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‘Schwartze’ (‘Puget Summer’) Strawberry

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‘Schwartze’ is a new short day strawberry (*Fragaria ¥ananassa* Duch.) cultivar jointly released by Washington State Univ. (WSU), Oregon State Univ., Univ. of Idaho, and the U.S. Dept. of Agriculture-Agricultural Research Service (USDA–ARS). ‘Schwartze’ has been noted for high yields of very late season fruit with excellent fresh flavor. Although the fruit is suitable for processed uses, because of the season fruit is produced, fruit of ‘Schwartze’ most likely be used for the fresh market. The name, ‘Schwartze’, was selected to reflect the contributions of C.D. Schwartze to the WSU small fruit breeding program from 1932 to 1969. Among the many cultivars Schwartze developed were the strawberries ‘Northwest’ and ‘Puget Beauty’ (Moore and Robbins, 1991) and the raspberry ‘Meeker’ (Moore and Daubeny, 1993). Although this strawberry cultivar will be officially released and patented under the name ‘Schwartze’, it will be marketed and trademarked with the name ‘Puget Summer’®. This name was chosen to reflect its adaptation to the Puget Sound area and its production of late season fruit.

Origin

‘Schwartze’ was selected from a cross of ‘Nanaimo’ (Daubeny and Kempler, 1997) x ORUS 1076-124 made in 1993 by the USDA–ARS (Fig. 1). ORUS 1076-124 is a full sib of ORUS 1076-126 that was released in 1997 as ‘Independence’ (Finn et al., 1997a). ‘Schwartze’ was selected and evaluated at WSU Puyallup Research and Extension Center (WSU Puyallup) as WSU 2310. Two *F. chiloensis* L. clones are in the recent ancestry of ‘Schwartze’. Del Norte is a parent of OSC 2467 and is present twice in the ancestry of ‘Schwartze’. Additionally, the Ecuadorian *F. chiloensis* clone, ‘Ambato’, is an ancestor of OSC 2234, and occurs three times in the ancestry of ‘Schwartze’.

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Performance

‘Schwartze’ was tested for the first time in a 1996 matted row planting at WSU Puyallup in a randomized block planting with 3 replications. In 1997, it had higher yield, larger fruit, less preharvest fruit rot and a later midpoint of harvest than ‘Redcrest’, ‘Totem’, ‘Sumas’ and ‘Hood’ (data not shown). In 1998 in the same planting, ‘Schwartze’ continued to have high yields, but the smallest average fruit size in the second fruiting season, although differences were statistically nonsignificant (data not shown). ‘Schwartze’ and nine other Pacific Northwest (PNW) cultivars were planted in a matted row planting with three replications at WSU Mt. Vernon and at WSU Puyallup (harvest data from Puyallup not shown) in 1998 and harvested in 1999 and 2000. ‘Firecracker’ (Finn et al., 1997b), ‘Independence’ and ‘Whonnock’ (Kempler et al., 1998), new late season PNW cultivars, were included for comparison. When the harvest data were analyzed as a single two-year study, there was a significant year × harvest interaction ($P \geq 0.001$) for yield and midpoint of harvest, but not for fruit weight and percent fruit rot ($P \geq 0.05$). When each harvest season was analyzed separately (Table 1) ‘Schwartze’ had high yields of late fruit with small amounts of preharvest fruit rot in each year. In 1999, ‘Schwartze’, ‘Independence’, ‘Whonnock’, and ‘Totem’ had the smallest average fruit weight among the nine cultivars. In 2000, ‘Schwartze’ also had the smallest value for average fruit weight, but there were no significant differences among cultivars. In 1999, ‘Schwartze’ had the latest midpoint of harvest and ‘Schwartze’, ‘Firecracker’ and ‘Independence’ had the latest midpoints of harvest in 2000.

‘Schwartze’ was also tested in replicated plantings by the USDA–ARS at Oregon State Univ. North Willamette Research and Extension Center at Aurora, Ore. and by Agriculture and Agri-Food Canada at Abbotsford, B.C. In the Oregon test, yield of ‘Schwartze’ was greater than ‘Totem’ and similar to ‘Puget Reliance’. Fruit weight in the second harvest season was small with lower yields (data not shown). In British Columbia, ‘Schwartze’ produced small fruit and moderate yields.

