

CMG GardenNotes #719

Vegetable Garden Hints

<u>Outline:</u>	Asparagus, page 1
	Beans, page 2
	Cole crops: broccoli, Brussels sprouts, cabbage, cauliflower, kale, kohlrabi, page 3
	Corn, page 4
	Leafy vegetables and salad crops: lettuce, spinach, Swiss chard, page 5
	Onion family: garlic, leeks, onions, shallot, page 5
	Peas, page 6
	Potatoes, page 6
	Rhubarb, page 7
	Root crops: beets, carrots, parsnips, radish, rutabagas, turnips, page 7
	Tomato family: tomatoes, peppers, and eggplants, page 8
	Vine crops: cucumbers, melons, pumpkins, and squash, page 9

Harvesting quality and quantity from a vegetable garden starts with the gardener's ability to provide nearly ideal growing conditions for individual crops. Central to all highly productive gardens is a rich soil, high in organic matter, created with annual additions of compost and/or other organic materials. The following home gardening hints summarize a variety of research projects focusing on quality in vegetable production. Crops are grouped by families that have similar cultural practices.

Asparagus

Soils – Asparagus tolerates a wide range of soils as long as they are well drained. It prefers soil high in organic matter, and full sun (eight hours/day minimum).

Fertilizing – Asparagus is a heavy feeder. Fertilize in spring as growth starts and again in mid-summer after the harvest period.

Mulching – Asparagus competes poorly with weeds and other crops for water, nutrients, and space. Organic mulch is recommended. Mulch also provides winter cold protection for the roots.

Harvesting – The asparagus bed can be weakened or destroyed by over harvesting. The harvest period for an established bed is only four to six weeks (May into mid-June). Harvest only larger spears. Stop harvesting if spears decrease to pencil size or smaller. Leave the ferns (foliage) to grow until fall or let stand through the winter, finally cutting before new growth begins in spring.

Planting – Extra efforts in plantings new beds pay off with increased production.

1. Thoroughly work in four inches of well-composted and aged organic matter through the soil to a 12 inch depth.
2. Before planting, soak roots in warm water for a couple of hours.
3. Dig a trench four to five inches deep and wide enough to accommodate the spread-out roots. Space roots, typically 18 inches apart, covering with only two inches of soil.
4. Add additional soil during the growing season, as plants grow. Asparagus roots are easily smothered if initially covered too deep. (Many texts talk of planting six to eight inches deep for better protection from cold winter soil temperatures. However, this deep planting will decrease yields.)

When planting from seed, start seeds indoors 12 weeks prior to transplanting outdoors. Harden off seedlings before transplanting outdoors.

Beans

Soils – Beans are tolerant of a wide range of soils, as long as they are well drained. Beans are rather sensitive to soil salt. A soil rich in organic matter (to hold water and nutrients for growth) is preferred.

Planting – Research clearly demonstrates that early growth sets potential yield.

- Avoid planting too early in the spring. Soil temperature should be above 50°F, measured at 8 a.m., six inches deep. For example, along the Colorado Front Range, this is typically early May for well-drained sandy soils to late May for clayey soils.
- Rich soil fertility should push early growth of plants. However, heavy nitrogen fertilization will lead to excessive plant growth at the expense of fruiting and increased disease problems.

Spacing affects yields – The potential for disease explodes once the plant canopy grows to cover over the patch; avoid over-crowding! Crop research suggests the following optimum spacings:

- 24 inches between rows with two inches between plants
- 18 inches between rows with three inches between plants
- 12 inches between rows with four inches between plants – (gives 20% higher yield than 24 inches × 2 inches spacing, but may increase disease pressure.)
- Six inches between rows with six inches between plants (this block style spacing will predispose the patch to foliage diseases.)

High water demand – During flowering and fruit production, beans have the highest water use of any vegetable crop. If the water supply is optimum, most varieties will produce until frost. If the water supply is low, beans will respond by:

1. Dropping blossoms
2. Producing pinched, pollywog-shaped fruit

Depending on temperature and wind, water use during fruiting will be ¼-inch to over ½-inch of water per day. Frequent watering in the right amount is essential for bean production.

Figure 1. Beans have a high water use. With inadequate water, blossoms drop, reducing yields. When beans need water, plant color changes slightly from a dark grass green to a grayish green. Windy weather significantly increases the water demand.



Cole Crops: Broccoli, Brussels Sprouts, Cabbage, Cauliflower, Kale, and Kohlrabi

Quality is dependent on the weather and the grower's ability to provide conditions for rapid growth.

