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VEGETABLE CROP INSECT PEST CONTROL PROGRAM

by

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The successful grower of vegetable crops of high quality is burdened with many difficulties. Among the most exacting factors the grower has to contend with are the insect enemies. The method by which these insects may be combated is briefly outlined in this Circular of Information.

Insecticides

Insecticides for controlling insects are applied by means of a liquid carrier or a dust carrier. Dusting the vegetable crops may prove for many the more acceptable form of application. The spray materials are, for the most part, available in dust form, and dusting outfits are comparatively inexpensive and handy.

The standard stomach poison, lead arsenate, and contact poison, nicotine sulphate, as well as other insect poisons, may be obtained from your dealer in spray materials. Directions for their use should be found upon each container. For garden insects, arsenate of lead is generally used at the rate of 2 pounds to 50 gallons of water, or 1 ounce (10 level teaspoonfuls) to 1 gallon of water. Casein spreader, skim milk or soap, 1 ounce dissolved to 1 gallon spray, is usually added to make spray wet waxy leaves such as that of cabbage. For information on mixing sprays, send for Station Circular 68 and Station Bulletin 259. Recently several new contact sprays for use against sucking insects, such as aphids or plant lice, as well as chewing insects, have appeared on the market under several different proprietary names. These are compounds containing pyrethrum, or derris. Calcium arsenate, it is believed, is now sufficiently standardized that it may be substituted for lead arsenate whenever desired. Other substitutes for lead arsenate that have made their appearance recently are the various fluosilicate salts.

Bordeaux mixture should be made fresh each time it is used. It is recommended for flea beetles and garden slugs. Commercial brands are available, or it may be made as follows:

|                      |              |
|----------------------|--------------|
| Copper sulfate ----- | 1 pound      |
| Quicklime -----      | 1 pound      |
| Water -----          | 12 1/2 gals. |

Use only wooden or earthenware vessels in preparing bordeaux. Dissolve the copper sulfate in 2 gallons of water, in one vessel. Slake the lime and make up to 2 gallons in another vessel. Pour the two solutions simultaneously through a strainer into a container holding 8 1/2 gallons of water.

Bordeaux oil emulsion, recommended for onion maggot control, is made by adding 1 1/2 gallons of a commercial oil emulsion stock to 50 gallons of bordeaux mixture. Agitate thoroughly before application. Use between 150 and 200 gallons per acre.

Corrosive sublimate is recommended against the cabbage maggot and onion maggot when used at a strength of 1 ounce to 12 gallons of water, applied at intervals of a week or ten days during the flight period of the fly. Drenching the soil with the solution of corrosive sublimate is of value in combating earthworms, slugs, larvae of fungus gnats, radish, onion and cabbage maggots. The preparation and handling of this chemical should be safeguarded as it is a deadly poison. As it corrodes metals, the solution should be prepared in a glass, glazed, or wooden vessel, which should be thoroughly cleaned or destroyed immediately after use. The use of hot water will hasten the solution of the corrosive sublimate.

Poison bran mash is the standard remedy for cutworms and grasshoppers. The following formula makes enough for a city garden or one-third of an acre:

|                                    |               |
|------------------------------------|---------------|
| Coarse wheat bran -----            | 5 pounds      |
| White arsenic or paris green ----- | 3 ounces      |
| (or Sodium fluoride -----          | 5 ounces)     |
| Molasses or syrup -----            | 1 pint        |
| Water to make a crumbly mash ----- | 2 to 3 quarts |

The dry ingredients are first thoroughly mixed and the water and molasses added. If too much water is used, the mash will be sloppy and hard to scatter; use just enough water so that it will be wet and still fall apart readily after being pressed together in the hands. The poison bait is broadcast over the area as soon as the first cutworm or grasshopper injury is noticed. As an insurance against cutworm injury, broadcast over the garden after soil is prepared, and just before garden is planted.

Carbon bisulfide is the most practical fumigant substance for the treatment of beans, peas and other seeds for weevils. It can be used, when properly applied, for the treatment of seeds intended for planting or for food. This material is inflammable. Keep all lights, sparks or flames away from it. Do not use in heated room. It is used at the rate of 10 to 30 pounds for every 1000 cubic feet of space in an airtight container. The liquid may be placed in very shallow pans on top of seed to be fumigated or dashed on gunny sacks previously spread over top of seed. For fumigating small amounts, place seed in a 2 quart jar, pour 1 tablespoonful of carbon bisulfide over seed and close the lid tightly. Allow gas to act for 48 hours before opening to air out. Keep seed in tight containers to prevent reinfestation. The gas is not effective if the temperature is much below 60°F. Warmer weather is more favorable.

