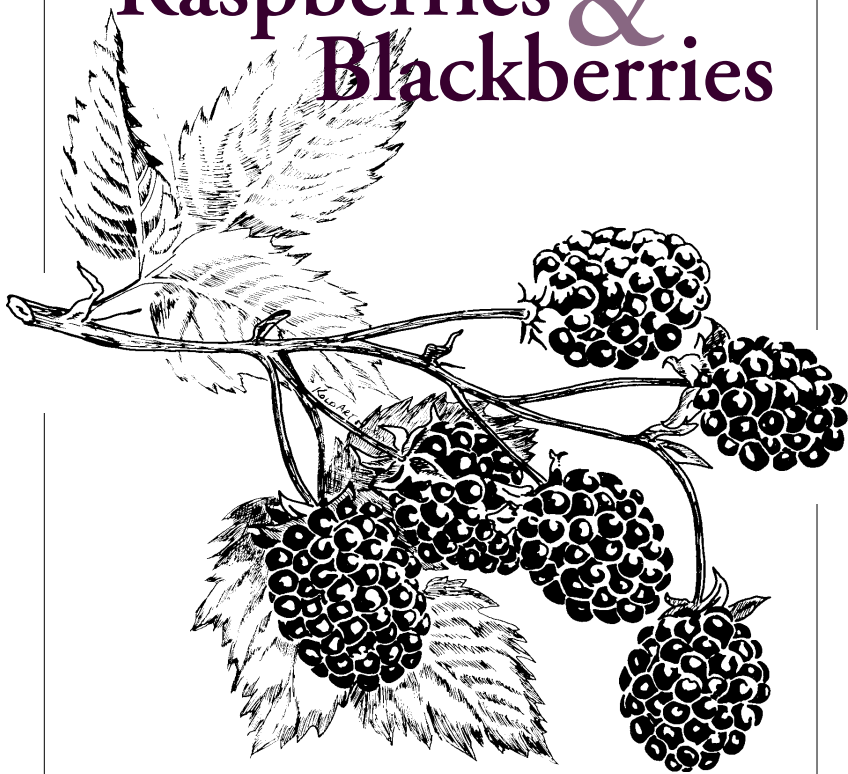


Growing Raspberries & Blackberries



in the Inland Northwest



Intermountain West

by Danny L. Barney, Michael Colt, Jo Ann Robbins,
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Contents

How raspberries and blackberries grow	3
Selecting and preparing your site	5
Designing your plots	6
Plant and row spacing	6
Support	8
Trellis posts	12
Selecting your plants	14
Planting	14
Caring for your berries	15
Irrigation	15
Fertilization	19
Weed control	22
Winter protection	23
Pruning	24
Harvesting and storing your berries	27
Controlling insect pests and diseases	28
Insects and mites	28
Diseases	29



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take three years from planting to reach maturity
and remain productive for 8 to 12 years.*



Growing Raspberries & Blackberries

in the Inland Northwest & Intermountain West

Raspberries and blackberries (brambles) are grown for home use and local sales throughout the Inland Northwest and Intermountain West. These popular fruits can be eaten fresh or made into jams, jellies, syrups, compotes, pastries, juices, and many other foods. Besides their excellent flavor, raspberries and blackberries provide vitamin A, vitamin C, and dietary minerals.



Raspberry and blackberry fruits develop their best flavors when allowed to ripen before picking. Once ripe, however, the berries become soft, bruise easily, and quickly lose their texture and flavor. Raspberries and blackberries being shipped long distances are picked before they are fully ripe and never develop full flavor. This creates a market advantage for commercial growers providing local customers with high-quality fruit.

Raspberries

Raspberries come in four colors: red, yellow, black, and purple. Red and yellow raspberries are the same species, and are the most cold hardy of the brambles. A few cultivars (cultivated varieties) tolerate winter temperatures of -25° to -30°F, and many are hardy to -20°F. Red raspberries



are popular for eating fresh, cooking, and juicing. Yellow raspberries are very sweet and excellent fresh, but lack the tartness and color needed for processing.

 *Red and yellow raspberries are the same species, and are the most cold hardy of the brambles.* 

Black raspberries belong to a different species and can be injured at temperatures around -10°F or lower. Black raspberry fruits are smaller and seedier than red raspberries. Some people like them fresh, but they are used most often in making pastries or jam.

Purple raspberries are crosses between red and black raspberries. They are very vigorous, highly productive, and fall somewhere between red and black raspberries in cold hardiness. In Idaho trials, purple raspberries survived winter temperatures of -20°F with no injury. Purple raspberry fruits have uneven shapes and often muddy, purplish colors. Their flavor makes them fair for eating out of hand, but excellent for preserves.

Raspberries produce either one or two crops of fruit each year. Summer-bearing raspberries produce a single crop of fruit beginning in early to mid summer. Fall-bearing (also known as everbearing) raspberries bear a crop in mid summer and another crop in late summer or early fall. Red and yellow raspberries may be either summer- or fall-bearing. All black and purple raspberries are summer-bearing. By growing several cultivars, you can enjoy fresh berries from early summer through late fall.

Blackberries

Blackberries come in trailing and erect types. Trailing blackberries include such cultivars as Marion, Logan,





Bababerry, and Youngberry. We often call trailing blackberries dewberries, and they come in both thorny and thornless types. Trailing cultivars do not develop much cold hardiness and many are injured or killed at 0° to 5°F.

Erect blackberries may be thorny or thornless and are generally more cold hardy than trailing types. Chester, Darrow, and Illini Hardy have survived winter temperatures between -15°F and -20°F with little injury in Idaho trials. All blackberries are summer-bearing, but some cultivars ripen in early summer, while others do not ripen until late fall.

How raspberries and blackberries grow

Most blackberries and raspberries take three years from planting to reach maturity and remain productive for 8 to 12 years. Because diseases and pests can gradually build up, many home and commercial growers replant about every 10 years.

 *By growing several cultivars,
you can enjoy fresh berries from early summer
through late fall.* 

Red and yellow raspberries and some blackberry cultivars spread by means of underground stems and can invade adjacent yards and planting beds. Canes arise as suckers from the crown or underground stems (rhizomes). These canes are biennial and live only about 18 months. During their first year of growth, we call the canes **primocanes**.

In summer-bearing raspberries and all blackberries, primocanes produce only leaves and no flowers or fruit.



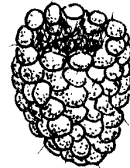
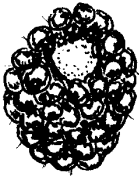
During their second growing season, we call the canes **floricanes** because they bear flowers and fruit. Shortly after the fruit ripens, the floricanes die. Each year, new primocanes grow to replace the floricanes.