Fruit description

The flowers and fruit of ‘Schwartze’ are borne completely beneath the leaf canopy, in contrast to ‘Independence’, which displays flowers above the leaf canopy. The fruit of ‘Schwartze’ is usually smooth and symmetrically conic with inserted seeds, does not have a neck and has a reflexed calyx (Fig. 2). The fruit is usually solid or has a small hollow center. The fruit are borne on short, stiff fruiting trusses and the flowers and fruit are usually held off the ground (Fig. 2). Color was measured on five fully ripe fruit using a tristimulus color analyzer (Minolta Chroma Meter CR-200b; Minolta Camera Co., Japan). The analyzer was calibrated to a standard white reflective plate and used CIE (Commission Internationale de l’Eclariage)

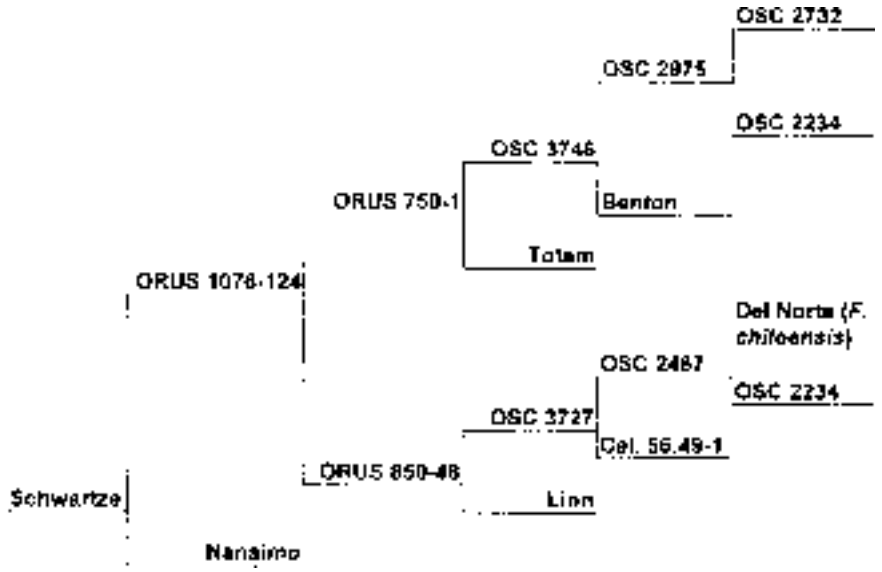

Fig. 1. Pedigree of ‘Schwartze’.

Table 1. 1999–2000 harvest data for 10 Pacific Northwest strawberry cultivars planted at Mt. Vernon, Wash. 1998.

	Yield (kg·m^{-1})			Fruit wt (g)		Fruit rot (%)		Midpoint of harvest	
Cultivar	1999	2000	Total	1999	2000	1999	2000	1999	2000
Firecracker	3.28 a[z]	2.40 c–e	5.7 a–c	15.7 bc	12.5 a	9.5 e	4.1 c	15 July b	11 July a
Hood	2.80 ab	1.51 e	4.3 cd	17.1 ab	12.4 a	30.2 ab	17.2 ab	5 July f	23 June f
Independence	2.21 bc	3.93 a	6.1 a	14.3 c–e	12.7 a	15.9 de	4.4 bc	11 July c	8 July ab
Puget Reliance	3.42 a	3.18 a–c	6.6 a	19.3 a	16.5 a	11.0 e	10.0 a-c	30 June g	27 June ef
Rainier	2.71 ab	1.84 de	4.5 b–d	14.7 cd	12.9 a	27.0 a–c	21.7 a	7 July de	6 July bc
Redcrest	3.28 a	2.71 b–d	6.0 ab	15.8 bc	12.8 a	22.0 b–d	9.1 a–c	9 July cd	4 July cd
Schwartze	3.35 a	3.63 ab	7.0 a	12.1 e	11.1 a	13.6 de	2.0 c	18 July a	11 July a
Sumas	3.04 a	2.47 c–e	5.5 a–d	15.4 bc	12.0 a	19.7 cd	11.1 a–c	29 June g	24 June ef
Totem	1.77 c	2.31 c–e	4.1 d	12.7 de	12.6 a	34.6 a	13.2 a–c	7 July ef	28 June e
Whonnock	2.90 ab	2.66 b–d	5.6 a–d	13.9 c–e	12.8 a	10.9 e	5.0 bc	10 July c	2 July d

[z]Means based on three replications. Means followed by the same letter within a column are not significantly different using Duncans multiple range test, $P < 0.05$.

Fig. 2. Plant of 'Schwartze' showing fruit and growth habit.

Illuminant C. Measurements were recorded in L*, a*, b* CIE (1976). The exterior of the fruit of 'Schwartze' (L* = 32.15, a* = 28.66, b* = 13.35) was slightly lighter, redder, and more yellow than 'Totem' (L* = 30.18, a* = 26.26, b * =9.88). The internal color was measured at the apex of a longitudinal slice of the fruit. 'Schwartze' (L* = 50.96, a* = 38.23, b* = 29.53) was much lighter, more yellow and slightly redder than 'Totem' (L* = 40.52, a* = 36.28, b* = 23.66).

