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Red Raspberry Cultivars for the Pacific Northwest

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The Pacific Northwest is considered to be one of the major red raspberry (*Rubus idaeus* L.) production regions in the world at the present time. Undoubtedly it is the most efficient region for production with the highest yields per unit area being recorded there (7). For almost 30 years, Willamette, which was released from the Oregon State University–United States Department of Agriculture program in 1943 (1), has been the most widely grown cultivar throughout the region. One of the main reasons for Willamette's longevity has been its freedom from virus diseases. Particularly important in this regard has been its escape from raspberry mosaic virus (RMV) which can be a limiting factor in red raspberry production (5). The cultivar is susceptible to *Amphorophora agathonica* Hottes, the aphid vector of the virus, but does not become infected. It appears to have innate resistance the basis of which is not understood at the present time (6). Another reason for the longevity of the cultivar has been the suitability of its fruit for the processing market which has been the main outlet for fruit produced in the region.

During the period from 1967 to 1977, three new cultivars were released by two of the red raspberry breeding programs in the Pacific Northwest. Meeker came from the Washington State program and Haida and Matsqui from the British Columbia program (1, 2). At the present time Meeker is being planted extensively in Washington and Oregon. In comparison to Willamette, the fruit shakes off the plants more readily and it is thus better adapted to mechanical harvesting. In addition the fruit is firmer and shows more rot resistance. These characteristics also make it better adapted to the fresh market. Haida is being planted in British Columbia mostly for local fresh market sales because of its particularly bright red fruit colour. Matsqui was released because it was better adapted to mechanical harvesting than Willamette. Plant stands and subsequently yields of this cultivar have been extremely variable. Preliminary evidence suggests that this is due to susceptibility

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to the meadow lesion nematode, *Pratylenchus penetrans* (Cobb) Chilwood and Oteifa (unpublished data). Matsqui is now planted on a very limited scale and is not considered to have any commercial potential.

The purpose of the present paper is to describe three new cultivars from the British Columbia red raspberry breeding program and to compare each with Willamette and also with Haida and Meeker. The new cultivars are Chilcotin (Sumner x Newburgh), Skeena (Creston x 6010/52, a selection from the Scottish Horticultural Research Institute) and Nootka (Carnival x Willamette). Chilcotin and Skeena have been released primarily for the fresh market and Nootka for mechanical harvesting and thus for the processing market.

The three new cultivars have been tested in trials at Abbotsford, British Columbia and at three sites in Washington (Mt. Vernon, Puyallup and Vancouver) and one site in Oregon (Aurora). In addition to these trials, which are all located at Research or Experiment Stations, the cultivars have been observed in growers' plantings in British Columbia and Washington.

Performance Information

For the sake of brevity, performance data (Tables 1-6) are limited to results obtained from a 1973-planted trial at Abbotsford. Data from the other trials, including several more at Abbotsford, have been essentially similar.

Yield data, expressed as percentage increase or decrease in relationship to Willamette, are given in Table 1. Chilcotin and Skeena each yielded more than Willamette the year after planting. Meeker yielded significantly more and Nootka and Haida each significantly less. Similar results, the year after planting, have been obtained with Chilcotin in other trials. Results with Skeena have not been as consistent. Also, Meeker usually has produced yields more similar to those obtained from Willamette. Considering the three new cultivars, it is reasonable to assume that Chilcotin, at least, is like Willamette and Meeker (and unlike many other cultivars, including Haida (2)) in producing relatively high yields the year after planting.

The yields recorded on subsequent years indicated that Chilcotin, as well as Haida and Meeker, outyielded Willamette (Table 1). Skeena and Nootka also outyielded Willamette but the differences were usually not as great as those recorded for the other two cultivars. A notable exception to this was Skeena in 1975 which produced a 76% higher yield than Willamette.

Chilcotin and Meeker produced larger fruit than Willamette in all the comparisons (Table 2). Skeena produced larger fruit in 3 of the 4 comparisons. Nootka and Haida produced smaller fruit than Willamette in all comparisons.