Soils – Being shallow rooted, cole crops require a fertile, moist, well-drained soil that is rich in organic matter and nitrogen.

Fertilizer – Cole crops are heavy feeders of nitrogen, phosphorus, and potassium. Apply a plant starter fertilizer (solution of water-soluble fertilizer like MiracleGro, Peters, and Rapid Grow) at planting, three weeks and five weeks. Starter fertilizers increase yields by 20%

Mulch – Because cole crops are poor competitors, mulch to stabilize moisture and control weeds. For early spring plantings, black plastic mulch helps warm cold soils. However, plastic becomes too hot when warm weather arrives. During warm weather, a grass clipping mulch cools the soil and microenvironment.

Irrigation – Cole crops are intolerant of drying. Dry soils quickly lead to strong flavors.

Temperature – Cole crops prefer growing temperatures between 65°F and 80°F. Hot weather reduces sweetness. Because seeds do not like cold soils, use transplants for spring planting. For a superior quality fall crop, direct seed the main planting in early-July (Front Range area). Both broccoli and cauliflower tolerate some frost (down to lower 20's) on maturing plants.

Using Bt – For cabbageworm and looper control, treat with *Bacillus thuringiensis*, Bt, (a biological control product). Because Bt is rapidly broken down by sunlight, treat in the evening. Bt, a living organism, has only a two-year shelf life and cannot survive storage under extreme heat or cold.

Transplants –

- Preferred growing temperature for transplants is 60°F to 70°F. High temperatures result in too rapid growth, and tall, weak plants that are easily broken off in transplanting.
- The ideal transplant is about four inches tall and about four weeks old. Avoid transplants older than six weeks. Quick maturing varieties should be transplanted within four weeks of seeding.

Heading – Yield is based on plant size as the head (curd) starts to develop.

- **Bolting** (rapid head formation)
 - o Broccoli and cauliflower are prone to bolting when exposed to cool weather before three to four pair of true leaves develop.
 - o Long days and hot weather in the summer cause broccoli to bolt and go to seed, and cause cauliflower curds to develop a red-purple discoloration.
 - o Cabbage bolts if exposed to two to three weeks below 50°F. Avoid planting too early in the spring.
- **Buttoning** (development of small heads or curds [buttons] on immature plants) – Factors that restrict early plant growth (including nitrogen deficiency, cold temperatures, shock to young transplants, and drought stress) lead to buttoning. Follow practices that will result in rapid vegetative growth.
- **Blindness** (plants having lost their terminal growing points produce no head) – Damage to the terminal growing point due to low temperatures, cutworms, damage or rough handling of transplants, will result in blind plants. Handle transplants carefully, control cutworms, and avoid planting in low temperatures.

Figure 2. For quality, broccoli, cabbage, and cauliflower need cool temperatures. In warm summer climates (like the Colorado Front Range) plant mid July for harvest in the cooler temperatures of fall. They will tolerate fall frost down to the mid-20s.



Corn

Variety types –

- Normal sugary, (su) – standard varieties
- Sugar Enhanced, (se) – Sugar Enhanced (se) genes increase the original level of sugar in the kernel and slow the conversion of sugar

into starch. Isolation is helpful, but not required

- Super Sweet, (sh) – Super Sweet (sh) genes increase sugar content two to three fold. Delay planting until soil temperatures reach 70°F, in June. Isolation from non-super sweet types by 300 to 500 feet or 14 plus day differences in maturity is required.

Yield = water + nitrogen + space

- Water stress will reduce overall plant growth reducing yields. In particular, water stress will delay silking beyond the time when tassels shed pollen, thereby preventing kernel formation.
- Side dress with nitrogen fertilizer frequently (every three to four weeks) through the summer to maintain a dark grass-green color. Sprinkle one cup 21-0-0 (or equivalent) per 50 feet of row, and water in.
- Spacing affects yields. Crowding decreases sunlight to the leaves, reducing the number and size of ears. Optimum spacing is 36 inches between rows with nine inches between plants or 30 inches between rows with 12 inches between plants. Allow side shoots to develop, but do not plant in clumps.

Plant in Blocks – Corn is wind pollinated, so plant in blocks at least three rows wide, preferably four to five rows wide. Single blocks may include only a portion of the row length, with the remainder of the row being part to a block of another variety that matures at different times.

Pollination – Corn is wind pollinated, but bees collecting pollen also frequently visit it. When applying insecticides, use caution to protect pollinating insects. Do NOT spray tassels with insecticides.