Three-in-One Dust: Repeated applications of a "Three-in-One" dust or "All-in-One" dust is of value in protecting the garden from insect attack. Begin dusting as soon as the plants appear above ground and repeat at intervals of 10 to 14 days and your insect troubles, it is believed, will be mostly prevented. Commercial brands of this dust are available, or it may be made as follows: Mix thoroughly 7 1/2 pounds of lead arsenate, 17 1/2 pounds of sulfur and 22 1/2 pounds of good hydrated lime. Then add 2 1/2 pounds of nicotine sulfate. To mix large quantities, place the lime-lead arsenate-sulfur mixture in a keg (50 pounds can be mixed in a 50 gallon keg), add the nicotine

sulfate, and then add 1/2 pound of rocks or pebbles about the size of a hen's egg, for each pound of dust to be mixed. The keg should then be closed tightly, and rotated for 10 minutes either by rolling the keg over the ground or by mounting it on a frame. In mounting the keg on a frame, spindles are placed on the ends of the keg and a hinged door fixed in the side. After mixing, the dust should either be used immediately or placed in air tight containers, as the dust loses strength rapidly. To remove pebbles, pass the dust through a 3/8" mesh wire screen.

| Crop                           | Insect                              | Control Program   |
|--------------------------------|-------------------------------------|---|
| Asparagus                      | Common Asparagus beetle             | Cut crop clean to market size. Destroy all volunteer plants and crop remnant. Leave trap rows and spray with arsenate of lead after larvae have hatched. Spray after crop is cut to destroy adults before cleaning patch for winter. Poultry of value in destroying beetle. |
| Bean                           | Bean weevil                         | Fumigate seed immediately after harvest with carbon bisulfide and destroy all vines.  |
|                                | Western 12-spotted cucumber beetle. | Experiments indicate following to be of value: Leave trap rows. Drive beetles to trap rows by dusting with lime. Spray beetles on trap rows with pyrethrum spray.   |
|                                | Aphis                               | Spray with nicotine sulfate 1/2 pint, water 50 gallons. Add 4 pounds dissolved soap. Nicotine dust effective in warm weather.   |
|                                | Thrips                              | Spray at intervals with nicotine sulphate or with nicotine dust.  |
|                                | Seed corn maggot                    | No satisfactory control. Plant shallow in heavy, wet soil and in wet seasons. Avoid sod land or new land, especially in cold, wet seasons.  |
| Beet                           | Flea beetles<br>Leaf beetles        | Periodic applications of lead arsenate spray or dust.   |
| Brussels sprouts               | Aphis                               | Spraying or dusting with nicotine.  |
| Cabbage<br>Cauliflower<br>Kale | Cabbage worms<br>Diamond Back Moth  | Dust with an arsenate of lead dust at intervals of 2 weeks until plants begin to head.  |
|                                | Cabbage root maggots                | Wet soil around plants with corrosive sublimate solution at intervals of 10 days, beginning 3 days after transplanting. Make 4 applications. Screen late plants to exclude the flies which produce the maggots.   |

