HORTSCIENCE 35(4):778–779. 2000.

'Everthornless' Blackberry

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Additional index words. Rubus laciniatus, fruit breeding, tissue culture, somaclonal variation

In the United States, blackberries are a commercial crop in many states, with major acreages located in Oregon, Texas, California, Washington, Missouri, and Arkansas. Ripening time, ease of cultivation and harvest, and winter hardiness are important factors that affect growers' selection of cultivars. Thornless canes are always preferred, as the presence of thorny canes interferes with culture operations and harvest, and thorns are a contaminant in processed fruit.

'Thornless Evergreen' blackberry is a periclinal chimera. The mutated thornless epidermal layer encompasses internal cells that retain the genetic potential to produce thorns (blackberry thorns are actually prickles that arise from epidermal tissue). As long as this periclinal arrangement is maintained, the plant remains thornless (Skirvin, 1983). However, any shoots arising from the internal tissue of a thorny genotype will be thorny and their gametes carry the thorny gene. Since blackberry roots develop from the thorny, internal parts of the stem, shoots arising from parental-type roots will always have thorns. Vigorous thorny canes interfere with cultural operations and harvest and may warrant abandonment of a planting.

Using common plant tissue culturing techniques, we have selected for and isolated the 'Everthornless' blackberry cultivar, a true thornless form of 'Thornless Evergreen'. This new and distinct cultivar produces abundant fruit, ripens late in the season, and should help improve blackberry production and harvesting operations. This new cultivar was selected from ex vitro variants of 'Thornless Evergreen', a perclinal chimeral form of *Rubis laciniatus* Willd.

Origin

'Thornless Evergreen' was introduced into shoot tip culture from virus-free plants. Shoot tips were proliferated and rooted in modified Murashige and Skoog (McPheeters and Skirvin, 1983; Murashige and Skoog, 1962) plant tissue culture medium. These long-term cultures were used as research material for a project designed to identify an ex vitro nonchimeral thornless selection of 'Thornless Evergreen'.

Ex vitro plants of 'Thornless Evergreen' were examined for trueness to the original type. Adventitious buds from isolated root segments were used to screen for the presence of the thornless mutation in internal tissues. First-test field trial plantings were established in Urbana and Simpson, Ill., and growth, flowering, and fruit set were monitored (McPheeters, 1981; McPheeters and Skirvin, 1983). Vegetative propagules of selections from Illinois first-test field trials were sent to Oregon State Univ., North Willamette Research and Extension Center, Aurora, Ore., for second-test field trials.

In Oregon, one somaclonal variant was selected that resembles the parental type in many characters, including fruitfulness and fruit quality (McPheeters, 1985; McPheeters and Skirvin, 1989). Adventitious shoot initiation studies on isolated root segments revealed that the selection was truly thornless not only in epidermal histogenic layer, but also in internal tissues. Based on data from field trials and laboratory studies, U.S. Patent and Trademark Office plant patent 9407 was awarded to 'Everthornless' blackberry in Dec. 1995 (Riordan, 1996).

Description

The 'Everthornless' produces thornless adventitious shoots from roots and is a compact plant (primocanes that are <3 m long, whereas 'Thornless Evergreen' primocanes are >9 m), which make it more suitable for the conventional trellising system of culture. Besides the shorter primocane length in 'Everthornless', there are many other distinguishing features of the 'Everthornless' cultivar relative to the parent cultivar. The petioles of 'Everthornless' are bent (Fig. 1), a trait not found in 'Thornless Evergreen'. Moreover, 'Thornless Evergreen' has clasping petioles that encircle the stem, while the petioles of the 'Everthornless' have a swollen base, without the clasping petioles (Norton and Skirvin, 1997).

'Everthornless' bears abundantly, but the fruits differ from those of 'Thornless Evergreen' (Table 1, Fig. 2). Although their shapes and appearances are similar, their organoleptic qualities are unique. 'Everthornless' is less acidic and has a higher pH than the parent; moreover its soluble solid content is significantly higher. Thus, the 'Everthornless' yields a superior quality fresh fruit.