Fall-bearing red and yellow raspberry plants produce fruit on their primocanes. In these cultivars, the primocanes grow 3 to 6 feet tall during the spring and early summer. Flower buds then develop on the top one-fourth to one-third of the primocanes. Flowers appear in mid to late summer, developing into fruit during the late summer and early fall. During the winter, the tops of fall-bearing primocanes wither and die. The following spring, flower buds arise on the still-living floricanes below the dead tops. In this way, a single cane bears first a fall crop, then a summer one, creating two crops of berries each year. The total yield of berries produced by a fall-bearing raspberry plant is about the same as that produced by a summer-bearer.

In a horticultural sense, neither raspberries nor blackberries are true berries.

Both produce aggregate fruits composed of many small, single-seeded drupelets held together with microscopic hairs. The drupelets form around the outside of a receptacle, or core.

When raspberries are picked, the cluster of drupelets that we call a raspberry slips off the receptacle, leaving the core behind. In blackberries, the receptacle breaks off where it connects to the stem and remains inside the "berry."



For fall-bearing raspberries, many commercial growers mow the primocanes off several inches above the ground after harvesting the fall crop. Doing so reduces pruning labor costs at the expense of the smaller summer crop. It is generally best to wait until early spring to mow off the canes. This wait allows carbohydrates produced by the bushes in summer to move into the rhizomes and roots and make your bushes more vigorous.

Selecting and preparing your site

Raspberries and blackberries have similar growing requirements. Usually they grow best in full sun on a well-drained (but not droughty), slightly acid to neutral soil that has a pH of 5.6 to 7.0. Brambles are shallow-rooted, with about 90 percent of the roots lying in the top 20 inches of soil.

Avoid planting into a poorly drained location. Red raspberries, in particular, are susceptible to root rot and cannot tolerate standing water or poor drainage. On poorly drained sites, plant raspberries in raised beds that are 6 to 12 inches above the surrounding soil. Raised beds in small gardens can be enclosed with wooden timbers or stones. For large plantings, use a tractor-mounted hill or bed former to create raised beds about 1 foot high and 3 feet wide.



*Avoid planting
into a poorly drained location.*



You can confine blackberries and raspberries to small garden beds by burying 14-inch-wide strips of aluminum or galvanized steel flashing (used in roofing) around the outsides of the beds.



Besides being intolerant of wet soils, brambles are susceptible to a disease called Verticillium wilt. Peppers, tomatoes, potatoes, eggplants, and other small fruits are also hosts for this disease. Whenever possible, do not plant brambles next to these crops or in locations where they have been grown within the past five years.

Select a site that receives full sun exposure and is not in a frost pocket. Plant where the bushes have good air drainage (this helps prevent diseases), but avoid windy sites, if possible. If you must plant in a windy area, protect the plants with a windbreak. Some authorities recommend planting brambles in rows running north and south to provide even exposure to sunlight on both sides of the row.

Before planting, eliminate all perennial weeds, such as quackgrass and Canada thistle. These highly invasive weeds can quickly choke out a bramble patch. The most effective method of eliminating perennial weeds is to kill them with a translocatable herbicide such as glyphosate. Contact your garden center for recommendations and always follow label directions. Note that herbicides that contain glyphosate are highly toxic to raspberries and blackberries and should not be applied after the brambles are planted.

Brambles benefit from compost or well-rotted manure added to the soil before planting. A soil test before planting can help identify potential problems with soil acidity and nutrients. Preparing the planting bed the preceding fall allows for easier and earlier spring planting.

Designing your plots

Plant and row spacing

Allow plenty of space for your planting. Overcrowding makes caring for crops more difficult and usually reduces yields and increases pest and disease problems. For red and yellow summer-bearing and black raspberries, lay out



Characteristics and requirements for raspberries and blackberries

Red and yellow raspberries

Expected yield: 2 to 3 pounds per hill

Hardiness: -20° to -30°F

Plant spacing:

Summer-bearing: 2 feet apart (hedgerow)
or 2 1/2 to 3 feet apart (hills)
in rows 8 feet apart

Fall-bearing: 2 feet apart (hedgerow)
or 2 1/2 to 3 feet apart (hills)
in rows 10 feet apart

Row width:

Summer-bearing: no more than 12 inches

Fall-bearing: no more than 18 inches

Black raspberries

Expected yield: 2.5 to 3 pounds per hill

Hardiness: -5° to -10°F

Plant spacing: hills 3 feet apart in rows 8 feet apart

Row width: No more than 12 inches

Purple raspberries

Expected yield: 3 to 4 pounds per hill

Hardiness: -15° to -20°F

Plant spacing: hills 3 to 4 feet apart
in rows 10 feet apart

Row width: no more than 12 inches

Blackberries

Expected yield: 6 to 7 pounds per hill

Hardiness: +5° to -20°F

Plant spacing:

Trailing: hills 5 feet apart in rows 8 feet apart

Erect: hills 5 feet apart in rows 10 to 12 feet apart

Row width: no more than 12 inches



planting rows 8 to 10 feet apart. Fall-bearing raspberries are more spreading than summer-bearing types and are easier to manage when the rows are 10 feet apart. Purple raspberries are quite vigorous and rows should be 10 feet apart. Trailing blackberries are confined to trellises and can be planted in rows as close as 8 feet. Erect blackberries are much more spreading and require rows 10 to 12 feet apart. Ensure that the row spacing will allow you to easily navigate between the bushes with the mowers, tractors, or other equipment you will be using. Leave room at the ends of rows for trellis posts (if needed) and to turn equipment around.

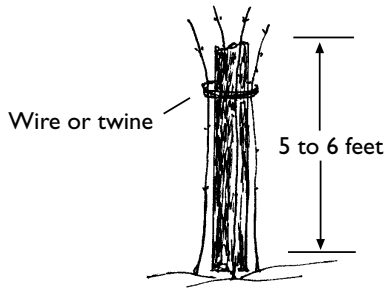
The planting distance within rows depends on the type of berry and the training system. When red and yellow summer-bearing raspberries are grown as individual bushes in “hills,” space the plants 2 1/2 to 3 feet apart in the rows. If you want to create a solid hedge of raspberries, space the plants 2 feet apart. A hill system makes weed control in the berry rows easier. Hedgerows simplify picking and improve light exposure. Fall-bearing raspberries are usually planted 2 feet apart in hedgerows, but can be planted 2 1/2 feet apart in hills.

Black and most purple raspberries do not spread underground (sucker) as much as red raspberries and are usually grown in discrete hills. The only exception is the purple cultivar Royalty, which can be grown either in hills or hedgerows. Space black raspberry hills 3 feet apart and purple raspberry hills 3 to 4 feet apart in rows. Space blackberries 5 feet apart in rows.

