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Disease Control in the Home Vegetable Garden

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Plant diseases can be a significant problem in home gardens. Most vegetables are susceptible to a number of diseases. Wilts, leaf spots, blights and fruit rots are just a few of the disease problems that plague vegetables gardens every year.

Plant diseases are caused by four primary types of organisms: fungi, bacteria, nematodes and viruses. These organisms are often referred to as *plant parasites* or *pathogens*.

Plant diseases caused by fungi and bacteria are most common when rain showers and/or heavy dews are frequent and temperatures are warm. During these times, scout the garden regularly for disease. Viral diseases can occur at any time, and nematode damage can be more evident if conditions are dry.

Home gardeners can reduce the occurrence of many diseases with sound cultural practices.

Site Selection

Although few people have an ideal garden spot, site selection is important for a successful garden.

A home garden site should be well drained. Avoid wet and poorly drained soils. Excessive soil moisture will favor root and crown diseases such as damping-off, crown and root rots caused by fungal soil-borne pathogens.

Most vegetables require full sunlight for maximum yield. Full sun speeds drying of the foliage, which reduces the incidence of most foliar diseases.

Crop Rotation

Crop rotation is very important in reducing losses to vegetable diseases. Continuous plantings within the same plant family of vegetables provide opportunities for pathogen buildup. Do not plant the same family of vegetable in the same areas year after year. Grow the same plants or closely related plants in the same soil only once every 3 to 5 years. This practice starves out most pathogens that cause stem and leaf diseases.

Unfortunately, crop rotation does not work against soil-borne problems such as root and crown diseases caused by the fungi *Phytophthora*, *Rhizoctonia*, *Pythium* and *Sclerotium*, and vascular wilts caused by the bacteria *Pseudomonas*. These organisms are long-lived in the soil and affect many plant families. You can get only a limited benefit against *Fusarium* wilt.

In the table on page 2 are the common vegetables listed by families or groups. Rotate these with another vegetable outside of that group.

Disease Free Seed and Transplants

Many plant diseases can be seed-borne. Do not save seeds from year to year. This is important to prevent a number of diseases, including halo blight, common blight, anthracnose of snap beans, and bacterial spot of tomatoes. Commercially available seed is often produced in the arid western United States where seed-borne pathogens do not occur and/or cannot survive.

Table 1. Commonly grown vegetables and their plant families.

Alliaceae	Brassicaceae	Cucurbitaceae	Fabaceae	Solanaceae
Chives	Broccoli	Cantaloupe	All beans	Eggplant
Garlic	Brussel sprouts	Cucumbers	English peas	Peppers
Leeks	Cabbage	Honeydew melons	Southern peas	Potatoes
Onions	Cauliflower	Pumpkins		Tomatoes
	Collards	Squash		
	Lettuce	Watermelon		
	Mustard			
	Radish			
	Rutabaga			
	Spinach			
	Turnip			
Asteraceae	Poaceae	Malvaceae	Chenopodiaceae	Apiaceae
Lettuce	Corn	Okra	Spinach	Carrot

Seed of some vegetable varieties, however, are not produced in the west, and local seed must be used. Purchase seed from a reputable dealer because you cannot distinguish healthy seed from diseased seed.

Seed are protected by fungicides often applied to the seed by the company. Seed can also be treated by the home gardener. These treatments give young seedlings some protection from soil-borne pathogens as they germinate and emerge. They do not, however, control pathogens that may attack the plant after the seedling stage. Some pathogens are carried on the surface of seed and can be controlled with fungicide treatment. Fungicides are not effective on pathogens carried beneath the seed coat.

Gardeners starting a crop from transplants should examine transplants carefully before purchasing. Select healthy transplants that appear disease and insect free.

Use Resistant Varieties

Using resistant varieties is the most efficient way of controlling vegetable diseases. Make an effort to buy resistant varieties when they are available. Seed catalogs generally list resistant traits of different vegetable varieties.

For example, disease resistant tomatoes are designated "VFN." These letter indicate resistance to *Verticillium* wilt (not common in Georgia), *Fusarium* wilt and nematodes. In tomatoes, there is also resistance to *Stemphyllium* (gray leaf spot) = S, Tobacco Mosaic Virus = TMV, *Alternaria alternata* stem canker = A or ASC, *Septoria* leaf

spot = L and Tomato Spotted Wilt = TSW.

Other vegetables such as squash, pepper, beans and peas also have disease and nematode resistance. Note that plant disease and nematode resistance are relative terms, as resistant varieties have differing levels of resistance. Resistance does not always mean the plants are immune to these problems. Some seed catalogs may indicate tolerance to a certain pest. Tolerance usually indicates that a particular variety of vegetable may produce fruit of acceptable yield and quality while exhibiting moderate to high levels of disease.

Planting Date Management

Planting dates can be an effective tool for disease management. Follow the recommended planting dates for the particular vegetable grown. For example, okra should be planted when soil temperatures are warm for good germination and growth. Planting this crop when soil temperatures are cool can cause increased incidence of soil-borne diseases such as soreshin and damping-off.

Using transplants may help avoid early disease problems so long as the transplants are from a reputable source and are disease free. Plant crops such as corn and beans earlier, because their seeds germinate in cooler soils. It is also advantageous to plant these particular crops early to escape severe virus infections. This is particularly true with squash. Aphids, which transmit many virus diseases, are at lower population levels early in the season. High aphid pop-

ulations late in the season can lead to more virus problems.

Trap Crops

Using trap crops may sometimes help manage virus diseases and aphid populations. A few rows of a trap crop around the vegetable garden (such as rye or corn) will cause aphids to feed there first, possibly loosening the virus they may carry. Trap crops can limit aphid damage and help reduce the incidence of virus diseases, which are sometimes severe on beans, cucurbits and solanaceous crops.

