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# 'Willamette' Red Raspberry

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'Willamette' has been the predominant red raspberry cultivar in the Pacific Northwest for almost 40 years. Only in the past few years has there been extensive planting of other cultivars which yield more, have larger fruit sizes, higher levels of pest resistance and/or better adaptation to fresh and other specialty markets. Since the Pacific Northwest accounts for more than 90% of the total red raspberry production in North America, 'Willamette' can be considered the continent's most important cultivar. Moreover, outside the Pacific Northwest it has been grown extensively by the burgeoning industry in central coastal California and also has been grown in protected locations in eastern North America. In the southern hemisphere it has been an important cultivar in Australia, New Zealand and Chile. It also has been grown successfully in several eastern European countries including Yugoslavia, where it is now of major importance, and Hungary. By virtue of all of the above, 'Willamette' has the unique distinction of having been and continuing to be the world's most important red raspberry cultivar.

There are interrelated reasons why 'Willamette' has had such immense and enduring success. Among the fruiting traits are the dark purple-red colour and the relative ease of removal or abscission. The colour and also the texture were ideally suited to the needs of the canning industry which was still important in the years immediately following the cultivars release. In more recent years this colour has suited the needs of the rapidly expanding juice industry. The fruit is well presented and this combined with the ease of removal or picking has facilitated hand harvest. The ease of removal is also ideally suited to harvesting by machines which are now used extensively in the Pacific Northwest for fruit destined for processing.

'Willamette' has resistance or tolerance to a number of pests and this, too, has contributed much to its success and longevity. For example, it is resistant to cane *Botrytis* (*Botrytis cinerea* Pers. ex. Fr.) (7), cane spot (*Elsinoe veneta* Burkh.) (9) powdery mildew (*Sphaerotheca macularis* (Wallr. Fr.) Lind) (3) and to crown gall (*Agrobacterium tumofaciens* [Smith and Towns] Conn) (7). It has also shown some resistance to the black vine weevil, *Otiorhynchus sulcatus* (F.) (2). Despite its susceptibility to *Amphorophora agathonica* Hottes, the aphid vector of the raspberry mosaic virus (RMV) complex, it has been assumed that 'Willamette' is tolerant to the complex since there have been no obvious effects of infection (5). Nevertheless, a recent study has indicated that 'Willamette' can become infected with leaf spot virus (LSV), one of the components of the complex (7), but there is no direct evidence that LSV by itself has an adverse effect on growth and fruiting. The cultivar does not become infected with the common strain of the pollen-transmitted virus, raspberry bushy dwarf (RBDV) (6).

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Subsequently, it does not show crumbly fruit and/or reductions in vigour and yield commonly found in susceptible cultivars that become infected with the virus either alone or in combinations with one or more other viruses. Although the cultivar will become infected with the nematode-transmitted virus, tomato ringspot, it usually is not severely affected by it (8). 'Willamette' supports high populations of the root lesion nematode (*Pratylenchus penetrans* (Cobb) Fil. & S. Skek.) but there is some evidence that tolerance to the pest could exist (1, 11).

The plant habit of 'Willamette' allows for relatively easy management compared to many other cultivars. Canes show minimum amounts of branching, are moderately vigorous and have medium length laterals which tend to grow upright. Production of abundant primocanes has meant that the cultivar has been easy to propagate and also that cane numbers have been easy to manipulate by chemical burning.

Under optimum growing conditions 'Willamette' plants will establish and grow more rapidly than those of some other cultivars. Thus the cultivar often produces a substantial crop the year after planting.

'Willamette' has remained genetically stable compared to some other cultivars. Of particular importance is the fact that mutations resulting in reduced fertility, expressed as crumbly fruit, have rarely been recorded.

In warmer climates, such as the production areas of southeastern Australia and central coastal California, 'Willamette' shows a greater level of heat tolerance than many other cultivars. In addition it will produce a fall crop on the primocanes in these climates. This crop, although later than that of the standard primocane fruiting cultivar, 'Heritage,' is of high quality. Alternative year cropping offers the option of manipulating the level of primocane fruiting which makes 'Willamette' a particularly flexible cultivar.

'Willamette' grows well in a range of soil types and has at least a partial degree of drought tolerance. It is not suited to heavier soils which might have drainage problems during the winter months. Under such conditions, the cultivar often shows root rot (most likely caused by *Phytophthora erythroseptica* Pethybr.) (7).

'Willamette' is also susceptible to several other diseases including spur blight (*Didymella applanta* (Niessl) Sacc.) (4) and bacterial blight (*Pseudomonas syringae* van Hall) (10). The fruit is relatively susceptible to both pre- and postharvest fruit rots; the former is mostly caused by *B. cinerea* and the latter by both *B. cinerea* and *Rhisopus* spp. (probably *R. stolonifer* [Ehr. ex. Fr.] Vuill.) (7). Susceptibility to postharvest fruit rots, along with the dark purple-red colour and lack of a high level of firmness, limits the shelf life of the fruit. This limitation, plus a somewhat acidic flavour, has meant the fruit has never been considered particularly well suited to the fresh market.

'Willamette' was selected in 1936 from the cross of 'Lloyd George' x 'Newburgh' made in 1933 by George Waldo working at Corvallis, Oregon in the Oregon State University — United States Department of Agriculture breeding program there. It was named in 1943 and within 10 years dominated the Pacific Northwest red raspberry industry. It has been used extensively in breeding programs. To date 'Meeker,' from the Washington State University breeding program at Puyallup, is the most notable cultivar which has 'Willamette' as a parent. It is expected that 'Willamette' and cultivars derived from it will continue to have major effects on world wide red raspberry production for many years to come.

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# Scab-Resistant Apple Cultivars

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Apple scab is the most serious apple disease in commercial orchards and in home gardens. Economic losses are greater from this disease than from any other apple disease. Apple scab is caused by the fungus *Venturia inaequalis* (Cke.) Wint. and attacks foliage and fruit of the apple tree. Scab thrives in cool and humid conditions, like those found in the Midwest during the spring. Infection of immature apples causes heavy fruit drop, resulting in reduced yields. Infection of leaves early in the season causes severe defoliation that weakens the tree and results in poor fruit set in the next season. The presence of brownish-black scabby patches on mature fruit results in a malformed and disfigured apple. This condition lowers fruit grade quality, prohibits its fresh marketability, and, therefore, causes the greatest loss. Using some of the scabby apples for processing is possible, but it is not very profitable. Apples with scab do not store well because of rapid loss of moisture through the scabby lesions.

To prevent these losses, a grower needs to apply fungicides seven to eight times during the growing season. The increased expenses associated with fungicides, spray equipment, and labor costs warrant using an alternative approach to deal with apple scab. Planting scab-resistant apple cultivars reduces grower costs by eliminating sprays needed for controlling scab.

Early in this century, the apple fruit breeding program was initiated at the University of Illinois. During this time, hundreds of crosses were made, including crosses between small-fruited crabapple types and large-fruited apples. One cross involved *Malus floribunda* 821 and 'Rome Beauty.'

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