



BROCCOLI PRODUCTION GUIDE FOR WESTERN NORTH CAROLINA

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Broccoli is a popular vegetable for use both fresh and frozen. The edible portion of the broccoli plant consists of the upper stem and the unopened flower buds. Broccoli is a cool-season crop that is closely related to cabbage, cauliflower, kale, mustard, and turnips. It can be grown in western North Carolina as either an early (spring) or a late season (fall) crop at the lower elevations (below 2500 ft.) or during mid-summer at elevations above 2500 ft.

Rapid, uninterrupted growth is required for high quality and good yields. Marketable heads must have tightly clustered buds with no yellow flower color. They must be free of insects. Formation of small, button heads and premature flowering (bolting) may result from exposure of transplants to periods of plant stress that interfere with vegetative growth. This can be a serious problem with large transplants and early maturing varieties. Extremes of temperature, moisture, or fertility appear to be causative factors. Providing protection during plant production, minimizing transplant shock, providing optimum moisture and fertility, and avoiding very early season plantings should minimize these problems.

Varieties

Green Comet (45 to 50 days) – has been a reliable variety in the mountains for many years, although stalk length is not always as long as commercially desired.

Green Valient (83 days), **Packman** (45 to 50 days) and **Baccus** (50 to 65 days) – also perform well. New varieties should be planted in limited quantities until local adaptability has been determined.

Plant Sources

Broccoli transplants may be obtained from commercial sources or produced in cold frames, hotbeds, or green-houses. Home-grown plants are preferred.

Transplant Production in Hotbeds or Coldframes

Select a site with a southern exposure and a well-drained, light soil. Soils that crust or bake should be avoided. Prepare the soil to a fine seedbed condition. Fumigate the soil for control of weeds, soil-borne insects, and diseases. (See extension bulletin AG-337, *Production of Commercial Vegetable Transplants* and the current *N.C. Agricultural Chemicals Manual* for detailed information on fumigation.) Fertilize and lime according to soil test recommendations for transplant production. Approximately 33 lb of 5-10-5 or 6-12-6 may be broadcast and incorporated into a 9 x 100-ft bed.

Plant seed $\frac{1}{4}$ to $\frac{1}{2}$ inch deep in rows 4 to 6 inches apart at the rate of about 24 seeds per linear ft of row. Four oz of seed should provide adequate transplants for one acre

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(about 14,000 plants). Firm the soil over the seeds to retain soil moisture. When two true leaves are visible, thin the seedlings to 1½ inches between plants. Irrigate to maintain good moisture, but avoid keeping the plant bed too wet. Fertilize with a soluble fertilizer every 1 to 2 weeks.

Downy mildew is the predominant foliar disease problem in plant beds. Apply recommended fungicides at weekly intervals from the time of appearance of the first true leaves. The cabbage root maggot can be a serious problem, especially in early spring plantings. An insecticide can be worked into the upper 3 to 4 inches of soil just prior to seeding for control of maggots. Aphids can be controlled with a soil insecticide application of disulfoton (Di-Syston).

Plants are ready to transplant when they are 5 to 6 inches tall. A light watering just prior to pulling the plants will reduce root damage and result in more rapid recovery from transplant shock.

Transplant Production in Greenhouses

Peat pots, cell packs or trays should be filled with a light, artificial potting medium. Sow seeds directly into the container, and thin to one per cell at the two-leaf stage. Irrigate frequently, and fertilize every week or two with a balanced, soluble fertilizer.

Setting out Transplants

Exposure of transplants to low temperatures may cause premature bolting. Most years, it is safe to set out transplants in mid- to late-April. It will ordinarily take about 8 weeks to produce transplants in outdoor beds for a spring crop or 5 weeks for a fall crop. It takes approximately 5 weeks to produce transplants in the greenhouse. For fall crops, plan to set out transplants in mid-August.

Transplant 10 to 15 inches apart in 30-inch rows (21,000 to 14,000 plants per acre, respectively). Very vigorous varieties may require wider spacing, and available equipment may dictate different row spacing. Transplant by hand, or use a mechanical transplanter. Set deeply, but leave upper leaves and bud exposed. Firm soil well around each plant, and water, preferably with a transplant

solution. An insecticide for root maggot control may be included in the transplant solution.

Direct Seeding

Broccoli is often direct-seeded for a fall crop. Seed in July and thin to desired in-row spacing when the plants have 3 to 4 true leaves.

