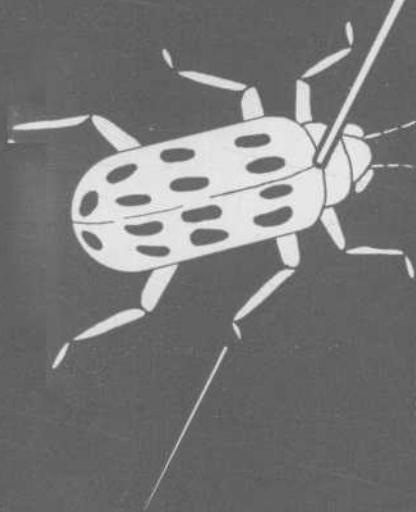


CONTROL



Garden Pests

CIRCULAR 122

Agricultural Extension Service

For Quick Reference

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CONTROL GARDEN PESTS

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and

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A Job to Do!

Because garden-fresh vegetables from the backyard plot have become an important item in the family food supply, the farm home gardener must, to achieve success, take active measures to control the ever-present threat of plant kingdom saboteurs — insect pests and plant diseases.

This publication is specifically prepared to assist home gardeners and small vegetable farmers in preventing or reducing losses from common garden pests.

Efforts to control plant pests are best directed toward prevention,

and should be applied before damage appears. The more efficient preventive measures are clean cultural practices, use of clean seed, use of disease-resistant varieties, and timely spraying and dusting with approved insecticides and fungicides.

Recommended cultural practices include: (1) deep spading or plowing to prepare ideal seed bed and to destroy hibernating places of many injurious insects and plant diseases; (2) rotation of crops to remove susceptible plants from infected areas; and (3) destruction of weeds and grasses which may act as breeding places for insects as well as carriers of virus diseases.

INSECTS

Aphids & Leafhoppers

Aphids or plant lice, and leafhoppers belong to the same order of insects, and both are equipped with sucking mouth parts. The aphids differ from the leafhoppers in shape since they are more globular, while the leafhoppers are long and narrow and more active. (At certain seasons aphids develop wings and migrate to other plants.) They occur in many shades of black, green, brown, gray, yellow, and red.

Aphids cause injury by sucking out the plant juices, thus causing stunting of the plant and in severe cases wilting and death. They are also spreaders of many plant diseases. These insects may be controlled by nicotine, pyrethrum, or rotenone dusts or sprays, but the insecticide used must come in contact with the insect.

Leafhoppers vary in color as do aphids, and they feed on about the same plants. They can be controlled by applications of pyrethrum and DDT sprays or dusts and in many instances by dusting sulphur.

Beetles

Beetles are a group of chewing insects which usually are covered with a rather hard chitin material. They vary in size from very minute to as large as 2 or 3 inches in length and 1 inch in width. They

appear in various colors and in combinations of colors. Some of the beetles in both the adult and grub stages may feed on either the root or the foliage of plants.

Some of the more common beetles are Colorado potato beetle, Mexican bean beetle, bean beetle, cucumber beetle, June beetle, flea beetle, and blister beetle. Best control of them is secured with arsenicals, fluorides, DDT or rotenone insecticides in either the dust or spray form. Do not apply arsenicals or fluorides to portions of plants to be eaten. Use rotenone compounds within 30 days of harvest, since none of the others should be applied that near to harvest time.

True Bugs

Under true bugs comes another group of sucking insects which includes the stink bug, harlequin cabbage bug, squash bug, and *Lygus* bug. These insects are usually shield-shaped and of all colors. Most of them are very noticeable by the frequent odors they excrete when disturbed. They cause injury by sucking out the plant juices and by stinging the seed pods of many plants. In some instances they may be spreaders of certain plant diseases. They are usually very difficult to control.

Nicotine, pyrethrum, rotenone and DDT dusts and sprays, however, have given good control of the nymphs, or young, and may kill some of the adults. Recent developments show that DDT and Sabadilla are very effective for these types of insects. Clean cultural practices of destroying old plants and cleaning up fence rows may aid materially in reducing the population the following season.

"Worms" or Larvae

"Worms," more properly called larvae, are one stage in the life cycle of many insects and usually the only stage that causes noticeable injury. Larvae are equipped with chewing mouth parts. In some instances they may be known as grubs or grubworms. The adult of the so-called grubworms are usually beetles, while those of most of the worms are either butterflies or moths.

These moths or butterflies deposit eggs on the plants from which hatch worms or larvae. The larvae feed on the plants until grown, then go into the pupal or resting stage. In this stage they transform into adults and emerge ready to deposit eggs.