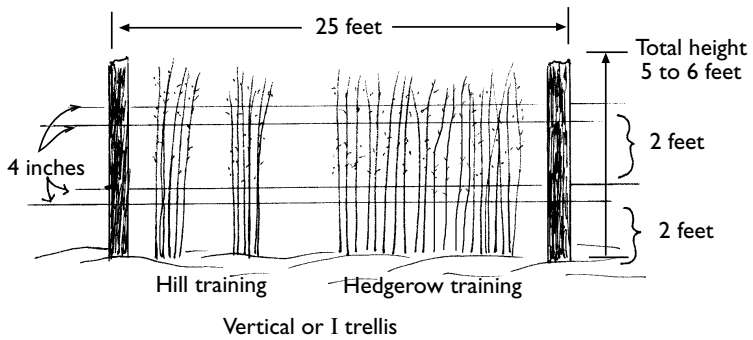
Support

A trellis keeps canes and fruit from touching the ground, reduces wind breakage and fruit loss, and makes weed control and other management easier. Red and yellow summer-bearing raspberries are usually supported on posts or trellis wires (fig. 1). Fall-bearing cultivars are sometimes

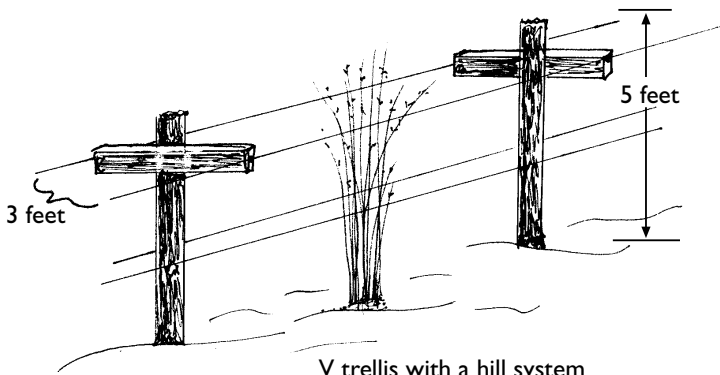




Hill system using a single fence post



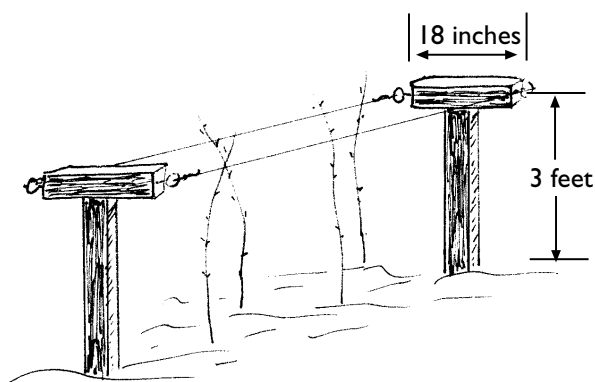
Vertical or I trellis



V trellis with a hill system
(The V trellis is also suitable for a hedgerow system.)

Figure 1. Training and trellises for summer-bearing red and yellow raspberries.





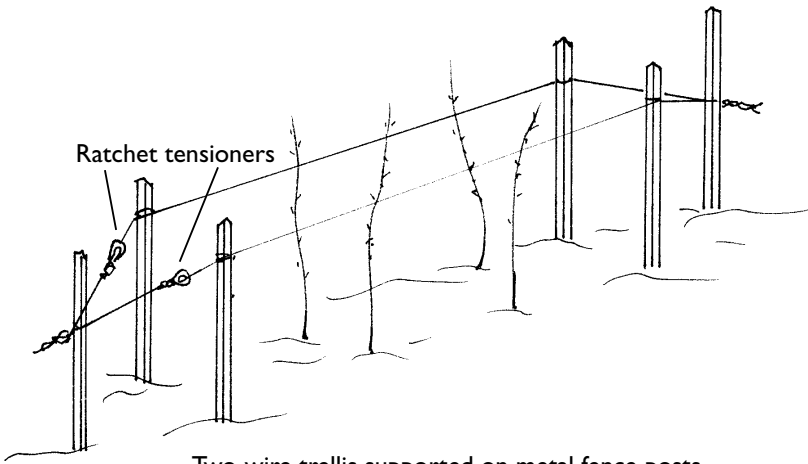
Two-wire trellis supported on wooden T-shaped posts

Figure 2. Trellises for fall-bearing red and yellow raspberries.

grown without support, but vigorous, heavily-laden canes can easily topple. A simple two-wire trellis supports fall-bearing raspberries and makes management much easier (fig. 2). Black raspberries and purple raspberries can be grown free standing, but benefit from trellis or post support in snow country or windy areas. Purple raspberry canes can grow 9 feet tall and bear heavy crops, making them likely to fall over. Erect blackberries are generally grown free standing, but trailing and semi-erect cultivars require support (fig. 3).

Trailing blackberries are always supported on trellises. One method of training trailing blackberries is to form wheels of canes (fig. 3). As the new primocanes grow, tie them together into a bundle. As the canes continue to grow, wrap them into a circle and support them by a hook on the top trellis wire (do not wrap the canes around the wires).





Two-wire trellis supported on metal fence posts
(Ratchet tensioners keep wires tight on long trellises.)

If your site experiences winter temperatures below about +5°F, lay the wheels of canes on a plastic sheet on the ground after the leaves have dropped in the fall. Cover them with another plastic sheet and then with straw or other mulch. Mulching the canes protects them from cold winter temperatures. If you mulch, set out baits or traps to control mice and voles.

In early spring, rehang the wheels of floricanes and begin forming new primocane wheels. After harvest, cut off the expended floricanes near the ground, leaving the primocanes that will bear next year's crop. This method is obviously best suited to home gardeners. Trailing blackberries are not generally recommended for commercial operations in the Inland Northwest and Intermountain West.



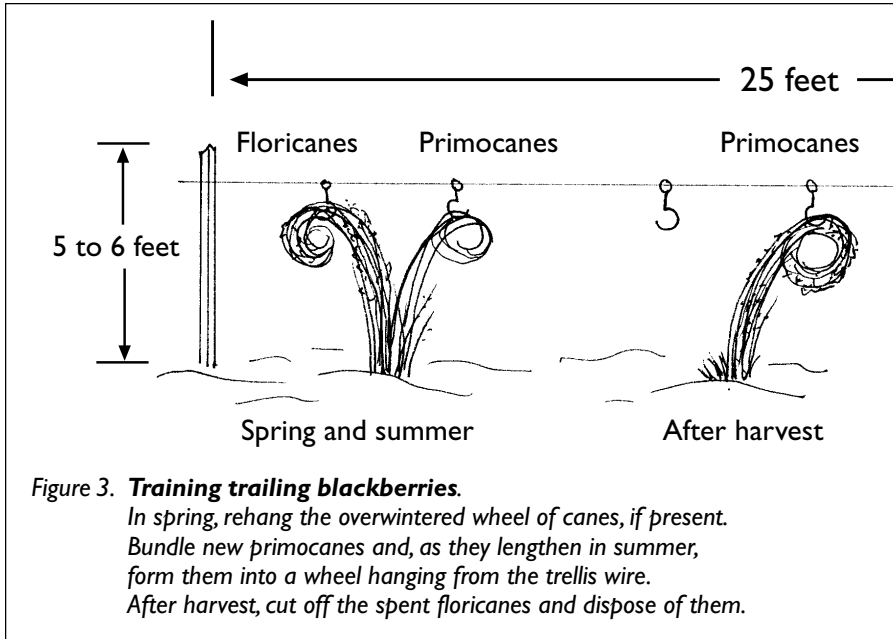


Figure 3. Training trailing blackberries.