Frozen fruit samples of 'Schwartze' and other cultivars from the 1999 harvest season at Puyallup were analyzed for pH, titratable acidity, soluble solids and total anthocyanins (Table 2). Fruit of 'Schwartze' had a soluble solids level similar to 'Hood' and 'Totem' and higher than 'Puget Reliance' and 'Redcrest'. There were no differences among cultivars for pH and titratable acidity. All cultivars had fruit pH below 3.25. Fruit pH below 3.51 is desirable for maintaining quality of frozen fruit (Wrolstad et al., 1970). The anthocyanin concentration of 'Schwartze' fruit was similar to 'Totem'. Wrolstad et al. (1970) concluded that anthocyanin concentration of fruit should be in the range of ≈450–700 µg/g to have acceptable color quality. Fruit of 'Schwartze' should be satisfactory as a processed product. The fruit of 'Schwartze' is sweet with a full strawberry flavor and has been consistently identified by informal taste panels of industry members and scientists as having outstanding flavor.

Plant description

Plants of 'Schwartze' are vigorous with an erect growth habit. It forms abundant runners and a dense matted row. The intermediate node on the runners will occasionally produce a runner. The leaves have three leaflets and are slightly cupped. The leaves rarely have leaflike bracts on the petiole. The petiole is long and the hairs on the petiole usually point toward the base of the petiole, but sometimes are at 90° to the petiole axis. The angle between the terminal leaflet base and the petiolule is ≈135°. The terminal leaflet is oval to orbicular with a rounded apex and is coarsely serrated. The terminal leaflet of 'Schwartze' averaged 21.1 serrations. This did not differ from 'Firecracker', 'Hood', 'Independence', 'Rainier', 'Redcrest', or 'Totem', but was fewer than 'Sumas' and more than 'Puget Reliance'. The serrations on the terminal leaflet of 'Schwartze' began about a quarter of the way up the leaflet. The terminal leaflet is relatively short and narrow. The petiole and petiolule length averaged 21.7 cm and 13.8 mm, respectively, which were greater than the other eight PNW cultivars measured. The leaves have sparse pubescence along the leaflet margin and along the veins on the lower surface of the leaves. The upper surface of the leaves is glabrous.

The color of the upper and lower leaf surfaces of 'Schwartze', along with eight other PNW cultivars, were measured with a Minolta Chroma Meter CR-200b. Only the leaves of 'Rainier' differed from 'Schwartze' in color of the upper surface of the leaves, with the leaves of 'Rainier' being darker and less intensely colored. The lower surface of the leaves of 'Redcrest' was darker than those of 'Schwartze'. The lower surface of the leaves of 'Hood', 'Puget Reliance', 'Redcrest', 'Sumas', and 'Totem' were more intensely

Table 2. Fruit characteristics from the 1999 harvest season for the strawberry cultivars Hood, Puget Reliance, Redcrest, Schwartze, and Totem, planted at Puyallup, Wash. in 1998.

Cultivar	Soluble solids (%)[z]	pH	Titratable acidity (% citric acid)	Anthocyanins (μg/g)
Hood	8.70 a[y]	3.21	0.490	583 a
Puget Reliance	7.30 b	3.03	0.602	390 c
Redcrest	6.60 b	3.00	0.574	624 a
Schwartze	8.47 a	3.13	0.698	476 b
Totem	8.07 a	3.11	0.774	525 b

[z]Means of three 10-g samples.
[y]Mean separation in columns by Duncan's multiple range test, $P < 0.05$.

colored than those of 'Schwartze' (data not shown).

Disease and pest reaction

The plants of 'Schwartze' grown at WSU Puyallup for three growing seasons have continued to be vigorous in unsprayed plots grown on non-fumigated ground. 'Schwartze' has not been tested for resistance to specific races of red stele, causal organism *Phytophthora fragariae* Hickman or viruses common to the Pacific Northwest, but based on its continued vigor at WSU Puyallup, it may have some tolerance or resistance. Powdery mildew [*Sphaerotheca macularis* (Wallr. ex. Fr.)] has not been a problem at WSU Puyallup or Mt. Vernon, but has been noted on foliage in grower fields and in research plots at WSU Vancouver Research and Extension Unit.

Fruit of 'Schwartze' have had low levels of preharvest fruit rot. This may be the result of a combination of the flowers and fruit being held off of the ground and the flowers opening later and the fruit ripening later in the season when the weather is usually drier.

Availability

Names of propagators with certified 'Schwartze' plants will be supplied by P.P.M. on request. 'Schwartze' will be patented, patent pending.

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