The ratings for fruit firmness, given in Table 3, are based on subjective ratings from the means of 8 to 10 harvests in 1977. Meeker produced the firmest fruit closely followed by Skeena and Nootka. There were no differences detected in firmness among Chilcotin, Willamette and Haida.

In 1977 the three new cultivars started to produce ripe fruit the same date as Willamette and each was earlier than Haida or Meeker (Table 4). Chilcotin had the longest harvest season of any of the cultivars. Similar ripening patterns have been observed in other years except that a longer harvest season has been recorded for Skeena.

Subjective taste panel ratings, obtained from frozen and subsequently thawed samples of fruit from the six

cultivars, over a 4-year period, are given in Table 5. Each of the cultivars appears at least as suitable as Willamette for freezing into retail packs.

In 1976 and 1977 fruit of both Chilcotin and Skeena were sent, via air freight, from a grower's trial in Washington to eastern United States markets. Fruit of both cultivars by virtue of lighter, brighter red colour, greater firmness and/or more resistance to post-harvest rot was considerably more attractive for retail sale than that of Willamette. Meeker fruit shipped in this way was comparable to that of Chilcotin or Skeena but did not have quite as attractive a colour. It is obvious that both Skeena and Chilcotin are superior to Willamette for long distance shipping.

Each cultivar produced more fruit per lateral than Willamette. This is shown in Table 6 from data obtained in 1977. All, except Haida, produced longer laterals than Willamette. Cane diameters were greater for Skeena and Haida than for Willamette; for each of the others the diameter was approximately the same. Cane heights were less in Chilcotin, Nootka and Haida and greater in Meeker; for Skeena they were approximately the same as Willamette.

The plant habits of the three new cultivars are improvements over those of Willamette and also Meeker. Skeena is particularly impressive in this regard with smooth, sturdy and very upright canes; Haida canes are similar to these. The canes of Chilcotin and Nootka are not as upright but are more so than those of either Willamette or Meeker.

Information on winter-hardiness of the three new cultivars is limited to observations made in 1972 from trials planted at Abbotsford in 1968, 1969 or 1970. Nootka appeared to be the most hardy and was comparable to Haida. Chilcotin and Skeena, as well

Table 1. Yields, expressed as percentage increase or decrease in relationship to Willamette, of red raspberry cultivars planted at Abbotsford in 1973.

	1974	1975	1976	1977
Chilcotin	+17	+52*	+49*	+59*
Skeena	+17	+76*	+18	+14
Nootka	−50*	+48*	+16	+17
Haida	−50*	+70*	—[a]	+48*
Meeker	+44*	+48*	+49*	+59*

*Significantly different (P = 0.05) than Willamette in the respective year.
[a]Haida was not harvested in 1976.

Table 2. Fruit size, expressed as grams/fruit, of six red raspberry cultivars planted at Abbotsford in 1973.

	1974	1975	1976	1977
Willamette	3.8	3.4	4.2	3.5
Chilcotin	4.0	3.7	4.4	3.7
Skeena	3.5	3.8	4.4	3.8+
Nootka	2.8—	3.2	3.7—	3.2—
Haida	3.2—	2.9—	—[a]	3.3
Meeker	3.9	3.5	4.6	3.8+

+ and − indicate significantly (P = 0.05) more and less, respectively, than Willamette for each year.
[a]Haida was not harvested in 1976.

Table 3. Mean fruit firmness ratings of six red raspberry cultivars in 1977 (10 = highest and 1 = lowest rating).

Willamette	7.0	Nootka	7.5
Chilcotin	7.0	Haida	7.0
Skeena	7.6	Meeker	7.7

Table 4. Length of harvest season for six red raspberry cultivars in 1977.

Willamette	July 4 - Aug. 6
Chilcotin	July 4 - Aug. 18
Skeena	July 4 - Aug. 8
Nootka	July 4 - Aug. 16
Haida	July 7 - Aug. 16
Meeker	July 12 - Aug. 16

Table 5. Mean subjective taste panel ratings, from 4 years, of frozen samples of six red raspberry cultivars (10 = highest and 1 = lowest rating).

