‘Black Pearl’ Thornless Trailing Blackberry

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‘Marion’ is currently the most important blackberry (Rubus L. subgenus Rubus) cultivar in the world and it is the predominant cultivar grown for the processed fruit market (Finn et al., 1997). While ‘Marion’ produces fruit of outstanding quality for processing, the plants are thorny (botanically termed spiny). When ‘Marion’ is machine harvested, thorns can end up in the product (Strik and Buller, 2002), which can lead to a poor product, and, more significantly in an economic sense, lawsuits. As a result, a primary priority for the breeding program has been the development of cultivars that are thornless, machine harvestable, and retain the excellent processing characteristics of ‘Marion’. Three thornless blackberry cultivars with these qualities are being released simultaneously: ‘Black Pearl’, ‘Black Diamond’ (Finn et al., 2005a) and ‘Nightfall’ (Finn et al., 2005b).

‘Black Pearl’ is a thornless trailing blackberry from the U.S. Department of Agriculture-Agricultural Research Service (USDA-ARS) breeding program in Corvallis, Ore., released in cooperation with the Oregon State University Agricultural Experiment Station and the Washington State University Agricultural Research Center. ‘Black Pearl’ is thornless, adapted to machine harvesting and has yield and processed fruit quality very similar to ‘Marion’. 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. & Schldtl 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).

Origin

In 1995, ‘Black Pearl’, tested as ORUS

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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 rubi Westend.), purple blotch [Septocya ruborum (Lib.) Petr.], rust [Kuehneola 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 planting 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

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 was harvested (Table 3). Subjective fruit evaluations were made during the ripening season using a 1 to 9 scale (9 = the best expression of each trait). The subjective evaluations were done on cultivars in the replicated trial as well as important commercial cultivars (‘Chester Thornless’ and ‘Kotata’) that were not. The 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 fruiting season for primocane and florican 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 petiolo), and flowering/fruiting 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 over-the-row harvester (Littau, Stayton, Ore.) in separate studies, the chemical characteristics of commercial cultivars and several advanced selections including ‘Black Pearl’ were evaluated (Siriwoharn et al., 2004). Yorgey and Finn (2005) prepared individually quick frozen (IQF) and puree products from several genotypes for evaluation by a blind panel of untrained experts. In Oregon, ‘Black Pearl’ had a similar yield to all of the cultivars tested including ‘Marion’ in replicated trial (Table 1). While not statistically different, ‘Black Pearl’ tended to have a higher yield than ‘Siskiyou’ in all years, ‘Marion’ and ‘Waldo’ in 2 of 3 years, and lower than ‘Silvan’ in all years. In the original observation plot, ‘Black Pearl’ had yields intermediate between ‘Marion’ and ‘Kotata’ that would suggest comparable commercial yields (Table 2). In the Washington State trial, ‘Black Pearl’ machine harvested well, yielding a good-looking product with few defective fruit, e.g., green, pedicel–calyx not detached from fruit. Fruit size for ‘Black Pearl’ tends to be larger than ‘Marion’, ‘Waldo’, and ‘Kotata’, more similar to ‘Silvan’ but not as large as ‘Siskiyou’ (Tables 1 and 2). ‘Black Pearl’ harvest begins in the first few days of July, peaks in early July and is largely done by the third week of July in Oregon (Tables 2 and 3). The harvest season is almost identical to ‘Marion’, later ripening than ‘Obsidian’ and ‘Metolius’ and is much earlier than ‘Waldo’. The earlier evaluation in unreplicated trial had similarly put ‘Black Pearl’ season as comparable to ‘Marion’s Table 2.

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.

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Primocane vigor</th>
<th>Florican vigor</th>
<th>Fruiting lateral</th>
<th>Fruit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Length</td>
<td>Strength</td>
<td>Firm</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Color</td>
</tr>
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<td></td>
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<td></td>
<td></td>
<td>Shape</td>
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<td>Texture</td>
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<td></td>
<td></td>
<td>Separation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Flavor</td>
</tr>
<tr>
<td>Black Pearl</td>
<td>9.0</td>
<td>8.6</td>
<td>8.0</td>
<td>3.7</td>
</tr>
<tr>
<td>Marion</td>
<td>9.0</td>
<td>4.6</td>
<td>8.5</td>
<td>4.8</td>
</tr>
<tr>
<td>Silvan</td>
<td>9.0</td>
<td>3.1</td>
<td>7.9</td>
<td>3.5</td>
</tr>
<tr>
<td>Waldo</td>
<td>8.6</td>
<td>8.4</td>
<td>7.6</td>
<td>1.7</td>
</tr>
</tbody>
</table>

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 fertil-
ized 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.

In our trials, under a minimal spray program,
‘Black Pearl’ has been free of serious cane, leaf
or fruit diseases. ‘Black Pearl’ is not particularly
susceptible to Septoria leaf spot and purple
blotch. ‘Black Pearl’ does not exhibit vegetative
or fruit symptoms of cane and leaf rust. In some
years, particularly 1997, ‘Marion’, ‘Kotata’,
and ‘Black Butte’ were severely damaged by a
dryberry syndrome. The cause of this problem
is not known currently but is suspected to be a
complex of diseases, particularly anthracnose,
that develops under certain combinations of
temperature and moisture. ‘Black Pearl’ has not
shown symptoms of dryberry in our trials nor
has it been noted in grower fields.

No significant winter injury has been noted
on this genotype since it was selected in 1997.
However, the winters, even those of northern
Oregon, 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.

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.

<table>
<thead>
<tr>
<th>Genotype</th>
<th>Harvest season</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5%</td>
</tr>
<tr>
<td>Metolius</td>
<td>25 June</td>
</tr>
<tr>
<td>Obsidian</td>
<td>25 June</td>
</tr>
<tr>
<td>Siskiyou</td>
<td>25 June</td>
</tr>
<tr>
<td>Silvan</td>
<td>26 June</td>
</tr>
<tr>
<td>Black Diamond</td>
<td>28 June</td>
</tr>
<tr>
<td>Marion</td>
<td>3 July</td>
</tr>
<tr>
<td>Black Pearl</td>
<td>3 July</td>
</tr>
<tr>
<td>Nightfall</td>
<td>3 July</td>
</tr>
<tr>
<td>Waldo</td>
<td>8 July</td>
</tr>
</tbody>
</table>

‘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 avail-
able 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.

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