‘Qualicum’ Red Raspberry

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‘Qualicum’ (Fig. 1) is a new floricanefruiting red raspberry (*Rubus idaeus* L.) from the breeding program at the Pacific Agriculture Research Centre (PARC) of Agriculture and Agri-Food Canada, Vancouver, B.C. ‘Qualicum’ produces high yields of large fruit with excellent quality. Although the cultivar appears suited to fresh and processing markets, it will be of particular interest to the former because of its firm fruit, which has relatively low susceptibility to postharvest rot, most of which is caused by *Botrytis cinerea* Pers. ex Fr.

‘Qualicum’, a British Columbia native Indian word that translates as “where the dog salmon run,” is a town on Vancouver Island. The choice of the name is in keeping with the tradition of choosing appropriate British Columbia native Indian words for cultivars developed by the breeding program at the PARC.

Origin

‘Qualicum’, which was tested as BC 83-16-50, was selected from a 1983 cross of ‘Glen Moy’ x ‘Chilliwack’. ‘Glen Moy’, released from the Scottish Crop Research Institute (SCRI) breeding program in 1981, is from the cross of SCRI selections whose parentage includes ‘Cumberland’ black raspberry (*R. occidentalis* L.), ‘Glen Clova’, ‘Lloyd George’, and ‘Malling Landmark’ (Jennings, 1982). ‘Glen Moy’ is now the most widely planted cultivar in Britain and is also planted in Holland and France for early fruit production under protective structures (Jennings, 1995). ‘Chilliwack’, released from the British Columbia breeding program in 1987, is from the cross of BC 64-10-198 (‘Sumner’ x ‘Carnival’) x ‘Skeena’ (Daubeny, 1987). ‘Chilliwack’ has become an important cultivar, particularly for fresh-market production, in the Pacific

Northwest (PNW), Chile, and southeastern Australia (Daubeny and Anderson, 1993). ‘Glen Moy’ is particularly susceptible to root rot, caused by *Phytophthora fragariae* var. *rubi* Wilcox and Duncan, whereas ‘Chilliwack’ shows some resistance (Daubeny and Anderson, 1993; Jennings, 1995).

Performance and description

Performance data for ‘Qualicum’, in comparison with other PNW cultivars, were obtained from two plantings made in 1988 and 1990, at Abbotsford, B.C. (Tables 1–3). The data on yield, fruit weight, season, fruit firmness, and soluble solids concentration (SSC) represent the means of 2 years, 1990 and 1991, from the 1988 planting, and the means of 3 years, 1992, 1993, and 1994, from the 1990 planting; the titratable acidity data are the means of 2 years, 1990 and 1991, from the 1988 planting combined with 1 year, 1992, from the 1990 planting. The postharvest fruit rot data, which were derived by the procedure described by Daubeny and Pepin (1974), were obtained in 1993 and 1994 from the 1990 planting. In each planting, a cultivar was represented by three plants replicated three times. The number of harvests varied from nine to 14,

depending on cultivar and year. ‘Qualicum’ also has been in trial plantings at Mt. Vernon and Puyallup, Wash.; East Malling in Kent, England; and Toolangi, Victoria, Australia; and in several grower fields in British Columbia.

‘Qualicum’ yields were not significantly less than those obtained from ‘Comox’ and ‘Tulameen’, both of which have been noted for high yields (Daubeny and Anderson, 1991), and not significantly higher than those obtained from the other cultivars, excluding ‘Willamette’ and ‘Chilliwack’ (Table 1). ‘Qualicum’ fruit weighed less than that of ‘Tulameen’ but more than that of each of the other cultivars. ‘Tulameen’ has been recognized for its heavy fruit (Daubeny and Anderson, 1991).

