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CONTROL OF GARDEN PESTS

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Watchfulness is the first essential for successful control of garden pests. With a small hand sprayer like that shown above, the grower can protect the young plants as soon as they break through the ground.

Insects offer one of the chief hazards in the growing of garden and truck crops. Insect attack often begins with the seeds in the soil. In the growing of melons and related crops the melon beetles often cause severe injury at the time the tender plants are breaking through the ground. The cost of treatment is small when one considers the cost of seeds and plants, the expense of preparation of soil, and other items. Every gardener should plan to protect his crops against insect damage. To do this most successfully one must know something about the destructive pests, when they appear, the proper time to control them, and the proper materials to use. Protection of the plants in the early stages of an attack is most important.

The insects described in this circular are grouped according to the time or the season when they are most likely to show up. Watch garden plants early in the growing season for indications of insect

damage. They will be either eaten full of holes or show wilting effects, perhaps due to a large number of sucking insects attacking the plants. Use the proper material as recommended. Sucking insects will not get any poison placed on the surface of a plant. They must be hit direct with a contact spray. Chewing insects must be fed poison if they are to be killed. Learn to know the pest by its type of injury.

EARLY SUMMER PESTS

Plant Lice or Aphids.—Aphids are very small purplish, green or black sucking type insects found clustered on the underside of curled leaves. Most garden crops are attacked. Radish, melon and cabbage plants may be damaged severely while very small.



A melon leaf curled by aphid.

Control. Use nicotine dust and treat plants when first found infested. Constant watching for these insects is necessary and treatment of plants before they are severely injured is essential. (For a full discussion of the poisonous mixtures mentioned in the various control recommendations, see page 5.)



A radish leaf riddled by flea beetles.

Flea Beetle.—Flea beetles are general feeders, feeding on many garden crops. They are very small striped or shiny black beetles $\frac{1}{8}$ inch long which jump when disturbed. They eat small holes in the leaves. Radishes and potatoes are attacked early.

Control. Use arsenate of lead-lime dust and cover the leaves on both sides. (See page 5.)

Bean Leaf Beetle.—The bean leaf beetle is a small yellowish beetle $\frac{1}{4}$ inch long with three black spots on each wing cover. They eat holes in leaves from underside and are rather difficult to find.



Control. Dust with calcium arsenate-lime mixture and apply to underneath side. Do not apply arsenate of lead to bean foliage. (See page 5.)

Colorado Potato Beetle.—This beetle is striped and thick-bodied $\frac{3}{8}$ inch long. Beetles and reddish-brown slugs eat leaves and stems. Tiny yellowish eggs in clusters may be seen on underside of plants. Feeds largely on potatoes, eggplant and tomatoes.



Potato vine attacked by Colorado potato beetle.

Control. Dust with either calcium arsenate or arsenate of lead-lime dust. Watch plants and keep covered when damage begins to show up. (See page 5.)

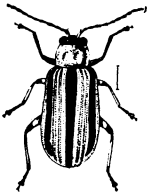
Cabbage Worm.—White butterflies seen about cabbage plants deposit small grayish eggs on the leaves. Velvety green worms eat the leaves of cabbage and damage related crops such as kale, cauliflower, etc.



Cabbage butterfly and worm.

Control. Use arsenate of lead-lime dust and treat affected plants as soon as worm damage shows up. Weekly intervals of dusting may be needed during late summer. (See page 5.) Hand picking the worms is helpful.

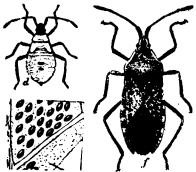
Striped Cucumber Beetle.—This pest attacks melons, cucumbers and other vine crops. It is about $\frac{1}{4}$ inch long, yellowish in color with 3 black stripes on back. The beetles gnaw holes in the leaves and stems of plants. The larvae feed in the roots.



Striped cucumber beetle.

