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‘Obsidian’ Trailing Blackberry

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‘Marion’ is currently the most important blackberry (*Rubus* L. subgenus *Rubus*) cultivar in the world as it is the predominant cultivar grown for the processed fruit market (Finn et al., 1997). ‘Chester Thornless’ was probably the most important fresh market blackberry in the world in the 1990s (Clark, 1992; Strik, 1992). However, since that time hundreds of acres of ‘Navaho’ in the midwestern U.S., ‘Tupi’ and ‘Brazos’ in Mexico, and proprietary cultivars around the world (J. Clark and C. Fear, personal communication) have been planted. The erect cultivars (e.g., ‘Navaho, ‘Apache, ‘Arapaho, and ‘Cherokee) and semi-erect cultivars (e.g., ‘Chester Thornless’, ‘Hull Thornless’, and ‘Triple Crown’) have been primarily grown for fresh market sales and the trailing cultivars (e.g., ‘Marion’, ‘Kotata’, and ‘Waldo’) for processing. However, there are some exceptions. ‘Olallie’, a trailing blackberry, was a major fresh-market cultivar in California for local sales and long-distance shipping until about 2001 (R. Harrison, personal communication) and, more recently, ‘Siskiyou’, which is produced along the West Coast, has proven adapted to long distance shipping. In the past, the erect and semi-erect blackberries have typically had better firmness and skin toughness and black color than the trailing cultivars, but the trailing cultivars have generally had better flavor and are more pleasant to eat (perception of smaller or fewer seeds). The USDA–ARS recently released three blackberry cultivars for the fresh market: ‘Obsidian’ and ‘Metolius’ (Finn et al., 2005b) as very early ripening blackberries and ‘Black Diamond’ (Finn et al., 2005a) as a midseason, dual-purpose (fresh and processing market) cultivar.

‘Obsidian’ is a 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. ‘Obsidian’ is a very early ripening, high-yielding, vigorous cultivar with large fruit that have excellent fresh fruit quality (Fig. 1).

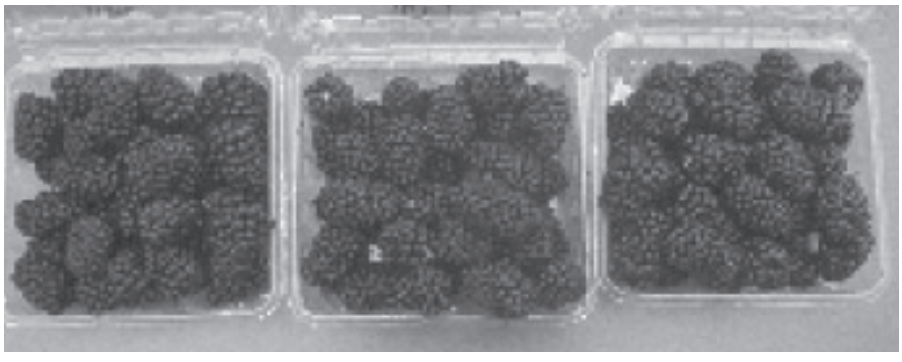

Fig. 1. (**above**) ‘Obsidian’ fruit in hand (**below**) (left to right) ‘Silvan’, ‘Metolius’ and ‘Obsidian’ fruit in clamshells.

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Origin

In 1995, ‘Obsidian’, tested as ORUS 1369-3, was selected from a cross between ORUS 828-43 and ORUS 1122-1 made in 1993 (Fig. 2). Both parents of ‘Obsidian’ have complex pedigrees, but ‘Marion’, ‘Olallie’, and OSC 878 (‘Jenner’ × ‘Eldorado’) figure prominently in their backgrounds. ‘Austin Thornless’, ‘Boysen’, ‘Logan’, ‘Zielinski’, ‘Young’, and ‘Lucretia’ can also be found in their pedigrees. ORUS 1122-1 was nearly named as a cultivar as it shares many characteristics with ‘Marion’, including outstanding fruit quality, thorns (botanically called spines), and soft fruit, but is higher yielding and larger fruited. However, when thorns in machine harvested product became a serious issue in the 1990s, the potential value of ORUS 1122-1 as a new cultivar decreased. Flow cytometry estimated ‘Black Pearl’s ploidy as 2n = 6x = 42 (Meng and Finn, 2002). ‘Obsidian’ is being released primarily due to its superior performance as a very early ripening fresh-market berry. The cultivar is named after the black, shiny, glass-like, volcanic rock of the same name.