The worms or larvae include the cabbage worm, webworm, corn earworm, tomato horn worm, cutworm, squash vine borer, corn borer, grubworm, and caterpillar. Many of these may be killed with an arsenical, fluoride, DDT, chlordane, or rotenone insecticide in either the dust or spray form. The worms may feed on the plant surfaces, or they may bore into the stems or fruits of the plants.

"Chewing" and "Sucking" Insects

In controlling insect pests it is essential to know whether the insect feeds upon the plant parts or sucks out the plant juices. Insects which feed upon the plant parts (beetles, worms, and grasshoppers) are equipped with chewing mouth parts and must be controlled by a stomach poison. The poison is applied to those portions of the plant being attacked. Insects which suck out the plant juices (aphids, leafhoppers, and stink bugs) are controlled by a contact poison. The insecticide should be applied in such manner that all the insects are covered with the material.

Insecticide Dilution Chart

Cryolite

Dust: Mix 1 part of pure cryolite (synthetic or natural) with 2 parts of talc, flour, or other inert material. If prepared dust is used, apply it according to directions.

Spray: Use 2 level tablespoonfuls of pure cryolite (synthetic or natural) per 1 gallon of water or 1½ teaspoonfuls per 1 quart of water.

Calcium arsenate

Dust: Mix 1 part of calcium arsenate with 3 parts of hydrated lime or flour.

Spray: 2¼ tablespoonfuls of calcium arsenate per 1 gallon of water or 1½ teaspoonfuls per 1 quart of water.

40% nicotine sulphate

Dust: Mix 2 tablespoonfuls of 40% nicotine sulphate with 1 quart of hydrated lime.

Spray: Use 1½ teaspoonfuls of 40% nicotine sulphate and 1½ teaspoonfuls of household ammonia to 1 gallon of water.

Rotenone (cube or derris)

Dust: Secure ready-mixed dusts. If you use your own mix, follow the directions on the container.

Spray: Use about 2 tablespoonfuls of 5% rotenone per 1 gallon of water.

Pyrethrum

Both sprays and dusts should be used according to directions. It is best to purchase ready-prepared mixtures.

Sulphur, dusting and wettable

Dust: Use the dust straight. Be sure to purchase 325-mesh **dusting** sulphur and not flowers of sulphur.

Spray: Use 2 tablespoons of wettable sulphur to 1 gallon of water.

Bordeaux mixture

Dust: Bordeaux mixture powder does not keep well. It is best to use a copper lime dust mixture fresh each season.

Spray: Use 3½ tablespoonfuls of powdered copper sulphate and 6⅓ tablespoonfuls of hydrated lime to 1 gallon of water. Mix it fresh, and do not leave it in a metal container over night.

DDT

Dust: 5% DDT dust should always be purchased ready mixed with either sulphur or an inert carrier. Never use sulphur mixtures on cantaloupes or cucumbers.

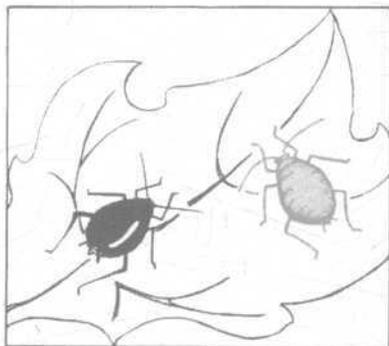
Spray: The wettable DDT powder usually comes in a 50% wettable powder. Use from 1 to 4 tablespoonfuls per 1 gallon of water as a spray. Keep it well agitated at all times.

Insect Control Measures

Aphid

Attacks practically all vegetable crops, especially cabbage, broccoli, peas, tomatoes, and turnips.

Dust or spray all parts of plants thoroughly to reach all insects. Use $1\frac{1}{2}$ teaspoonfuls of 40% nicotine sulphate and $1\frac{1}{2}$ teaspoonfuls of household ammonia in 1 gallon of water; or dust with activated nicotine dust. (If temperatures are above 90 degrees, omit the ammonia.) Combinations of pyrethrum and rotenone sprays and dusts also are very good.



7 x size

Green, black, brown, red

Blister Beetle

Attacks tomatoes, peppers, eggplants, and potatoes.

Dust thoroughly with sulphur-rotenone dust of .5% rotenone content, cryolite-sulphur dust mixture, dry pyrocide dust containing 2% pyrethrins, or 5% DDT and sulphur dust mixture. Place a pile of straw or hay outside of the row, drive the beetles into the pile, add kerosene, and burn.



