



Gardening:
Vegetables
in Wyoming
KAREN L. PANTER

UNIVERSITY
OF WYOMING
Cooperative Extension Service

B-1115
January 2002

Author

Karen L. Panter, University of Wyoming Extension Horticulture Specialist, Department of Plant Sciences, P.O. Box 3354, Laramie, WY 82071

UNIVERSITY OF WYOMING

Editor: Tonya Talbert, College of Agriculture, Office of Communications and Technology

Graphic Designer: Tana Stith, College of Agriculture, Office of Communications and Technology

Issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Glen Whipple, Director, Cooperative Extension Service, University of Wyoming, Laramie, Wyoming 82071.

Persons seeking admission, employment, or access to programs of the University of Wyoming shall be considered without regard to race, color, religion, sex, national origin, disability, age, political belief, veteran status, sexual orientation, and marital or familial status. Persons with disabilities who require alternative means for communication or program information (Braille, large print, audiotape, etc.) should contact their local UW CES Office. To file a complaint, write the UW Employment Practices/Affirmative Action Office, University of Wyoming, P.O. Box 3434, Laramie, Wyoming 82071-3434.



Home vegetable gardening is a popular activity all across the United States. Gardening serves many purposes such as providing sources of food, exercise, and maybe even profit for many people.

Wyoming residents can grow excellent vegetable gardens if they are aware of the special problems that may be encountered. In Wyoming, the following environmental characteristics may be problems:

- Growing seasons range from short to *very* short.
- Growing season temperatures are often too low, sometimes too high, and often include untimely frost.
- High or steady winds can cause physical damage to plants plus soil erosion and rapid drying.
- Low relative humidity levels increase the rate of water loss from plants and soil.
- Poor native soils are usually alkaline, low in organic matter, shallow, rocky, and cold.
- Water is possibly low in quantity and poor in quality.
- Hailstorms can be disastrous to vegetable gardens, as well as other crops.

VEGETABLE GARDENING TIPS

Location

Smart home gardeners find many ways to tailor the garden environment to favor the growth of vegetables. One way is to locate the garden on a gentle slope facing south, southeast, or southwest. By orienting the garden in those directions, the soil will warm up more quickly in the spring and cold air will drain away, provided there is no barrier on the lower side. Choose a spot in full sun. Vegetables planted on the south side of a building often mature sooner because of the reflected heat from the building and possible protection from the wind.





Windbreaks

A Wyoming garden needs a good windbreak on the side facing prevailing winds. The windbreak can be a fence, trees, or shrubs and usually will give adequate wind protection for a distance downwind equal to 10 times the height of the windbreak. Avoid placing a vegetable garden close to trees or shrubs whose roots will compete with the vegetables for water and nutrients.

Crop selection

In Wyoming, the growing season is short and summer temperatures can be cool. When selecting crops, choose from quickly maturing plants that grow well in cool weather, including radishes, leaf lettuce, and onions. Other crops to consider are cabbage, cauliflower, head lettuce, spinach, beets, carrots, and peas. Some vegetables, such as tomatoes, peppers, eggplants, melons, winter squash, pumpkins, and sweet corn, must have hot weather and a long growing season to produce well.

Seed catalogs will list many varieties of each crop, but gardeners should choose varieties recommended for their growing areas. Varieties that have short maturation times or that have been developed in the northern United States or Canada are usually best for Wyoming's climate.

Start early

Many vegetable crops can and should be started indoors before the danger of frost damage is past. These seedlings can be transplanted outdoors when the weather gets warmer. A gardener can gain a few days or even weeks of growing time by setting out transplants at the normal time for outdoor seed planting. Transplanting inevitably causes some slowing of plant growth, but it is temporary. Most plants recover quickly and resume growing if they are given good care. Some crops, such as sweet corn, cucumbers, melons, squash, and pumpkins, will not recover well from transplanting if their roots are damaged in the process. Use care when transplanting these vegetables to the outdoor garden.



Frost protection

Often, individual plants or rows of plants are given frost protection early in the season. Individual plastic plant covers or circular plastic tubes filled with water can help. A fabric cover over a row of plants will give some frost protection and also will raise the air and soil temperatures under the cover, speeding plant growth. Clear plastic tunnels, 14 inches tall and 12 inches wide, placed over wire hoops, can be helpful in boosting growth of warm-season plants such as tomatoes and peppers. Portable cold frames also can be used to give early season protection to small plants.



HOW DO I KNOW HOW MUCH WATER I'VE APPLIED?

To easily determine the amount of water you have applied while irrigating, follow these steps:

1. Choose a straight-sided can or jar. A soup, tuna, or single-serve vegetable can will work well.
2. Place the can in the area to be irrigated.
3. Irrigate as you normally would.
4. Using a ruler, measure the amount of water in the can or jar.
5. Determine how much more or less you need to water at each irrigation to give your vegetables about 2 inches of water weekly.
6. Keep in mind that the soil should be moist to a depth of 6 to 8 inches after each irrigation.

Fertilization

Wyoming gardeners should give particular attention to the fertilization of their gardens so growth will not be slowed by lack of nutrients. An early season soil test will determine which nutrients and how much fertilizer may be needed in the garden. Vegetables require adequate and constant nutrient sources, especially as they approach maturity. Reputable dealers sell many different types of fertilizers, so options are many, ranging from liquid formulations to slow-release types, organic to synthetic. Always read and follow label directions and do not over-apply fertilizers. Over-application does more harm than good.

Soil preparation

Organic matter is usually lacking in native Wyoming soils. Pre-plant incorporation of a high-quality, well-composted organic matter will lighten heavy clay soils, improve soil structure, allow better water penetration, allow air to reach root systems (roots must have oxygen), and provide some essential nutrients. Organic matter is recommended as an amendment for sandy soils to improve water-holding capacity, as well. As an added benefit, organic matter aids soil microorganisms, helping to make nutrients more available for plants. Organic matter is the best amendment for vegetable gardens. Apply 2 inches evenly across the garden area, then till or spade it to a depth of at least 6 inches. Never add sand to a clay soil because compaction and density will become problematic.