Soils and Fertilization

Broccoli will grow on a wide variety of soils. It performs best, however, on a well drained, medium to heavy soil which is high in organic matter. Adjust pH to 6.0 to 6.5 with lime. Fertilize according to soil test recommendations or use 700 to 1000 lb of 10-10-10 fertilizer per acre. Broccoli requires extra boron (B) for normal growth. Apply 2 lb of actual boron per acre at planting, preferably as part of the complete fertilizer. Common sources of boron are Borax (11.4% B) or Solubor (20.5% B). **Caution:** do not apply boron in the transplant solution. If side shoots are to be harvested, maintain vigor with additional sidedressings of 30 lb of 10-10-10 at 2- to 3-week intervals.

Weed Control

Weed control is important for production of quality broccoli. Any cultivation and hoeing should be shallow to minimize damage to the roots. For the latest herbicide recommendations, consult the current *N.C. Agricultural Chemicals Manual* or contact your local county agent.

Insect Control

The most troublesome insects on broccoli in western North Carolina include root maggot (especially with early season plantings), flea beetles, aphids, cabbage worms, and cabbage loopers. Recommended use of insecticides will result in essentially an insect-free crop. Formulations of *Bacillus thuringiensis* are particularly effective against cabbage loopers and caterpillars.

Disease Control

The major foliar diseases of broccoli include downy mildew and *Alternaria* leaf spot. Control measures include

close observations and sprays with recommended fungicides at first appearance and at 7- to 10-day intervals.

Irrigation

Broccoli is a succulent plant which requires continuous, rapid growth for high yields and good quality. Uneven soil moisture will adversely affect growth. Irrigate with overhead or drip irrigation to maintain a constant supply of moisture.

Harvesting

The marketable portion of the broccoli plant consists of the upper stem and the clusters of unopened flower buds. These “stalks” or “heads” should be cut while the clusters are still compact and before individual flower buds begin to open and show any yellow color. When mature, central heads usually measure 4 to 7 inches across and may weigh 0.3 to 1.0 lb each. Overmaturity is indicated by woodiness in the outer stem tissue, loosening and separation of the flower clusters, and partial opening of the flowers with yellow color showing. Such stalks are not marketable. Depending on the variability within the variety, central stalks may mature over a two-week period. At higher elevations or cooler temperatures, harvesting at 4- to 7-day intervals may be adequate to avoid overmature heads. At lower elevations and warmer temperatures, rate of maturity is accelerated and the harvest interval may need to be shortened to 2 to 5 days.

Maintaining good growing conditions past the time of harvest of the central head, including adequate moisture and fertility and a good pest control program, can result in the development of heads on the lateral shoots until frost. These will usually range from 1 to 4 inches in diameter and 0.1 to 0.3 lb in weight. Second and third commercial harvests of these side shoots is sometimes possible.

Removing more of the main plant stem, along with the central head, will generally result in fewer, but larger, side shoots on the remaining portion of the stem.

Preparation for Market

Broccoli is very perishable and should be removed to the packing shed as soon as it is harvested, then trimmed, bunched, tied, and cooled. Trim stems to 6 to 8 inches. Bind into 1¼- to 1½-lb bunches using rubber bands or “twist-ties,” and pack 14 to 18 bunches in a standard waxed carton for a net weight of 21 to 23 lb. Broccoli is highly perishable and its color and quality deteriorate very rapidly after harvest under high temperatures. Therefore, it should be cooled as soon as possible after harvest. Cooling rapidly to near 32°F and refrigerating is essential for broccoli that must be held for a few days before shipment. For medium to long distance hauling, icing and refrigerated transportation are essential. In addition, most supermarkets expect all broccoli to be iced.

Yields

Central head weight will vary with variety and growing conditions. Variety tests have produced average head weights, depending on spacing, variety and year, from 0.3 to 1.0 lb per head. Yields of central heads may range from 200 to 750 cartons (21 lb per carton) per acre. Two or more side shoots per plant, averaging from 0.1 to 0.3 lb per shoot, could provide from 50 to 150 additional cartons per acre. Good management and good growing conditions should result in average yields of 500 cartons per acre.

* Refer to the current *N.C. Agricultural Chemicals Manual* for recommended materials, rates and application methods for insect, disease and weed control.