Figure 3. Corn needs to be planted in blocks for wind pollination. For pollination, two side-by-side four-foot wide beds are used. Each bed has two rows going down the bed. This makes the block four rows wide. To extend the harvest season, the top of the bed could have an early planting with a later planting at the bottom.



Leafy Vegetables and Salad Crops: Lettuce, Spinach, Swiss Chard, etc.

Quality lettuce, spinach, chard, and other salad crops is the mark of a great gardener. Quality is based on the gardener's ability to match ideal conditions for rapid growth, including water, fertilizer, space, and temperature.

Soils – A rich soil, high in organic matter, is necessary for quality.

Mulch – Organic mulch (like dry grass clippings) reduces summer soil temperatures producing sweeter produce, conserves moisture, and controls weeds. Weeding by cultivation will damage surface roots.

Irrigation – Keep soil moist with 1 to 1½ inches of water per week (including rain). If the crop gets dry, it will become tough and stringy.

Spacing – Thin the crop to reduce competition for nutrients, moisture, light, and space.

Planting for fall harvest – Plant lettuce and spinach in mid to late summer to produce exceptional harvest quality during cool fall weather. It can also be planted mid-fall for extra-early spring crops. Cover the small seedlings with organic mulch for winter protection.

Figure 4. For quality, leafy vegetables need a constant supply of water, rich soils. For best quality, thin plants when crop is tiny. Here a variety of leaf vegetables are in a raised bed, going across the box. As one row is harvested, immediately replant for a continual harvest of young tasty produce.



Onion Family: Garlic, Leeks, Onions, Shallots, etc.

Soils – The onion family has a poor, inefficient root system, making the crop intolerant of poor soils and competition from weeds. The plants are heavy feeders. Quality produce arises from a well-drained, fertile soil, rich in organic matter.

Mulch – The onion family thrives with organic mulch (like dry grass clippings), which cools the soil, conserves moisture, and controls weeds.

Photoperiod sensitivity – The onion family is sensitive to the length of night, which triggers bulb development. In Colorado, plant only long day varieties that start bulbing with day lengths of 14 to 16 hours and temperatures above 65°F. Plant size at the time conditions trigger bulb development determines the size of the bulb. Plant onions as soon as soil conditions allow in the spring.

Seed head – Keep seed heads picked. They pull plant resources away from bulb development.

Seed, Sets, or Transplants – Onions can be planted from seed, sets, or

transplants. If planted from sets, sort sets larger than a dime from smaller ones. Plant small and large sets separately. Harvest from larger sets first because they do not store as well as onions grown from small sets.

Figure 5. Onions have a shallow inefficient root system. For quality they need an even moisture supply and rich soils.



Peas

Soils – Peas grow best in a rich soil, high in organic matter. They require a well-drained soil.

Types of peas –

- English Pea – standard, shelled pea
- Edible Pod Pea, Sugar Pea or Snow Pea – edible pod, pick before seeds swell
- Snap Pea – edible pod and plump sweet pea fruit

Plant as early as possible –

- Peas are sensitive to the photoperiod (length of night), influencing yields. At Colorado's latitude, an April 1st planting will have a 50% higher yield than a May 1st planting.
- Plant when soil temperatures reach 40°F. Avoid planting in wet soils.

Planting for fall harvest – Peas may be planted in mid-summer for harvest during cooler fall weather. Sweeter peas develop in cooler temperatures. However, yields of the fall crop are reduced due to photoperiodism and the vines are prone to powdery mildew in the fall.

Figure 6. *Snap peas* are edible pod types eaten with plump peas filling the pod. *Edible pod peas*, *sugar peas* or *snow peas* are edible pod types eaten before the pod fills with peas.



Potatoes

Soils – Potatoes thrive in a soil rich in organic matter that provides water and nutrient holding capacity, and improved drainage. However, avoid heavy applications of fresh manure or compost, as it will make the tuber surface rough and increase the occurrence of scab.

Certified Seed – The use of certified seed helps reduce disease problems.

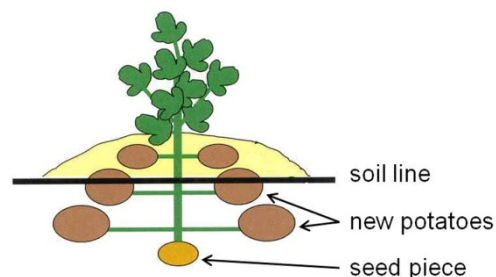
Give the plants a vigorous start –

- Plant when soil temperatures rise above 50°F, four inches deep at 8 a.m.
- Avoid using too small of a seed piece. Cutting seed pieces to 1½ to 2 inches in size provides for early plant vigor. Many gardeners prefer to use seed pieces that require no cutting to reduce decay potential.