Control. Use calcium arsenate-gypsum mixture and aim to keep plants covered from time they come up until runners develop. This will require about weekly application. (See special mixtures, page 7.) If agricultural gypsum is not available, use road dust.

Squash Bug.—The large, flat, brownish-black bugs about $\frac{3}{4}$ inch long found on underside of leaves, vines, clods, etc., beneath squash, pumpkin or melon vines are squash bugs. Oftentimes clusters of nymphs are found on leaves near eggs. (See directions for control of sucking insects, page 6.)



Eggs, nymphs and adult squash bug.

Control. Trap fullgrown bugs under boards, beside plants and crush each morning. Hand picking egg masses and full grown bugs helpful. Nicotine dust is effective only on young nymphs.

Harlequin Cabbage Bug.—Red-spotted black bugs about $\frac{1}{2}$ inch long found on leaves of horseradish, mustard, cabbage and related crops causes the edges of leaves to turn brown and curl. Small, black-banded eggs in clusters on underside of leaves look like miniature barrels.



Eggs, nymphs and adult of Harlequin cabbage bug.

Control. Hand picking and destruction of full grown bugs and egg masses very helpful. Watch for them in early part of season on radishes and horseradish. Mustard may be used as trap crop. Nicotine dust is effective only on young nymphs. (See control of sucking insects, page 6.) Destroy crop remnants in fall.

Cutworms.—1 to 1½ inches long, black to greenish striped. They are usually found during the day coiled under clods or in the ground at base of plant. Plant is cut off at ground level.

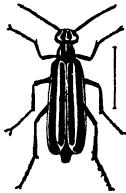
Control. Use poison bran mash and apply late in evening. (See special mixtures, page 7.)

Moles.—Being beneficial as an underground insect destroyer, this little animal can be very troublesome. Moles may burrow anywhere throughout the garden in search of food. Oftentimes ground mice use their runways for passageways and destroy seeds.

Control. Trapping is the most effective means of control for moles. Set traps in main runways. Watch their path for signs of daily activity. Offensive materials, such as lye or moth balls placed in their runways are oftentimes helpful.

MIDSUMMER PESTS

Blister Beetles.—Large brown striped or gray to black slender-bodied beetles $\frac{3}{4}$ inch long attack foliage of most any garden plants in large numbers. Very destructive to entire plants. May show up over night.



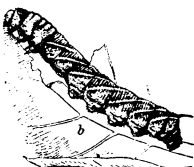
Control. Dusting heavily with arsenate of lead or calcium arsenate-lime dust may be fairly effective. (See page 5.) Knock off in pans of oil, hand pick, or drive into weeds.

Corn Ear Worm.—Brownish to greenish striped worms 1 to 2 inches long injure tips of ears of sweet corn. Same worm eats holes in tomato fruits.



Control. For corn: Apply calcium arsenate and sulphur mixed equal parts 3 to 4 times at 3-5 day intervals, beginning when silks appear (page 5). For tomato fruits: Apply arsenate of lead or calcium arsenate-lime dust when first tomatoes are size of marbles and follow with another application at a 10-day interval. Do not dust fruits with lead or calcium arsenate within three weeks prior to picking. Use poison substitutes as discussed on page 7.

Tomato Horn Worm.—Large greenish worm 1½ to 3 inches long with prominent horns on one end devours foliage of tomato and tobacco plants. Worm is entirely harmless to handle. Large hummingbird moth lays the eggs from which the worms are hatched.



Control. Dust plants thoroughly with arsenate of lead or calcium arsenate-lime dust mixture (page 5). Hand pick.

Pickle Worm.—Whitish to greenish worm about $\frac{1}{2}$ to $\frac{3}{4}$ inch long gnaw into ripening fruits of squash, melons and cucumbers. May also attack blossoms and foliage. Brightly colored yellowish-brown moths of 1 inch wing expanse lay eggs in blossoms.