Actual size

Gray, brown, black, and striped

Cabbage Looper and Imported Cabbage Worm

Attacks cabbage, cauliflower, broccoli, and lettuce.

When plants are small, dust with cryolite or any arsenical dust or spray with arsenical mixture, according to directions. After heads begin to form, use rotenone or pyrethrum sprays or dusts according to manufacturer's directions. 5% DDT dust and cryolite also are very effective.



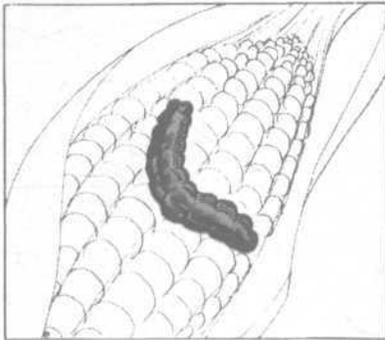
Actual size

Light green and fuzzy green

Corn Earworm

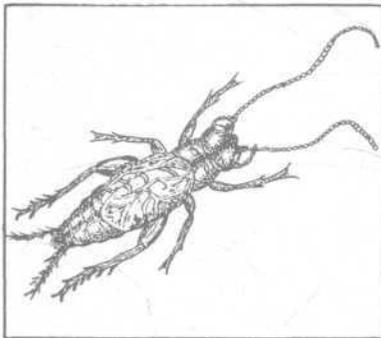
Attacks corn.

On corn, use commercially prepared mineral oil containing .2% pyrethrum — 12 to 14 drops in the tip of each ear four to six days after the silks begin to turn brown. Every silking ear must be treated. A 10% DDT dust may be used when the corn is injured in the bud stage. Recent work shows that certain DDT dusts applied with a puff-type duster may give good control of worms in the ears. These dusts have to be applied about 3 or 4 times at 2-day intervals.



$\frac{1}{2}$ size

Light green to brown



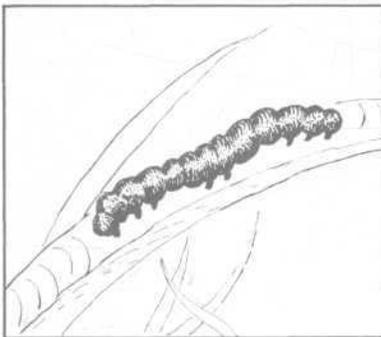
Actual size

Dark brown, black

Cricket

May attack almost all garden plants just emerging.

Dusting the soil with a 5% or 10% chlordane dust will give excellent control. Poisoned apple-peel bait is also very effective. Spread the applepeel along the beds just above the water line.



Actual size

Brown to grayish

Cutworm

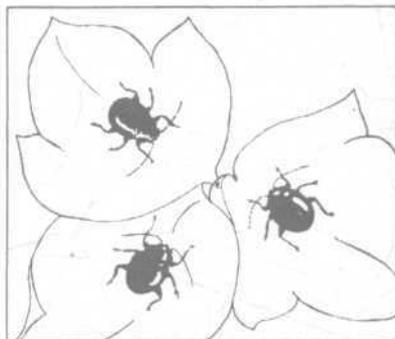
Attacks almost all garden crops.

Use poison-bran bait: 5 pounds of wheat bran; 1 level teaspoon of Paris green, sodium arsenate, or sodium fluosilicate; $\frac{1}{2}$ pint of molasses; and about 4 pints of water to make a crumbly mash. Spread the bait under plants or seedlings in late afternoon. Repeat if necessary. Make a two-inch collar of heavy paper and place around each plant with about 1 inch in the soil.

Flea Beetle

Attacks corn, cabbage, peppers, turnips, and tomatoes.

As soon as beetles appear, dust with 10% DDT dust. Usually two or three applications at 7 day intervals are necessary. Or use 1 pound of cryolite or calcium arsenate to 9 pounds of hydrated lime; repeat in five to seven days, if necessary. On edible portions of the plants use pyrethrum or rotenone dusts or sprays.



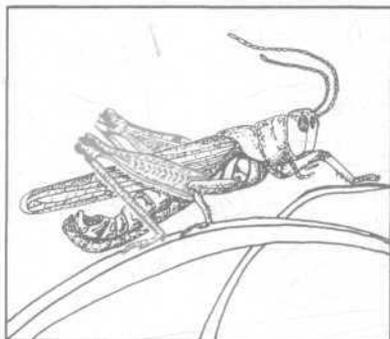
8 x size

Blue metallic, brown, or black

Grasshopper

All garden crops may be attacked.