Spacing – Plant spacing determines tuber size. Learn by experience the optimum spacing for the variety in a particular garden soil. A starting point is an equal-distant spacing of 12-15 inches between plants and between rows (or three plants across a four-foot wide raised bed). Spacing that allows the plants to close in and shade the soil yields sweeter spuds. However, thick foliage and reduced airflow can also increase the occurrence of disease.

Mulch – Transplants are hardened-off (growth rate slows so the plant is more tolerant of the move the greenhouse environment to the bright, windy outdoors) by withholding water and/or nutrients or by exposure to cooler temperature.

Figure 7. The new crop of potatoes grows above the seed piece. To shield the growing tubers from sunlight (which turns them green) soil is “hilled” (mounded) around the base of the plant. Straw mulch may be used as an alternative to hilling.



Fertilizer – Potatoes are heavy feeders of nitrogen, phosphorus, and potassium. Running out of nitrogen by August is the most common potato problem. Symptoms are a general yellowing of leaves that starts with lower interior leaves. Nitrogen stress pre-disposes the crop to Early Blight.

Moisture – If the soil is too wet or has poor drainage, tubers will rot. If the soil becomes overly dry, tubers will develop knobs.

Rhubarb

Soils -- Rhubarb thrives on any soil that is high in organic matter and well drained.

Yields – Yield is based on the plant's ability to store food reserves in the roots for the next year's crop.

- Keep seed stalk picked off.

- Stop harvest when temperatures rise above 85°F.
- Remove oldest stalks at the base when plants grow crowded, giving room for new stalks to grow. Never remove more than 1/4 of the stalks at one time.

Mulch – Rhubarb is a poor competitor for water and nutrients. Keep mulched with organic mulch.

Sun – It prefers full sun but grows poorly with reflected heat.

Coloration – Poor coloration of stalks develops from too much shade, too much heat, overly wet soils, or an inferior variety.

Re-planting – Reset when stalks become slender and the center of plant dies out, about every eight years. Rhubarb is best transplanted in the fall.

Root Crops: Beets, Carrots, Parsnips, Radish, Rutabagas, Turnips, etc.

Soils – Root crops need a rich, well-drained soil, high in aged organic matter.

Mulch – Use an organic mulch (like dry grass clippings) to cool the soil in summer, stabilize soil moisture, and control weeds.

Irrigation – Consistent soil moisture is a must!

Carrot disorders –

- Strong flavor – Many varieties have a high oil content (and the oil can turn rancid); change varieties.
- Hairy or rough root surface develop from too much fresh organic matter in the soil. Use old, well-aged compost or manure in the root crop section.
- Stubby, knobby, or cracked roots arise from uneven moisture supply, hot soil temperatures, or poor, rocky, or compacted soil conditions.
- Green shoulders result from root crowns exposed to sunlight and reduce sweetness. Mulch with dry grass clippings to shade the crown of the root.
- Failure of seedlings to emerge may arise from soil crusting, planting too deep or high soil temperatures.

Radishes –

- Hot and/or pithy radishes arise from hot weather, hot soil, and/or plants that are past maturity.
- Thin plants as soon as they pop through the ground!

Replanting of root crops for fall harvest – For tender young root crops, replant in mid-summer (Front Range area) for fall harvest.

Winter storage of roots – Some varieties of carrots store well in the garden soil or in a root cellar for year-round use. Other carrot varieties become strong-

flavored as the oil becomes rancid. Two useful options for winter storage include:

- Leave undisturbed where growing in the garden and mulch the bed with straw or other organic materials. Dig as needed.
- Place harvested carrots in straw in a garbage can storage pit.

Figure 8. Burpee white radish: for quality, root crops need an even moisture supply and rich soil.



Tomato Family: Tomatoes, Peppers, and Eggplants

Mulch – Use black plastic mulch for earlier production and higher yields. The mulch also helps control weeds, conserves water, and protects the foliage from disease spores splashing from the soil.

Trellis – Trellis or cage tomatoes to allow for easier picking and suppress Early Blight (the most common tomato disease) and psyllids. Trellising allows plants to dry quickly following rains. An ideal trellis is two feet wide and four to five feet tall. It can be easily made from a six and half-foot length of concrete reinforcing wire coiled in a circle.

