



CONTROLLING DISEASES IN THE HOME VEGETABLE GARDEN

Diseases of vegetables grown in the home garden may reduce both the yield and quality of vegetables. Controlling such diseases often determines success or failure and adds immeasurably to the pleasure derived from the garden.

Diseases of vegetables are caused by microorganisms, including fungi, bacteria (including mycoplasmas and spiroplasmas), viruses, and nematodes. These organisms are spread by wind-blown or water-splashed spores, insects, infected seeds or transplants, by the movement of infested soil, and by humans handling wet plants.

Vegetable diseases can be successfully controlled using an integrated disease control program. Such a program involves the use of crop rotation, sanitation, disease-resistant or tolerant varieties, disease-free seeds or transplants, sound horticultural practices, balanced soil fertility (based on soil tests), and proper and timely applications of pesticides. There is no single control practice that can control all of the diseases of any vegetable crop. Therefore, several measures must be used to achieve satisfactory control.

DISEASE CONTROL BEFORE THE GARDEN IS PLANTED

Choose and prepare the site. The site for the vegetable garden should be well-drained, have adequate sunlight (8 or 10 hours of direct sunshine per day), and good air circulation. The soil should have adequate soil fertility and the proper pH (5.5 to 7.0). Information on garden location, soil fertility, and soil pH can be found in University of Illinois Extension Circular 1331, Vegetable Gardening in the Midwest.

If the area has produced garden vegetables for several years, sanitation and rotation practices will reduce the risk of disease-causing organisms that have survived from preceding crops. Removing or turning under dead and diseased plant material in the fall is important for disease control. Crop residues from healthy plants can be composted and returned to the garden.

Disease-causing fungi and bacteria can survive composting unless the decomposition of the crop residue is complete, a situation that seldom occurs. Therefore, we suggest that no diseased plant parts be placed in the compost pile. Some disease organisms will even survive complete composting, including corn smut; clubroot of cabbage, broccoli, cauliflower and other crucifers; Verticillium wilt of potato, tomato, pepper, and eggplant; and root-knot nematodes.

Turning (plowing or tilling) under crop residues in the fall helps prevent the over-wintering of many disease-causing organisms. Besides destroying the “winter home” of various organisms, this practice also

For further information contact Mohammad Babadoost, Extension Specialist in Fruit and Vegetable Pathology, Department of Crop Sciences, University of Illinois at Urbana-Champaign. (Phone: 217-333-1523; [email:babadoos@uiuc.edu](mailto:babadoos@uiuc.edu)).

helps control the insects that transmit certain diseases. Also, crop debris that is turned under improves soil tilth and makes spring garden work easier.

Crop rotation. Crop rotation is an important control measure since many disease-causing organisms only attack related plants in the same family. Unrelated plants do not serve as hosts on which these organisms can multiply. Therefore, if possible, avoid planting any vegetables within each of the following groups in the same location more than once every three or four years.

Cole crops—(cabbage family) broccoli, Brussels sprout, cabbage, cauliflower, Chinese cabbage, mustard greens, kohlrabi, radish, rutabaga, and turnip.

Cucurbits—(cucumber family) cucumber, gourds, muskmelon, pumpkin, squash (all types), and watermelon.

Solanaceous crops—(tomato family) eggplant, husk tomato (ground cherry), potato, pepper, tomato.

Chenopodiaceous crops—beet (red and sugar) and spinach.

Amaryllidaceae—(onion family) chives, leeks, onions, shallots, and garlic.

Legumes—pea, beans (all types).

Umbelliferous crops—carrot, parsnip, celery.

For example, cabbage, broccoli, radish, or turnips should not be planted in the same location for two successive years. Cabbage could be followed with beans, a vine crop such as cucumber, or with sweet corn.

Diseases affecting beans, peas, sweet corn, carrot, lettuce, spinach, rhubarb, okra, edible soybeans, and similar plants are usually specific to only one of these crops, and generally will not infect others or members of the major vegetable crop groups.

