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**diseases
of
garden
crops**

regular 227

**Agricultural Extension Service
University of Arizona, Tucson**

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Diseases of Garden Crops

By Ivan J. Shields
Extension Plant Pathologist

Diseases of vegetables may be considered under two main groups (1) Those caused by fungi, bacteria, viruses, and nematodes, and (2) Those brought about by improper growing conditions

When garden vegetables are attacked by fungi, bacteria, viruses, or nematodes they are said to be diseased. They may be attacked any time from planting to maturity. Death, reduced yields, or poor quality may result.

In many cases, unfavorable soil and weather conditions cause abnormal growth. Vegetables so af-

ected also may be considered diseased. Poor soil fertility, too much or too little water or an excess or shortage of plant food may cause unhealthy plants.

These problems are discussed in Circular 130 "Arizona Home Gardening" available at your County Agricultural Agent's office. Also see Circular 122, "Control Garden Insects."

The following information will deal mainly with the control of the diseases caused by the parasitic organisms.

Disease Control Program

Because healthy and disease-free plants are desired, certain control measures are necessary to keep disease losses low. Although complete control of garden diseases is not practicable, there are simple inexpensive methods that will prevent much of the damage.

Resistant Varieties

Selecting vegetable varieties which are resistant to diseases present in the area offers the only effective means of disease control in many cases. Such resistant varieties are usually so marked in the seed catalogs. Their use is recom-

mended where varieties are adaptable to the area in which they are to be grown.

Clean Seed and Seed Treatment

Purchase seed and plants from reliable firms or growers. As some diseases are carried in the seed, it is necessary to obtain seed from disease-free areas.

The treating of seed with recommended chemicals gives two advantages. It (1) kills any disease parasites which may be present on the seed, and (2) protects the seed and seedling against decay organisms.

in the soil.

The cost of seed treatment is low when compared to the protection obtained. Either ask your seed dealer for treated seed or buy one of the recommended chemicals and treat your own seed according to the directions on the package. No special equipment is needed.

Rotation & Sanitation

Where root knot, root rots, and some of the wilts are problems it is very important to rotate with other vegetables or crops not susceptible.

Early destruction of plant refuse is important to reduce carryover of disease parasites. During the growing season, take out and destroy badly diseased plants, especially those with virus diseases. Control weeds as they harbor many diseases. Plants should be handled as little as possible, especially when wet, as some of the diseases

are easily spread in this manner.

Soil Fumigation

If rotation with non-susceptible crops is not possible, ethylene dibromide, or dichloropropene can be used as fumigants to control nematodes and reduce other soil inhabiting parasites. This chemical is toxic to plants, so treatment must be made about ten days to two weeks before planting.

Spraying & Dusting

Certain diseases of the home garden, such as mildews, leaf spots, certain blights, and rusts can be controlled by proper use of recommended fungicides. Good results with dusts or sprays are obtained only when the affected plants are thoroughly covered with material recommended. Do not delay, as control measures must be timely to be effective.

Common Diseases of Vegetables

Soil-Borne Diseases

Damping-off and Seed Decay

Damping-off is a disease which attacks the seedlings of most vegetable crops, especially when air temperatures are extreme, humidity high, and soil excessively wet.

Symptoms

The small plants may fail to come up or may be killed soon after emerging. A close inspection of the seedling will often reveal a sunken brown area on the root near the soil line which is caused by a fungus in the soil. The seed may decay before or as it germinates.

Treatment

Use a reliable seed disinfectant. Chemical seed treatments accomplish a twofold action.

1. Controlling the seed decay before germination and protecting the small seedlings from damping-off for a brief period after germination.

2. Disinfecting the seed surface killing any parasitic organism that may be present there.

Proper precautions of favorable soil temperature, good seedbed preparation, and adequate moisture are necessary to insure a quick germination and an even stand.

Arasan can be used on beans, beets, lima beans, carrots, cantaloup, cucumber, chard, eggplant, parsley, pepper, pumpkin, squash, sweet corn, tomato, and watermelon.

Semesan can be used on beets, cabbage, cantaloup, carrots, cucumber, eggplant, parsnip, parsley, peas, pepper, pumpkin, salisfy, spinach, squash, tomato, and watermelon.

Sperguson can be used on beans, lima beans, carrots, lettuce, peas, and romaine. Other seed-treatment chemicals may also be used. If in doubt, check with your County Agricultural Agent regarding seed treatment.

