Description and Performance

‘Black Pearl’ has been tested predominantly at the Oregon State University North Willamette Research and Extension Center (NWREC) in Aurora, Ore. In test plantings, standard cultural practices for trailing blackberry production were used, including annual pre- and postemergent herbicide applications, annual spring nitrogen fertilization (78 kg N/ha), postharvest removal of floricanes, training of primocanes to a two wire trellis, and weekly overhead application of about 2.5 cm of irrigation. Each of the plantings received applications of dormant season fungicides (liquid lime sulfur and copper hydroxide) to control leaf and cane spot (Septoria rubri Westend.), purple blotch [Septoria ruborubens (Lib.) Petr.], rust [Kuehnella uredinis (Link) Arth.] and anthracnose [Elsinoe veneta (Burkholder) Jenk.]. They also received a single bloom application of captan to control anthracnose, botrytis [Botrytis cinerea Pers.:Fr.], cane spot, purple blotch and stamen blight (Hapalosphaeria deformans [Syd.] Syd.) at labeled rates. In 1997, before evaluation in replicated trial (Table 1), ‘Black Pearl’ was planted in an unreplicated trial with a number of selections and cultivars (Table 2). The replicated plantings at NWREC was arranged in a randomized complete block design, with four, three-plant replications to assess fresh fruit characteristics and three replications hand-harvested once per week to determine harvest season, yield and fruit weight. The average fruit weight for a season is a weighted mean based on the weight of a randomly selected subsample of 25 fruit from each harvest. These data, collected from 2001–03, were analyzed as a split plot in time with cultivar as the main plot and year as the subplot. Of the 23 genotypes harvested in replicated trial for yield, only the data from ‘Marion’, ‘Silvan’, and ‘Waldo’ and the new releases ‘Black Pearl’, ‘Black Diamond’ (Finn et al., 2005a), and ‘Nightfall’ (Finn et al., 2005b) were included in the analysis (PROC GLM; SAS Institute, Cary, N.C.). The cultivar × year

Origin

In 1995, ‘Black Pearl’, tested as ORUS 1380-1, was selected in Corvallis, Ore. from a 1993 cross of ORUS 1117-11 × ORUS 1122-1 (Fig. 1). ORUS 1117-11 was a very promising thornless selection that was very late ripening and whose thornlessness was derived through NC 37-35-M-2 from ‘Austin Thornless’. ORUS 1122-1 shares many characteristics with ‘Marion’ but is higher yielding and larger fruited. Unfortunately, ORUS 1122-1 is only suited for processing and is thorny which became an unacceptable combination in the early 1990s. ORUS 1117-11 and ORUS 1122-1 share many genotypes in their respective pedigrees; R. ursinus Cham. & Schltld derivatives such as ‘Zielinski’, ‘Logan’, ‘Jenner-1’, ‘Marion’ and ‘Ollalie’ are prominent and the eastern blackberry ‘Eldorado’ (R. allegheniensis hybrid) accounts for nearly 1/8 of ‘Black Pearl’s background. Flow cytometry estimated ‘Black Pearl’s ploidy as 2n = 9x = 63 (Meng and Finn, 2002).

Fig. 1. ‘Black Pearl’ pedigree.
interaction was significant for yield but not for fruit weight. Therefore, the interaction means for yield are presented and compared using Duncan’s multiple range test (Table 1). The fruit ripening season in Ore. was characterized by the dates at which 5%, 50%, and 95% of the total fruit yield were harvested (Table 3). Subjective fruit evaluations were made during the fruiting season using a 1 to 9 scale (9 = the best expression of each trait) (Table 4). These subjective evaluations were done on cultivars in the replicated trial as well as important commercial cultivars (‘Chester Thornless’ and ‘Kotata’) that were not. Fruit ratings included firmness (as measured subjectively by hand in the field on six to eight berries), color, shape (with a uniform, long conic ideal), texture (as measured subjectively when chewed while tasting berries in the field), separation (subjective rating of how easily ripe fruit separated from the plant), and flavor (subjectively rated by tasting berries in the field) (Table 4). Plant ratings were conducted one time each year from 2001–03 during the fruited season for primocane and floricanie vigor, spines (9 = spineless; cultivars derived from ‘Austin Thornless’ are seldom completely spineless, basal spines are common and occasionally a single spine on the lower side of the petiolule), and flowering/lateral length (1 = very short, 5 = very long) and strength (1 = weak, droopy; 5 = stiff, sturdy) (Table 4). In 2004, fruit were harvested by an over-the-row harvester (Littau, Stayton, Ore.) with a horizontal (Christy) head from a large number of genotypes each planted in 2003 in a single five-plant plot at Enfield Farms (Lynn, Wash.). In separate studies, the chemical characteristics of commercial cultivars and several advanced selections including ‘Black Pearl’ were evaluated (Siriwhorn et al., 2004). Yorgey and Finn (2005) prepared individually quick frozen (IQF) and pureed products from several genotypes for evaluation by a blind panel of untrained experts.