Irrigation

Irrigation of the vegetable garden will be necessary anywhere in Wyoming. Use the highest quality water available. Water containing large amounts of dissolved salts will require occasional leaching of the garden to remove these salts. (Another benefit of organic matter in the soil is that it acts as a buffer, tying up salts before they can reach plant roots and cause damage.) Overhead sprinklers, drip irrigation tubes, or furrow systems can be used to irrigate. Most vegetables will require at least 1½ inches of water each week as they near maturity.

There are no hard and fast rules for frequency of irrigation because of variations in weather, soil types, and garden micro-climates. Gardens growing in sandy soils will require more frequent watering than gardens in clay soils.

Furrow irrigation is very thorough, albeit time consuming, and it avoids getting foliage wet. Overhead sprinkler irrigation is satisfactory, but few gardeners know how much water they are applying with this method. Sprinkler irrigation also keeps leaves wet for long periods of time, often leading to foliar disease problems. Trickle or drip irrigation applies water at a very slow rate through tubes set on the ground next to the row of plants. Foliage does not get wet, and the slow trickle allows water to penetrate and soak the area around the roots. Trickle systems often use less water than other irrigation methods.



Mulch

Mulching with an organic matter source is an excellent home garden practice that helps maintain uniform moisture and temperature in the soil; reduces erosion, water loss, and weed problems; and adds organic matter when the mulch is turned under. Organic mulches should be applied only after the soil has warmed up in the late spring or early summer; otherwise, the soil temperature will not warm up enough for proper plant growth.

Materials that can be used as organic mulches include grass clippings (provided they are herbicide- and seed-free), sawdust, straw, peat moss, wood chips, leaves, good quality compost, and even newspaper. When using organic materials, spread a 2- to 3-inch layer around the plants in mid-June. Keep it in place through the growing season. Additional fertilizer will probably be needed, especially nitrogen, because using of any of these materials may cause nutrient deficiencies to develop in vegetable plants. So, always fertilize when organic mulches are used.



PLANNING THE VEGETABLE GARDEN

Long-term crops

Perennial vegetables, such as rhubarb and asparagus, should be planted along one side of the garden. This way they are out of the way of tilling and other preparations. Tall plants, such as corn and tomatoes, should be planted on the north side of the garden, so they will not shade the smaller crops.

Grouping

Try to group plants by the length of their growing period. Separate quick crops from those requiring a full season to mature. Early maturing crops can be planted in the same row or between rows of later-maturing crops. For example, radishes can be planted in the same row with transplanted cabbage, cauliflower, and broccoli. Lettuce may be grown where tomatoes, peppers, and corn will be planted later.

Spacing

Make sure plants are spaced according to seed or label recommendations. Remember to leave space in the garden for maintenance and harvest. Leave enough room to walk and kneel between rows during the growing season.

Cool- and warm-season vegetables

Cool-season crops grow from early to late spring. Usually, light frosts will not injure them. If planted too late, long hot summer days cause many spring crops to “bolt,” that is, to flower and form seeds. Some plants will develop off-flavors, bitterness, poor texture, and low yields. Examples of vegetables suitable for spring gardens are beets, carrots, lettuce, onions, peas, radishes, spinach, and turnips. Many of these can be replanted in late summer or early fall for late harvest.

COMPANION PLANTING

Companion planting is sometimes promoted as a means to deter insect pests from attacking garden vegetables. There is little evidence to support this notion, which is based upon the human sense of smell. Most plants touted as being “repellent plants” have been selected because they have a strong odor to humans, not because insects react to them the same way we do. In fact, insects detect chemicals very differently from humans. They are frequently attracted to plants that give off odors that humans find offensive, including mustard gas, which is produced by radishes and cabbage.

The real key to a healthy garden is diversity. The positive effects of using companion plantings come from the added diversification, not necessarily the introduction of a plant that produces a repellent chemical.

SITE PREPARATION TIPS

- Select a sunny site that is easily accessible.
- Stake out the site and clean out debris, brush, and rocks.
- Have a soil test done. Contact the local University of Wyoming Cooperative Extension Service (UW CES) office for instructions and necessary materials and fees.
- Work the garden in the fall if possible. This allows for decomposition of organic matter during the winter. Till or spade the garden to a depth of at least 8 inches. Do not overwork the soil, just loosen it.
- Incorporate organic matter at a depth of 2 inches on top of the soil, then turn it under to at least 6 inches.

PLANTING TIPS

- Sow fresh, new, high-quality seeds. Generally, old seeds will have low germination rates and may lack seedling vigor.
- Drop seeds into continuous marked rows. Space them according to package instructions.
- Cover the seeds according to package directions, and lightly water them.
- When using transplants, purchase high-quality, healthy plants. Follow label instructions for spacing and planting depth.
- Thin seedlings as they emerge. Thinning may actually be harvesting for some plants such as lettuce, radishes, beets, and turnips. These seedlings make excellent salad greens.
- Keep the soil evenly moist until seedlings have emerged or transplants are established.

GENERAL CARE TIPS

Plan on routine care of your vegetable garden during the growing season. Some of the tasks to be done throughout the season include the following:

- Early on, make sure to thin plants within rows. This is especially important for root crops, such as carrots and beets, which may be deformed or small if they are crowded. This is also important for vegetables that have small seeds as they are very difficult to sow uniformly.



HEIRLOOM VEGETABLES

Interest in these old-fashioned plants has soared recently, in part because of a back-to-basics movement in home gardening. Heirloom varieties may be desirable for many reasons, but can be challenges in the garden. If you choose to use heirloom varieties, keep in mind they probably do not have early maturity or disease resistance genes bred into them. This means heirlooms typically take longer to reach maturity (a drawback in Wyoming) and may be prone to more insects and diseases than newer hybrid varieties.

