

progressing from the bottom of the cane to the top. These symptoms may only appear on one side of the plant and are most frequently observed during hot, dry periods. Young canes may show a purple discoloration starting near the soil line and extending upward. Canes eventually die.

**Management:** *Verticillium* attacks a wide range of plants, including potatoes, tomatoes, peppers, squash and strawberries. Do not plant raspberries following any of these crops. Non-host crops such as corn or wheat can help eliminate the fungus if grown for at least 2 years before planting raspberries. Many weed species, including pigweed and lamb's-quarters also carry the disease, so good weed control in the raspberry planting is essential. Preplant soil fumigation can help eliminate this fungus, but is quite costly. This disease is most serious on black raspberries.

**Phytophthora Root Rot** (*Phytophthora fragariae*): The *Phytophthora* fungus invades the roots of raspberries and disrupts the vascular system, causing infected plants to produce weak, stunted canes, with small, off-color leaves. When dug up, the roots of these plants may look dead. Symptoms are most obvious in the spring, frequently causing this disease to be misdiagnosed as winter injury. In order to spread throughout a planting, the fungus requires flooded soils.

**Management:** Good soil drainage is critical for preventing this disease. The varieties Latham and Newburgh seem to have some resistance to *Phytophthora*, while Titan and Hilton are very susceptible. Soil drenches with Ridomil in the spring and fall will provide control of *Phytophthora*, but should not be considered a substitute for good soil drainage and appropriate variety selection. This is only an emergency measure and it is better to move the planting to a more suitable location. Planting on raised beds helps with this problem and wet feet in general. Mulching new plantings with straw has been observed to increase the likelihood of *Phytophthora* infection the following spring.

**Crown Gall** (*Agrobacterium tumefaciens*): Crown gall is a widespread disease of all brambles caused by a bacterium *Agrobacterium tumefaciens*. The bacteria induce galls or tumors on the roots, crowns, or canes of infected plants. Galls interfere with water and nutrient flow in the plants. Seriously

infected plants may become weakened, stunted, and unproductive.

Young galls are rough, spongy, and wart-like. Galls can be formed each season and vary in size from a pinhead to several inches in diameter. They develop near the soil line or underground in the spring. Cane galls occur almost exclusively on fruiting canes and usually appear in late spring or early summer. Both crown and cane galls become hard, brown to black, woody knots as they age. Some disintegrate with time and other may remain for the life of the plant. The tops of infected plants may show no symptoms, but plants with numerous galls may be stunted, produce dry, poorly-developed berries, break easily and fall over, or show various deficiency symptoms due to impaired uptake and transport of nutrients and water.

**Management:** Control procedures include: (1) planting only nursery stock which is free of any obvious galls on crowns or roots; (2) not planting into a field where crown gall has occurred previously, unless a non-host crop, such as strawberries or most vegetables, is grown for two or more years before replanting; and (3) minimizing injury to root and crown systems during farm operations such as cultivation.

In addition to the above procedures, a nonpathogenic bacterium, *Agrobacterium radiobacter*, strain K-84, is commercially available for biological control of crown gall. The biocontrol agent may be applied to roots of healthy plants when they are first set out. After planting, the control becomes established in the soil around the root zone and prevents crown gall bacterium from entering this region. However, the biocontrol agent will not cure plants which are already infected before its application.

## Viruses

Several types of viruses infect raspberry plants causing a variety of symptoms, including mosaic yellow patterning of the leaves, leaf curl and/or crinkle, cane dwarfing and crumbly berries. Once a plant becomes infected with a virus, it cannot be cured. All infected plants, including the roots, should be removed from the planting and destroyed. Viruses are typically spread by aphids, but in some cases (e.g., crumbly berry) nematodes may be responsible. When these creatures feed on infected plants they can take in the virus and then spread it to other

plants. In order to prevent the spread of viruses, start with certified, virus-free planting stock. Plant your raspberries away from any wild brambles which may be harboring viruses that could be spread to your plants. A distance of at least 600 feet between cultivated raspberries and any wild brambles is

recommended. Controlling the insects which spread these disease is usually not a practical method of preventing infection. However, some raspberry varieties are resistant to aphid feeding and are thus somewhat protected. These varieties include Canby and Titan.

Table 36. Relative hardiness and disease resistance for bramble varieties recommended for New England.

Variety	HD	SB	AN	VR	PH	Comments
Algonquin	F	R	U	R	F	Spineless canes, upright growth; med. size fruit, good quality.
Anne						5-7 days earlier than Heritage, tall moderately vigorous canes with few thorns. Fruit medium-large, light yellow with white bloom, very good quality.
Autumn Bliss	F	U	U	F	F	Everbearing; vigorous plants; med. to large fruit, good quality.
Autumn Britain	G	U	U	U	G	Everbearing, vigorous plants, med. to large fruit, good quality.
Boyne	E	F	S	U	F	Early ripening; small dark fruit, good quality; most reliably hardy.
Canby						Tall, midseason, nearly thornless, moderate hardiness. Med-large fruit, good quality. Limited success in cold climates.
Caroline						5-7 days earlier than Heritage, tall vigorous canes, large fruit, very good quality.
Dinkum						5-10 days earlier than Heritage, similar to Autumn Bliss, tall canes with moderate vigor, large fruit with good quality.
Earlisweet						Vigorous plants with hardiness similar to Jewel. Fruit ripens early and is medium to large with good quality.
Encore						Very late for a summer-bearing type, hardy, vigorous canes. Med-large fruit with good quality and yield.
Festival	G	R	U	R	U	Midseason; short plants; med. size fruit, good quality; very susceptible to leaf rust.
Jewel						Early, tall vigorous canes, thorny. Fruit are medium size, good quality. Hardest of the blacks, but only moderately hardy compared to reds. Some disease resistance.
Heritage	F	U	U	S	S	Everbearing; second crop late; vigorous plants; med. to large fruit, good quality.
K81-6	G	R	R	S	S	Tall, vigorous canes; late season, large fruit, good quality.
Killarney	E	F	S	U	F	Early ripening; med. size fruit, good quality and yield.
Latham	G	S	S	F	U	Midseason; med. size fruit, crumbly, fair quality.
Lauren	F	U	U	F	U	Large fruit, productive, early season.
Newburgh	G	F	F	U	F	Midseason; med. size fruit, yields and quality fair.
Nova	G	R	R	R	U	Midseason; vigorous plants; med. size fruit, good quality.
NY 7	G	U	U	U	F	Spineless canes, vigorous; large, firm fruit, extended harvest season.
NY 1009	G	U	U	U	U	Everbearing, but use for very early summer crop. Large, firm fruit.
Polana						10-14 days earlier than Heritage. Short, vigorous, thorny canes. Fruit is medium-sized, not uniform (lots of doubles), but good quality.
Prelude						Very early floricanes (summer) crop, moderate to good vigor, medium-sized fruit, dark, but good quality. Late primocane crop.
Reveille	U	U	U	U	U	Early to midseason; med. to large fruit, good flavor but soft.
Taylor	F	S	S	S	S	Mid to late season; vigorous plants, med. to large fruit, excellent quality.

HD: Hardiness; SB: Spur blight; AN: Anthracnose; VR: Viruses; PH: Phytophthora

E=excellent G=good F=fair R=resistant S=susceptible U=unknown