Mix poison bran bait composed of 5 pounds of wheat bran, 2 tablespoons of 5% chlordane or 20% toxaphane, one-half pint of molasses (not corn syrup), and enough water to make a mash that will stick together. Place around on the ground near plants. A 5% chlordane dust sprinkled around on the ground near the plants and on the plants also is very effective.



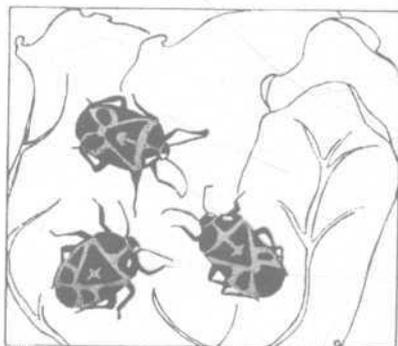
Actual size

Brown, green, yellow, many colors

Harlequin Cabbage Bug

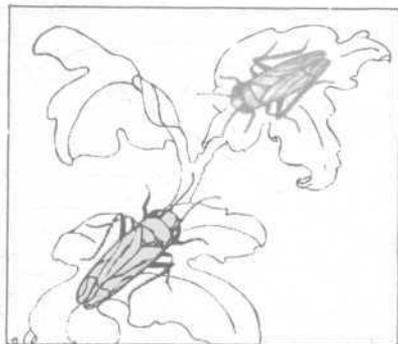
Attacks broccoli, cabbage, cauliflower, turnips, mustard, and rutabagas.

Attempt to hand-pick the bugs when they first appear. Plant a trap crop of kale or mustard, then spray with kerosene and burn to kill all insects present. Rotenone-sulphur and dry pyrocide dusts have given control in the nymphal stage. Recent work shows that 10% Sabadilla dust gives perfect control of all stages.



Actual size

Reddish and black markings



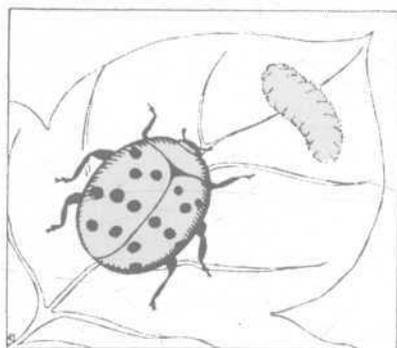
4 x size

Green, brown, straw-colored, etc.

Leafhopper

Attacks beets, cucumbers, peppers, potatoes, squash, and tomatoes.

On potatoes, control by dusting with sulphur and 5% DDT. Dust and sprays are not effective on other crops. Plants may be screened in early stages to prevent the feeding of the insect which transmits curly top blight. (See curly top of tomatoes, or yellows blight of tomatoes, page 14.)



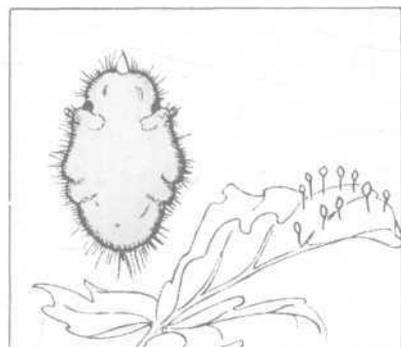
2½ x size

Yellow, with black spots

Mexican Bean Beetle

Attacks beans and cowpeas.

Before bean pods are half grown, use cryolite or calcium arsenate dust with equal parts of hydrated lime. After the pods are half grown, use rotenone dust or spray according to directions. **Be certain** to apply the control to the lower surface of the leaves, as insects feed only on this part of the leaf. DDT does not kill this insect.



10 x size

Light tan

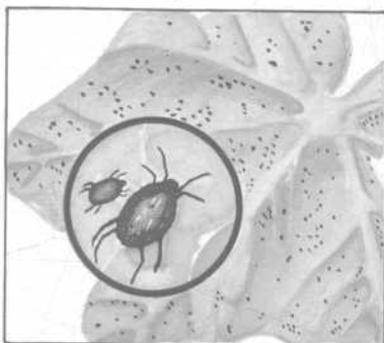
Potato Psyllid

Attacks potatoes and tomatoes.

Spray with liquid lime-sulphur—1 pint to 5 gallons of water, or ½ pounds of wettable sulphur to 5 gallons of water; or dust thoroughly with dusting sulphur or dry-lime sulphur. Be certain to cover the lower surfaces of the leaves, since insects live mostly on this portion of the plant. Begin when the plants are 6 to 8 inches high and repeat fourteen days later. 5% DDT-sulphur is now used in many places.