Proper Spacing and Trellising

Proper spacing and trellising can reduce the occurrence of vegetable diseases. Space plants properly to allow growth and air circulation. Humid and wet conditions occur if plants are crowded and unable to dry quickly. Extended periods of wet foliage are ideal for development of fungal and bacterial diseases. Crowded plants take longer to dry and provide favorable disease conditions. Crop protectants also cannot penetrate dense foliage, thus limiting their effectiveness.

Staking or trellising tomatoes, pole of half runner beans, and cucumbers will prevent soil contact with the foliage and fruit. Air circulation will be better if these plants are trellised, promoting foliage drying and reducing disease severity. Limiting soil-plant contact reduces diseases such as fruit rots. Crop protectants also can be more effectively applied to trellised plants.

Proper Watering Practices

Avoid excessive soil moisture. Over-watering enhances seed decay, damping-off, and root and crown rot diseases. *Choanephora* fruit rot, which causes the whisker-like blossom end rot, can be increased by over-watering.

If possible, irrigate by running water between the rows. Avoid splashing plants with soil, since any potential pathogens are soil-borne. Drip irrigation is also a good method of watering without wetting foliage. Drip irrigation uses either a hose or tape that allows water to be applied slowly over time at the base of the plant or just beneath the soil surface. Garden drip irrigation kits are readily available.

Avoid wetting the foliage when watering. Wet foliage is favorable for development of most foliar fungal and bacterial diseases. If wetting the

foliage is unavoidable, irrigate in the morning so foliage can completely dry before evening.

Maintain uniform soil moisture. This can reduce problems such as blossom end rot (calcium deficiency) of tomatoes and peppers.

Don't work in the garden when plants and soil are wet. Bacterial and fungal diseases spread easily from one plant to another by hands and clothing when above-ground plant parts are wet.

Use a Mulch Layer

Use a mulch layer of straw, bark, shredded paper or plastic to prevent soil from splashing onto plants and to prevent fruit from touching the bare ground. This will help prevent rots on mature fruit such as strawberries, tomatoes, squash, cucumbers and melons. Mulches also are a sound cultural practice to help conserve soil moisture and reduce weed infestations.

Proper Fertilization

Adequate and proper fertilization helps prevent vegetable diseases. Test soil three to six months before the growing season, and follow the recommendations to supply appropriate nutrient requirements and adjust soil pH. Avoid excessive amounts of nitrate forms of nitrogen, which encourage root rot diseases. Use ammonium forms instead (no more than 50 percent). Be sure the soil pH level is in the proper range for a particular crop. Proper pH prevents blossom end rot and encourages healthy growth of tomatoes and peppers.

Weed Free Garden

Weeds in the same families as some of the vegetable crops can be another source of diseases and insects. For example, some weeds can serve as virus reservoirs for several insect-transmitted viruses that can infect homegrown vegetables. Good weed control will increase air movement in the garden and decrease conditions — such as excessive moisture — that favor disease development.

Avoid Tobacco when Working in the Garden

If you use tobacco, wash your hands thoroughly before handling plants. This practice will prevent the spread of tobacco mosaic virus, which can infect many different kinds of

vegetables, particularly solanaceous crops such as tomatoes and peppers.

Nematode Control

Nematode control is important in growing vegetable crops. Nematodes are microscopic soil-inhabiting roundworms that injure vegetables and other plants by feeding on their root systems, causing decay and/or galling. You can sample soil for nematodes by submitting a sample through your county extension office to the Extension Nematology Laboratory.

The most damaging nematode in Georgia is the root-knot nematode, named for the knots it produces on infested roots. Soil solarization can be used to reduce the number of nematodes present. This involves tilling the garden and then covering the area with a clear plastic tarp for six to eight weeks. Solar radiation is trapped in the soil and can raise soil temperature high enough to kill most nematodes in the upper 3 to 4 inches of soil. In Georgia, the best time to solarize soil is June through August, when temperatures are at their hottest. Soil solarization requires intense solar heat to be effective. Repeated roto-tilling can also desiccate and kill many nematodes, although repeated tilling may decrease overall soil organic matter.

Sanitation

Sanitation will help reduce overwintering of disease-causing organisms. After harvest, remove and destroy plant material. Plow the soil to help break down small roots and debris that may harbor nematodes, fungi and bacteria. Plant refuse may also be plowed under. Remove diseased plants, plant residue and weeds in and

around the vegetable garden to reduce the occurrence of some diseases.

Pesticide Use

Use of pesticides should be the last defense available to home gardeners once all other disease-control options have been exhausted. Home gardeners have few fungicides or bactericides available compared to commercial growers.

Chlorothalonil (Bravo® or Daconil®), maneb, mancozeb, Terraclor® (PCNB), sulfur and copper products can be used on certain crops. These products provide disease suppression across a range of foliar diseases and are more effective if they are applied in a preventive manner at the very onset or before a disease outbreak occurs. Chlorothalonil, maneb and mancozeb generally provide broad-spectrum disease suppression of most fungi. Terraclor is used as a transplant soil drench to suppress Southern blight and Rhizoctonia damping-off. Copper products suppress fungi but primarily reduce losses to bacterial pathogens. Sulfur is suppressive to fungi and is especially effective against powdery mildews. As with any pesticide, read the label and follow the recommended precautions to ensure the chemical is applied in a safe, effective manner.

Contact your county extension office for specific information about pesticides.

Summary

Most importantly, use proper cultural practices to promote and maintain healthy plants. Healthy plants do not get diseases as readily as weak ones. Healthy plants are the **best** control against plant diseases.

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