In spring, rehang the overwintered wheel of canes, if present. Bundle new primocanes and, as they lengthen in summer, form them into a wheel hanging from the trellis wire. After harvest, cut off the spent floricanes and dispose of them.

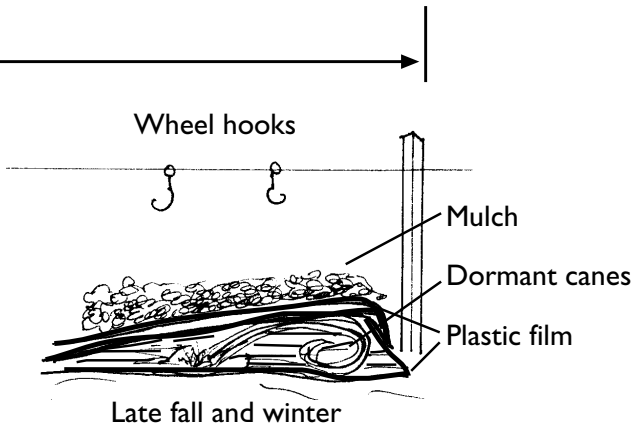
Trellis posts

Fence posts 8 to 10 feet long and driven or buried 3 to 5 feet deep work well for support. Soils that frost heave call for the longer posts and greater depths. For trellises 50 feet or longer, use two anchor posts at the ends of the rows (fig. 4). Farm supply stores carry the necessary hardware to create trellis systems.

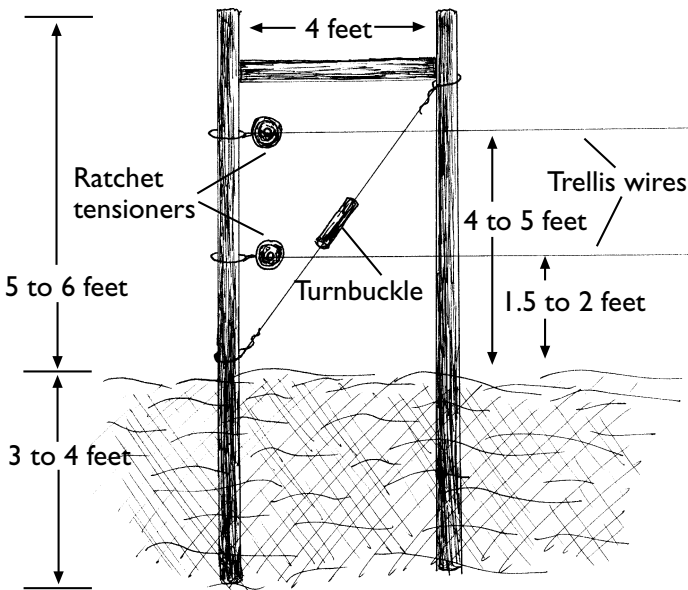
Figure 4. Double post arrangement for anchoring the ends of trellises.

Posts may be either of wood or of metal. For wooden posts, bolt or nail cross bars to the two posts. Special "T" fasteners are available for metal fence posts. Ratchet tensioners allow easy tightening of trellis wires.





In late fall or early winter, after the leaves have dropped, lay the primocane wheel on the ground and cover it with straw, sawdust, or another mulch. Install rodent traps or baits. Sandwiching the primocane wheel between two layers of plastic film can keep the canes clean and reduce diseases.



Selecting your plants

Begin with the best nursery stock available. Taking root cuttings or transplants from established beds, either your own or a neighbor's, is unwise. Nursery plants nearly always grow better because they harbor fewer pests and diseases. If possible, select plants certified as **virus indexed**. They will be more vigorous and long-lived than virus-infected stock. While **tissue cultured** plants are usually free of pests and diseases, they are smaller and more tender than traditional bare root stock and harder to establish. Most growers have better success with **nursery matured** raspberries and blackberries. These are tissue cultured plants grown out in a container or nursery bed for a year before sale. Recommended cultivars are listed in table 1.

Planting

Most mail order raspberry plants are sold bare root. Schedule shipments so that your bare root plants arrive in late March or April. Keep them cool and moist, but protect them from freezing. One option is to dig a trench about 1 foot deep in a shaded location. Fill the trench with moist sawdust and heel (bury) the canes in the sawdust until planting. Transplant bare root stock as soon as the ground becomes workable in the spring.

Local nurseries generally sell raspberries and blackberries as containerized plants. You can transplant these any time, but the earlier in the season you plant them, the sooner they will become established.

Brambles seldom need root pruning at the time of planting, other than to cut off damaged or diseased roots. For dormant, bare root plants, dig a trench 3 to 4 inches deep, spread the roots horizontally along the bottom of the



trench, and cover them with 3 to 4 inches of soil. Remove containerized plants from their pots and bury them so that the tops of the root balls are covered by about 1/2 inch of soil. Do not prune the canes when planting.

Whatever planting stock you use:

- Eliminate all weeds (especially perennials) before planting.
- Prepare a loose, friable planting bed.
- Never allow roots to become dry during planting.
- Water the plants after planting.
- Mulch around the new plants with clean straw, sawdust, or compost to keep the soil moist and control annual weeds.

Caring for your berries

Irrigation

Raspberries generally require irrigation from bloom through harvest to ensure good berry size. Raspberries cannot, however, tolerate wet soils and you must avoid overwatering. Planting on a wet site or overwatering is especially damaging to red raspberries, which are highly susceptible to root rot. On alkaline soils (those whose pH is above 7.0) overwatering makes iron chlorosis problems more serious.

Overhead sprinklers are often used to water brambles, but can encourage fruit and cane diseases. A better practice is to apply water directly to the soil at the base of the plants. If you use sprinklers, apply water early in the morning to allow the canes to dry quickly.

Reduce watering after the first frost to encourage the canes to harden off. A late fall watering after the plants are dormant will help prevent winter injury caused by the canes drying out.



Table 1. Recommended raspberry and blackberry cultivars for the Inland Northwest and Intermountain West.