Red Spider or Spider Mite

These almost microscopic pests are not true insects since they have 8 legs. They vary in color from red to green, brown and variegated. They feed on the leaves and are evidenced by the plants loosing their green color. Close observation shows a webbing. On ornamentals and most garden plants sulphur will control them. With some species, a new insecticide known as a phosphate is best. Contact your county agricultural agent about using it.



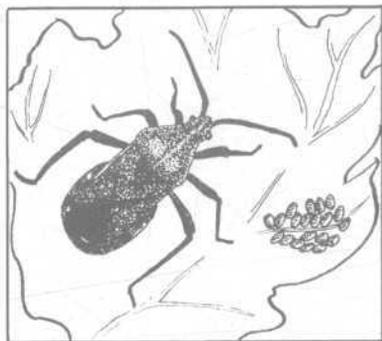
14 x size

Red to brown

Squash Bug

Attacks cantaloupe, cucumbers, pumpkins, and squash.

Hand-pick the adults and destroy the bronze egg masses on various parts of the plant. Place boards in the middle of the row in late afternoon, visit early in the morning, and destroy insects in hiding. Rotenone and dry pyrocyde dusts are somewhat effective on young stages of the insect. 10% Sabadilla dust is also effective.



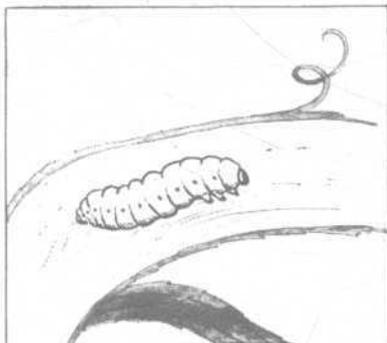
1½ x size

Brown to black

Squash Vine Borer

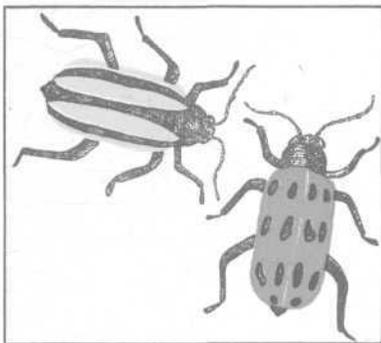
Attacks pumpkins and squash.

Remove and destroy all infested plants as soon as the borer is observed. Spray the bases of the vines with nicotine sulphate or rotenone to kill the eggs. Cover the vines with soil beyond the point of damage to stimulate new root development.



1¼ x size

A white grub



5 x size

*Green or brown, with yellow stripes
or black spots*

Striped or Spotted Cucumber Beetle

Attacks leaves of cantaloupes, cucumbers, squash and watermelons.

As soon as the plants come through the soil, dust them with 1 part of cryolite or calcium arsenate to 9 parts of hydrated lime or gypsum. Repeat the application from five to seven days as the new leaves grow and until the young melons appear. Recent experiments show that 50% cryolite dust gives best results.



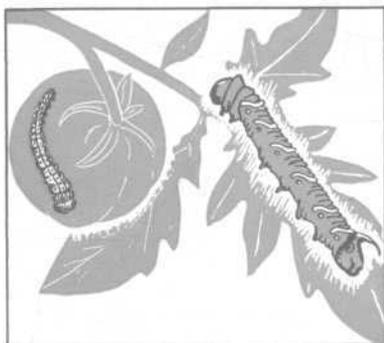
10 x size

Brown to black

Thrip

Thrips (several species) feed on flowers and garden plants. They feed on the underside of leaves, giving them a silvery appearance. Often they feed on the blooms of tomatoes, peppers and destroy them. They cause severe injury to onions. They vary in color; however the straw colored one is most numerous.

Dusting with 10% DDT at ten-day intervals gives good control on onions. Several applications are necessary.



½ size

Green with white markings

Tomato Fruit Worm & Tomato Horn Worm

Attacks tomatoes.

These large green worms feed on the leaves of tomato plants, often stripping them. It is difficult to see the worms when they are not moving, since they are the same color as the stems.

Hand-pick and destroy the worms. Dust the plants with calcium arsenate. 50% cryolite dust or 10% DDT dust is very effective.

Other Pests

There are additional minor insects and other pests which at times attack garden crops. General control measures previously described for beetles, bugs, worms, and aphids are effective in combating these pests.

Ants frequently carry off seeds and destroy spring seedlings. They may be controlled by locating the nest and by applying commercially prepared ant killers according to directions.

Sow bugs—bright, gray, soft-bodied, segmented creatures found under mulch and trash in damp places—feed on plant roots and tender portions of stems near the ground. They may be controlled by using poison bran mash, described for controlling grasshoppers and cutworms.