Southern Blight

Most of the vegetables, many weeds, and other crops are subject to attack of southern blight. It usually appears in small patches in the field killing a few plants or may become more severe and affect large areas. It is often active in rotting the fruits of cantaloups.

Symptoms

Southern blight usually attacks the plant at the base of the stem or where leaves or fruit touch the soil. The plant soon wilts and a rotting of the stem is soon evident. A white cottony growth is usually present and small round resting bodies, one-eighth inch or less in diameter, are present.

Treatment

1. Practice clean cultivation to destroy susceptible weeds and keep soil surface exposed. When feasible remove and destroy diseased plants.

2. Where possible grow plants

on beds and avoid excessive irrigation.

3. Rotate with immune crops such as corn, small grain, or grasses. Cabbage shows considerable resistance to the disease.

Watery Brown Rot or Drop

Watery brown rot is a disease caused by a fungus in the soil. It attacks lettuce, cabbage, carrots, celery, and related crops. It does considerable damage when susceptible vegetables are grown successively on the same ground.

Symptoms

The rot begins on the stem near the soil, or on one of the lower leaves which is in contact with the soil. It spreads rapidly under wet soil conditions killing additional leaves and rotting the heart of the stem.

This watery decay soon contains many black odd-shaped resting bodies much larger than those of southern blight. These remain alive in the soil for several years.

Treatment

1. Practice a three-year rotation with such crops as corn, cereals, onions, potatoes, or beets.

2. On highly infested soils, heavy applications of calcium cyanamide have been effective in reducing the incidence of the disease. Spot treatment is effective. (See Bulletin 253, "Watery Brown Rot of Vegetables in Arizona.")

3. Removing and burning all diseased plants is possible on smaller areas and will slow a buildup of the disease.

Root Knot

The root knot nematode, a small eel-like worm, attacks the roots of most vegetable crops. Tomatoes, field peas, root crops, melons, and

okra are the most susceptible. The root knot nematode is usually more damaging in sandy or sandy loam soils.

Symptoms

Infested vegetables will be stunted or slow growing. The leaves often will yellow and may wilt during the hotter parts of the day. The roots will have swellings or knots, which reduce their ability to absorb water and nutrients. In the case of root crops, the swellings will make the crop unmarketable.

Treatment

1. Dry summer fallow, where the ground is kept free of weeds, will reduce the damages to the next year's vegetable crop.

2. Rotate with resistant crops such as sorghum, small grains, grasses, or peanuts. There are very few crops in which this nematode will not maintain some of its population.

3. In many cases soil fumigation will be necessary to reduce the nematode population. EDB and D-D mixtures are soil fumigants and can be easily applied on small plots. They should be applied ten days to two weeks before planting, in well cultivated soil with moisture sufficient for germinating seeds. The soil temperatures should be near 60° F. to 70° F. Using fumigant two feet or less from roots of growing plants may cause severe injury to them.

4. In the event you discover nematodes on your crop, more frequent watering will aid the plant in obtaining an adequate water supply and increase chances for a fair crop. One or several of the above control measures should follow to control the nematodes the next season.

Insect-Borne Diseases

Curly Top

Curly top is a virus disease which may cause severe injury to many of the vegetable crops in Arizona. Originally the disease built up in sugar beets and related weed hosts. The virus-carrying leafhoppers spread the disease from these infected plants to the vegetables.

Curly top is very destructive to all varieties of tomatoes, most varieties of green or snap beans, and many varieties of dry beans. It may be serious on spinach, garden beets, Swiss chard, squash, and pumpkin.

It causes moderate injury on mustard, eggplant, peppers, cucumbers, and some varieties of muskmelon. There is no apparent injury on lima beans, lettuce, watermelons, onions, cabbage, garden peas, asparagus, and rhubarb.

Symptoms

In susceptible varieties seedlings that become infected with the curly top virus are badly injured or killed. In older plants a rolling and yellowing of the leaves may occur, and severe stunting will result in many cases. Some of the severely stunted plants often die. The roots of diseased plants are smaller and an excessive number of the small lateral roots near the ground level may occur.

Treatment

It is not practical to control the leafhopper but here are a few suggestions which may help the home gardener to reduce losses from curly top.

1. Plant more seeds to the row and weed out the curly top infected plants when they show symptoms. This is especially helpful in toma-

toes.