Cultivar	Cold hardiness (°F)	Fruit characteristics					Disease resistance	
		Ripening	Size	Flavor	Fresh use	Processing use	Phytophthora root rot	Spur blight
Summer-bearing red raspberries								
Algonquin	-30	I	M-L	E	G	G	3	2
Canby	-25	I	M	E	G	G	1	1
Chilcotin	-25	I	L	G	G	G	2	2
Festival	-30	I	M	G	G	G	3	3
Haida	-20	I	M	G	G	G	2	3
Killarney	-30	I	M	F-G	G	F	3	3
Latham	-25	I	S	G	F	G	4	2
Newburgh	-20	I	S	G	G	P	4	2
Nootka	-25	I	M	G	F	G	2	1
Nordic	-30	I	M	G	G	G	3	2
Reveille	-30	I	L	G	G	G	3	2
Skeena	-25	I	M	E	E	E	1	2
Souris	-30	I	M	E	G	G	3	2
Taylor	-25	I	L	G	G	G	3	2
Tulameen	-20	I	L	G	G	G	3	2
Fall-bearing red raspberries								
Amity	-25	1,4	M	G	G	G	2	2
Autumn Bliss	-25	1,3	M	E	G	G	3	2
Heritage	-25	1,4	L	G	G	G	3	2
Redwing	-25	1,3	M	G	G	G	3	2
Summit	-25	1,3	M	E	E	E	4	2
Yellow raspberries								
Amber	-25	1,3	M	E	E	P	3	2
Fall Gold	-25	1,3	M	E	E	P	3	2
Golden West	-25	I	M	G	G	F	3	2



Table 1. Recommended raspberry and blackberry cultivars for the Inland Northwest and Intermountain West (cont.).

Cultivar	Cold hardiness (°F)	Fruit characteristics				Disease resistance		
		Ripening	Size	Flavor	Fresh use	Processing use	Phytophthora root rot	Spur blight
Black raspberries								
Allen	-10	I	L	G	G	G	4	3
Blackhawk	-15	I	M	F	F	F	4	3
Bristol	-10	I	M	F	F	F	4	3
Cumberland	-5	I	L	G	G	G	4	3
Haut	-15	I	M	E	E	E	4	3
Purple raspberries								
Brandywine	-20	2	L	G	F	E	3	3
Success	-20	2	M	G	G	E	3	3
Royalty	-20	2	L	G	G	E	3	3
Thornless blackberries								
Chester	-20	3	M	G	G	E	4	4
Dirksen	-15	3	L	G	G	E	4	4
Navaho	-10	4	S-M	G	G	E	4	4
Thornfree	-10	4	L	E	E	E	4	4
Thorny blackberries								
Darrow	-25	2	S	F	F	G	4	4
Illini Hardy	-20	4	M-L	G	G	E	4	4

Ripening: 1 = early to mid summer; 2 = mid to late summer; 3 = late summer to early fall; 4 = early to late fall

Fruit size: S = small; M = medium; L = large

Fruit flavor, fresh use, and processing use: P = poor; F = fair; G = good; E = excellent

Disease resistance: 1 = very susceptible; 2 = susceptible; 3 = moderately resistant; 4 = very resistant



Table 2. Fertilizers to add for each 10 feet of row.

Year	Cow & horse*								
	manure (pounds)	<i>or</i>	10-10-10 (ounces)	<i>or</i>	20-20-20 (ounces)	<i>or</i>	21-0-0 (ounces)	<i>or</i>	36-0-0 (ounces)
Planting	15		13		6.5		6.5		3.5
2	20		18		9		8.5		5.0
3+	30		27		13.5		12.5		7.5

Note: Scatter fertilizer in a 2- to 3-foot-wide band centered on the berry row.
 10-10-10 contains 10% each by weight N, P, and K,
 20-20-20 contains 20 % each N, P, and K; 21-0-0 is ammonium sulfate,
 36-0-0 is ammonium nitrate.

*Cow and horse manure contain about 0.5% N.

Rabbit and poultry manure contain about 1.8% N, so use one-third the manure rates shown in table 2.

Table 3. Phosphorus fertilizer to add at planting for each 10 feet of row, based on soil tests.

Soil test P (ppm)	0-45-0 ^a (ounces)	<i>or</i>	Steamed bone meal ^b (ounces)
0 to 1.0	4.0		16
1.0 to 2.0	3.0		12
2.0 to 3.0	2.5		9.5
3.0 to 4.0	2.0		8.0
4.0 to 5.0	1.5		6.0
5.0 to 10.0	1.0		5.0
Above 10.0	0		0

Note: Scatter fertilizer in a 2- to 3-foot wide band centered on the berry row.

^a0-45-0 is triple-super phosphate.

^bUse steamed bone meal to avoid potential problems with human pathogens.

Table 4. Potassium fertilizer to add at planting for each 10 feet of row, based on soil tests.

Soil test (ppm)	Potassium sulfate (ounces)	<i>or</i>	Potassium nitrate (ounces)	<i>or</i>	Potassium-magnesium sulfate (sul-po-mag) (ounces)
0 to 50	4.0		5.0		10.0
50 to 75	2.5		3.5		7.0
75 to 100	2.0		2.5		5.0
Above 100	0		0		0

Note: Scatter fertilizer in a 2- to 3-foot-wide band centered on the berry row.





*When choosing fertilizers,
select those that are low in chlorides.*



Fertilization

Raspberries and blackberries benefit from regular fertilization. Many fertilizers are available. Ammonium nitrate and urea add only nitrogen to the soil. Ammonium sulfate adds nitrogen and sulfur. Because ammonium sulfate acidifies the soil, it is especially useful for growing sites with alkaline soils. You may also choose to apply a “complete” fertilizer, which contains nitrogen, phosphorus, potassium, and sometimes other plant nutrients.

When choosing fertilizers, select those that are low in chlorides. Raspberries are particularly sensitive to chlorides.

Nitrogen. Nitrogen should normally be added each year. How much nitrogen fertilizer to add depends on the age of the planting (table 2). In general, if plants are stunted and leaves are yellowish, add more nitrogen. If cane growth is excessive, particularly if fruit set is poor and leaves are dark green, reduce the amount of nitrogen fertilizer you are applying.

Some fertilizers are very soluble and their nutrients become available to plants quickly. Other fertilizers release nutrients into the soil slowly, providing a steady supply of nutrients to the plants. Both kinds of fertilizers can be used effectively.

For quick-release fertilizers, such as ammonium nitrate or ammonium sulfate, determine the total amount of fertilizer you will need to apply for the year. Then apply one-third of that amount in early spring just as new growth begins. Apply another third about the first of June and the final third about the first of July. Splitting the fertilizer applica-



tions reduces loss of the nitrogen into the groundwater and ensures a supply of nitrogen when plants most need it.

Slow-release fertilizers, such as sulfur-coated urea and manure, can be applied all at once, but are best applied in early spring.

Phosphorus and potassium. The amounts of phosphorus and potassium in soils vary greatly from region to region and you may or may not need to add these materials yearly. A soil analysis will guide you on which fertilizers and how much fertilizer to add (tables 3 and 4). Spread fertilizers in 2- to 3-foot-wide bands centered along the berry rows.

Sulfur and boron. Sulfur and boron are also important in raspberry nutrition. If your soil test shows less than 10 parts per million (ppm) of sulfur, add $\frac{1}{2}$ ounce of sulfur to each 10 feet of row. Less than 0.5 ppm of boron in soil tests indicates you need to add boron. Boron, however, becomes toxic to plants at very low concentrations. Never apply more than 1 to 2 pounds of actual boron per acre. These rates are equivalent to 0.01 to 0.02 ounces of boron per 10 feet of row.