Control. No treatment entirely satisfactory. Destroy remnants of old crop. Fall plow. Using early maturing varieties of squash as trap crop may be helpful. Dusting with calcium arsenate-gypsum mixture or calcium arsenate 1 part, flour 5 parts until after first fruits appear is helpful. (See special mixtures, page 7.)

Grasshoppers.—Use poison bran mixture and apply in early morning before 8 o'clock. Scatter very thin over the ground at the rate of 3 quarts to one-sixth acre. (See special mixtures, page 7.)

LATE SUMMER PESTS

Squash Vine Borer.—Large white grub bores through stems and sometimes cuts them through near the roots.

Control. Control of this pest is very difficult. Very little can be done with infested cucumber vines, except to keep the damaged portions well covered with dirt. Keep plants growing as vigorously as possible. Use early squash as a trap crop. Infested squash vines may be slit lengthwise and thus remove the borer but this may not be a very practical measure. Dead vines and crop remnants should be destroyed in early fall. Deep spring plowing may help somewhat.

Weevils.—Small white grubs develop inside the beans and peas in the field and a dull gray beetle comes out of a small round hole in the side of the bean or pea. Infested beans appear full of holes.

Control. Plant only seed free from weevils. Weevils cannot be kept from attacking beans or peas in the field after they once show up. As soon as the seed becomes dry, harvest the crop and fumigate with carbon disulphide at the rate of 1 pound per 100 bushels. For small containers use at the rate of 1 tablespoon for each 3 bushels. (See special mixtures, page 7.) Put carbon disulphide in a shallow container and place on top of beans in a tight container. Leave closed up for 36 hours.

At this time of year ordinarily one must watch out for pests that showed up earlier in the season and apply proper control measures as needed.

POISONOUS MIXTURES

1. **For Insects Eating Foliage.**—Use 1 pound arsenate of lead or calcium arsenate to 5 pounds hydrated lime and dust plants until well covered. In terms of pints, use 1 pint of the arsenical

to 5 pints of lime. *Caution:* Do not use arsenate of lead on bean foliage. It seems to have the tendency of stunting growth. Use calcium arsenate. Excessive use of materials may cause injury. A good even coverage is sufficient.

Many gardeners and truck crop growers have sprayers and they can use these with satisfactory results. Many prefer to use liquid sprays instead of dusts. Six teaspoonsful of calcium arsenate or lead arsenate or two of Paris green to each gallon of water will be sufficient for the preparation of small quantities for the home garden. The addition of equal quantities of lime will make these arsenicals safer from the standpoint of plant injury. For larger quantities, 1 to 2 pounds of calcium arsenate or lead arsenate to each 50 gallons of spray is a common recommendation. Follow directions on the container.

2. For Insects Sucking Out Plant Juices and Causing Plants To Wilt.—Use nicotine dust mixture. Mix as follows at the rate of 2 tablespoons of nicotine sulphate (Blackleaf 40) in 1 pint hydrated lime. (This is the same rate as 1 oz. to 1 lb.) Mix the nicotine and lime in a syrup pail with a tight lid. Six to eight small stones placed in the bucket will help mix the material. Shake 15 to 20 minutes. If a large amount of dust is needed, mix at the rate of 47 pounds of hydrated lime and 3 pounds of nicotine sulphate in a barrel or other container having a tight fitting cover. Apply the nicotine dust during the warm part of the day and when little wind is blowing. Better kill of insects will be accomplished if the dust is applied under a cloth cover or large can. Some growers attach a funnel to the end of their small duster, as shown in the accompanying picture.



This Dunklin county melon grower found that by fastening a funnel to the end of his duster he could dust his plants in windy weather and get good control.

For small gardens the use of two teaspoonsful of nicotine sulphate in a gallon of water is recommended. A one-inch cube of cheap laundry soap should be shaved up and thoroughly mixed in the solution. Full directions are given on the containers. In spray-

ing, one must wet the insects by the spray or they will not be killed. Thoroughness of spraying and the use of sprays as soon as the insects are noticed are essential.