Millipedes and **slugs** which inhabit damp places and sometimes feed on young seedlings may also be controlled by using poison bran mash.

DISEASES

Effort to control plant diseases is best directed toward prevention. The more common preventive measures are (1.) use of clean seed, (2.) seed treatment, (3.) cultural practices, (4.) soil disinfection, (5.) use of disease-resistant varieties, and (6.) timely spraying and dusting with approved fungicides.

Damping-Off

Damping-off is a common disease on plants which are started in flats, hotbeds, or cold frames. It is caused by organisms living in the soil. There are two phases—one which attacks the seedling before it emerges, and the other which attacks after the seedling is above ground.

The first phase is difficult to recognize and a thin stand is often

attributed to poor germination of the seed. The second phase is recognized by a wilting and a water-soaked condition of the seedlings at the soil level. Plants will soon fall to the ground, bending at the soil line. Often weblike threads of the fungus grow on the fallen plant.

Control: Seed-treating chemical compounds are available which control pre-emergence damping-off and also many of the soil-borne diseases. Other practical control measures are the use of light, well-drained soil. Covering the seed with about $\frac{1}{4}$ inch of sand allows the surface to dry more quickly and makes conditions less favorable for the disease. After the seedlings are up, water the flats or beds sparingly and keep them well ventilated. Water and air the flats in the morning.

If damping-off appears after the seedlings are up, use bichloride of mercury, 1 to 1,000, and sprinkle it over the flat or along the row. Or use 1 ounce of cuprous oxide to 3 gallons of water, or 1 ounce of Semesan to 3 gallons of water. Use the mixture at the rate of 2 gallons per square yard or about $\frac{1}{2}$ gallon per flat. Always use the same material on the same flats or rows. Some seedlings, especially peppers, may be injured by allowing bichloride of mercury solution to dry on the leaves. Rinse with water or avoid wetting tops. All the seed-treating compounds are **POISON**, so keep them out of the reach of children and pets.

Root Knot or Nematodes

This is a most serious pest in vegetable gardens, particularly on the crops growing during the summer and fall months. Beans, tomatoes, cantaloupes, watermelons, squash, pumpkins, carrots and okra are especially susceptible. Gall-like swellings are produced on the fibrous feeding roots. They weaken and eventually kill the plant. At first the plants appear stunted and yellowed, and they often wilt easily on hot days. Later, the plants turn yellow and die. It is most severe on light or sandy soils and below 4,000 feet elevation.

Control: Do not plant the garden on infested soil. Do not use infested transplants. Many susceptible crops can be grown on infested soil during the winter and spring, as the pest is relatively inactive during the cooler seasons. Infested soil should be plowed and dried thoroughly during the summer if

planted to nonsusceptible crops. Alabama No. 1 and Hopi No. 155 varieties of beans are said to be tolerant to the attack of nematodes. Sweet corn, onions, and the Porto Rico and Jersey varieties of sweet potato are only slightly injured.

Arizona Bulletin 212 discusses thoroughly the root knot nematode and its control under Arizona conditions. If you have a root knot problem, ask your local county agricultural agent for a copy of this bulletin.

In recent years considerable success in greatly reducing the number of nematodes in soil by the injection of chemicals has been achieved. The most effective chemicals are chloropicrin (Larvacide), DD mixture, Carbon bisulphide, methyl bromide, ethylene dichloride, and formaldehyde. For directions see Arizona Bulletin 212, or ask your county agricultural agent.

Curly Top of Tomatoes

The most serious disease of tomatoes in Arizona is curly top, often called "blight," or yellows. A plant infected with this malady has an erect habit of growth and a stunted condition. The leaflets roll inward and the whole leaf turns downward in a spiral form. The leaves become crisp, yellow, and thickened with a purplish color along the veins and stems. The fruit ripens prematurely and is insipid in flavor. The plants die prematurely.

The virus causing curly top of tomatoes affects many other garden crops, and on the desert there

are many native host plants. The virus is carried by the beet leafhopper and is spread from plant to plant by the feeding of the infected insects. Most early vegetable crops are infected in the early spring as the insects migrate northward. However, some stragglers may live over on native host plants and infect garden crops in midsummer or fall.

Control: In the higher altitudes the best method of control is the prevention of the insect from feeding on the plants. Grow the transplants in a flat or hotbed under a cheesecloth cover. Be sure to keep the plants covered in hotbeds as well as in the field.