2. Sowing seed directly in the field often gives the plants a better start and enables the grower to take advantage of a thicker stand.

3. Practice rigorous weed control as the leaf hoppers can build up on certain curly top susceptible weeds.

4. Shading under slatted frames or muslin cloth helps prevent losses from curly top.

5. Some curly top resistant varieties are being developed in beans, squash and pumpkins. Many of these varieties have not, as yet, been adequately tested in Arizona. Marblehead squash and the Cushman pumpkin have been grown successfully in the state.

The Mosaics

The mosaics, caused by several viruses, are represented in many vegetable crops, especially the melons, beans, lettuce, and related crops. In many instances the mosaic virus is carried from one season to another in the seed. The disease is then spread in the field the following season, chiefly by aphids. It can also be spread from diseased to healthy plants mechanically, by equipment, or handling.

Symptoms

In mosaic, the leaves usually become mottled with yellow and green, ruffled or otherwise distorted and dwarfed. Affected plants usually produce a low quality and low yielding crop. From severely affected plants, no yield should be expected.

Treatment

1. Obtain mosaic-free seed, if possible, to reduce the source of the mosaic disease.

2. Susceptible crops should be

isolated from other crops which may harbor mosaic including alfalfa, pinto beans, soy-beans, and weed hosts.

3. Early season removal of mosaic infected plants and control of aphids will help in checking the spread of the disease.

4. Some varieties have shown resistance to mosaic in several states:

Beans—Top Crop, Wade, Rialto, Rival, Logan, Ranger, Contender, and Florida Belle.

Cucumber—Niagara, Ohio MR17.

Spinach—Virginia Savoy.

Muskmelon—MR17, Early Sure Crop Hybrid, Sensation Hybrid, Ohio 31, and Burpee Resistant.

Tobacco Mosaic or Tomato Mosaic

The tobacco mosaic virus occurs commonly on tobacco, tomato, pepper, and eggplant.

Symptoms

The tobacco mosaic causes a light and dark green mottling accompanied by some curling and malformation of the leaf, very similar to the other mosaics. Occasionally a yellow mottling occurs also. It is spread by aphids, through soil, through handling, and occasionally through seed.

The more common source of the virus is smoking tobacco. Gardeners contaminate their hands in smoking and infect plants during normal handling.

Treatment

Strict sanitation is necessary. Wash hands with soap after handling diseased plants or tobacco before touching healthy plants. Also control weeds.

Diseases By Vegetable Crop

Asparagus

Rust (Fungus)

Symptoms

This fungus, which overwinters in old infected plant parts, causes small reddish yellow spots on the new shoots in early spring. These spots, or pustules, soon spread the disease by releasing the rust spores. In severe cases, tops turn yellow and die early.

This disease usually is not serious in Arizona.

Treatment

Plant rust-resistant varieties such as Mary Washington. Dust with sulfur several times beginning three weeks after cutting stops. Dust when plants are wet with dew. Cut tops close to ground in the fall and burn them.

Beans (bush, pole, and lima)

Damping-off and Seed Decay

(See page 4)

Bacterial Blight (Bacteria)

Symptoms

The bacteria overwinters in the seed and on old diseased plants. The water-soaked patches soon appear on leaves of seedlings which are often surrounded by yellowish halos. Spots on pods usually are water-soaked with reddish margins, often sunken. Yields may be reduced in Arizona especially in areas of summer rains.

Treatment

Plant seed grown in western arid areas. Do not save seed from spotted pods. Do not work beans when wet. No resistant varieties are available.

Curly Top (See page 6)

Root Knot (See page 5)

Southern Blight (See page 4)

Beets, Swiss Chard

Damping-off and Seed Decay

(See page 4)

Curly Top (See page 6)

Root Knot (See page 4)

Broccoli (See Cabbage)

Brussels Sprouts

(See Cabbage)

Cabbage, Broccoli, Brussels Sprouts, Cauliflower, Chinese Cabbage, and Collards

Damping-off and Seed Decay

(See page 4)

Black Rot (Bacteria)

Symptoms

Yellow or brown spots first appear on edges of leaves and form V-shaped areas. The veins of these areas darken and the blackening progresses into the stem. Plants may show some stunting.

Treatment

Plant disease-free seed in soil that has not grown cabbage or cauliflower for at least four years, as the bacterium is carried over in the seed in infested seedbeds or in the soil. Use steam-sterilized soil in seedbeds or obtain healthy transplants. Destroy all diseased plant refuse by burning.

