



Red Raspberry Production in Utah

Schuyler Seeley, Diane Alston, and Darrell Rothlisberger

Source of Plants

Raspberry plants for new plantings should be obtained from reputable nurseries. They should be certified virus, disease, and insect free. Plantings with starts from established fields bring all the accumulated diseases and pests, and such plantings often decline within two to three years.

Soil

Red raspberry roots require good soil conditions. A medium textured soil, which has not been in raspberries recently, is best. The soil should have high organic matter content and good drainage. Soil should be deep plowed and planted to crops that are weeded with herbicides to control perennial weeds in the years before planting. Soil should be checked for nematodes in case fumigation may be necessary before planting. Heavy manure applications (20-30 tons per acre) just before planting increase plant growth and yield. Fertilize with nitrogen at 30 to 35 pounds per acre and phosphate as indicated by soil testing just after new growth is evident.

Planting

Plant raspberries as early in the spring as possible once soil moisture content is such that plowing or discing results in few clods. Annual weeds can be controlled with residual herbicides watered into the soil after plants have settled in. Plants are set at 2-3 foot spacing in row and 8-10 feet between rows running north and south, if possible, for higher production. Hedgerow crown areas should be maintained at a width of 12" by shallow cultivation between rows.

Irrigation

Watering too early in the season often cools the soil, slows root growth, causes poor aeration, and induces iron deficiency yellowing. Once the soil has warmed and soil moisture monitoring with gypsum blocks or tensiometers indicate irrigation is needed, water can be applied. Irrigate when soil water content is at about 50% of readily available moisture, or when the soil has dried out in the top 2-3 inches. Sprinkler irrigation is better than furrow because of the danger of over-irrigation in soils suitable for



furrow irrigation. Drip irrigation, while expensive, is more efficient, less labor intensive, and produces the largest plants and highest yields.

Culture

June bearing cultivars require over-wintering of canes. Canes are resistant to cold during dormancy, but drying from wind and sun can cause death. Once canes complete winter chilling, they will grow at temperatures above 45 F and lose cold resistance. Therefore, areas with long cold winters are preferred for raspberries. Late summer and fall irrigations facilitate winter hardening. Withholding irrigation to force hardening is not recommended since hardening will occur earlier but it will not be as extensive. Fruited canes and weak new canes are removed in the fall after new canes have grown and become dormant. Plant crowns should be mulched with some source of organic matter such as chopped hay or grass to insulate the roots, preserve water, and provide soil building organic matter. A two-wire trellis with wires about 16" apart and 30" high can be used to position fruiting canes outside the row middle where the new canes can grow. This arrangement makes picking easier and faster.

Raspberry Viruses

Viruses affect the fruit and the plant. The most serious viruses are Bushy Dwarf and Mosaic. Crumbly fruit is due to ovary infertility leading to reduced numbers of drupelets. Reduced cane growth accompanied with yellowing and malformed leaves causes general weakening of the plant. Weakened plants become targets for other

Raspberry Viruses

Virus	Transmission	Symptoms	Control
Mosaic	<i>Amphoraphora agathonica</i> aphid	Small, misshapen leaves, large green blisters	Aphid resistant cultivars
Bushy Dwarf	Pollen/bees	Crumbly fruit, yellow, misshapen leaves	Virus free resistant cultivars
Leaf Curl	<i>Aphis rubicola</i>	Small leaves, tips and margins turn down	Resistant cultivars
Tomato Ringspot	<i>Xiphinema americanum</i> Nematode	Crumbly fruit, spots, yellow leaves turn brown	Resistant cultivars

diseases and they fail to harden adequately and are killed by winter and spring freezes.

Bushy Dwarf virus is pollen transmitted. Viruses spread by bees are very difficult to control. Even though most red raspberries are self-fruitful, they require insect transfer of pollen to set enough drupelets for adequate berry size. Once pollen-transmitted viruses are spread over an area, newly planted virus-free plants will be rapidly infected. Transmission from backyard and escaped plants is rapid due to mode of spread. Rouging can be successful, but every plant must be removed for miles around new plantings. Even then, transfer from pollen from relocated bees is a danger. Bushy Dwarf symptoms do not occur unless other viruses are also present. Therefore, transmission avoidance for the other viruses is a good strategy.

To prevent infection with tomato ringspot virus, plant raspberry stock in soil free of the vector, dagger nematode. Pre-plant fumigation of soil can eliminate the nematode from infested soil. In one study, a 3-year rotation with plants that are non-hosts of tomato ringspot virus and weed-free fallow were as effective as fumigation with methyl bromide in preventing re-infection of raspberry plants with the virus.

Insecticides that provide control of virus transmitting aphids on raspberry include:

- **Malathion.** Do not use during bloom. 1 day PHI¹. 12 hr REI².
- **Esfenvalerate (Asana XL).** Toxic to pollinators. 7 day PHI. 12 hr REI.
- **Diazinon.** Do not use during bloom. 7 day PHI. 24 hr REI.
- **Azinphosmethyl (Guthion).** Do not use during bloom. 14 day PHI. 2 or 4 days REI (depending on field activity).
- **Insecticidal soap.** Apply at 1-2% v/v solution. 0 day PHI. 12 hr REI.
- **Beauveria bassiana (Mycotrol ES).** Live fungal spores. 0 day PHI. 12 hr REI.

¹Preharvest Interval = time between spray and harvest. ²Restricted Entry Interval = time between spray and reentry into the sprayed area.

Viruses can be eliminated from plant material with heat therapy. However, most trials have failed to do this with raspberries. In vitro repeated shoot tip tissue culture trials may produce virus-free plantlets in the near future. Recombinant DNA technology is currently being used to derive transgenic raspberry plants for resistance to Bushy Dwarf virus. These transgenic plants are in field trials. Commercial use is years away.

In the interim, growers should use Bushy Dwarf and Mosaic resistant raspberry plants. Cultivars resistant to Bushy Dwarf virus are: Boyne, Chilcotin, Citadel, Fairview, Restival, Glen Cova, Glen Moy, Haida, Heritage, Hilton, Killarney, Malling Admiral, Malling Jewel, Malling Joy, Malling Promise, Nootka, Puyallup, Scepter, Sentinel, Sumner, and Willamette. Cultivars resistant to Mosaic (the aphid vector) are: Canby, Carnival, Chilliwack, Comox, Glen Moy, Glen Prosen, Haida, Malling Autumn Bliss, Malling Joy, Malling Leo, Nootka, Reveille, and Skeena. Raspberries resistant to both are Haida, Malling Joy, and Nootka. Of these, Haida is the most cold hardy (5, rating 1-5 with 5 most hardy) with Malling Joy (4) hardy, and Nootka less hardy (3).

Until virus resistant plants of our main cultivars can be produced, the best way for Utah growers to successfully grow raspberries in growing districts infested with viruses is to grow Haida or Malling Joy. Nootka is too cold tender. Quality and yield ratings for Haida and Malling Joy are 3, 4 for quality (1-5, 5 best, Canby = 3) and 5, 5 for yield (Canby = 4). In addition to planting resistant cultivars for Bushy Dwarf and Mosaic viruses, plantings should be protected through the season with aphidicides listed above.

More information

http://ohioline.osu.edu/b782/b782_29.html,

<http://www.gov.on.ca/OMAFRA/english/crops/facts/raspvra rc.htm>

<http://www.nraes.org/publications/nraes35.html>

Converse, R.H., Ed, 1987. Virus Diseases of Small Fruits. USDA Ag. Handbook 631.

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