Spacing – Avoid crowding plants. Crowding will not increase yields, but will promote disease problems. The minimum spacing for trellised tomatoes is two feet.

Watering – Avoid overhead irrigation, which promotes leaf diseases. A soaker hose type of drip irrigation works well under plastic mulch. Tomatoes can also be furrow irrigated with water running in furrows under the plastic mulch.

Transplanting – Except for avid gardeners who use extra protective efforts to realize a few early tomatoes, avoid early plantings. Plant the main tomato crop when the threat of frost has passed and daytime temperatures are consistently above 60°F. A week of daytime temperatures below 50°F stunts growth.

Fertilizer –

- Over-fertilization causes excessive vine growth at the expense of fruiting.

- However, starter fertilizer at planting and a couple of weeks later will encourage early growth. (MiracleGro, Peters, and Rapid Grow are examples of water-soluble fertilizers that make great starter fertilizers.)
- An additional light fertilization as the first fruits color also will increase yields and resistance to Early Blight.

Blossom drop – Hot, dry summer winds can cause blossoms to drop. Inconsistent watering contributes to this condition. Mulch plants.

With night temperatures below 55°F, blossoms that open the following morning will not have pollen, and blossoms will drop. For example, there is a 50/50 probability along the Colorado Front Range that any given summer night will too cool for pollen development. For early production and in cool locations the “blossom set sprays” effectively improve yields. If daytime temperatures rise above 90°F by 10 a.m., blossom opening that morning will abort.

Blossom end rot – Irregular watering and over-watering causes development of a dark, leathery area on the blossom end of fruits. Water consistently in a deep, improved garden soil and mulch will help prevent this condition.

Figure 9. Sweet 100 Tomato - Over 2,000 cultivars allow the gardener lots of options in flavor, fruit size, and disease management.



Vine Crops: Cucumbers, Melons, Pumpkins, and Squash

Soils – Vine crops thrive in well-drained soils high in organic matter. Yearly applications of compost will likely supply needed nutrients.

Mulch – Use black plastic mulch for earlier production and higher yields. It also controls weeds and conserves water.

Planting time – Do not plant too early. Daytime temperatures should consistently be above 55°F. Protect young, tender plants from cool winds.

Seeds or Transplants – Direct seeding is reported to give higher yields. If using transplants, they should be small, never more than two to four weeks old.

Blossom Drop –

- Vine crops have male flowers and female flowers (small fruit behind the flower). Male flowers develop first, and generally predominate.

- Young fruits that are not pollinated will abort.
- When bee activity is limited, increase yields by hand pollination. Pick a male flower, remove petals, and touch the center of the female flowers with the male flower.
 - Any form of stress (like too much or too little water, poor soil conditions, extreme heat, and wind) can reduce flowering and lead to abortion of fruits.

Figure 10. Vine crops have female flowers (left blossom) and male flowers (right blossoms). The female blossom has a tiny fruit at the base of the petals. For production, bees or the gardener must move the pollen from the male flower to the female flower.



Additional Information – CMG GardenNotes on vegetable gardening:

#711	Vegetable Garden Soil Management and Fertilization	#718	Tomato Early Blight
#712	Sample Vegetable Garden Seed Catalogs	#719	Vegetable Garden Hints
#713	Block Style Layout in Raised Bed Vegetable Gardens	#720	Vegetable Planting Guide
#714	Irrigating the Vegetable Garden	#721	Sample Planting for Raised-Bed Garden
#715	Mulches for the Vegetable Garden	#722	Frost Protection and Extending the Growing Season
#716	Water Conservation in the Vegetable Garden	#723	Growing Vegetables in a Hobby Greenhouse
#717	Growing Tomatoes	#724	Vegetable Gardening in Containers

Authors: David Whiting, with Carol O'Meara and Carl Wilson: Colorado State University Extension. Photographs and line drawings by David Whiting.

- o Colorado Master Gardener *GardenNotes* are available online at www.cmg.colostate.edu.
- o Colorado Master Gardener training is made possible, in part, by a grant from the *Colorado Garden Show, Inc.*
- o Colorado State University, U.S. Department of Agriculture and Colorado counties cooperating.
- o Extension programs are available to all without discrimination.
- o No endorsement of products mentioned is intended nor is criticism implied of products not mentioned.
- o Copyright 2003-2012. Colorado State University Extension. All Rights Reserved. *CMG GardenNotes* may be reproduced, without change or additions, for nonprofit educational use.

Revised January 2012