In a 1992-planted trial at the Washington State Univ. (WSU), Mt. Vernon Research and Extension Unit, ‘Qualicum’ was the second highest yielder among 21 cultivars and selections in 1994; it outyielded ‘Tulameen’ by 5%, ‘Meeker’ by 12%, and ‘Chilliwack’ by 45% (detailed data not presented). ‘Qualicum’ had a mean fruit weight of 4.9 g compared to 5.1 g for ‘Tulameen’, 3.7 g for ‘Meeker’, and 3.6 g for ‘Chilliwack’. In a 1991-planted trial at the WSU, Puyallup Research and Extension Center, ‘Qualicum’ was the fourth highest yielder over 2 years (1993 and 1994) among 14 cultivars and selections (data not presented). Its fruit had a relatively low incidence of at-harvest rot over the period.

The first harvest date for ‘Qualicum’ was later than that of ‘Chilcotin’, ‘Skeena’, and ‘Willamette’; earlier than that for ‘Chilliwack’, ‘Meeker’, and ‘Tulameen’; and the same as for ‘Comox’ (Table 2). The 50% harvest date for ‘Qualicum’ was the same as for ‘Chilliwack’;

Fig. 1. Fruiting lateral of ‘Qualicum’ red raspberry.

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Table 1. Yield and fruit weight of 'Qualicum' and other Pacific Northwest red raspberry cultivars.^z

Cultivars	Yield ^b (kg/plant)	Wt ^c (g/fruit)
Qualicum	3.99 ab	4.1 b
Chilcotin	3.58 bc	2.9 d
Chilliwick	3.05 c	3.2 e
Comox	4.35 a	3.4 c
Meeker	3.51 bc	3.0 e
Skeena	3.52 bc	2.9 e
Tulameen	4.24 a	4.5 a
Willamette	3.29 c	2.8 e

^aMean separation within columns by Student–Newman–Keuls multiple range test, $P = 0.05$.

^bYields were taken in 1990, 1991, 1992, 1993, and 1994 from three plant plots of each cultivar in each of three replications. The plants were maintained in stool beds.

^cFruit weight was based on the mean weight of 50 fruit/harvest over 5 years.

earlier than for 'Tulameen', 'Comox', and 'Meeker'; and later than for 'Skeena', 'Chilcotin', and 'Willamette'. Harvest duration was shorter than for 'Chilcotin' and 'Comox', longer than for 'Chilliwick', and similar to the other cultivars. Previously, 'Chilcotin' and 'Tulameen' had been noted for their long harvest durations (Daubeny and Anderson, 1991); this is evident only for 'Chilcotin' in the plantings from which our data were obtained.

'Qualicum' fruit was not as firm as that of 'Comox', which had been noted for its firmness (Daubeny and Anderson, 1991); it was similar in firmness to that of the other cultivars. However, in the previous planting; 'Chilcotin', 'Meeker', and 'Willamette' produced softer fruit than 'Tulameen', 'Chilliwick', and 'Skeena'.

The SSC of 'Qualicum' fruit was lower than that of 'Chilliwick', which has been noted for its high SSC (Daubeny, 1987; Daubeny and Anderson, 1991); higher than that of 'Chilcotin' and 'Willamette'; but similar to that of 'Tulameen', 'Meeker', 'Comox', and 'Skeena' (Table 3). Titratable acidity of 'Qualicum' fruit was the same as that of 'Tulameen' and higher than that of 'Meeker' and 'Chilliwick'.

We consider 'Qualicum' fruit, which is long and conic in shape, to be attractive and appealing. It is medium red and not as glossy as that of 'Chilliwick' or 'Tulameen'. Fresh flavor, while not as sweet as that of 'Chilliwick', is in our judgment most like that of 'Tulameen', which has a similar SSC: acid ratio (Table 3). In trial plantings at Horticulture Research International (HRI), East Malling, England, and at WSU, Puyallup, 'Qualicum' fruit has been noted for large size, firmness, and good flavor (V. Knight and P. Moore, respectively, personal communications). British Columbia growers have commented that 'Qualicum' fruit is firm, attractive, and has a longer shelf life than 'Chilliwick' and, thus, is even more suited for long-distance transport for fresh market. The fruit also appears to be suited to processing, both as an individual quick-freeze (IQF) product and as a dessert pack.