When the plants are set in the field, cover them with a cheesecloth tent made with 2 yards of the cloth folded once, with the end and one side sewed up. Put the tent over small sticks with rough bark or use plasterlath stakes to hold it up. Set the plants in the row so the tent will cover two plants. Spread the sides of the tent by using 1-foot-long stakes to hold them out. Keep the cover over the plants until the middle of June.

Tomato plants grown in the afternoon shade of trees or tall growing crops are less affected. Early tomatoes seeded in the rows and covered as described will escape most of the early infection. By setting two plants in a hill and placing the hills close together the loss from curly top will be reduced. Tomatoes planted from seed sown in the garden, and where the roots are not disturbed, show less injury from curly top than transplants.

There are no garden varieties of tomatoes resistant to curly top. Spraying the plants with fungicides will not control curly top.

Curly Top of Other Vegetables

As previously mentioned, curly top attacks a number of garden crops, among the more common of which are beans, cucumbers, cantaloupes, garden beets, peppers, pumpkin, spinach, and squash. The Cushaw types and Marblehead squash are tolerant to the disease. The Tennessee sweet potato and cheese groups of pumpkins are said to be resistant.

For early plantings of the other crops, the control method is the same as for tomatoes, but it is difficult to keep vine crops under cover. In the low and middle elevations with a long growing season, the loss from curly top may be escaped by planting the susceptible crops after the middle of June when the migration of the hopper has passed. In this case use early-maturing varieties.

Soil-Borne Diseases

In some areas where gardens have been planted on the same ground for a long time, soil-borne diseases have built up until it is almost impossible to control them. The best method is to select a new garden spot and use clean, treated seed. Plant the old garden spot to corn, grain sorghum, grain, or grass crops for at least four years and turn under large quantities of barnyard manure or green manure crops.

Disease Control Measures

CROP & DISEASE	APPEARANCE AND CONTROL
Beans	Irregular, watery, light-green spots on leaves which later turn dry and brown. Rusty-red spots on pods. The disease is carried on and in the seed. Use disease-free seed, preferably western grown. Destroy plant refuse. Do not pick or cultivate beans when leaves are wet.
Bacterial Blight	
Rust	Small raised, rust-colored brown spots on leaves and sometimes on pods. Use resistant varieties — Refugee (1000-1); Refugee Wax; Keeny's Rustless Golden Wax; Decatur; Kentucky Wonder: White, Resistant, and No. 4; and others. Sulphur dust will reduce loss if applied as soon as rust appears.
Cabbage Cauliflower Broccoli	Plants dwarfed, often one-sided, with yellow leaves. Veins and midribs become black. Heads often decay and fall off. Use only clean seed. Treat it before planting by soaking seed in hot water at 122° F. for 25 minutes. Dry it and, just before planting, treat the seed with Semesan. Sow the seeds and set the plants in disease-free soil. Burn infected plants and refuse. Keep cruciferous plants off the land for four years.
Black Rot	
Yellows (Cabbage only)	Plants stunted, yellowish green, and often one-sided. The lower leaves drop, often leaving the stem bare. Use resistant varieties: EARLY — Jersey Queen, Resistant Golden Acre. MID-SEASON — Marion Market, Globe. LATE — Wisconsin All Season, Wisconsin Ballhead, Wisconsin Hollander.
Carrots	Soft, slimy rot on the roots just below the ground level; the rot spreads from root to root where the plants touch. Rotate crops. Do not plant carrots on infected ground.
Soft Rot	
Cucumbers	Powdery white coating on leaves and stems of vines. Dust with dusting sulphur except when afternoon temperatures are over 90° F. In that case use an insoluble copper dust.
Powdery Mildew	

Cucumbers	Plants dwarfed; young leaves crinkled; rosetted old leaves turn yellow, wilt, and die.
Cantaloupes	See curly top on crops other than tomatoes, page 15. Stunted yellow plants, leaves dwarfed, bunchy, and mottled. Fruit deformed.
Curly Top	
Mosaic	Burn plants showing symptoms. Control insects which spread the disease. The Shamrock variety is resistant and good for home gardens as a slicing cucumber.

Peas	Small water-soaked spots on leaves, stems, and pods. The young plants usually die; older plants turn yellow but may survive, but the pods will be spotted.
Bacterial Blight	Use clean seed and plant in well-drained soils. Destroy infected plant refuse.
Powdery Mildew	Powdery white coating on stems, pods, and leaves. Dust with dusting sulphur except when afternoon of Bordeaux Mixture to 3 gallons of water. Avoid wetting the foliage.
Rhizoctonia and Fusarium Root Rots	Seedlings damp-off, as described. Roots and stems of older plants show rotting. Plants become stunted and yellowish and die before producing a crop. This is a soil-borne disease. Rotate the crops; treat the seed (use Arasan, Semesan or Spergon). If the seedlings in the row begin to die, soak that part of the row with 1 to 1000 mercuric chloride, using 1 ounce of crystals (dissolved in 2 quarts of hot water) to 7 ¹ / ₂ gallons of water.