Table 1. Fruit weight and yield in 2001–03 for blackberry genotypes planted in 1999 in replicated trial at the Oregon State University–North Willamette Research and Extension Center in Aurora.

| Genotype     | Fruit size (g)2001–03 | Yield (kg·ha–1) | Mean Yield (kg·ha–1) |
|--------------|-----------------------|-----------------|---------------------|
|              | 2001   | 2002   | 2003   | 2001–03 |
| Nightfall    | 6.2 b  | 42474 a| 13405 a| 20962 a| 25604 a|
| Silvan       | 6.2 bc | 31757 ab| 16811 a| 21485 a| 23351 a|
| Black Diamond| 5.8 cd | 29281 a–c| 15568 a| 19001 a| 21283 ab|
| Marion       | 5.1 e  | 26380 a–c| 13021 a| 18397 a| 19266 ab|
| Black Pearl  | 6.2 b  | 26969 a–c| 14373 a| 15505 ab| 18949 ab|
| Waldo        | 5.3 a  | 25849 bc| 11000 a| 17286 a| 18045 ab|
| Siskiyou     | 6.9 a  | 20669 c | 9054 a | 9359 b | 13394 b |

2Means withing a column followed by the same letter are not significantly different p < 0.05, by Duncan’s multiple range test.

Table 2. Average fruit size, yield and harvest season in 1999–2000 for four blackberry cultivars in an unreplicated trial planted in 1997 at the Oregon State University–North Willamette Research and Extension Center in Aurora.

| Genotype | Fruit size (g) | Yield (kg·ha–1) | 2001–03 Harvest season |
|----------|----------------|-----------------|------------------------|
|          | 2001 | 2002 | 2003 | 2001–03 |
| Black Pearl | 6.1 | 15038 | 6 July | 16 July | 8 Aug. |
| Marion | 4.8 | 19896 | 9 July | 14 July | 28 July |
| Waldo | 4.8 | 15038 | 6 July | 16 July | 8 Aug. |
| Kotata | 4.4 | 13323 | 6 July | 18 July | 28 July |

Table 3. Mean scores for subjectively evaluated characteristics of ‘Black Pearl’ and three commercial blackberry cultivars planted in 1999 at the Oregon State University–North Willamette Research and Extension Center in Aurora.

| Cultivar     | Primoane vigor | Floricanie vigor | Fruiting lateral | Fruit |
|--------------|---------------|-----------------|-----------------|-------|
|              | Thorns        | Length          | Strength        | Firm  | Color | Shape | Texture | Separation | Flavor |
| Black Pearl  | 9.0           | 8.6             | 8.0             | 3.7   | 3.3   | 6.3   | 8.3     | 8.3        | 8.7    | 8.1    |
| Marion       | 9.0           | 4.6             | 8.0             | 4.8   | 3.3   | 5.4   | 8.3     | 8.3        | 8.9    | 8.9    | 8.6    |
| Silvan       | 9.0           | 3.1             | 7.9             | 3.5   | 2.7   | 3.9   | 7.1     | 7.2        | 8.2    | 8.6    | 8.0    |
| Waldo        | 8.6           | 8.4             | 7.6             | 1.7   | 4.5   | 7.0   | 8.6     | 8.9        | 8.8    | 8.8    | 6.9    |

3Characteristics (except for laterals) scored on a 1 to 9 scale, where 1 = the poorest expression of the trait and 9 = the best expression of the trait, i.e., 9 = very vigorous, spineless, very firm, black, uniform shape, pleasant to chew not seedy, separates easily from the plant, and intense flavor, respectively. Lateral characteristics scored on a 1 to 5 scale, where 1 = short or weak laterals and 5 = long or strong laterals.

Table 4. Average fruit weight, yield and harvest season in 1999–2000 for four blackberry cultivars in an unreplicated trial planted in 1997 at the Oregon State University–North Willamette Research and Extension Center in Aurora.

| Genotype | Fruit weight (g) | Yield (kg·ha–1) | 5% | 50% | 95% |
|----------|-----------------|-----------------|----|-----|-----|
| Black Pearl | 6.1  | 15038 | 6 July | 16 July | 8 Aug. |
| Marion | 4.8  | 19896 | 9 July | 14 July | 28 July |
| Waldo | 4.8  | 15038 | 6 July | 16 July | 8 Aug. |
| Siskiyou | 4.4  | 13323 | 6 July | 18 July | 28 July |

Table 5. Mean scores for subjectively evaluated characteristics of ‘Black Pearl’ and three commercial blackberry cultivars planted in 1999 at the Oregon State University–North Willamette Research and Extension Center in Aurora.

| Cultivar     | Primoane vigor | Floricanie vigor | Fruiting lateral | Fruit |
|--------------|---------------|-----------------|-----------------|-------|
|              | Thorns        | Length          | Strength        | Firm  | Color | Shape | Texture | Separation | Flavor |
| Black Pearl  | 9.0           | 8.6             | 8.0             | 3.7   | 3.3   | 6.3   | 8.3     | 8.3        | 8.7    | 8.1    |
| Marion       | 9.0           | 4.6             | 8.0             | 4.8   | 3.3   | 5.4   | 8.3     | 8.3        | 8.9    | 8.9    | 8.6    |
| Silvan       | 9.0           | 3.1             | 7.9             | 3.5   | 2.7   | 3.9   | 7.1     | 7.2        | 8.2    | 8.6    | 8.0    |
| Waldo        | 8.6           | 8.4             | 7.6             | 1.7   | 4.5   | 7.0   | 8.6     | 8.9        | 8.8    | 8.8    | 6.9    |