Gypsum provides a safe and convenient way to add sulfur and boron to crops. If soil tests show sulfur is deficient, spread 5 ounces of gypsum along each 10 feet of row (175 pounds per acre). If boron is deficient, apply 5 ounces of borated gypsum along each 10 feet of row. Borated gypsum is available through farm supply stores. Never apply boron-containing fertilizers in narrow bands. Instead, apply them evenly throughout your planting using a broadcast fertilizer spreader.

Magnesium. Magnesium concentrations less than 0.25 milliequivalents of charge per 100 grams of soil indicate that magnesium is deficient. If your soil is deficient in magnesium, add 5 to 6 ounces of magnesium sulfate (epsom salts) or 5 to 6 ounces of potassium-magnesium



sulfate (sul-po-mag) for each 10 feet of row. Dolomitic limestone also provides magnesium and is a good choice when liming to increase soil pH. This material reacts slowly in the soil and will raise the soil pH. If you apply dolomitic limestone to correct a magnesium deficiency, add about 7 or 8 ounces for each 10 feet of row. Monitor your soil pH closely and keep it between 5.6 and 7.0.

Iron chlorosis. Iron chlorosis is common in raspberries grown on alkaline soils (soil pH above 7.0). Desert and other arid-region soils are often alkaline. This disorder causes stunted canes with leaves that are yellow to almost white, except for their dark green veins.

To prevent iron chlorosis, avoid planting on alkaline or heavy, poorly drained soils, and avoid both overwatering and applying too much phosphorus. Keeping plants generally healthy helps reduce the likelihood of chlorosis. In small gardens you can use elemental sulfur to acidify the soil and reduce chlorosis problems, but this practice is usually too expensive for larger plantings. On alkaline soils, regularly using ammonium sulfate fertilizer can help reduce soil pH and chlorosis.

Manure tends to raise soil pH and can create iron chlorosis problems on already alkaline soils. If your planting soil is alkaline and you use manures, consider acidifying the soil with elemental sulfur.

If chlorosis develops, consider applying iron directly to the plants or soil. For soil applications, use only chelated products. These are quite expensive and you must apply them every year or two. Foliar sprays of iron-containing materials can also prevent or reduce chlorosis. Follow label directions carefully as these products can damage leaves. You will probably have to apply iron sprays every 10 to 14 days during the growing season, usually in the late afternoon or early evening. Check with your garden center or farm supply store for iron-containing fertilizers.





Weed control

Weed control in raspberries and blackberries is critical for quick establishment and healthy canes. Preparing a weed-free bed before planting is the most important weed control step. Cultivation by hand or with rototillers controls weeds after planting. Raspberries and blackberries are shallow-rooted, however, so cultivate no deeper than 2 to 3 inches. Thornless blackberries sucker badly if their roots are disturbed by cultivation, and the new canes they develop are often thorny. A moderate amount of cultivation both controls weeds and creates a loose surface layer that helps retain soil moisture. Excessive cultivation with machines, however, can destroy needed soil structure.

Medium-sized bark chips ($1/2$ to $1\frac{1}{2}$ inches in diameter) or clean straw mulches can help control annual weeds. Bramble roots grow into sawdust, fine bark, and compost mulches, making the roots more susceptible to drought and freezing. Fine-textured organic mulches also provide ideal root environments for quackgrass, Canada thistle, and other perennial weeds that spread underground. Because brambles produce new canes from the crown and rhizomes, weed barrier fabrics do not work well.

Some herbicides are registered for use on blackberries and raspberries, and can be an important part of a weed control program. Check with the extension system office in your county to find out what herbicides are registered for your area. Always follow label directions.

 *Medium-sized bark chips*
($1/2$ to $1\frac{1}{2}$ inches in diameter) or clean straw mulches
can help control annual weeds. 



Winter protection

Even cold hardy brambles can be injured when warm midwinter thaws are followed by sub-zero temperatures. Cold, open winters with little or no snow are especially likely to cause winter injury. Mulching the base of raspberry and blackberry plants with bark, straw, or pine needles before winter helps protect the crowns from injury. Even if the canes are injured or killed, new canes will arise from the crowns. Use rodent traps or baits if you apply mulches.

Because of poor cold hardiness, growing trailing blackberries is risky in the Inland Northwest and Intermountain West. If you grow them, train the canes in wheels and mulch them during the winter as described earlier.



Mulching the base of raspberry and blackberry plants with bark, straw, or pine needles before winter helps protect the crowns from injury.



Fall-bearing raspberries are well suited to very cold areas that also have growing seasons long enough to mature fall crops. Simply mow off all canes or selectively remove injured canes during spring pruning. Mulching fall-bearing raspberries during the winter can help protect the roots and rhizomes from freezing injury.

Healthy canes are much more resistant to winter damage than canes weakened by pests, diseases, poor nutrition, over- or underwatering, weeds, shading, and other stresses. Keeping canes healthy with good cultural practices helps maximize cold hardiness. In dry areas, water the canes well before the soil freezes.



Pruning

Proper pruning removes weak, damaged, and dead canes. It also improves light and air movement throughout the bushes, which reduces pest and disease problems and ensures good bud development, well-colored fruit, and easy picking. How to prune depends on the crop.

Fall-bearing raspberries. Fall-bearing raspberries produce two crops each year, the first during the early summer on floricanes and the second in late summer or early fall on the tops of primocanes. If you double crop in this fashion, prune in late fall to remove all spent floricanes that bore fruit that summer. Also cut off the spent tops of primocanes that bore that fall. In the spring, do not thin out primocanes, but keep rows narrowed to no more than about 18 inches wide.

Commercial growers often mow fall-bearing raspberries off about 1 inch above the ground in early spring before growth starts, allowing only the fall crop to develop.

Summer-bearing red and yellow raspberries. Prune these crops twice each year.

1. In late fall to early spring, thin out the dormant canes and head them back to about 6 feet tall. Remove dead or weak canes and cut off winter- or disease-damaged cane tips. Heading back floricanes makes picking easier but reduces crop yields without increasing berry size. To create a solid row of canes (hedgerow), leave four to six of the strongest canes for every foot of row. For a hill system, space the plants $2\frac{1}{2}$ to 3 feet apart and retain 10 to 12 canes per hill. Keep both hedgerow and hill system rows no more than 12 inches wide.
2. After the summer harvest, remove the spent floricanes.



Black and purple raspberries. Tip black raspberry primocanes during the summer to stimulate the lateral shoots that bear fruit. Tipping means pinching or pruning off the terminal 2 to 3 inches of primocanes. Tip black raspberries when the canes are 18 to 24 inches tall. Tip each primocane only once.

During late fall to early spring, remove short and weak canes. Cut back the remaining canes to 5 to 6 feet above the ground and head back lateral shoots to about 8 inches long. After harvest, remove the canes that bore fruit.

