

Growing Broccoli in West Virginia

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Broccoli (*Brassica oleracea* L.) is a nutrient-dense, cool-season vegetable which can be grown throughout West Virginia. Broccoli is in the cole crop family and is botanically related to other popular garden vegetables, such as Brussels sprouts, cabbage, collards, cauliflower, kohlrabi and kale.

Broccoli grows best when average daily temperatures range from 65 to 75°F, making it suitable to grow in some regions of the state in spring, and most regions in fall.



Figure 1. Characteristics of a suitable broccoli variety: good color, domed head and small beads. (Source: Lewis Jett)

Variety Selection:

Many different varieties of broccoli are available for both home garden and commercial production (Figure 1). Excellent broccoli varieties will have tight buds with a domed head and grow well under temperature stress. Varieties recommended for West Virginia are listed in Table 1.

Table 1. Recommended broccoli varieties for West Virginia.

Variety	Days to Maturity (from transplant)	Comments	Disease Resistance (Downy Mildew, Black Rot)
Arcadia	63	Cold-tolerant; best for fall	DM, BR
Bay Meadows	60	Blue-green with good cold and heat tolerance	
Castle Dome	65	Early-season with domed head	
Diplomat	68	Performs well in fall	DM
Emerald Crown	63	Excellent uniformity; small bead and domed; Heat and cold tolerant	
Everest	61	Performs well in spring and fall	DM
Green Comet	55	Side shoot (florete) production	

Variety	Days to Maturity (from transplant)	Comments	Disease Resistance (Downy Mildew, Black Rot)
Green Magic	60	Heat-tolerant	DM
Gypsy	60	Medium green domed head; produces side shoots	DM
Imperial	72	Summer to fall production	
Lieutenant	71	Heat-tolerant with excellent color and shape	
Packman	50	Early-season; head isn't dome shaped	

Soils and Mulching:

Most fertile garden soils throughout West Virginia are suitable for growing broccoli. Cole crops prefer soils that are not overly acidic with an optimal pH of 6.5 and greater than 2% organic matter. Fall broccoli can follow early tomatoes or cucumbers in the garden.

For home garden production, mulching with straw or newspaper can help lower soil temperatures and increase soil moisture, which will improve crop growth and yield. Commercial producers can use black plastic mulch on raised beds to warm the soil for spring production.

To cool soil for summer and fall production, white or metalized plastic mulch can be used. The mulch modifies the soil temperature, reduces weed growth and prevents soil moisture evaporation. A drip tube or soaker hose can be placed under the mulch for irrigation. Row covers may be used to protect the crop from light frosts, freezes and insects.

Fertilization:

For optimal results, a soil test should be taken in the fall before planting broccoli the following year. In West Virginia, free soil testing is available to all residents through the WVU Extension Service. Contact the WVU Extension Service office in your county or visit <http://ext.wvu.edu/soiltest>.

Broccoli is a vegetable that feeds heavily on nutrients, particularly nitrogen. In the absence of a soil test, a general purpose fertilizer, such as 5-10-10, can be used. A general recommendation is to broadcast about 5 pounds of 5-10-10 fertilizer for each 100 square feet of area. This should be applied and worked into the soil about one week before the plants are set.

For commercial production, 100 pounds of nitrogen per acre (e.g., 1,000 lbs. of 10-10-10) can be broadcast and disked in prior to raised bed planting and mulch application. Side-dress an additional 50 pounds of nitrogen per acre (e.g., 320 lbs. of 15-0-0) approximately four weeks after transplanting. That application should be made when the developing head of broccoli is about the size of a 50-cent piece. Follow soil test recommendations to apply phosphorous and potassium.

Planting:

Broccoli can be established by direct seeding or transplanting. Growing transplants from seed is a relatively easy and inexpensive process that can provide plants for either spring or fall. Choose heat-tolerant cultivars for spring and early summer production (Table 1). Transplanting is the preferred method for planting broccoli since it results in a uniform plant that grows evenly and competes very well with weeds.

Broccoli transplants can be grown at home in a well-lit room or greenhouse. Choose containers, such as peat pots or recycled paper containers, for transplant production. Commercial producers can use 50- to 72-cell plastic or foam trays. A standard potting soil or germination mix can be used. For spring production, seeds can be sown around Feb. 20. For fall production, seed around June 1. Supplemental lighting may be needed for early-season transplant production. Plants for summer planting and fall harvest can be grown in trays or containers outside in a partially shaded area. Even watering and light fertilization with a water soluble fertilizer (e.g., 20-20-20) will produce a healthy transplant that is ready for the garden or field in approximately eight weeks.

Broccoli plants are not as hardy as cabbage, so it is best to set the broccoli a few days after the earliest setting date for cabbage. For most regions of West Virginia, the plants should be set around April 10 to 20 for the early crop, and around July 1 to 15 for the fall crop. When planting broccoli in the summer for fall harvest, transplant in late afternoon to provide a less stressful environment for stand establishment. Set plants 12 to 18 inches apart in the row, with single rows 30 to 36 inches apart. Alternatively, the plants can be grown as a twin-row on a raised bed with 4- to 5-foot centers with rows 18 inches apart.

Plants should be watered with a starter solution when they are set in the garden or field. Starter fertilizers are available commercially, or can be made by dissolving 1 cup of 5-10-10 fertilizer in 12 quarts of water. Stir and let the mixture stand for a few hours, then pour 1 cup of this solution around the roots of the plant. Immediately fill the hole with soil and gently press it around the roots. Commercial broccoli growers may find it better to use a commercial starter solution that will work well in a mechanical transplanter.

Insect Management:

There are a handful of insect pests that can cause considerable damage to broccoli and other cole crops; listed below are the most common. Cultural controls are provided. For biological and chemical controls, see *Controlling Common Broccoli Pests in the Home Garden* by John Porter and the [Mid-Atlantic Commercial Vegetable Production Guide](#).