- Weeding is essential. Weeds can rob your vegetable plants of necessary water, nutrients, and light. There are several ways to weed: pull them by hand, cultivate them with a hoe or cultivator, or use a mulch to inhibit their growth. Chemical herbicides are *not recommended* in vegetable gardens. Small weeds can be pulled by hand or hoed. Use shallow hoeing or cultivating in vegetable gardens so the plants, especially root crops, are not damaged. If weeds are allowed to get too large, pulling them may damage maturing vegetables, so weed early and often.
- Scout and monitor vegetables often, at least weekly, for insect and disease pests. If caught early, simple measures, such as hosing off aphids and spider mites or removing a diseased leaf, will be enough to prevent the problem from worsening. If the problem persists, make sure it is properly diagnosed, then use an appropriate treatment. Sometimes an insecticide or fungicide may be warranted, but *read and follow label directions carefully*. Some gardeners prefer to use cultural methods (hosing off insects, watering early in the day, hoeing out weeds that may harbor insect and disease pests, etc.) and beneficial organisms (ladybird beetles for aphids, lacewings for several insect pests, etc.) for managing pests. There are many options available.
- Vegetable water requirements will vary during the growing season and with the weather. As crops develop more leaf area, they will usually require more water. If a garden is irrigated using an automatic timer, the settings will need to be changed during the growing season.
- Fertilization is very important, especially as vegetables start to mature. There is no one best fertilizer to use and the choice is up to the gardener. When trying to decide how much to apply, have the soil tested by a reputable laboratory. The local UW CES office can help. There are several types of fertilizers available, including slow release, water-soluble, and organic. Slow release types are useful for those who do not like to mix and apply fertilizers in a liquid form. They are usually applied once at the beginning of the growing season. Water-soluble fertilizers must be applied frequently during the growing season. Organic fertilizers should be well-cured to minimize chances of root damage from salts. The gardener should understand that organic fertilizers are usually lower in nutrient levels than other types of fertilizers and may need to be applied frequently. With any fertilizer, *read and follow label instructions carefully*.
- Harvesting should be done frequently and at the proper stage of vegetable maturity. It is often the most rewarding part of vegetable gardening. A common mistake is allowing produce to become over-mature, losing the best flavor or appetizing texture. Try to harvest produce at the stage found at the grocery store. Frequent harvesting is important for some crops like asparagus, cucumbers, summer squash, and sweet corn. The best time of day to harvest is in the early morning. Use or process fresh produce as soon as possible.

VEGETABLE DESCRIPTIONS AND SUGGESTED VARIETIES

The following information will be helpful in planning a garden, buying seeds or transplants, and growing and harvesting vegetables. Days from seeding or transplanting to harvest are given in parentheses for most crops to indicate an approximate growing period. These days will vary in cooler or warmer parts of the state. Some varieties will not mature where the growing season is short.

Cucumbers, eggplant, muskmelons, okra, winter squash, peppers, tomatoes, and watermelons are not recommended for elevations above 6,500 feet.



Asparagus

A perennial vegetable, an asparagus plant can live 10 to 25 years. Plant asparagus in an area of the garden where it will not be disturbed. Start from 1- or 2-year-old crowns planted in April. Dig a trench 6 inches wide and 6 to 8 inches deep. Set the crowns 15 to 18 inches apart in rows 48 inches apart. Place the crown in the bottom of the trench, spreading the roots out. Keep the crown itself higher than the roots. Cover the roots with soil and firm it around the plants.

Harvest asparagus the second year after planting, for a period of 1 to 3 weeks. The root systems need to develop and store food reserves to produce growth the following spring. Plants harvested for too long a period while they are young will become weak and spindly. The third year and thereafter, harvest for 8 to 10 weeks. The tops of the plants can be removed after they die back either in the fall or, preferably, in the spring.

Asparagus spears should be snapped off when they are 5 to 7 inches tall. It is best to break them off instead of cutting them, as cutting can injure the crown buds that will produce the next spears.

Suggested varieties

Transplants: Jersey King, Jersey Knight, Mary Washington, Purple Passion.



Beans

Beans are available either as bush or pole varieties. Bush beans are popular because they mature early and require relatively little space. Many bush bean varieties can be harvested 50 to 60 days after seeding. Pole beans require staking, a trellis, a fence, or some other kind of support. They also require several more days to harvest, usually about 65 days from seeding.

Green beans should be planted after the last killing frost in the spring. Bean seeds planted in cold soil grow very slowly and are more susceptible to seed and stem rotting. Staggered plantings, 2 to 3 weeks apart, can be made until July 1. Plant bush bean seeds in rows 24 to 30 inches apart. Seeds should be sown 2 inches apart in the row and 1 to 1½ inches deep. Pole beans should be planted in rows 40 to 60 inches apart.

Green bean plants have shallow roots, so be careful during cultivation and hoeing. They also require consistent soil water availability, especially at bloom and pod set time.

Beans should be picked as they reach eating maturity. Healthy plants will continue to produce for several weeks if the beans are picked regularly.

Suggested varieties

Bush types: Bush Blue Lake 274 (58), Early Contender (49), Kentucky Wonder (60), Tenderpick (54), TopCrop (51), White Half Runner (60).

Pole types: Kentucky Blue (65), Kentucky Wonder (67), Neapolitan (60), Scarlet Runner (65)



Beets

Beets will tolerate cool temperatures and can be planted about 2 weeks before the average date of the last killing frost. They grow well in cool weather and during the summer.

Plant beets in rows 18 inches apart. Space the seeds 2 inches apart and cover them with $\frac{1}{2}$ inch of soil. Each beet seed is actually a dry fruit that contains several seeds. This tends to produce clumps of plants, which must be thinned early. Leave a final spacing of about 3 inches between plants for best root growth. As beets increase in size, the tops may grow out of the ground and should be covered with soil to prevent sunscald.

Young beets harvested early when the roots are small are very tender and are of excellent quality. Heavier yields are produced by letting the roots grow larger, but these beets often will be woody, fibrous, and undesirable. Beet tops make excellent salad greens — a great use for the small plants removed in thinning.

Suggested varieties

Chicago Red (49), Detroit Dark Red (63), Red Ace (53), Red Heart (58), Ruby Queen (60)



Broccoli

Broccoli has long been recognized as a good home garden vegetable for fresh use or for freezing. Sprouting broccoli has a central green head. After this is harvested, small lateral heads often will develop. Varieties differ in their compactness and the number of sprouting lateral heads they will produce.

Buy or produce transplants and set them out in the early spring, as early as 4 weeks before the average last frost date. Set plants 18 inches apart in rows 30 inches apart.