'Qualicum' fruit releases readily from the

Table 2. Season of 'Qualicum' and other Pacific Northwest red raspberry cultivars.^{z,y}

Cultivar	First harvest (date)	50% Harvest (date)	Harvest duration (days)
Qualicum	27 June c	15 July c	37 b
Chilcotin	20 June a	12 July b	44 d
Chilliwick	29 June d	14 July c	32 a
Comox	25 June bc	17 July d	41 c
Meeker	29 June d	18 July d	37 b
Skeena	21 June a	9 July a	37 b
Tulameen	29 June d	17 July d	38 b
Willamette	24 June b	11 July b	35 b

^aMean separation within columns by Student–Newman–Keuls multiple range test, $P = 0.05$.

^ySeason data were taken in 1990, 1991, 1992, 1993, and 1994 from three plant plots of each cultivar in each of three replications. The plants were maintained in stool beds.

Table 3. Fruit traits of 'Qualicum' and other Pacific Northwest red raspberry cultivars.^z

Cultivar	Firmness ^y (N)	Soluble solids concn ^x (%)	Titratable acid ^w (% citric)	<i>Botrytis</i> -incited fruit rot after 48 h ^v (%)	
				1993	1994
Qualicum	1.87 ab	11.0 bc	1.75 a	28.3 d	53.5 cd
Chilcotin	1.46 b	8.5 d	---	70.1 ab	60.5 bc
Chilliwick	1.80 ab	12.0 a	1.64 b	41.0 cd	41.0 d
Comox	2.17 a	10.6 c	---	42.4 cd	68.1 a–c
Meeker	1.38 b	11.2 bc	1.42 c	41.0 cd	70.2 a–c
Skeena	1.93 ab	10.3 c	---	64.6 b	83.4 a
Tulameen	1.85 ab	11.7 ab	1.80 a	52.8 bc	77.1 ab
Willamette	1.84 ab	8.1 d	---	85.4 a	53.5 cd

^aMean separation within columns by Student–Newman–Keuls multiple range test, $P = 0.05$.

^yFirmness, which is given in Newtons and is the force required to close the opening of the fruit, was obtained for 10 fruit at each of three harvests in 1990, 1991, 1992, 1993, and 1994.

^wMeans of 10 fruit from each of three harvests in 1990, 1991, 1992, 1993, and 1994.

^xMeans of 10 fruit from each of three harvests in 1990, 1991, and 1992. No determinations were made for 'Chilcotin', 'Comox', 'Skeena', and 'Willamette'.

^vMeans from five tests in 1993 and three tests in 1994. In every test a cultivar was represented by 12 fruit from each of the four replications.

receptacle, a trait that is desirable for machine and hand harvesting. For the latter, this means fruit that is not fully ripe can be harvested for the fresh market and subsequently be firmer and have a longer-duration shelf life.

'Qualicum' flowers are self-fertile, and percent drupelet set under simulated monoculture conditions (data not presented) has been similar to that of 'Meeker', 'Willamette', 'Tulameen', and 'Chilliwick', each of which is recognized for high percent set (Daubeny, 1971, 1987; Daubeny and Anderson, 1991).

'Qualicum' primocanes are green with a light rose-red overlay. They are vigorous and upright with purple spines mostly limited to basal portions. The cultivar produces an adequate number of primocanes for plant establishment but not as many as 'Willamette', which produces particularly high numbers.

'Qualicum' floricanes are light brown with a gray overlay and show some cracking. Fruiting laterals are long, strongly attached, and droop somewhat. Fruit is well-spaced along these laterals. Accessibility of fruit is good.

Information on the relative winter hardiness of 'Qualicum' plants is limited. In 1993, 'Meeker', considered the least winter hardy of the PNW cultivars, appeared to suffer some damage after particularly low temperatures the previous December. 'Qualicum' suffered similar damage, and thus may not be any more hardy than 'Meeker' and less hardy than the other PNW cultivars.

Preliminary observations from a trial planting at the Toolangi Field Station in Victoria, Australia, suggest that 'Qualicum' may have a

low chilling requirement since the canes showed relatively good budbreak (G. McGregor, personal communication). It also showed good cane growth at that location.