Choose disease-resistant varieties. The use of well-adapted, disease-resistant varieties is the simplest and most efficient method of controlling many diseases. Lists of disease-resistant vegetables recommended for use by Illinois gardeners are given in Circular 1331 (Vegetable Gardening in the Midwest). Additional information on disease resistance is also given in the following paragraphs. A listing of varieties and their resistance can be found in Circular 1363, Midwest Vegetable Production Guide for Commercial Growers.

Start with disease-free seeds, plants, and planting materials. It is important to start with disease-free seeds or planting materials (bulbs, tubers, transplants, sets, and so on) to keep from introducing serious diseases into the garden. In general, gardeners are encouraged not to save their own seed but to purchase seed from reputable seed dealers. Hot-water soaks and fungicide seed treatments may be used to control the seedborne disease organisms that cause seed rots and damping-off. Since temperature controls and timing must be precise, home gardeners usually buy seed that has already been treated with hot water by the seed processor. Hot-water treatment of cabbage, broccoli, Brussels sprout, and cauliflower seed is particularly important.

Many vegetable seeds are coated with a fungicide at the time of purchase, as evidenced by the colored coating on the seed. Untreated seed can be treated by the home gardener by placing a small quantity (the size of one or two match heads) of captan or thiram in the seed packet and shaking the packet for a minute or two to thoroughly cover the seed. Excess protectant may be sifted out before planting.

Do not plant diseased material (for example, transplants, sets, bulbs, or tubers). All planting material should be healthy and free of yellowing and brown or black spots, and should not be stunted or show poor development. Only certified, disease-free potato tubers or sweet potato slips should be used. Examine transplants thoroughly for signs of leaf or stem disease. It never pays to buy and plant diseased transplants, no matter what the price!

Damping-off diseases affecting home-grown vegetable transplants can be controlled by the use of disease-free soil and fungicides.

CULTURAL PRACTICES

Cultural practices such as controlling weeds, planting at the right time, planting at the proper depth and spacing, employing cages or stakes, and watering when the temperature is rising to promote a rapid drying of the foliage can help control many foliar diseases. Mulches help to control fruit rots and aid in control of blossom-end rot of tomato, pepper, and vine crops by maintaining a uniform supply of moisture in the soil. Weed control in and around the garden reduces the risk of attacks by viruses that overwinter in these plants. Do not work or harvest wet plants, since this can spread many diseases, particularly those caused by bacterial and fungal pathogens.

DISEASE CONTROL DURING THE GROWING SEASON

Many diseases, such as the early blight disease of potato and tomato, occur each year despite all preplanting precautions. For such diseases, applications of fungicides and bactericides to the growing plants may be needed. The best way to apply these materials is as sprays before the disease occurs. Often a wetting agent such as liquid detergent or soap (1/2 teaspoon in 1 gallon) is added to obtain more thorough wetting and coverage of the foliage. Apply sprays to the point of run-off on a 7- to 10-day schedule. This maintains a fresh or effective covering of fungicide and protects the new growth. Fungicides and bactericides currently recommended for use on vegetables is given in the Illinois Pest Control Handbook which is updated each year.

PRINCIPAL DISEASES OF VEGETABLES AND CONTROL MEASURES

Asparagus

Rust. Grow resistant varieties. Start spray applications after harvest and continue until mid-August on a 10-day schedule with an approved fungicide.

Crown and root rots. Maintain proper fertility and good soil drainage. Avoid over-cutting.

Beans

Seed decay and damping-off. Use captan- or thiram-treated seed. Plant in a warm, moist, well-prepared seedbed.

Bacterial blights. Do not save seed from infected plants. Purchase seed from a reputable seed dealer. Spray a copper-based bactericide such as copper sulfate at the first sign of disease, and continue on a 7-day schedule until harvest. Do not work among wet plants.

Rust. Grow rust-resistant varieties. Apply fungicides at the first sign of disease and continue on a 7-day schedule.

Mosaics. Grow resistant varieties..

Beets

Seed decay and damping-off. Plant seed treated with thiram or captan.

Leaf spots. Spray with an approved fungicide on a 7-day schedule.