POISON SUBSTITUTES

There should be no danger to health from the use of arsenical dusts on plant foliage, providing they are not applied during a period of at least three weeks prior to the use of the foliage or fruits. For those who may have difficulty in meeting arsenical residue tolerances with the marketable products and for those who may wish to control insects on the vegetables which are ready for use, it is suggested that materials which are not very toxic to man be used. Two such materials are in use and should be available in most localities. They are as follows:

Pyrethrum Dust.—This dust is made ready for use by mixing half and half with finely pulverized clay, talc, or cheap flour and has given very good results in most cases against the insect attacking crops at harvest time. This material acts quickly and should be applied thoroughly.

Derris or Other Rotenone Dusts.—These have also proven satisfactory on several of the common garden pests. These materials which may be obtained from commercial insecticide companies usually contain about 4 or 5 per cent rotenone. A one-half to one per cent rotenone dust has proven satisfactory to control cabbage worms, tomato fruit worms and others. To dilute the materials, use clay, talc, cheap flour or sulphur and prepare by mixing Derris one part to from four to eight parts carrier. *Note:* Hydrated lime cannot be used as a carrier because of harmful chemical reactions.

Ready mixed dusts of these materials can be secured from most commercial insecticide companies.

SPECIAL POISONOUS MIXTURES AND OTHER PREPARATIONS

For Striped Cucumber Beetles.—Use calcium arsenate-gypsum mixture prepared at the rate of 8 tablespoons calcium arsenate in 5 pints agricultural gypsum. (Same as 1 lb. to 20 lbs.) Less burning to plants will be had when this mixture is used. Apply according to directions. Where one has only a few hills to treat, use cheesecloth to cover the plants. Make framework out of wire and cover edge with dirt. Nicotine dust may be helpful if beetles can be subjected to dust. Severe burning may be noticed, if excessive amounts of lime are dusted on plants.

For Grasshoppers and Cutworms.—Use poison bran mash mixed at the rate of 3 quarts dry bran with 2 tablespoons paris green

(either white arsenic or sodium arsenate may be used in place of paris green).^{*} Mix and place in a container that will hold water. In another container mix $1\frac{1}{2}$ cups water and $\frac{1}{4}$ cup cheap molasses. Pour the diluted molasses over the poisoned bran and mix thoroughly until every flake is moistened. Add enough water to make the mixture crumbly when squeezed through the hand. Too much water will make it sloppy. Apply in early morning, scattering very thinly and evenly over the ground. The above quantity should cover about one-sixth acre.

For Weevil Fumigation.—Use carbon disulphide as recommended. (*Caution:* Carbon disulphide when enclosed in a tight container is explosive, if one brings fire in contact with it. It is safe if used carefully and according to directions.) Do not fumigate unless temperature is 70 degrees or above.

EQUIPMENT

The small hand dusters as shown on the front page and on page 6 cost about 75c to \$1.25. These are available at most hardware stores and are sufficient for small plantings. The use of a can with holes punched in the bottom to apply the materials will be all right for some leaf eating pests. For sucking insects the can duster is not very satisfactory. For more extensive plantings larger dusters may be secured from commercial concerns and the cost will depend on the size. Liquid spray equipment is also available at most hardware dealers. The use of proper equipment is almost necessary if good results are had.

Every Good Gardener Should:

Have on Hand at Beginning of Season ::

1. A small hand duster.
2. One to two pounds of arsenate of lead.
3. One to two pounds of calcium arsenate.
4. A few pounds of hydrated lime.
5. One to two ounces of nicotine sulphate.

Practice:

1. Crop rotation.
2. Destruction of crop residue (fall).
3. Fall plowing.
4. Proper use of insecticides.
5. Thorough and timely applications.

^{*}When white arsenic or sodium arsenate is substituted for paris green, dissolve poison in water and molasses instead of mixing with bran.

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