Cabbage Worms:

The most troublesome pests for broccoli are generally referred to as cabbage worms, which feed on the leaves and heads of broccoli. The imported cabbage worm is the caterpillar of one of the most common

butterflies in the northeast, the cabbage white butterfly, which is a small, white butterfly with black spots in the middle of their wings.

Another type of cabbage worm is the cabbage looper resembles an inchworm and is the larva of a mottled gray-brown moth.

The easiest way to deter cabbage worms is by excluding them from the garden. Protect plants from egg-laying adults by using floating row covers or covering individual plants with fine mesh netting. For smaller plantings, picking insects off plants by hand should be effective. In larger gardens, practice crop rotation. Be sure to remove any plants or plant parts at the end of the season, as evidence suggests cabbage worm eggs may overwinter on debris left in the garden.

Harlequin Bug:

The harlequin bug can be a serious pest for broccoli and other cole crops. The bug is black with distinct red, orange and yellow markings (Figure 2). Harlequin bugs do damage by feeding on florets and leaves, which causes wilting or death of the plant. Control them by using row covers or insect netting. Destroying crop residue after harvest by plowing will also control this insect. Cleome or “Spider Flower” can be an effective trap crop for this insect.



Figure 2. Adult harlequin bug. (Source: Lewis Jett)

Cabbage Root Maggot:

This small, gray-brown fly deposits eggs at the base of the broccoli plants and in soil cracks nearby. The eggs hatch in about one week, and the newborn maggots feed on the stem and roots. Symptoms of infestation include poor plant growth and color change to yellow or purple. Root maggots need cool soil temperatures to thrive, so early plantings of cole crops are most susceptible.

A combination of methods is necessary for effective control of cabbage root maggot. Since infestation comes from eggs in the soil, annual crop rotation is a must. Crop rotation should be used in conjunction with floating row covers to deter adults from laying eggs. Row covers can be removed after mid-June

when temperatures are high and adults are not active. Using row covers on non-rotated crops may not be effective as overwintering eggs can hatch under them.

Disease Management:

Cabbage Club Root:

Club root is a fungal disease that causes the underground stem to swell and grow irregularly on roots of cauliflower, cabbage, broccoli and other cole crops. The swellings, or clubs, on the roots interfere with the plant's ability to take up nutrients from the soil and as a result, such plants become stunted, wilted and may not produce a crop. Once the organism responsible for this disease is introduced into a field or garden, it will remain troublesome, even if no cole or cruciferous crops are grown during the period.

It is important to avoid introducing the pathogen into the field; therefore, you should carefully examine plants before transplanting for suspicious swellings. If symptoms are present, do not use the plants. Rotating cole crops can help to limit the spread of the disease. Crops, such as broccoli, cauliflower, cabbage, Brussels sprouts and kale, should not be grown in the same areas in back-to-back years. If club root is observed in a field, avoid planting cole crops in that area for the following three to seven years.

The disease may be limited by increasing the soil pH to 7.0; however, remember that the change in soil pH will be long lasting and other crops may not tolerate higher pH levels.

Downy Mildew:

Downy mildew is a fungal pest that occurs when the weather is cool and moist. It affects all above-ground parts of the plant. Infected young seedlings may die, and plants with infections on the leaves may lose vigor. Infected crowns are undesirable and usually unmarketable.

Multiple practices can limit the spread of this disease. Increase plant spacing to promote airflow and ensure proper soil drainage to reduce moisture. Brassica type weeds, such as mustards, can also carry the disease so plots should be well weeded. Avoid using any type of overhead irrigation. Resistant varieties are available and should be used to prevent disease problems.

Harvest and Postharvest Handling:

Harvest broccoli heads using a sharp knife to limit bruising of the stem and to extend storage life. Heads should be harvested when florets (beads) are tight and green. In West Virginia, most broccoli are cut as "crown cuts" when the head reaches a diameter of 4 inches. These single heads are cut with approximately 5 inches of stalk and sold as single-head broccoli.

To reduce the effects of field heat, broccoli should be harvested in early morning. The harvested heads can be hydrocooled in ice water and placed in a cooler until they are ready to be marketed. Broccoli requires storage temperatures of 32°F to 40°F and high humidity. Heads can be refrigerated and stored for up to two weeks in breathable plastic bags or containers. A clean root cellar is also suitable for

storage. After harvesting the main head, side shoots may appear on some cultivars and can be sold as loose florets.

Broccoli Preparation:

Broccoli should be cooked as soon as possible after cutting in order to retain the maximum amount of vitamin C and flavor. Split the stem four ways to help it cook more quickly. When cooking, use a small amount of boiling, salted water in a covered pan. Broccoli is also an excellent candidate for steaming, which is the cooking method that best retains the plant's nutrients.

Be sure to handle the broccoli gently to prevent the delicate florets from breaking. A pair of kitchen tongs will give the broccoli a safe trip from the saucepan to the vegetable dish.

Many enjoy broccoli served with a cheddar cheese sauce or with melted butter. Lower-fat options include sprinkling the broccoli with grated parmesan cheese or a squeeze of fresh lemon juice.

When freezing broccoli, choose young, firm stalks with a tender, compact head. Discard large leaves, tough stalks and woody portions. Separate heads into desired preparation sizes. Wash well and soak the head in brine (4 teaspoons of salt to 1 gallon of cold water) for about 30 minutes to remove insects. Split lengthwise so heads are not more than 1½ inches across. Blanch in boiling water for 3 minutes or steam blanch for 5 minutes. Cool immediately by soaking in ice water, drain and pack in containers or freezer bags leaving no headspace. Freeze at once.

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