Yellows (Fungus) (cabbage,
kohlrabi, and kale)

Symptoms

Young seedlings wilt and die. On older plants leaves may yellow, wilt, and drop off beginning at the base. Edges of leaves may be purplish in color. Infected plants seldom produce good heads.

Treatment

Start seed in clean soil as fungus lives in the soil and enters plant through roots. Spraying is of no value.

Where Yellows occurs plant resistant varieties, such as: **Early**—Resistant Golden Acre,* Jersey Queen; **Mid-season**—Medium Copenhagen,* Resistant Detroit,* Marion Market, Globe; **Late**—Wisconsin Ball Head or Red Hollander.

**(In recent tests conducted in the Salt River Valley by the University of Arizona, Department of Plant Pathology, these varieties showed significantly better yields planted on infested ground.)*

Root Knot (See page 5)

**Cantaloup or Muskmelon,
Cucumber, Squash,
Honeydew, Melon,
Jap Melon, and Casaba**
Damping-off and Seed Decay

(See page 4)

Powdery Mildew (Fungus)

Symptoms

Small powdery white spots on underside of leaves enlarge until the entire leaf is covered. The foliage later appears yellowish and may be killed.

Treatment

Apply dusting sulfur as soon as any mildew is found. Imperial 45

cantaloup is not sulfur-resistant and is injured by sulfur dust or spray. A spray of 3 ounces of cuprous oxide in 10 gallons of water may be used as an alternative, especially when temperatures exceed 90° F.

Curly Top (See page 6)

Root Knot (See page 5)

Carrots

Damping-off and Seed Decay

(See page 4)

Soft Rot (Bacteria)

Symptoms

A soft shiny mushy rot develops in the field at the end of the growing season, in transit, or in storage. An offensive sulfurous odor distinguishes this type of decay.

Treatment

Practice crop rotation. Dig crop when soil is not wet and allow the roots to dry off before storing. Avoid injury in carrots while handling. Store only sound carrots in a cool, dry place.

Watery Brown Rot (Fungus)

(See page 5)

Aster Yellows (Virus)

Symptoms

Leaves are twisted, stunted, yellow or reddish. Additional hair-like roots develop laterally from the tap root.

Treatment

Control weeds which harbor the virus and insects. Insect control is only partially successful. The disease is usually not serious in Arizona.

Root Knot (See page 5)

Casaba (See Cantaloup)

Cauliflower (See Cabbage)

Celery

Early Blight (Fungus)

Symptoms

Light or reddish brown, irregular spots on older leaves enlarge and turn dark becoming ashen gray later. Leaf stalks often are affected.

Treatment

Five or 10 percent zineb dust may be applied as soon as any leaf spotting is seen. Up to 15 percent sulfur in the dust aids coverage. Repeat at two-week intervals for three or four applications, if necessary.

The fungus is carried over on old plants or refuse. Or it spreads to new plants in seed-beds or in the field.

Late Blight (Fungus)

Symptoms

Small circular spots containing many black dots appear on the leaves. Stems show similar but elongated spots.

Treatment

Same as for Early Blight.

Pink Rot (Fungus) (See watery brown rot page 5)

Root Knot (See page 5)

Chard, Swiss (See Beets)

Chinese Cabbage (See Cabbage)

Collard (See Cabbage)

Corn (Sweet)

Damping-off and Seed Decay
(See page 4)

Smut (Fungus)

Symptoms

Hard greenish "boils" appear on ears, stalks, or tassels which soon become black, smutty masses.

Treatment

Cut out and burn smut galls at weekly intervals before the spores are spread. As smut can be carried over in the soil, three-year rotation is of some benefit.

Cucumber (See Cantaloup)

Eggplant

Damping-off and Seed Decay

(See page 4)

Root Knot (See page 5)

Endive (See Lettuce)

Garlic (See Onions)

Honeydew (See Cantaloup)

Jap Melon (See Cantaloup)

Kale (See Cabbage)

Kohlrabi (See Cabbage)

Leek (See Onions)

Lettuce, Endive

Damping-off and Seed Decay
(See page 4)

Drop (Fungus) (See watery brown rot, page 5)

Mosaic (Virus) (See page 7)

Big Vein (Virus)

Symptoms

Young seedlings may be severely affected. Older plants have pale colored enlarged veins. Heads are poorly formed.