Description and Performance

While ‘Obsidian’ has been tested on grower sites and research stations in Oregon and at the Agriculture and Agri-Foods Canada research station in Abbotsford, B.C., the most thorough testing was done at the North Willamette Research and Extension Center (NWREC) of Oregon State University at Aurora, Ore. In each of the trial plantings, standard cultural practices for trailing blackberry production were used, including annual pre- and postemergent herbicide applications, 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 [*Septocyta ruborum* (Lib.) Petr.], rust [*Kuehneola uredinis* (Link) Arth.] and an-

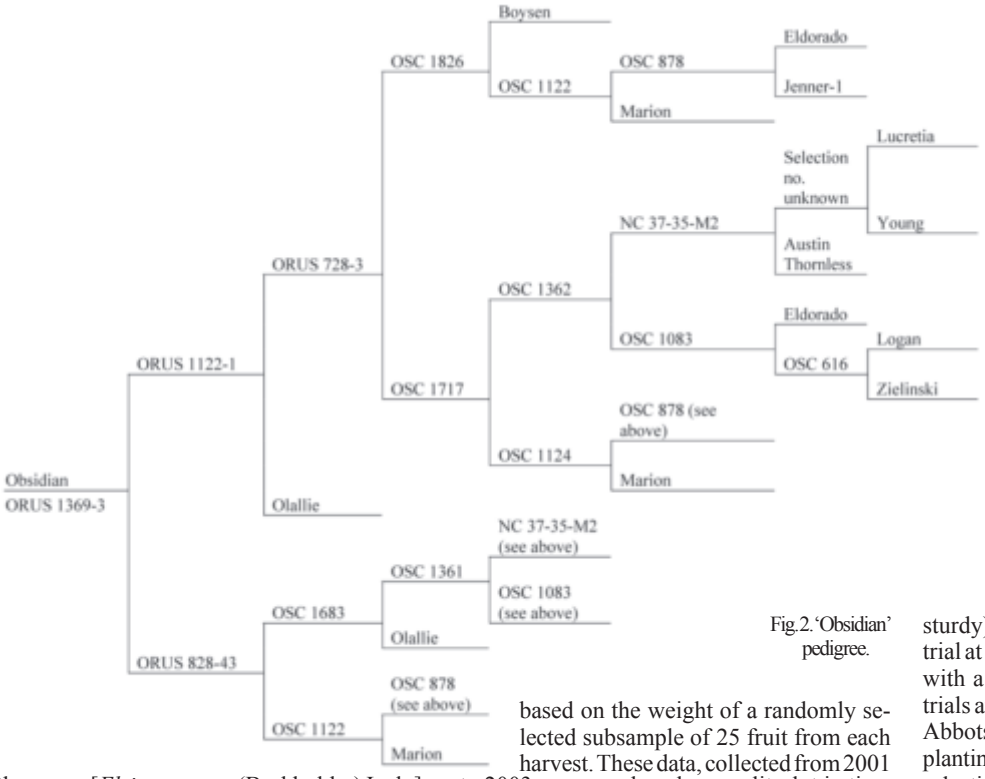

Fig. 2. 'Obsidian' pedigree.

thracnose [*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. At the NWREC in 1996, 'Obsidian' was planted in a single plot while the standard cultivars were in planted in a randomized complete block design, with four, three-plant replications. Based on excellent performance in this 1996 planted trial, 'Obsidian' was then planted at the NWREC in 1999 along with standard cultivars in a randomized complete block design, with four, three-plant replications used for fresh fruit characteristics and three replications hand harvested once a 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 to 2003, were analyzed as a split-plot in time with cultivar as the main plot and year as the subplot. Of the 23 genotypes harvested, only the data from the cultivars 'Marion', 'Silvan', 'Siskiyou', and 'Waldo' and the new releases 'Obsidian', 'Black Diamond' (Finn et al., 2005a), and 'Metolius' (Finn et al, 2005b) were included in the analysis (PROC GLM; SAS Institute, Cary, N.C.). The cultivar × year 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 Oregon was characterized by the dates at which 5%, 50%, and 95% of the total fruit yield were harvested (Table 2). Subjective fruit evaluations were made during the fruiting season using a 1 to 9 scale (9 = the best expression of each trait).