Peppers	Leaves begin to droop, wilt, and curl, and soon the plants turn brown and die. Dark strands show up in cut stems.
Fusarium or Chili Wilt	Sterilize soil in seedbeds. Use the ridge method of culture; keep adding more soil to the ridge as the season progresses. Avoid infested soil. There are no resistant varieties.
Fruit Rot	Dry, sunken spots on fruit. Fruit usually deformed. Fruit rot seems to be combined with sunburn injury. Anything to prevent sunburning is suggested as a control.
Curly Top	Protect plants in hotbeds same as tomatoes. Put two plants in each hill, use closer spacing, seed in place if possible.

Potatoes

Ring Rot

The first symptom noticed may be the sudden wilting of one stem of the plant. In the tuber there may be a soft, rotted area about $\frac{1}{4}$ inch beneath the skin; later the entire heart of the tuber may be rotted.

Use only clean seed. Cut the seed with a knife sterilized after each slice. Hand-drop the seed in gardens. Do not store seed in bags or bins with infected material.

Early Blight

Brown spots appear, usually with concentric rings on the leaves.

Apply potato psyllid sprays or use 4 ounces of Bordeaux mixture to 3 gallons of water. Be certain to cover both the upper and the lower surfaces of the leaves.

Psyllid Yellows

Marginal yellowing and upward rolling of the base of small leaflets on young leaves develop. The affected leaves often turn a reddish or purplish color on the edges. In later stages the plants become harsh and stiff, turn yellow, and die. Yield of tubers very poor.

This disease is transmitted by insects. (See control of potato psyllids, Page 10.)

Black Scurf or Rhizoctonia

Small-to-large black spots appear on the skin of the potato. It is often called "the dirt that will not wash off."

Plant clean seed; treat all seed with the acidulated mercuric chloride or standard mercuric chloride treatment.

Common Scab

Rough, pitted, corky spots on surface of tubers. Organism lives in the soil from year to year.

Rotation and clean seed or seed treatment as for Rhizoctonia is recommended.

Virus and Mosaic Diseases

Rugose Mosaic—Leaves small and much crinkled. Leaf Roll—Leaflets roll upwards and plant is erect.

These are both virus diseases carried in the tubers. Use the best seed available, as there is no remedy. Yield is greatly reduced.

Plant only clean seed potatoes. (Send plant specimens to the Department of Plant Pathology, University of Arizona, for disease identification and specific measures for control.)

Squash

Curly Top

Dwarfing, rosetting, and wilting of the younger leaves; in later stages the leaves turn light yellow and the plants die.

(See curly top on plants other than tomatoes, Page 15).

Fruit Rot

Rot will attack all sizes and ages of fruit, but it is more common on young fruit.

Train the vines on a high, dry bed. Keep the fruit covered with insoluble copper dust (Cuprocide).

Both young and old plants wilt and die. Woody strands in the stems are discolored.

Wilt

Rotate crops. Do not plant on infected soil or where other cucurbits have been planted.

Tomatoes

Curly Top

Plants have erect, rigid habit of growth; the leaves roll inward, and the branches droop. The leaves are thickened and yellow and are harsh to the touch. The growth is retarded and the plants eventually die.

(See curly top of tomatoes, Page 14.)

Early Blight

Irregular brown spots with concentric rings appear on leaves. Sometimes late in the season the plants are almost defoliated, resulting in sun-burned fruit.

Spray with 4 ounces of Bordeaux Mixture to 3 gallons of water, or use insoluble copper compound.

Soft Rots of Fruit

Watery, rotten spots appear on the fruits usually where they touch the ground.

Stake the plants by tying two or three stems to hold them erect. Spray with Bordeaux Mixture, as above, or insoluble copper compound.

Wilt

The leaves turn yellow and wilt and the plant eventually dies. (There is no erect growth or purpling as there is in curly top.) Wood strands in the stems are discolored.

Plant on clean soil; use wilt-resistant varieties: Marglobe, Break O'Day, Norton, Pritchard (Scarlet Topper), Rutgers and Pearson.

For Gardening Information . . .

If you wish information on growing farm gardens, ask your County Agricultural Agent for a Copy of Extension Circular 130, "Arizona Home Gardening."

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