Treatment

Avoid planting on soil with big vein disease history. Virus lives over in the soil and apparently passes into the feeding roots. Avoid using soil from infested fields.

Root Knot (See page 5)

Tip Burn (Physiologic)

Symptoms

Low humidity and adverse temperature conditions cause the margins of the leaves to turn brown and dry. Often appears shortly after rain or heavy irrigation.

Treatment

Maintain best growing conditions possible. A uniform water supply is desired. Great Lakes variety is resistant.

Muskmelon (See Cantaloup)

Mustard (See Cabbage)

Okra

Root Knot (See page 5)

Wilt (Fungus)

Symptoms

Yellowing and stunting may be followed by wilting and death of plant. Stem may show dark streaks when split lengthwise.

Treatment

Plant in rotation with other vegetables.

Onions, Garlic, Leek

Damping-off and Seed Decay

(See page 4)

Pink Root (Fungus)

Symptoms

Roots turn pink then shrivel or decay. New roots eventually become diseased also. Plants are stunted.

Treatment

Rotate crops. Grow crop under ideal conditions, with adequate nitrogenous fertilizer. Several strains of yellow and white Bermuda onions are resistant.

Parsley (See Carrots)

Parsnip (See Carrots)

Peas

Damping-off and Seed Decay

(See page 4)

Bacterial Blight (Bacteria)

Symptoms

Water-soaked spots develop on stems, leaves, and pods. The young plants usually die. Older plants may turn yellow and survive but pods will be spotted.

Treatment

Rotate crops. Plant seed from disease-free fields. Destroy infected plant residue.

Powdery Mildew (Fungus)

Symptoms

Grayish powdery coating forms over leaves, stems, and pods. The mildew will rub off. Diseased plants soon turn yellow and may be killed.

Treatment

Dust affected plants with 325-mesh sulfur as soon as mildew appears. In hot weather use bordeaux mixture.

Root Knot (See page 5)

Peppers

Damping-off and Seed Decay

(See page 4)

Bacterial Leaf Spot (Bacteria)

Symptoms

Small, round, water-soaked spots occur on leaves which may cause leaves to yellow and drop. Fruits may show wart-like raised spots.

Treatment

Losses can be reduced by treating the seed with a 1:2000 solution of mercuric chloride for three to four minutes. After treating, wash plants in running water for fifteen minutes, and then plant in new seedbed soil. Rotate crops. Spraying or dusting with copper containing fungicides may reduce leaf infection.

Mosaics (Virus) (See page 7)

Curly Top (See page 6)

Root Knot (See page 5)

Potatoes, Irish

Ring Rot (Bacteria)

Symptoms

Sudden wilting of one or more stems of the plant is usually the first symptom. Tubers rot and when cut across show a yellow or brown mushy ring one-quarter inch under the skin.

Treatment

Plant seed stock free from disease. Treat seed stock. Use mercuric chloride 1:500 on knives for cutting seed.

Black Leg (Bacteria—seed and soil borne)

Symptoms

One or more stems of a hill may be affected with yellowish colored foliage accompanied by rolling of the leaves. The stems are black-

ened and rotted at or below the ground line. Blackening and rotting will extend into the stem end of the tubers and also may extend six to eight inches up the stem. Tubers may rot entirely, usually beginning from center outward.

Treatment

Same as for ring rot.

Crop rotation will reduce losses as bacteria will carry over in the soil for long periods. Suberizing of cut seed before planting will reduce infection from soil.

Common Scab (Fungus)

Symptoms

Numerous rough, corky, or scabby spots are present on tubers as they mature. Parasites may live in the soil from year to year and are spread by scabby seed.

Treatment

Plant Certified or scab-free seed stock. Treat seed stock. Do not plant where disease is known to be in the soil. Applications of fresh manure before planting usually increase scab that season.

Black Scurf or Rhizoctonia (Fungus)

Symptoms

This disease causes reddish brown cankers on new sprouts or stems. These cankers may girdle stems of older plants causing stunting and sometimes formation of aerial tubers in the axils of the leaves. Small to large black spots appear on the skin of the potato tuber.

Treatment

Plant clean seed. Treat seed with acidulated mercuric chloride or standard mercuric chloride. Rotate crops.

The disease is often more damaging when following alfalfa.