Table 1. Fruit weight and yield for blackberry genotypes planted in 1996 and 1999 at Oregon State University–North Willamette Research and Extension Center. 'Obsidian' was planted as a single plot in 1996 while the standards were replicated (three, three-plant plots). In the 1999 planting, 'Obsidian' and the standards were replicated (three, three-plant plots).

Genotype	Fruit size (g)	Yield (kg·ha^{-1})			Mean
1999 Planted trial	2001–03	2001	2002	2003	2001–03
Obsidian	6.8 a[z]	40895 a	20148 a	24087 a	28377 a
Silvan	6.2 b	31757 ab	16811 ab	21485 ab	23351 b
Black Diamond	5.8 bc	29281 ab	15568 ab	19001 a–c	21283 bc
Marion	5.1 d	26380 ab	13021 ab	18397 a–c	19266 bc
Metolius	5.6 c	31324 ab	12547 b	12517 c	18796 bc
Waldo	5.5 c	25849 ab	11000 b	17286 c	18045 bc
Siskiyou	6.9 a	20969 b	9854 b	9359 d	13394 c
1996 Planted trial	1998–2000	1998	1999	2000	1998–2000
Obsidian	5.5	22092	18503	18647	19747
Marion	5.1 a	20056 a	9203 ab	18212 a	15824 a
Kotata	4.6 b	20637 a	6965 bc	19543 a	15715 a
Waldo	5.4 a	13847 b	13807 a	17889 a	15181 a
Douglass	5.2 b	7089 c	2476 c	9543 b	6367 b

[z]Means within a column followed by the same letter are not significantly different $p > 0.05$, by Duncan's multiple range test.

These 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 3). Plant ratings were conducted one time each year from 2001 to 2003 during the fruiting season for primocane and floricane vigor, spines (9 = spineless), and flowering or fruiting lateral length (1 = very short, 5 = very long) and strength (1 = weak, droopy; 5 = stiff, sturdy) (Table 3). In 1996, in addition to the trial at NWREC, 'Obsidian' was planted along with a number of selections and cultivars in trials at Agriculture and Agri-Foods Canada in Abbotsford, B.C. The primary purpose of this planting was to assess cold hardiness of these selections. While observations were made on these plants from 1997 to 2000, the winters were relatively mild (minimum temperature in winter1996 to 1997 was –12.9 and –9.5 °C, –11.3 and–6.5 °C in the following three winters). In 2001, 'Obsidian' was planted, along with a number of genotypes, in plots at Enfield Farms (Lynden, Wash.) along the Canada–U.S. border to assess cold hardiness and suitability for machine harvest. While observations were made on these plants from 2002 to 2004, the winters were once again relatively mild (minimum winter temperature in winter 2001 to 2002 was –8.0 °C with –3.8 and –9.7 °C minimums in the following two winters). In 2003, fruit were harvested by an over-the-row Littau (Stayton, Ore.) harvester with a horizontal (Christy) head from five-plant plots. In separate studies, the chemical characteristics of commercial blackberry cultivars and advanced selections including 'Obsidian' were evaluated (Moyer et al., 2002; Siriwoharn et al., 2004).

In Oregon, 'Obsidian' had greater three year average yield than all other cultivars. However, while yield of 'Obsidian' tended to be greater in each of the single years, it was not significantly different in any single year (Table 1). 'Obsidian's yield was generally double that of the current early season fresh market standard 'Siskiyou' (Table 1). In a single observation plot planted in 1996 and harvested from 1998 to 2000, 'Obsidian' had higher yields than 'Marion', 'Kotata', 'Waldo', and 'Douglass' in each year (Table 1). 'Obsidian' and 'Siskiyou' had the largest fruit size in the 1999-planted replicated trial and both were much larger than 'Marion' (Table 1).

'Obsidian' and 'Metolius' are the earliest ripening blackberry cultivars in the Pacific Northwest. These cultivars ripen 2 to 4 weeks earlier than all semi-erect and erect blackberry cultivars, are the earliest ripening trailing cultivars, and are slightly earlier ripening than

early-season raspberry cultivars such as 'Willamette' (Table 2). 'Obsidian' harvest begins in late June, peaks in early July and is largely done by the second week of July in Oregon (Table 2). 'Obsidian' and 'Metolius' have nearly identical harvest seasons that begin about the same time as 'Silvan' or 'Siskiyou' and a little over a week earlier than 'Marion'. Both harvest seasons peak 4 to 5 d ahead of 'Silvan', 'Siskiyou', and 'Black Diamond', a week ahead of 'Marion' and 2.5 weeks ahead of 'Waldo'.