The edible broccoli head is actually composed of flower buds. The heads must be harvested before the flowers open or show any yellow color. A good mature head will be 3 to 6 inches across. Heads that develop later will be smaller. When harvesting, cut 3 to 4 inches of the stem and the accompanying leaves with the head.

Suggested varieties

Bonanza (55), Green Comet (40), Green Goliath (55), Packman (57)



Brussels sprouts

Brussels sprouts do best as an early spring, fall, or cool weather crop. For growing in early spring, start seeds about 8 weeks before May transplanting, allowing for harvest around August 1.

Sprouts produced on the lower leaves of the plant should be harvested when they are about 1 to 1½ inches in diameter. Lower leaves should be broken away and the sprouts can then be twisted or cut off close to the stem. Harvest from the base upward as the sprouts develop.

Suggested varieties

Jade Cross (82), Long Island Improved (90), Tasty Nuggets (78)



Cabbage

Cabbage can grow from early spring until late fall and will withstand spring temperatures as low as 15 to 20 degrees Fahrenheit. Buy or produce transplants by starting them 4 to 6 weeks before the outside transplanting date. Since cabbage is relatively hardy, it can be transplanted outdoors as early as 4 weeks before the average last frost date.

Plant spacing affects head size. Crowded plants, less than 12 inches apart in the row, will produce small heads. Spacing should be about 18 inches apart in rows 30 inches apart. Large headed or late-maturing varieties may need wider spacing.

Harvest cabbage when the heads are of adequate size and are firm and fully mature. Mature heads left on the plant may split from the pressure of excessive water entering the head. Make successive plantings of cabbage to avoid a glut of cabbage needing to be harvested at the same time.

Suggested varieties

Copenhagen Market (70), Earliana (60), Fast Ball (45), Golden Cross (40), Salad Delight (red, 50), Stonehead (67)



Carrots

Carrots are another cold-tolerant crop that can be planted 1 to 2 weeks before the average last frost date. The seeds germinate slowly and often will not emerge until after the frost has passed. There are many different varieties of carrots with varying colors, shapes, and sizes. The shorter “half long” types are better suited to the heavy soils found in Wyoming.

Carrots should be planted in rows at least 18 inches apart with the distance between seeds in the row 1 to 2 inches. Cover seeds with $\frac{1}{4}$ to $\frac{1}{2}$ inch of soil. Seeds germinate slowly and seedlings are often tiny and weak. Thin seedlings after emergence if necessary. For carrots to grow and develop properly, there should be at least 2 inches between plants.

Deep, loose soil is best for carrot root formation. Rocky, heavy, or shallow soils make it difficult to grow good-quality carrots. In these situations, carrots can be grown in raised beds of well-prepared soil about 10 to 12 inches deep.

Carrots provide a long period of harvest. They can be used as soon as they are large enough and they can be left in the soil until late fall. Fall’s cool temperatures help increase sugar content and improve flavor.

Suggested varieties

Danvers Half Long (75), Little Finger (65), Short ‘n Sweet (68), Sweet Treat (70), Thumbelina (70), Toudo (70)



Cauliflower

These plants need a cool climate to develop a good center head, but cold temperatures also can cause stunting of growth and premature heading.

Cauliflower plants should be started about 4 to 5 weeks before transplanting outdoors. They can be planted outside as early as 2 weeks before the average last frost date and as late as June 15 for a fall crop. Set the plants 18 inches apart in rows 30 inches apart.

Exposure to sunlight discolors white cauliflower and produces off flavors. To prevent this, gather the long leaves below the head and tie them together over the head as soon as the head is visible in the center of the plant. Some newer varieties of cauliflower, such as purple and green types, do not need to be covered.

Cauliflower heads will be mature about 2 weeks after tying, reaching about 6 inches in diameter. The heads turn from clear white at the peak of maturity to yellowish-brown when over-mature.

Suggested varieties

Burgundy Queen (purple) (70), Chartreuse (green) (62), Early White (52), First White (50), Self-Blanching Snowball (70), Snow King (60)



Cucumbers

There are many varieties of cucumbers from which to choose, including those specifically bred for slicing and those used for pickling. Pickling cucumbers are short and blocky in shape. They mature and become seedy at a smaller size than slicing cucumbers.

Cucumber vines will spread over a considerable area, so give them plenty of room. Rows or hills should be 4 to 6 feet apart. The vines also can be trained on a trellis or fence along the edge of the garden, taking up less space and keeping the fruit off the soil.

For the flower to develop into a fruit, pollination by bees must take place. Bees carry pollen from male flowers to female flowers. Female flowers look like they have a tiny “pickle” at their base. Male and female flowers may be on the same or different plants. Poor cucumber set is common during rainy or cool weather when bees are inactive. Cucumber plants often produce male flowers earlier than female flowers — and in much greater numbers. Newer hybrids will produce only female flowers and, as a result, have a high yield potential if plants with male flowers are located nearby.

Cucumbers may be harvested and used from the time they are 1¼ inches long until they begin to turn yellow. Cucumber fruits may become bitter if plants are grown under severe stress caused by lack of water, low fertility, disease, or unusually hot weather. Harvest cucumbers regularly to keep them producing longer. A mature fruit left on the vine will inhibit further flower formation.

Suggested varieties

Pickling types: Bush Pickle (45), County Fair (50), Homemade Pickles (55), Pickalot (54)

Slicing types: Bush Crop (55), Early Spring Burpless (52), Salad Bush (57), Sweet Success (54)



Eggplant

Eggplants require hot weather to grow well, limiting their suitability in many areas of Wyoming. Buy transplants and move them to the garden when the weather is warm, after the last frost, or seed them indoors about 7 weeks prior to planting outside.

Fruits are edible from the time they are one-third grown until they are ripe. They will remain edible after reaching full color. Harvest mature fruits so new ones will develop. Over-mature eggplants are dull in color and will be soft, spongy, and seedy.

Suggested varieties

Blacknite (61) (purple), Blue Marble (62), Ghostbuster (72) (white), Twilight (62) (purple), Vittoria (61)



Kale

Varieties of kale are available in many sizes, shapes, and colors. Although not widely grown, kale is a nutritionally valuable crop.