Mosaic Diseases (several viruses)

Symptoms

Several mosaic diseases cause various types of light or dark green mottling, often accompanied by crinkling of the foliage and stunting of the plant. A yellow mottling may also be evident.

Treatment

Plant Certified or mosaic-free seed as the virus is seed-borne and is spread in the field by aphids. Aphid control is of questionable benefit in growing commercial potatoes unless an infestation occurs early in the growing season.

Leaf Roll (Virus)

Symptoms

Plants show upward rolling of the leaflets lengthwise. Some stunting or yellowing may occur. Reddish or purplish discoloration of the affected leaves may occur. Smaller and fewer tubers usually result.

Treatment

Use of clean seed and aphid control reduce the losses from this disease.

Root Knot (See page 5)

Psyllid Yellows

(Psyllids, a type of insect)

Symptoms

Bases of leaves roll and cup upwards. The rolled portions often assume a reddish or purplish color. Older affected leaves may die. Excessive branching and tubers are often formed along stems. The disease is not carried over in tuber, but plants grown from affected tubers are greatly weakened.

Treatment

Control Psyllids with DDT, sulfur, or lime-sulfur spray.

Pumpkin (See Cantaloup)

Radishes

Damping-off and Seed Decay

(See page 4)

Root Knot (See page 5)

Spinach

Damping-off and Seed Decay

(See page 4)

Downy Mildew (Fungus)

Symptoms

Yellow spots appear on upper sides of leaves and a violet gray mold on the lower sides. The lower leaves are usually affected first. The yellow spots soon die and turn brown. The infection then soon spreads over the entire plant.

Treatment

Obtain disease-free seed, if possible. Follow a two or three-year rotation, and plow under the old spinach immediately after harvest. Spraying or dusting has not proved practical in controlling this disease.

Avoid too thick a planting on well-drained soil. Excessive irrigation aggravates the disease.

Squash (See Cantaloup)

Sweet Potatoes

Scurf (Fungus)

Symptoms

Scurf causes brown to black spots of discoloration in the skin. The discoloration may spread uniformly over the potato in later stages. Only the underground parts are affected, but this allows the entrance of rotting organisms.

Treatment

Careful selection of scurf-free

seed, seed treatment, and three to four-year rotation are effective in preventing this disease. Making vine cuttings is a further precaution in getting disease-free transplants.

Root Knot (See page 5)

Black Rot (Fungus)

Symptoms

Grayish black to greenish black spots are present on the potatoes when harvested. This reduces quality and increases storage rots. Slips made from infected potatoes are yellowish and spindly. Stems will rot off in the field, but may continue to live as other roots develop which support the weakened plant.

Treatment

Plant disease-free slips from Certified seed roots. Use a three to four-year rotation. Seed may be dipped in mercuric chloride (1 ounce to 8 gallons of water) or semesan bel solutions.

Tomatoes

Damping-off and Seed Decay

(See page 4)

Early Blight (Fungus)

Symptoms

Formation of a stem lesion, or irregular brownish-gray spots with concentric rings in the leaves indicates the presence of early blight. Occasionally fruit infections occur causing black sunken spots.

Treatment

Practice a three-year rotation both in nursery seedbed and in the field. Acquire disease-free seed if possible. Treat the seed.

Control is seldom necessary in the field, but spraying or dusting with fixed copper compounds controls the disease. The Stone, Norton, and Marglobe varieties are fairly resistant to early blight.

Curly Top (See page 6)

Root Knot (See page 5)

Blossom End Rot

(Physiological)

Symptoms

Fruits develop dark sunken spots on the blossom end. This is caused by irregular water supply. It is most noticeable after dry periods or water stressed plants.

Treatment

Try to maintain an even water supply. Irrigate at regular intervals. The Pritchard and Marglobe varieties are less susceptible.

Turnips (See Cabbage)

Watermelon

(See also Cantaloup)

Fusarium Wilt (Fungus)

Symptoms

Stunting or death of seedlings and wilting of older plants are indications of wilt infection. Several runners may be affected before the whole vine wilts. The fungus lives indefinitely in the soil and is carried in the seed.

Treatment

Obtain wilt-free seed, if possible. Plant on ground where wilt has never been a problem. Resistant varieties are Klondyke R7, and Blue Ribbon.

TO THE HOME GARDENER:

Ask your County Agricultural Agent or Home Demonstration Agent for copies of "Arizona Home Gardening," Circular 130, and "Control Garden Insects," Circular 122