4Characteristics (except for laterals) scored on a 1 to 9 scale, where 1 = the poorest expression of the trait and 9 = the best expression of the trait, i.e., 9 = very vigorous, spineless, very firm, black, uniform shape, pleasant to chew not seedy, separates easily from the plant, and intense flavor, respectively. Lateral characteristics scored on a 1 to 5 scale, where 1 = short or weak laterals and 5 = long or strong laterals.
However, the winters, even those of northern Washington, have been mild. In Fall 2003, the temperatures dropped rapidly to –3 to –6 °C in Oregon and –4 to –8 °C in northern Wash. the last two days of October. Many genotypes including ‘Marion’ and ‘Silvan’, but not ‘Black Pearl’, were severely damaged (cane and bud death) by this rapid change in temperature in our Washington, but not our Oregon, trials. One reason for the greater damage in Washington may be that the plots were in a commercial red raspberry field where plants were heavily fertilized with nitrogen and irrigated to maximize growth the first year and yield the following year. This approach may have led to injury on plants that were not yet dormant. Nonetheless, ‘Black Pearl’ came through this episode with much less damage than ‘Marion’.

Outstanding characteristics of ‘Black Pearl’ include large fruit, a yield similar to that of ‘Marion’, excellent processed fruit quality, excellent adaptation to machine harvesting, and thornless plants with good disease tolerance. ‘Black Pearl’ should be a useful commercial cultivar for the processed blackberry industry. ‘Black Pearl’ will not likely be well suited for the fresh market as it is too soft, but this cultivar is suited for homeowners. ‘Black Pearl’ is expected to perform well in areas where trailing blackberries are adapted, including the Pacific Northwest, California, Chile, New Zealand, United Kingdom, and the Mediterranean region.

### Table 4. Mean ripening season and date at which the yield of each genotype reached the given percentage of total yield at the Oregon State University–North Willamette Research and Extension Center in Aurora. Trial was planted in 1999 and harvested in 2001–03.

| Genotype   | Harvest season |
|------------|----------------|
|            | 5%  | 50% | 95% |
| Metolius   | 25 June | 3 July | 14 July |
| Obsidian   | 25 June | 4 July | 15 July |
| Siskiyou   | 25 June | 8 July | 25 July |
| Silvan     | 26 June | 8 July | 21 July |
| Black Diamond | 28 June | 10 July | 22 July |
| Marion     | 3 July | 10 July | 24 July |
| Black Pearl| 3 July | 11 July | 23 July |
| Nightfall  | 3 July | 11 July | 23 July |
| Waldo      | 8 July | 22 July | 7 Aug. |

**Availability**

‘Black Pearl’ is not patented. When this germplasm contributes to the development of a new cultivar or germplasm, the authors request that appropriate recognition be given to the source. ‘Black Pearl’ nuclear stock has tested negative for tomato ringspot, raspberry bushy dwarf, and tobacco streak viruses by ELISA and has indexed negative on grafting to *R. occidentalis*. Further information or a list of nurseries propagating ‘Black Pearl’ is available on written request to the contact author. The USDA–ARS does not have commercial quantities of plants to distribute. In addition, plants of ‘Black Pearl’ have been deposited in the National Plant Germplasm System, at the USDA–ARS NCGR in Corvallis, accession number PI 638260, where it is available for research purposes, including development and commercialization of new cultivars.

**Literature Cited**

Finn, C.E., B.M. Yorgey, B.C. Strik, R.R. Martin, and M.C. Qian. 2005b. ‘Black Pearl’ thornless trailing blackberry. HortScience 40:2179–2181.

Finn, C.E., B.M. Yorgey, B.C. Strik, R.R. Martin, and M.C. Qian. 2005a. ‘Nightfall’ thornless trailing blackberry. HortScience 40:2182–2184.

Finn, C., B.C. Strik, and F.J. Lawrence. 1997. Marion trailing blackberry. Fruit Var. J. 51:130–132.

Meng, R. and C. Finn. 2002. Determining ploidy level and nuclear DNA content in *Rubus* by flow cytometry. J. Amer. Soc. Hort. Sci. 127:67–75.

Siriwongham, T., R.E. Wrolstad, C.E. Finn, and C.B. Pereira. 2004. Influence of cultivar, maturity and sampling on blackberry (*Rubus* L. hybrids) anthocyanins, polyphenolics, and antioxidant properties. J. Agr. Food Chem. 52:8021–8030.

Strik, B. and G. Buller. 2002. Reducing thorn contamination in machine-harvested ‘Marion’ blackberry. Acta Hort. 585:677–681.

Yorgey, B.M. and C.E. Finn. 2005. Comparison of ‘Marion’ to thornless blackberry genotypes as individually quick frozen and puree products. HortScience 40:513–515.