Kale is quite hardy and can be planted in the spring as early as the soil can be prepared. The plants may be grown indoors and transplanted to the garden after about 3 weeks. Space the plants in rows 24 to 30 inches apart with plants 10 to 12 inches apart in the row. Directly seeded plants should be thinned to a 10- to 12-inch final spacing.

Suggested varieties

Blue Curled Vates (56), Dwarf Siberian (58), Red Russian Heirloom (60)



Kohlrabi

Kohlrabi is a member of the cabbage family that produces an edible, enlarged stem. Seeds can be planted directly in the garden or 4-week-old transplants can be planted outdoors. The plants should be spaced 6 inches apart in rows 18 inches to 2 feet apart. The crop is cold-resistant and can be planted as early as cabbage. It grows best in cool spring and fall weather or in locations where the summer climate is cool.

The quality of kohlrabi is best when growth is rapid and unchecked. Stems should be harvested when they are about 2 to 3 inches in diameter and still tender. They become woody and fibrous when they get too large. Make several plantings 2 to 3 weeks apart to have a continuous supply of tender kohlrabi.

Suggested varieties

Early White Vienna (55), Grand Duke (48), Purple Vienna (60), Sweet Vienna (45)



Lettuce

Lettuce is a cool-season vegetable crop that will withstand light frost. High sunlight and warm summer temperatures cause seed stalk formation (bolting) and bitter flavors, especially in bibb types. Slow bolting or heat resistant varieties are available. Lettuce is a good choice to grow in a partially shaded garden area.

There are four types of lettuce: head, bibb, romaine or cos, and leaf. Head lettuce is the most common for fresh market and grocery store sales. Bibb lettuce is often grown in forcing structures such as greenhouses. Romaine or cos lettuce is a very nutritious type that forms an upright head. Leaf lettuce is the most common for home gardens and will have green or red-tinged leaves.

Sow leaf lettuce varieties in rows 8 to 12 inches apart, with 10 to 20 seeds per foot. Alternatively, sprinkle the lettuce seed evenly over prepared soil

and simply scratch it into the soil. The three heading types are usually started as transplants and spaced 12 to 18 inches apart in rows 24 to 30 inches apart. Lettuce can be started or set in the garden 2 weeks before the last average frost date. Lettuce can be planted on the shady side of tall crops, such as sweet corn, tomatoes, and pole beans, or in other cool areas of the garden. Leaf lettuce matures quickly and can be interplanted between or in rows of slower growing crops such as tomatoes, broccoli, and brussels sprouts. Leaf lettuce also makes a good border around flower beds. Make several plantings to have lettuce available over a long period of time.

Leaf lettuce can be harvested, outer leaves first, when plants are 5 to 6 inches tall. Harvest every other plant, or the very largest plants, in order to thin the crop. Bibb lettuce is mature when the leaves begin to cup inward and form a loose head. Romaine is ready to use when the leaves have elongated and overlapped to form a tight head about 4 inches wide at the base and 6 to 8 inches tall. Head lettuce is mature when the leaves overlap, forming a moderately firm head similar to those found in the grocery store.

Suggested varieties

Head types: Butter Crunch (65), Ithaca (65), Mini Green (65), Summer-time (70)

Leaf types: Black Seeded Simpson (45), Crispy Frills (50), Prizeleaf (48), Red Sails (40), Royal Oak (50), Simpson Elite (48)



Muskmelons (cantaloupes)

Muskmelons are a warm-season crop. Most varieties require a long growing season of at least 80 days from seed to produce mature fruit, plus a considerable amount of space.

Muskmelons can be produced from transplants or can be sown directly. Transplanting will gain a few days of growing time. Rows should be 5 feet apart with hills spaced 2 to 3 feet apart. Seeds should be sown $\frac{1}{2}$ to $\frac{3}{4}$ inch deep after the danger of frost has passed. Grow 2 or 3 plants per hill. Start transplants about 3 weeks before planting outdoors.

As with cucumbers, male and female muskmelon flowers are separated on the same plant. Bees must carry pollen from flower to flower to ensure fruit set. Harvest melons when the fruit pulls away from the vine attachment easily and smoothly.

Suggested varieties

Alaska (65), Minnesota Midget (65), Sweet 'n Early (66)



Okra

Okra is a warm-season vegetable requiring much the same growing conditions as sweet corn. The edible pods are produced in leaf joints on plants that can reach 6 feet tall. Plant after the danger of frost has passed. Seeds should be sown 1 inch apart and thinned later to 5 to 8 inches apart in rows 2½ to 4 feet apart. Harvest okra frequently, as plants will stop producing if fruits are not picked regularly.

Suggested varieties

Annie Oakley II (50), Baby Bubba (53), Cajun Delight (49), Clemson Spineless 80 (56)



Onions

Onions are available in a wide variety of colors and degrees of pungency. Yellow, white, and red onions are common, as are green onions (scallions) and their cousins, leeks.

Onions can withstand some cold temperatures and can be planted in early spring. Gardeners can purchase sets, which are simply small onions, or seeds. Sets should be planted 1 to 2 inches apart and 1 to 2 inches deep in the row. Later, they can be thinned to 4 inches apart. Use the thinned plants as green onions. Avoid sets that are too large, more than 1 inch in diameter, as they may produce seed stalks instead of bulbs. Seed stalk development is also favored by planting too early in the spring and cold temperatures. Seeds or sets should be planted in rows at least 18 inches apart and thinned to 2 to 3 inches between plants. Since onion plants have quite shallow roots, regular irrigation is important to encourage best growth.

Harvest onions when about ⅔ of the tops have fallen over. Dig the bulbs out carefully to avoid cuts and bruises. If the onions will not be used right away, they can cure for several days in a dry, airy spot out of the sun. Remove tops before or after curing, leaving about ¾ inch on the bulb.

Suggested varieties

Candy (85), Columbia (95), Red Hamburger (95), White Bunching (60)

Parsnips

Parsnips require a long growing time, at least 100 days. Therefore, these vegetables can be grown only in the warmest areas of Wyoming. They should be planted about 2 weeks before the average last frost date in rows 18 inches apart with seeds 2 to 3 inches apart.