Fruit of 'Obsidian' are large, somewhat conical and very attractive (Table 3, Fig. 1). They are not as uniform as 'Siskiyou', 'Metolius', and 'Black Diamond' nor nearly as lumpy as 'Marion' or 'Chester Thornless'. 'Obsidian has very good firmness; fruit are not quite as firm as 'Siskiyou' or 'Metolius', but are firmer than 'Kotata'. 'Obsidian' has excellent color (Table 3) that remains black in refrigeration or after freezing, whereas some cultivars turn purple. The fruit separate easily from the plant when hand-picked (Table 3). At Enfield Farms (Lynden, Wash.), 'Obsidian' was easily harvested by machine and produced a good product (data not shown). The fruit texture when eaten is comparable to the other trailing cultivars, with much less noticeable seeds than 'Chester Thornless'. While 'Obsidian' fruit flavor is full and rich, it is not as aromatic as 'Marion' but is much more pleasant than 'Chester Thornless'.

The USDA–ARS blackberry program in Corvallis has traditionally been primarily concerned with processed fruit quality with very little emphasis on fresh-market fruit quality. However, recognizing the potential of 'Obsidian' as a fresh-market cultivar, we did some evaluations of fresh-market traits. Firmness and flavor in our program are primarily evaluated when a fruit is fully ripe. However, most fruit for the fresh market are harvested at a full black, not a full-ripe stage. 'Obsidian' fruit harvested at full-black stage have excellent firmness and very good flavor with no noticeable off flavors (data not shown). In 2001, fruit of a number of advanced selections and cultivars were packed in clamshells and stored at Hurst's Berry Farm (Sheridan, Ore.) where they conducted evaluations of fruit quality. After 22 d in refrigerated storage, 'Obsidian' was still fairly firm, had only some mold and the flavor was still fairly good.

Siriwoharn et al. (2004) and Moyer et al. (2002) evaluated 'Obsidian' along with a number of other genotypes for among other things total soluble solids, titratable acidity, total phenolics, total anthocyanins, polyphenolic content, oxygen radical absorbance capacity (ORAC), and ferric reducing antioxidant power (FRAP). While Moyer et al. (2002) generally reported lower values for total phenolics, total anthocyanins, ORAC and FRAP than did Siriwoharn et al. (2004), the genotypes in common were ranked similarly. The primary purpose of Moyer et al. (2002) was to look at a great diversity of germplasm and therefore sampling was limited whereas, Siriwoharn et al. (2004) evaluated a much smaller number of genotypes in multiple years with greater sampling and will therefore be the focus of discussion here. 'Obsidian' fruit had similar or slightly less, total soluble solids than 'Marion', 'Silvan', and 'Waldo', but total soluble solids were much greater than those for 'Chester Thornless' . The total titratable acidity for 'Obsidian' was less than 'Waldo', similar to 'Marion' and 'Silvan', and greater than 'Chester Thornless' and 'Thornless Evergreen'. The total phenolics, total anthocyanins, and ORAC values for 'Obsidian' fruit were similar to those for 'Marion', although the FRAP values were less. While the proportion of polyphenolics varied greatly among genotypes in their study, 'Obsidian' had procyanidin levels much greater than those of 'Marion' and 'Chester Thornless' and levels of ellagitannins and flavonols, similar to 'Marion' and greater than those of 'Chester Thornless' (Siriwoharn et al., 2004). In examining the anthocyanins in the fruit, 'Obsidian' appeared to have similar cyanidin 3-glucoside, slightly higher cyanidin 3-rutinoside, lower cyanidin-containing xylose and cyanidin 3-glucoside acylated with malonic acid in comparison to 'Marion'. In addition, while 'Marion' fruit contained cyanidin 3-dioxalyl-glucoside, 'Obsidian' fruit did not.

'Obsidian' plants are vigorous; similar to 'Marion', 'Silvan', and 'Siskiyou' and somewhat more vigorous than 'Black Diamond' (Table 3). 'Obsidian' is thorny, similar to 'Marion' but less thorny than 'Kotata' and 'Metolius' (Table 3). 'Obsidian' has flowering laterals that are medium-long in length and are similar to 'Marion' and 'Chester Thornless' in stiffness (Table 3). While not scored, 'Obsidian' canes have good flexibility in that they can be trained with little cane breakage.