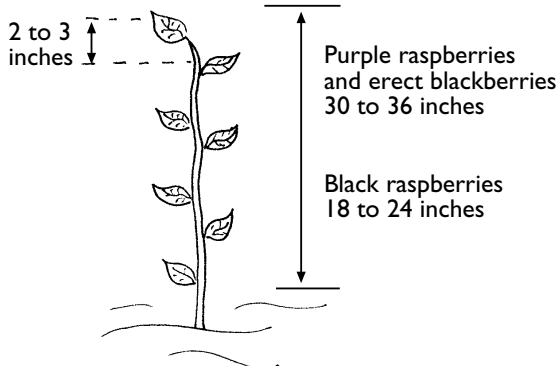
Prune purple raspberries the same as black raspberries, but tip the primocanes when they are 30 to 36 inches tall, and, when plants are dormant, head lateral shoots to between 10 and 18 inches (fig. 5).

Blackberries. Prune and train erect cultivars the same as purple raspberries, but head laterals to 18- to 24-inch lengths (fig. 5). During the growing season, tip primocanes when they reach 30 to 36 inches of height. After harvest, remove the canes that bore fruit.

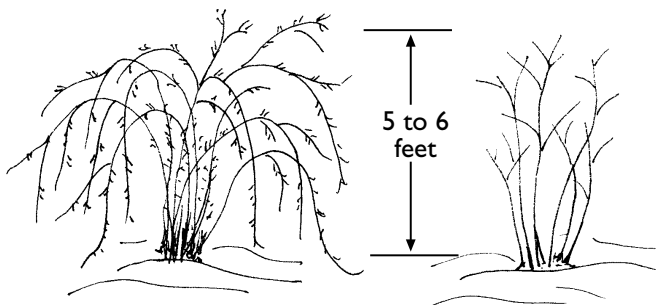
Blackberries grow best in hills about 5 feet apart. Thin out the canes during the dormant season, keeping as many as seven or eight strong canes per hill. Remove suckers that develop between rows and hills. Erect blackberries can be grown without support, but growing them between two wires helps keep the canes confined and manageable.

Do not tip trailing blackberry primocanes or head back floricanes. Instead, wind them into wheels of canes as discussed under Support. After the harvest, cut off spent floricanes. Blackberries typically develop dense, thorny thickets and can become troublesome weeds if abandoned or allowed to grow out of control.





A. Summer tipping of primocanes



B. Dormant pruning

Figure 5. Tipping and pruning black raspberries, purple raspberries, and erect blackberries.

(A) In summer, tip black raspberries when primocanes are 18 to 24 inches tall. Tip purple raspberries and erect blackberries when primocanes are 30 to 36 inches tall.

(B) During the dormant season, shorten black raspberry laterals (side shoots) to about 8 inches long. Shorten purple raspberry laterals to 10 to 18 inches long. Shorten blackberry laterals to 18 to 24 inches long.

After harvest, remove the canes that bore fruit.



Harvesting and storing your berries

Except in large commercial plantings, raspberries and blackberries are usually harvested by hand. The berries are delicate and easily damaged by rough handling. For fresh use, pick ripe berries gently and collect them in shallow containers no more than four or five berries deep. Berries intended for processing can be picked into larger containers. Pick only healthy, intact fruit. Damaged berries leak juice and quickly rot.

For best fruit quality and storage life, cool raspberries and blackberries to between 34° and 36°F as quickly as possible after picking. A few hours' delay can result in the loss of juice from the fruit and poor fruit quality. Cool the fruit by placing it dry into a refrigerator. Do not immerse the fruit in water. Wet berries quickly rot, even in a refrigerator. Rinse off the berries just before use.

Raspberries and blackberries freeze well. Harvest the berries as for fresh use. Wash the berries and allow them to dry in a colander or spread out on towels. When the berries are dry, spread them in layers one berry deep on cookie sheets lined with waxed paper and place the sheets into a freezer. The berries will freeze individually, and you can store them in plastic bags or food storage containers. Simply pour out the berries you need and place the rest back into the freezer.

Berries intended for sale are generally picked into the baskets in which they will be sold. The berries are not removed from the picking containers for sorting and are not washed before sale. Half-pint and pint containers made from cardboard or plastic are generally used for fresh sales. These containers are usually collected into cardboard flats that hold 12 picking baskets. As for home use, the berries should be cooled to between 34° and 36°F as quickly as possible after picking. Commercially, fresh market berries are usually cooled in forced air tunnels within walk-in-coolers.



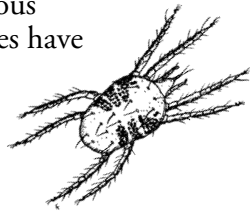
Controlling insect pests and diseases

Although raspberries and blackberries are susceptible to many insect pests and diseases, only a few are serious in the Inland Northwest and Intermountain West. Proper site selection, soil preparation, and plant selection are important steps in preventing pest and disease problems.

Sometimes pests and diseases are controlled using insecticides, fungicides, or miticides. Because regulations governing the availability and use of these materials change frequently, contact your local cooperative extension office, garden center, or farm store for up-to-date information.

Insects and mites

Spider mites occasionally become serious during hot, dusty weather. Spider mites have eight legs. Use a magnifying lens to examine the bottoms of leaves where the tiny mites feed and spin their webs. Affected leaves take on a speckled appearance or bronze color.



Natural predators usually control spider mites, but the mites can become numerous if their predators are killed by excessive pesticide use. Both organic and nonorganic pesticides are available to control spider mites. Keep bushes open by proper pruning and reduce dust by maintaining roads and alleys in grass or cover crops or by mulching.

Raspberry cane borers cause sudden wilting and drooping of canes. The adult flies lay eggs under the skins of the canes. One borer species attacks the tips of canes. Two other species lay their eggs at the bases of canes. The white larvae that develop from the eggs burrow through the center of the canes.



Control cane borers by pruning out and then burning or discarding affected canes. Preventative insecticides can be applied to the canes before bloom.

Leafrollers. Several caterpillar-like pests known as leafrollers cause rolling of raspberry and blackberry leaves. These pests seldom become serious. If they become numerous, you can easily control them using either biological or chemical pesticides. In garden plots, pick off and discard infected leaves.



Thrips, fruit worms, and other minor insect pests can also be controlled with organic or nonorganic insecticides.

Diseases

Anthracnose. Anthracnose is a common fungal disease in the western United States, and can cause serious damage. Black raspberries are most seriously damaged, but the disease can infect red raspberries, purple raspberries, and occasionally blackberries. Outbreaks are most severe in wet weather.

Symptoms include small reddish-purple spots that appear most often on canes, but can also occur on leaves, fruit, and flowers. As the disease progresses, the spots enlarge, become sunken, and turn tan or gray. On leaves, the spots can develop white centers that fall out, leaving a shot hole appearance. Affected canes weaken and may die, especially during the winter. Fruit laterals can be malformed and fruit ripening delayed.

Good cultural practices reduce Anthracnose problems. Prune regularly to remove dead and diseased canes. Keep



rows narrowed to the widths recommended in the pruning section of this publication and keep bushes open to improve air and light penetration. Remove prunings from the planting and burn them or discard them in the trash.