Parsnip seed loses its viability quickly — within one year — so make sure to use fresh seed. The seed is slow to germinate and a good stand may be difficult to produce in heavy soils and with low moisture.



Dig parsnips in late fall or leave them in the ground throughout the winter. They will tolerate alternate freezing and thawing but will be damaged if frozen after harvest. Harvest them in the spring, before top growth starts, for tender, sweet roots.

Suggested varieties

All-American (105), Hollow Crown (105)



Peas

Garden peas are frost hardy and should be planted in early spring. They will not yield well if they mature during hot weather. In some areas, they can be planted from July 1 to 15 for fall maturation. Peas will produce during the summer in high altitude areas where the summer climate is cool.

Plant seeds 1 inch apart in rows 18 to 24 inches apart. They will usually produce better if they are later thinned to 3 inches apart in the row. Pea varieties vary in height from 18 inches to 6 feet. The taller varieties should be grown on a trellis for easier picking and less disease problems. The trellis can be made of wire fencing, wood, or even string.

Harvest edible pod peas while the pods are still flat, before the seeds inside start to enlarge. Pick them consistently to prolong the harvest season.

Suggested varieties

Edible-pod types: Dwarf Gray Sugar (66), Little Sweetie (60), Oregon Sugar Pod II (68), Snowbird (58)

Snap types: Sugar Ann (56), Sugar Daddy (72), Sugar Snap (70), Super Snappy (65)

Garden types: Early Alaska (52), Little Marvel (62), Maestro (61), Spring (57)



Peppers

There are too many types of peppers to name them all. Both sweet and hot types can be grown in the warmer parts of Wyoming. Pepper plants require warm temperatures and should not be transplanted to the garden until after the last frost. Space the plants 2 feet apart in the row with rows 3 feet apart.

Peppers simply will not grow if the temperature falls below about 55 degrees Fahrenheit. Fruit set on peppers is also temperature sensitive. The flowers will not form fruits if the night temperature drops below 60 degrees Fahrenheit, or if the day temperature rises much above 90 degrees. Hot, dry winds can cause the flowers to fall without forming fruits.

Harvest peppers as soon as they reach a usable size by cutting them off the stem close to the fruit. Green peppers can be left on the plant to mature to their red or yellow color. The mature fruits are often sweeter than the green ones.

Suggested varieties

Sweet types: Crispy Bell (65), Early Crisp (60), King of the North (65), Red Beauty (68)

Hot types: Big Chile (68), Biker Billy (66), Garden Salsa (73), Tam Mild Jalapeno (70)



Potatoes

Both white-skinned and red-skinned potatoes can be grown as a crop for fresh use in early summer and as a late crop for table use in winter. Choose an early variety and a medium-to-late maturing variety. In most parts of Wyoming, plant early potatoes about May 1. Potatoes yield best with cool spring weather and uniform moisture throughout the growing season.

Purchase certified seed (actually chunks of potato tubers) that has been inspected for diseases that contribute to low yields. Seed potatoes should be firm with no sprouts. Wilted or sprouted seed usually has lost vigor from being too warm in storage.

Seed pieces for planting should be cut in about 1½ inch cubes. A 6 ounce potato will yield about four seed pieces. Each seed piece must have at least one good bud or “eye.” Plant the seed pieces in furrows 3 to 4 inches deep, 10 to 12 inches apart, in rows about 36 inches apart. Make sure to be careful during cultivation to avoid damaging developing potatoes.

An early crop of potatoes can be dug before the skins are set and while the potatoes are somewhat green. However, yield will be greater if the crop is harvested after the vines have been dead for about 2 weeks. At this point, the skins of the potatoes will have toughened and losses from peeling will be minimized. Dig the late potato crop after the first frost has nipped the vines in the fall.

Suggested varieties

All Blue (blue tuber), Early Ohio (white skin), Kennebec (brown skin), Norland (red skin), Red Pontiac (red skin), Yukon Gold (yellow tuber)



Radishes

Radishes are a hardy, quick crop. They can be planted in the early spring in rows 12 to 18 inches apart. Thin the seedlings to 1 to 2 inches apart in the row soon after they emerge.

Plantings of radish seeds should be made every 10 days or so for four to six weeks to give a continuous harvest. The plants should be grown rapidly with regular watering. Roots from such plants will be crisp and flavorful.

Suggested varieties

Champion (25), Cherry Belle (21), Crimson Giant (29), Easter Egg (28), White Icicle (30)



Rhubarb

Rhubarb is another perennial vegetable, like asparagus, that is grown by planting pieces of crown. These crown pieces can be purchased commercially or can be cut from older plants. If you have an old plant, cut down through the crown, between the buds, leaving as large of a piece of storage root as possible with each large bud. Plant the crown in early spring. If it is necessary to hold the crown for a week or so before planting, store it in a cool, dark place. Crowns may need to be divided and new plantings made when numerous small stalks appear. These indicate that the crowns are crowded. Seed is not recommended for growing rhubarb because rhubarb seedlings may not be identical to the parent plant.

Crowns are usually planted 3 feet apart in rows 4 to 5 feet apart. Cover each piece with 2 to 3 inches of soil. Since rhubarb will stay in the garden for several years, plant it along the edge of the garden or in an area where it will not be disturbed. Deeply dug, well prepared soil will prolong the life and productivity of rhubarb.

Harvest rhubarb for a short period during its second year. A full harvest period of 8 to 10 weeks should follow in succeeding years. Pull the stalks with a twisting motion instead of cutting them. The green leaf blades contain large amounts of soluble oxalates and are poisonous. Eat only the stalks.

Suggested varieties

Chipman's Canada Red, Crimson Red, Valentine



Rutabagas

Rutabagas are close relatives of turnips but have thickened yellow roots instead of white roots. They are a late-maturing crop whose flavor is often made sweeter by fall frosts. Seedlings can tolerate late frosts, so plant them a few weeks before the last frost date.

Seeds should be planted 1 inch apart, then thin them to 5 to 8 inches apart in rows 12 to 18 inches apart. Harvest in the fall for best flavor.

Suggested varieties

American Purple Top (90), Laurentian (90)



Spinach

Spinach, like lettuce, is a quick-maturing, cool-season crop of high nutritional value grown in early spring and in the fall. Under favorable weather conditions, some varieties will mature as early as 40 days after planting. Warm temperatures in the summer will cause bolting and seed development.

