilled only infrequently, but their activities always excite interest.

It is with this thought in mind that a few illustrations of beneficial insects and their work are inserted.



Fig. 5. Ladybird beetles feeding upon aphids.

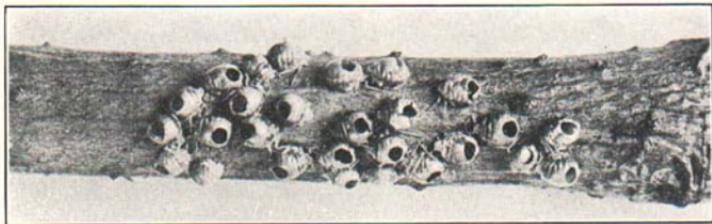


Fig. 6. Parasitized aphids showing holes through which *Lysiphlebus* parasites have emerged. Enlarged about three times.



Fig. 7. An aphid from which *Lysiphlebus* has emerged (greatly enlarged).

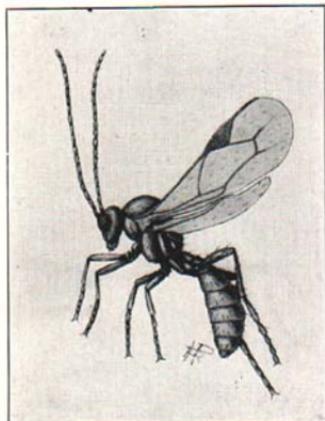


Fig. 8. *Lysiphlebus*, a wasplike parasite of aphids (greatly enlarged) which lays eggs in the bodies of aphids.



Fig. 9. Lace winged fly, with characteristic eggs borne on filaments. From these eggs voracious larvae which consume many aphids, emerge. U. S. D. A.

Michigan State College of Agriculture and Applied Science and U. S. Dept. of Agriculture co-operating. R. J. Baldwin, Director Extension Division. Printed and distributed under act of Congress, May 8, 1914.

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