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| Cabbage<br>Cauliflower<br>Kale (Cont'd.) | Cabbage aphid   | Spray as soon as lice appear and before leaves curl, with nicotine sulfate 1/2 pint, dissolved soap 4 pounds and 50 gallons water. Nicotine dust effective in warm weather.  |
| Cucumber<br>Muskmelon<br>Squash          | Striped cucumber beetle<br>12-spotted cucumber beetle | Dust with mixture of calcium arsenate powder 1 pound, land plaster 20 pounds, when plants appear above ground. Repeat application every 4 days during fair weather and after each rain.  |
|  | Aphid   | See cabbage aphid.   |
|  | Seed corn maggot                                      | See bean.  |
| Horseradish                              | Diamond back moth                                     | Repeated application arsenate of lead dust.  |
| Onion                                    | Thrips  | Burn or plow under grassy or weedy borders near onion field in early winter to destroy thrips. Spray with 1/2 pint nicotine sulfate, 2 pounds dissolved soap, 50 gallons water, or 1 teaspoonful nicotine sulfate, 1 inch cube of soap to 1 gallon of water, when thrips appear in spring. Dust with nicotine dust when temperatures are above 60°F. |
|  | Onion maggots   | Spray soil around plants with corrosive sublimate solution or bordeaux oil emulsion, beginning when plants are 1 inch high. Five applications at weekly intervals are recommended.   |
| Pea                                      | Pea weevil  | Fumigate seed with carbon bisulfide immediately after harvest and destroy all vines.   |
|  | Pea aphid   | See Bean   |
|  | Seed corn maggot                                      | See Bean   |
| Potato                                   | Grub worms and wireworms                              | These insects more prevalent in potatoes grown on new or sod land, or land not well drained.   |
|  | Flea beetles  | Spray with bordeaux mixture to which is added arsenate of lead powder at rate of 1 ounce to 1 gallon of bordeaux mixture.  |
|  | Colorado potato beetle                                | Dust or spray with lead arsenate at rate of 1 1/2 pounds to 50 gallons water. Make first application as soon as beetles appear on young plants and a second about 2 weeks later.   |

|            |                                       |   |
|------------|---------------------------------------|---|
| Radish     | Radish maggot or<br>cabbage maggot    | Exclude the egg-laying flies by planting radishes in rows. When second pair leaves appear, place 10 or 12 inch boards on edge along the row, join the ends by short boards and cover top with mosquito bar or fly screen.<br>See Cabbage. |
| Squash     | Squash bug                            | Place small boards or old carpet near vines when they first come up. The bugs collect beneath these objects and may be destroyed. Try pyrethrum sprays.   |
|            | Western 12-spotted<br>Cucumber beetle | See Cucumber.   |
| Sweet corn | Corn earworm                          | Fall, winter or early spring plowing followed by frequent summer cultivation is said to be of value. Dust the silk at weekly intervals until silk shoots become dry. Use a calcium arsenate dust or fluosilicate dust.                    |
|            | Seed corn maggot                      | See Bean  |
| Tomato     | Green tomato horn<br>worms            | Pick off by hand or spray with arsenate of lead, 1 1/2 pounds to 50 gallons water, or dust with arsenate of lead dust mixture.  |
|            | Tomato fruit worm                     | Spray before fruit is half grown with arsenate of lead 1 1/2 pounds to 50 gallons water or dust with arsenate of lead dust mixture.   |
|            | Flea beetle                           | See Potato  |

#### GENERAL PESTS

|  |             |  |
|--|-------------|--|
|  | Cutworms    | Poison bran mash standard control.   |
|  | Garden slug | Clean up all trash, crop remnants and debris about garden. A combination of a repellent spray such as bordeaux mixture applied to the plants and an attractive poison bait scattered on the soil is recommended. The poison bait for use in combination with spray consists of:<br><br>Calcium arsenate - - - - - 1 ounce<br>Chopped up lettuce leaves<br>or diced carrots - - - - - 1 pound<br>Mix well and scatter about area to be protected. |

|                                    |   |
|------------------------------------|---|
| Garden slug<br>(Cont'd.)           | Lime, soot, powdered copper sulfate and lime, or dry bordeaux mixture periodically dusted on the soil about the plants and also lightly hoed in between the rows, give temporary protection. Care should be exercised in application as some of these substances may burn the plants. |
| Symphilids or<br>garden centipedes | No effective control measures known.  |
| Grasshoppers                       | Spray or dust plants with arsenate of lead. Spread poison bran bait as suggested for cutworms.  |
| Red spider mites                   | Suggest spraying with summer oil emulsion 1 1/2 gallons to 100 gallons of water, or repeated applications of a sulfur-lime dust. (See "Three-in-One" Dust)  |
| Millipeds                          | Place diced vegetables (potato, carrot) dipped or dusted with paris green about their haunts. Sprinkle dry paris green, 1 part and sugar, 9 parts by weight, about infested places.   |
| Sow bugs                           | Sprinkle haunts with same materials suggested for millipeds, or with a poison bait made of paris green 1 part, white flour 2 parts, sugar 2 parts by weight.  |