Carrots

Seed rot and damping-off. Plant seed treated with captan or thiram.

Leaf spots. Practice a 2- to 3-year crop rotation. Spray weekly with an approved fungicide, starting about mid-June.

Aster yellows. Destroy infected plants as soon as they appear. Apply insecticide sprays for leafhopper control. Spray before removing infected plants.

Cole Crops (cabbage, broccoli, Brussels sprout, cauliflower, Chinese cabbage, kohlrabi, mustard greens, radish, rutabaga, and turnip).

Seed decay, damping-off, black rot, and blackleg. Plant hot-water-treated seed which has also been treated with captan or thiram. Several black-rot-resistant cabbage varieties are now available.

Leaf spots and blights. Practice 2- to 3-year crop rotation for broccoli, cabbage, cauliflower, and Brussels sprout. Apply an approved fungicide on a 7-day schedule.

Clubroot. Purchase disease-free transplants. PCNB (Terraclor) may be added to the transplant water.

Fusarium yellows. Grow only varieties that are resistant to yellows.

Cucurbits (Cucumber, gourds, muskmelon, pumpkin, squash, and watermelon).

Seed rot and damping-off. Plant seed treated with captan. Plant in a warm, well-prepared seed bed.

Angular leafspot. Practice a 2- to 3-year crop rotation. Spray with a fixed copper bactericide, such as COCS. Remove diseased plant material. Plant resistant varieties whenever possible.

Anthracnose, Alternaria leaf blight, downy mildew, blossom blights, fruit rots and spots, and gummy stem blight or black rot. Practice 2- to 3-year crop rotation. Apply an approved fungicide at weekly intervals, starting when the plants are in the two-leaf stage.

Adequate nitrogen fertility is essential for the successful control of *Alternaria* leaf blight. Plant resistant varieties when available.

Bacterial wilt. Spray with an insecticide to control cucumber beetles as soon as the seedlings “crack” the soil before they emerge. Continue weekly spraying until the plants are in bloom. Spray in the evening to avoid killing bees.

Fusarium wilt. Grow only cantaloupe and watermelon varieties that are resistant to *Fusarium* wilt.

Powdery mildew. Spray with an approved fungicide at the first sign of disease, and weekly thereafter. Grow resistant varieties.

Mosaic and other virus diseases. Grow resistant varieties where possible. Only cucumber-mosaic-resistant cucumbers should be grown.

Eggplant

Seed rot, damping-off, and *Phomopsis* blight. Plant seed treated with captan or thiram.

***Phomopsis* blight and other fruit rots.** Practice a 2- to 3-year crop rotation. Spray weekly with an approved fungicide when fruits are half size, or when disease first appears.

***Verticillium* wilt.** Mulching with black plastic may help reduce losses.

Onion

Smut, seed rot, and damping-off. Plant seed treated with thiram or captan.

Leaf diseases. Practice a 2- to 3-year crop rotation. Spray weekly with an approved fungicide. Carefully follow label directions as regards the days between the last spray and harvest.

Bulb rots. Control leaf diseases. Also follow these recommendations: avoid storing improperly cured or injured bulbs; let all onion tops fall over (ripen) naturally; store under cold dry conditions; and do not allow cured bulbs to be exposed to sunscald, water, or high humidity.

***Fusarium* basal rot.** Grow resistant varieties.

Pea

Seed rot and damping-off. Plant seed treated with captan or thiram.

Root rot. Plant early in well-drained soils. Use a fungicide seed treatment.

***Fusarium* wilt.** Plant only varieties that are resistant to wilt.

Peppers

Seed rot and damping-off. Plant seed treated with captan or thiram.

Bacterial spot. Use the hot-water seed treatment, or dip seed in a solution of 1 part household bleach to 3 parts water and rinse with water. Follow with a fungicide seed treatment. Apply weekly sprays of a fixed copper fungicide such as COCS, through the bloom stage. Use crop rotation outside the tomato family

Tobacco mosaic. Plant resistant varieties.

Potato

Viruses, late blight, Verticillium wilt, and ring rot. Plant only “certified” disease-free seed.