'Qualicum' (BC 83-16-50) has been characterized by isoenzyme analysis (Cousineau et al., 1993). The patterns obtained are as follows, with the letters indicating the banding patterns: malate dehydrogenase, D; phosphoglucumutase, C; phosphoglucosomerase, A; triose phosphate isomerase, A; isocitrate dehydrogenase, A; shikimate dehydrogenase, A.

Disease and pest reactions

In the two years in which reactions to postharvest fruit rot caused by *B. cinerea* were determined, 'Qualicum' showed the least amount in 1993 and, along with 'Chilliwick' and 'Willamette', the least in 1994 (Table 3). 'Chilliwick' has been recognized for its relatively low susceptibility to postharvest rot (Daubeny, 1987). In the years in which 'Qualicum' has been tested in the Abbotsford trial plantings, the amount of at-harvest fruit rot, also caused by *B. cinerea*, has been relatively low. However, 'Tulameen' produced more rotted fruit (2.3%) and 'Meeker' less (0.6%) than the other cultivars, including 'Qualicum' (data not presented). The greater susceptibility of 'Tulameen' to at-harvest rot agrees with previous observations (Daubeny and Anderson, 1991).

'Qualicum' plants, growing in the field at Abbotsford, have been indexed for raspberry bushy dwarf virus (RBDV), using the en-

zyme-linked immunosorbent assay technique, at least once a year since the initial selection was made in 1986. RBDV has not been found in any of the indexing. Throughout this period (1986 to 1994), initially virus-free clones of known RBDV-susceptible cultivars have become infected. From this, it might be reasonable to assume that 'Qualicum' has an effective level of resistance to pollen transmission of the virus. However, at the Puyallup site, which has a higher incidence of the virus, it indexed positive 4 years after planting.

'Qualicum' was first selected as a small seedling for resistance, conferred by gene *Ag₁*, to the common biotype of *Amphorophora agathonica* Hottes, the North American aphid vector of the raspberry mosaic virus (RMV) complex. Since 1990, aphid colonization has been noted on plants of the cultivar in the Abbotsford trials. We assume that this is a resistance-breaking biotype of the aphid, which has been found on other cultivars with the *Ag₁* gene (Daubeny and Anderson, 1993). The RMV complex has not been found in yearly (1991 to 1994) indexing by using the double-stranded RNA technique for the plants in the trials.

In the Abbotsford trial plantings, 'Qualicum' has shown some resistance to spur blight [*Didymella applanata* (Niessl) Sacc.] and moderate susceptibility to cane *Botrytis* (*B. cinerea*) and to cane spot (*Elsinoe veneta*

Burh.). At HRI in England, 'Qualicum' was characterized as moderately susceptible to spur blight, as well as to cane *Botrytis* and to cane blight, caused by *Leptosphaeria coniothyrium* (Fuckel) (V. Knight, personal communication).

Reaction to *P. fragariae* var. *rubi*-incited root rot, as determined in greenhouse pot tests, showed that 'Qualicum' was less susceptible than its 'Glen Moy' parent (unpublished data). Field reactions to root rot have not been determined.

'Qualicum' is resistant to powdery mildew [*Sphaerotheca humuli* (DC) Barr.] and is susceptible to crown gall [*Agrobacterium tumefaciens* (Smith and Towns) Conn]. Reactions to bacterial blight (*Pseudomonas syringae* Van Hall) and root-lesion nematode [*Pratylenchus penetrans* (Cobb) Fillip and Stek] are unknown.

Adaptability and uses

'Qualicum' appears well adapted to the northern portions of the PNW; preliminary information suggests it might also have some adaptation in southeastern Australia and southeastern England. Its large, firm, attractive fruit, with some resistance to postharvest rot, is particularly suited to the fresh market. The fruit is also suited for processing, including the high-value IQF product.

Availability

Certified 'Qualicum' plants are being propagated under royalty agreements with three Pacific Northwest propagators, the names of whom will be supplied upon request.

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