In areas where Anthracnose is severe, avoid sprinkler irrigation and apply water directly to the bases of the plants. Apply dormant sprays of lime sulfur or Bordeaux mix where pesticide regulations allow. The red raspberry cultivars Heritage, Chilcotin, and Nootka are resistant to the disease.

Cane blight. Cane blight is caused by a fungus that attacks all brambles. This disease usually attacks primocanes wounded by mechanical harvesting, and seldom occurs in home or small commercial plantings. Damaging primocanes with string trimmers or mowers also can open them up to infection.

Cane blight is best controlled by good cultural practices: avoid damaging primocanes, do not use overhead sprinkler irrigation, and keep rows narrow and open with good pruning. Apply lime-sulfur or Bordeaux sprays in the spring after pruning.

Crown and cane gall. Two bacteria are responsible for crown and cane galls. These diseases attack all blackberries and raspberries and other woody plants in at least 93 families. Affected plants weaken and often die, making this a particularly serious disease.

Crown gall bacteria live in the soil and invade plants through wounds on the roots or lower stems. The most obvious symptom is the formation of rough, scabby ridges or round growths. These galls occur most often on the roots and crown near the soil surface (crown gall), but can develop high up on canes (cane gall). Affected canes are weak, stunted, often yellowish, and unproductive.



There are no treatments for cane gall- or crown gall-infected plants. Rogue out and destroy them when you note symptoms.

The disease organism can survive in the soil for at least three years. When planting, select a site that has shown no evidence of the disease. If possible, avoid planting where shrubs or trees have grown for at least three years. Planting sites previously used for vegetables, grains, or pasture are best. Plant using new stock from a reputable nursery. Tissue cultured or nursery-matured plants are least likely to harbor the pathogens.



*Keeping plants generally healthy
is the best way to reduce crumbly fruit.*



Crumbly berry. Occasionally raspberry canes bear crumbly berries that literally fall apart when you pick them. Viruses and other diseases, poor nutrition, weather conditions, and pesticide damage can cause crumbly fruit. Some cultivars are more susceptible to crumbly fruit than others. Keeping plants generally healthy is the best way to reduce crumbly fruit. If the problem persists, consider eliminating your raspberry plants and replanting with new nursery stock in a different location.

Cane Botrytis, blossom blight, and fruit rot. These diseases are all caused by one fungus. The disease can become very serious in wet years and may kill infected canes.

On canes, symptoms appear in mid to late summer as pale brown lesions on primocane leaves. The pathogen moves into the cane and can girdle it. During winter, the cane lesions become a prominent gray or white. Flowers infected with Botrytis die and are covered with grayish-black mold. Infected fruit develops tan spots on drupelets. Grayish-black mold then quickly covers the fruit.



Good cultural practices greatly reduce Botrytis problems. Proper pruning and training will help ensure good air movement and light penetration through the plants. Avoid sprinkler irrigation, if possible. If you use sprinklers, water early in the day to allow the canes, leaves, and fruit to dry quickly. Remove dead and diseased plants and all prunings from the planting. Commercial growers in wet regions use fungicides to control this disease.

Phytophthora root rot. Phytophthora root rot is the most serious red raspberry disease worldwide. Several species of *Phytophthora* fungi seem to cause root rot. The fungi primarily infect red and yellow raspberries and their hybrids, but can also infect black raspberries.

Affected plants begin to thin out, producing fewer canes each year. Primocanes begin developing normally, then wilt suddenly. Infected floricanes often leaf out, flower, and begin setting fruit. Before the fruit ripens, however, the canes die and the leaves become brittle and yellow with brownish-red streaks. Developing fruit dry up and shrivel.



Phytophthora root rot is the most serious red raspberry disease worldwide.



To confirm your diagnosis of Phytophthora, pull an affected cane and its attached roots and rhizomes out of the ground. Use a knife to scrape away the bark from the lower cane, crown, and roots. Healthy tissues will be green or white. Tissues infected by root rot will be cinnamon brown with distinct borders between the infected and healthy tissues.

The fungi that cause the disease occur naturally in the soil and can be rapidly spread in running water; on machines,



tools, and feet; and on infected plants. Spores from the fungi can live in the soil for many years.

Naturally wet or overirrigated soils greatly increase the occurrence and severity of root rot. Likewise certain cultivars are especially susceptible to root rot. The most important steps in avoiding root rot are to plant on well-drained soils and select rot-resistant cultivars (table 1). Whenever possible, plant red raspberries on raised beds or ridges 6 to 12 inches high and 2 to 3 feet wide. Fungicides are available that can control root rot in affected plantings. The fungicides, however, are quite expensive and less effective in controlling the disease than using raised beds and resistant cultivars.

Spur blight. This fungal disease attacks blackberries and raspberries. Red raspberries are most seriously affected. Severe outbreaks usually occur only in poorly managed beds or fields that are overrun with weeds or are overfertilized.

Symptoms begin as wedge-shaped, dark lesions on the tips and margins of primocane leaves. Before the infected leaves fall, the fungus invades the stems and buds at the bases of the leaves. Purplish-brown lesions then develop around the infected buds. On floricanes, infected buds produce poorly developed laterals and leaves or do not produce them at all.

Several raspberry cultivars are reportedly resistant to spur blight (table 1). The best way to control the disease is to maintain a well-managed planting. Keep berry rows pruned and open to allow light and air exposure. Control weeds. Avoid sprinkler irrigation. Apply a lime-sulfur spray in the spring as the buds are swelling. Other fungicides also control spur blight.



Viruses. Raspberries and blackberries are susceptible to several virus and virus-like diseases. Blackberries usually tolerate virus infections better than other brambles. Infected raspberries gradually decline and can eventually die. Viruses often kill or seriously damage black raspberries.

Symptoms include shrunken, deformed leaves that may be a mottled green or have distinct yellow patches or patterns.

Viruses can be spread by infected planting stock, on pruning tools, by nematodes, and by aphids.

There are no treatments for virus-infected plants. If you suspect that a raspberry or blackberry is infected with a virus, pull the plant out and burn it or dispose of it.

Buy plants certified virus indexed. Eliminate all wild and virus-infected domestic raspberries and blackberries within 300 feet of your planting site. Control aphids from spring through fall using insecticidal soap or other registered pesticides.



There are no treatments for virus-infected plants.

If you suspect that a raspberry or blackberry is infected with a virus, pull the plant out and burn it or dispose of it.



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Growing Raspberries & Blackberries gives you the information you need to plan, plant, and raise healthy raspberry and blackberry plantings in a market garden or backyard bed. Learn about cultivars whose fragile berries you'll never see in a supermarket, despite their surpassing flavor. Read about the routine, nonchemical practices that will bring heavy crops and keep your plants nearly pest free.



Did you know?

By growing several cultivars, you can enjoy fresh berries from early summer through late fall.



Nursery-grown plants nearly always grow better than transplants from established beds because they harbor fewer pests and diseases.



Overhead sprinkling can encourage fruit and cane diseases. To keep your canes healthy (and conserve water) use drip irrigation or other methods that apply water directly to the soil.



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