Seedpiece rots. Treat cut seedpieces with captan as a dust or dip. Plant in warm soil (over 50°F) after the cut surfaces have corked over (suberized).

Early blight and late blight. Practice a 2- to 3-year crop rotation. Destroy or remove cull tubers. Spray at weekly intervals, starting when the plants are 4 to 6 inches high with an approved fungicide. Plant late blight-resistant varieties.

Verticillium wilt and root-knot nematodes. Plant resistant varieties.

Scab. Plant resistant varieties, or adjust the soil pH to 5.2 to 5.5. Use fungicide seedpiece treatments.

Storage rots. Store only disease-free, unbruised tubers. Allow tubers to cure at 60°F for 5 to 7 days before reducing temperature to 36° to 40°F (if possible).

Sweet corn

Seed rot and damping-off. Plant seed treated with captan or thiram.

Smut. Plant resistant varieties. Remove smut galls from the garden before they break. Do not compost smutted corn or infected corn residues.

Stewart’s bacterial wilt. Plant resistant varieties. Control flea beetles with a recommended insecticide. Early season control is particularly important.

Foliage blights and rust. Plant varieties resistant to northern and southern corn leaf blights and rusts. Apply an approved fungicide. However, the use of fungicides is rarely justified. Diseased plant material should be removed from the garden. Blighted leaf tissue is safe to compost.

Maize dwarf mosaic. Plant as far from Johnsongrass as possible. Control wild Johnsongrass plants. Plant tolerant varieties.

Spinach

Seed rot and damping-off. Plant seed treated with captan or thiram.

Cucumber mosaic virus (blight). Plant resistant varieties.

Downy mildew or blue mold. Plant resistant varieties.

Sweet potato

Black rot, scurf, foot rot, wilt, and soil rot. Buy certified, disease-free slips. Plant resistant varieties. Use a 3- to 4-year rotation.

Storage diseases. Do not expose roots to temperatures below 55°F. Cure the roots immediately after digging at 85°F and high humidity for 10 to 14 days. Store at 55°F. Never store in airtight bags or containers. Apply an approved fungicide as a post-harvest dip. Follow the manufacturer's directions carefully.

Tomato

Seed rot, damping-off, bacterial spot, bacterial canker, and tobacco mosaic virus. Plant seed which has been treated with hot water or acid and then treated with captan or thiram. Purchase seed or transplants only from reputable dealers. Soaking seed in copper sulfate solution (2 ounces per gallon) or dipping in bleach solution as described under peppers will help prevent bacterial spot and canker if seed are saved.

Bacterial spot. Plant certified, disease-free seed or transplants. Practice a 2-to 3-year crop rotation. Spray plants weekly with a fixed copper fungicide, beginning with the first sign of disease, through the bloom stage.

Early blight, Septoria leaf blight, anthracnose, buckeye rot, and soil rots. Spray weekly with an approved fungicide. Practice 2- to 3-year crop rotation. Remove or destroy infected plant parts. Carefully follow label directions as regards the days between the last spray and harvest. Staking or caging plants and providing good air circulation will help reduce foliar diseases. Staking, caging or mulching will also help prevent fruit rots, such as anthracnose, buckeye rot, and soil rot.

Blossom-end rot. Maintain uniform soil moisture by mulching the plants and irrigating when needed. Avoid heavy pruning, excessive nitrogen applications, or damage to the roots by cultivation or hoeing.

Verticillium and Fusarium wilts. Grow only VF - or VFN-resistant varieties. There are many varieties available.

Root-knot nematodes. Grow VFN-resistant varieties.

Viruses. Avoid contact between potatoes and tomatoes to prevent "double infections" of potato and tomato viruses. Wash hands thoroughly with soap and hot water before handling your plants. Do not use tobacco when working with tomatoes.

The following publications are excellent guides for gardeners:

Circular 1331 Vegetable Gardening in the Midwest, and Circular 1373 Midwest Vegetable Production Guide for Commercial Growers, available from Information Technology and Communication Services, University of Illinois, P345, 1917 S. Wright St., Champaign, IL 61820.