In early May, sow seeds in rows 12 to 18 inches apart or start fall planting in late July. Thin plants to 4 to 6 inches apart. When the plants reach 4 to 6 inches in diameter, cut the whole plant at soil level. Make several staggered plantings to produce spinach over a longer period of time.

Suggested varieties

Avon (44), Bloomsdale Long Standing (48), Teton (48), Tyee (37)



Summer squash

Summer squash grows on large, bushy plants. The immature fruits are eaten before the skin hardens and the fruit becomes seedy. Most varieties of summer squash produce fruit 7 to 8 weeks after planting and will continue to bear for several weeks. Some types of summer squash include zucchini and yellow varieties.

Plant summer squash after the danger of frost is over in hills 4 feet apart with 2 or 3 seeds in each hill. All squash are warm-season plants and grow best when soil and air temperatures are above 60 degrees Fahrenheit. For earlier fruit, plant seeds indoors and transplant them to the garden about 3 weeks later.

Squash plants have male and female flowers on the same plant. The flowers are pollinated by bees.

Suggested varieties

Black Zucchini (46), Early Golden Summer Crookneck (42) (yellow), Early Prolific Straightneck (42) (yellow), Jackpot Zucchini (42), Saffron (50) (yellow straightneck), Sunny Delight (45) (scallop)



Sweet corn

Sweet corn varieties vary tremendously in their quality and time to maturity. Weather is a big factor in how long it takes a variety to mature. Corn is a warm-season vegetable.

Plant sweet corn on the average date of the last killing frost. Plants can be started from seed or you can purchase transplants. For a longer harvest period, plant early, mid-season, and late-maturing varieties at the same time. Or, make successive plantings of the same variety every week or two. Use only the earliest maturing varieties for July plantings. Sweet corn varieties that mature in the fall will usually be the highest quality because of cool night temperatures.

For early maturing varieties that produce small plants, plant in rows 30 inches apart with plants 8 to 9 inches apart in the row. For medium to large plant sizes, use a 30- to 36-inch row spacing with plants 12 inches apart in the row. Plant at least three or four rows of the same variety in a block for good pollination and full ears. Some early varieties may produce suckers from the base of the plant. There is no advantage in removing these.

Harvest sweet corn in the morning when it is cool. Normally, sweet corn is ready for harvest about 20 days after the first silk appears on the ear.

Suggested varieties

Early and Often (64), Early Xtra-Sweet (70), Honey and Cream (84), Northern Seneca Snowshoe (65), Polar Vee (53), Quickie (68), Sugar Baby (65), Xtra-Sweet (67)



Swiss chard

Swiss chard is grown for its green leaf blades and fleshy leaf stalks. It will withstand both hot weather and frost, from spring until late fall.

Plants may be started indoors and transplanted to the garden 1 or 2 weeks before the last frost, or seed may be sown directly at that time. Make rows 18 inches apart and sow seeds $\frac{3}{4}$ inch deep. Thin the seedlings to 8 to 12 inches after emergence.

Many harvests can be made from the same plant throughout the growing season. Remove outer leaves near ground level with a sharp knife, leaving the smaller central leaves. Avoid cutting into the growing point or the bud in the center of the plant, as this is where new leaves develop.

Suggested varieties

Bright Lights (55), Lucullus (60)



Tomatoes

Tomatoes require relatively little space for the large production they yield. However, they are warm-season plants and high temperatures and abundant sunshine are important for best growth and development.

Set tomato plants out after the danger of frost is past. Select healthy, stocky transplants that are 6 to 10 inches tall. Set the transplants in the soil a little deeper than they were in the container. If the plants are tall, do not prune them as this will delay harvest and reduce yields. A better practice is to trench the plant so the roots and a portion of the stem are covered with soil. New roots will develop along the buried stem.

Experts highly recommend using tomato cages to support the growing plants and their fruit load. During the growing season, regular irrigation is important. Harvest the fruits when they are fully ripe. Late-season green tomatoes can be ripened indoors if they are picked before the frost.

Suggested varieties

Celebrity (70), Cold Set (65), Early Girl (52), Gardener's Delight (65) (cherry), Good 'n Early (62), Italian Gold (70), Lemon Boy (72), Roma (75), Sub-Arctic Plenty (51), Super Sweet 100 (65)



Turnips

Turnips, a rapidly maturing cool-season crop, can be planted for late-spring or late-fall harvest. Some varieties are grown only for their leaves or “greens” while others are grown for their fleshy root. Turnip greens are nutritionally rich; white fleshed turnips are recommended for the roots.

Plant the seeds ½ inch deep in rows 12 to 15 inches apart for uniform growth. Two plantings 3 weeks apart will provide a uniform supply. The plants should be thinned to 3 to 4 inches apart in the row after they are established.

Harvest turnips when they are 2 to 3 inches in diameter. Large turnips become woody and unappetizing.

Suggested varieties

Purple Top White Globe (57), Tokyo Cross (35)



Watermelons

Because of their large vines, watermelons require considerable space. For early harvest, start seeds indoors 2 to 3 weeks before the outdoor transplanting date. Then transplant them after the danger of frost has passed. Watermelons are warm-season plants and require warm soil and air to thrive.

The most common way of planting watermelons is by direct seeding. Plant 2 to 3 seeds per hill about 1 inch deep after frost is passed. Hills should be 5 to 6 feet apart in the row with rows 6 feet apart.

The best indicator of harvest time is a yellowish undercolor where the melon lies on the ground, and a dull appearance compared to a slick, shiny appearance prior to maturity. A dead tendril or curl near the point where the fruit is attached to the vine is used by some as an indication the fruit is ready for harvest. Thump the fruit and listen for a dull sound. If the sound is more metallic, the fruit is not yet ripe.

Suggested varieties

Charleston Gray (85), Crimson Sweet (88), Million Bucks (78), Sugar Baby (85), Yellow Doll (68) (yellow flesh)



Winter squash

This squash is typically harvested in the fall when the fruits are ripe and mature. They are generally used in pies and baking. Some types include acorn and butternut, as well as pumpkin.