	Appearance	Colour	Firmness	Flavour
Willamette	7.1	7.1	7.5	7.4
Chilcotin	7.5	8.8	6.9	7.9
Skeena	7.1	7.3	8.9	7.1
Nootka	7.1	7.0	7.4	8.1
Haida	7.2	7.2	8.2	7.7
Meeker	7.6	7.3	7.8	7.6

Table 6. Measurements of cane growth and fruit laterals of six red raspberry cultivars at Abbotsford in 1977.

	Cane ht. (cm)	Cane diam. (cm)	Lateral length (cm)	No. of fruit/ lateral
Willamette	236	1.07	43.40	17
Chilcotin	226—	1.04	54.57+	27+
Skeena	244	1.26+	56.37+	30+
Nootka	227—	1.11	57.50+	28+
Haida	209—	1.13+	45.90	26+
Meeker	281+	1.11	69.57+	30+

+ and — indicate significantly (P = 0.05) more and less, respectively, than Williamette for each measurement.

Table 7. Relative resistance of six red raspberry cultivars to postharvest fruit rot caused by *Botrytis cinerea* and *Rhizopus* spp. (5 = most resistant and 1 = most susceptible).

Nootka	5	Skeena	3
Chilcotin	4	Willamette	2
Meeker	4	Haida	2

as Meeker, were more comparable to Willamette and each showed more winter injury than Haida.

Disease and Insect Responses

In most years very little "pre" or "at" -harvest fruit rot, caused by *Botrytis cinerea* Pers. ex. Fr., is recorded at Abbotsford. However, 1976 was an exception: as much as 32% of the fruit was rotted of a particularly susceptible cultivar or selection at one harvest date. There was little difference in rot incidences among Willamette, Nootka, Skeena and Meeker; Chilcotin showed a slightly higher incidence. Records were not taken for Haida in that year but observations in commercial plantings indicated that the incidence was probably greater than that recorded for Chilcotin.

In general, little relationship has been found between preharvest resistance to *B. cinerea* and postharvest resistance to that organism or to *Rhizopus* spp., the other organism that is an important cause of postharvest rot (unpublished data). In the postharvest screening trials, which are an integral part of the breeding program, Nootka has been used as the resistant standard since it has consistently shown more resistance to *B. cinerea* and to *Rhizopus* spp. than most other cultivars or selections (4). Relative resistance, based on several years of postharvest screening trials, to rot caused by both organisms among the six cultivars, is given in Table 7. Chilcotin and Willamette in particular, have each shown differences between relative resistance to preharvest and to postharvest rots.

Both Skeena and Nootka are immune, as is Haida, to *Amphorophora agathonica* Hottes, the aphid vector of RMV; they will thus remain free of the virus. Chilcotin supports colonies of the aphid. However, to date no RMV has been found in the variety in any of the plantings. It is assumed that the cultivar is similar to Willamette which shows resistance to the virus despite aphid susceptibility (5). Meeker, also, would seem to be like Willamette in this respect.

Chilcotin and Skeena are each less susceptible to spur blight, caused by *Didymella applanata* (Niessl) Sacc., than Willamette but not nearly as resistant as Haida (3). Nootka, as well

as Meeker, are in the same susceptibility class as Willamette.

Both Nootka and Skeena, as well as Haida, are slightly susceptible to powdery mildew, caused by *Sphaerotheca macularis* (Wellr. ex. Fr.) W. B. Clarke but the disease is not considered detrimental since it is effectively controlled by fungicides recommended for fruit rot control (H. S. Pepin, personal communication).

Summary

Compared to Willamette, which is the most widely grown red raspberry cultivar in the Pacific Northwest, several new cultivars by virtue of superior fruit colour, more fruit rot resistance and/or firmness are much better adapted to fresh market outlets. Included among these new cultivars are Chilcotin and Skeena which have recently been released from the British Columbia breeding program. Nootka, another recent release from this program, and Meeker are better adapted to mechanical harvesting than Willamette. All the cultivars described outyielded Willamette in trial plantings.

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Message from the President

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