In our trials, under a minimal spray program, 'Obsidian' has been free of serious cane, leaf or fruit diseases. 'Obsidian' is not particularly susceptible to septoria leaf spot (*Septoria rubi*) and purple blotch [*Septocyta ruborum*]. 'Obsidian' has not exhibited 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. 'Obsidian' has shown no symptoms of dryberry in our trials.

No significant winter injury has been noted on the genotype since it was selected in 1995, however, the winters, even where it has been grown in southern British Columbia and northern Washington, have been relatively mild. In Spring 1998, 1999, and 2000, while 'Marion' had minor but noticeable winter damage, no damage was noted on 'Obsidian' in British Columbia with midwinter low temperatures ranging from –3.7 to –11.3 °C (data not shown). No winter injury has ever been noted on 'Obsidian' in Oregon, even after precipitous temperature changes in October 2002 and 2003 when some cultivars, including 'Marion' had cold injury noted. At NWREC, minimum temperatures in 2002 ranged from 1.1

Table 2. Mean ripening season and date at which yield of each blackberry genotype reached the given percentage of total yield and for similar aged 'Willamette' red raspberry plants harvested in the same years in an adjacent planting at the Oregon State University–North Willamette Research and Extension Center. Trial was planted in 1999 and harvested in 2001–2003.

	Harvest season		
Genotype	5%	50%	95%
Metolius	25 June	3 July	14 July
Obsidian	25 June	4 July	15 July
Silvan	26 June	8 July	21 July
Black Diamond	28 Jun	8 July	21 July
Siskiyou	25 June	8 July	25 July
Marion	3 July	10 July	22 July
Waldo	8 July	22 July	7 Aug.
Willamette red raspberry	27 June	7 July	21 July

Table 3. Mean scores for subjectively evaluated characteristics[z] of the newly released cultivars 'Black Diamond', 'Metolius' and 'Obsidian', the industry processing standard 'Marion', and three cultivars commonly sold in the wholesale fresh market planted in the 1990s at the Oregon State University–North Willamette Research and Extension Center, Aurora, Ore.

	Primocane		Floricane	Fruiting lateral		Fruit					
Cultivar	vigor	Thorns	vigor	Length	Strength	Firm	Color	Shape	Texture	Separation	Flavor
Black Diamond	8.3	8.6	8.4	3.0	3.7	7.3	8.3	8.9	8.2	8.5	6.8
Chester Thornless	9.0	9.0	8.7	4.8	3.4	7.2	8.7	6.2	5.5	8.4	6.2
Kotata	9.0	3.3	8.6	3.2	3.9	7.4	8.9	7.7	8.4	8.8	7.7
Marion	9.0	4.6	8.5	4.8	3.3	5.4	8.3	6.7	8.9	8.9	8.6
Metolius	9.0	2.5	7.9	4.3	4.7	8.2	8.7	8.8	8.8	8.8	7.8
Obsidian	8.9	4.9	8.8	3.5	3.3	7.7	8.6	7.5	8.0	8.2	7.5
Siskiyou	9.0	4.0	8.5	4.1	3.6	8.1	8.7	8.1	8.5	8.9	8.2

[z]Characteristics (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.

to 7.3 °C from 25 Oct. to 1 Nov. but dropped to –5.6 °C on 2 Nov. and –3.4 °C on 3 Nov. and in 2003 ranged from 1.7 to 10.6 °C from 25 to 31 Oct. but dropped to –3.9 °C on 1 Nov. Similar rapid temperature changes took place in Lynden, Wash., in October 2003. In Spring 2004, in Lynden, while 'Marion' had significant bud and cane damage, 'Obsidian' was uninjured.

Outstanding characteristics of 'Obsidian' include very early ripening, large, firm, fruit with excellent color and flavor, high yields, and outstanding plant vigor. 'Obsidian' should be a popular fresh market cultivar. While it also produces an excellent processed product, its thorns will prevent it from being popular for machine-harvested, processed markets (Strik and Buller, 2002). 'Obsidian' 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.

Availability

'Obsidian' 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. 'Obsidian' 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 'Obsidian' is available on written request to C. Finn. The USDA–ARS does not have commercial quantities of plants to distribute. In addition, plants of 'Obsidian' have been deposited in the National Plant Germplasm System, USDA–ARS National Clonal Germplasm Repository in Corvallis, Ore., accession number PI 638259, where it is available for research purposes, including development and commercialization of new cultivars.

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