Growing winter squash is similar to summer squash. The plants, however, will require more room as the fruits are harvested later.

Suggested varieties

Early Acorn (75), Early Butternut (82), Sweet Mama (75), Table Queen Acorn (80), Waltham Butternut (85)



VEGETABLE STORAGE

Most root vegetables need storage temperatures between 32 and 40 degrees Fahrenheit. A cellar under a house, with no heat source, will work. Alternatively, an extra refrigerator might be a good investment for storage of large quantities of garden produce. However, there may be considerable temperature variation from one shelf to the next, especially in older refrigerators. Use a refrigerator thermometer to check temperature; they are available at virtually any store that sells kitchen tools and equipment.

In order to keep vegetables from drying and shriveling, store them in burlap bags or plastic bags with holes punched in them. Air circulation is important. Storage containers that allow air to move through them are also satisfactory.

Here are tips for storing specific vegetables:

- Sort freshly dug potatoes to remove those that are diseased or damaged. Gently brush off most of the soil, then spread them out to cure for about 10 days in a shady, well-ventilated space, at 50 to 55 degrees Fahrenheit. Curing helps condition potatoes for long storage times. After curing, place them in a darkened, unheated room, cellar, or refrigerator that is kept as close to 40 degrees Fahrenheit as possible, is fairly humid (up to 90 percent relative humidity), and has adequate air circulation. Keep potatoes away from light as this can cause them to turn green and become unsuitable for eating.
- Trim off all but $\frac{1}{2}$ inch of the tops of carrots, turnips, parsnips, rutabagas, and beets and brush off excess soil. Always sort vegetables before storage and discard any that are diseased or damaged. Keep these vegetables between 32 and 40 degrees Fahrenheit.
- Harvest cabbage when the heads are solid and remove roots and outer leaves. Cabbage will store easily for 1 to 4 months in a cellar or in a refrigerator at 32 to 40 degrees Fahrenheit.
- Green, yellow, or red peppers will keep for 2 to 3 weeks in the refrigerator. Freeze any surplus.
- Hot peppers can be dried in the sun or other warm location. Store them after they dry in a cool, dry, dust-free place at about 45 to 50 degrees Fahrenheit.
- Put cured onions in mesh bags, spread them on wire screens, or hang them in bunches in a dry, cool (32 to 40 degrees Fahrenheit), airy place.
- Greens do not store well, but they can be held 1 to 2 weeks in a cool (but not freezing) section of the refrigerator.

- Ripe tomatoes will keep about 1 week in a refrigerator at 45 to 50 degrees Fahrenheit.
- Harvest full-size, mature, green tomatoes before frost. They will keep for 3 to 6 weeks at 55 to 60 degrees Fahrenheit with 80 to 90 percent relative humidity. Make sure to check for ripeness every few days.
- Root cellars are too cold and moist for pumpkins or winter squash. Cure them first, then store them at 55 to 60 degrees Fahrenheit. Store them in a single layer to minimize decayed spots.



PEST MANAGEMENT

For tips on pest management in the home garden, refer to UW CES fact sheet B-1035, "Landscape Pests: Integrated Pest Management Strategies for Controlling the Dastardly Dozen."

Cultural methods

The following tips will help prevent losses caused by insects and diseases:

- Have a soil analysis done on garden soils. Contact the local UW CES office for instructions, materials, forms, and fee schedules.
- Follow recommended fertilization practices. If in doubt, under-fertilize; never over-do it.
- Plant crops suited to a specific soil and local climate.
- Use fresh seed from reputable seed companies.
- Select vegetable varieties with disease resistance. Seed catalogs and garden centers will have this information.
- Select transplants that are sturdy and a healthy green and have a white, well-developed root system.
- Rotate the garden plan if possible. Do not grow the same type of produce in the same spot each year.
- Mix crops as opposed to maintaining solid plantings of each type in order to separate disease or insect problems and to reduce potential damage.
- Thin young plants to the proper spacing.
- Water plants early in the morning. If overhead watering is used, morning irrigation will allow plant foliage to dry before darkness sets in. If drip irrigation is used, the timing is not as critical, simply because the foliage will not get wet. Morning is still best, though, so the plants can utilize the water during the day.

- Keep weeds to a minimum. They often harbor pests and also compete with vegetable plants for water, light, and nutrients.
- Remove all plant debris at the end of the growing season to reduce carry over of disease and insect problems. When a garden plant is no longer producing, remove it. If it is healthy, turn it under or use it in compost. Never compost diseased plant material.



Biological methods

Many naturally occurring, beneficial insects and diseases can be used to help manage insect pests in the vegetable garden. Many garden centers carry supplies of beneficial organisms, and many can be ordered through catalogs or via online websites. Be aware, however, that once their food supply is gone, the beneficials will be too. When using biological management methods, the gardener will have to put up with a certain number of pests in order to keep the predators around. The use of any biological management organism effectively rules out the use of any pesticides in or around the vegetable garden. Beneficial insects are highly sensitive to many pesticides, so be careful.

- ***Bacillus thuringiensis*** B.t., as it is commonly called, has been around for many years. It is highly effective against lepidopterous caterpillars that often damage vegetable plants. B.t. is a naturally occurring bacteria that is lethal against moth and butterfly larvae. For this reason, spray it only when necessary because it will harm moths and butterflies that are not plant pests.
- **Tachinid flies.** The larvae of these insects will eat soft-bodied insect pests.
- **Parasitoid wasps.** These wasps lay their eggs in the pupae of insect pests, effectively killing them.
- **Ladybird beetles.** The larvae of “ladybugs,” as they are commonly known, are voracious aphid-eaters. The larvae will eat many more aphids than adult ladybird beetles will.

Pesticides

The range of chemical pest management products available today is quite large, and ranges from quite safe (such as horticultural soaps and oils) to fairly toxic (such as many chlorinated hydrocarbons).

It is important to positively identify the cause of the problem. Identification may take the expertise of a diagnostic laboratory or UW CES personnel. Once the problem has been identified, management tools can be recommended. Always look for pesticides labeled for the particular problem on the particular type of plant. Then, *read and follow the label instructions carefully*. And remember, applying *more* than the label says may not only be harmful, it is also illegal.