The most distinctive characteristic of 'Everthornless' is that is produces thornless root suckers, making it an excellent replacement cultivar for replanting 'Thornless Evergreen' fields that have been overgrown by thorny canes. 'Everthornless' is well suited for

Fig. 1. Bent petiole of 'Everthornless' blackberry.

Fig. 2. 'Everthornless' blackberry fruit clusters and a market container filled with harvest fruit.

Table 1. A comparison of 'Thornless Evergreen' and 'Everthornless' blackberry fruit characteristics (McPheeters and Skirvin, 1995).

Cultivar	Wt/berry (g)[z]	Normal fruit (%)[y]	pH	Acidity (%) (w/w)[x]	Soluble solids (%) (w/w)
Thornless Evergreen	3.0	95 ab	3.30 a	1.29 b	13.6 ab
Everthornless	3.5	97 b	3.75 b	0.80 a	14.5 c

[z]Average weight of 25 berries per plot per harvest in Oregon.
[y]Mean separation within columns by Duncan's multiple range test, $P \leq 0.05$.
[x]Expressed as citric acid.

Received for publication 9 Apr. 1999. Accepted for publication 7 Sept. 1999. Published with the approval of the director of the Illinois Agricultural Experiment Station. This research was supported in part by the Cooperative State Research, Education, and Extension Service, U.S. Dept. of Agriculture, and the Univ. of Illinois Agricultural Research Station under Project No. 65-0323. We thank Lloyd Martin for collecting data during the Oregon evaluation of 'Everthornless' and thanks to Margaret Norton and Alan Otterbacher for helping to care for the plants. The cost of publishing this paper was defrayed in part by the payment of page charges. Under postal regulations, this paper therefore must be hereby marked *advertisement* solely to indicate this fact.

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the Pacific Northwest and other production areas with mild winters.

Information on the selection of 'Everthornless' from an ex vitro population, as well as photos of tissue cultures, fruit and plants, and the complete text of the patent document can be seen on the 'Everthornless' Web site (http://w3.aces.uiuc.edu/NRES/faculty/Skirvin/Everthornless).

Availability

Sakuma Brothers Farms, Inc., 969 Chuckanut Drive, P.O. Box 427, Burlington, WA 98233 (360-757-6611), is licensed to propagate and sell 'Everthornless' blackberry. All patent matters are handled by Research Corporation Technologies, 101 North Wilmot Road, Suite 600, Tucson, AZ 85711-3335 (520-748-4400).

Literature Cited

McPheeters, K. 1981. Histogenic layer manipulation in chimeral 'Thornless Evergreen' trailing blackberry. MS Thesis, Univ. of Illinois, Urbana–Champaign.

McPheeters, K. 1985. Stability of 'Thornless Evergreen' blackberry in vitro and ex vitro. PhD Diss., Univ. of Illinois, Urbana–Champaign.

McPheeters, K. and R.M. Skirvin. 1983. Histogenic layer manipulation in chimeral 'Thornless Evergreen' trailing blackberry. Euphytica 32:351–360.

McPheeters, K. and R. Skirvin. 1989. Somaclonal variation among ex vitro 'Thornless Evergreen' trailing blackberries. Euphytica 42:155–162.

McPheeters, K.D. and R.M. Skirvin. 1995. 'Everthornless blackberry. U.S. Plant Patent No. 9407. 26 Dec. 1995.

Murashige, T. and F. Skoog. 1962. A revised medium for rapid growth and bioassays with tobacco tissue culture. Physiol. Plant. 15: 473–497.

Norton, M.A. and R.M. Skirvin. 1997. Somaclonal variation among ex vitro 'Thornless Evergreen' trailing blackberries: The morphological status of selected clones after seven years of field growth. J. Amer. Soc. Hort. Sci. 122:152–157.

Riordan, T. 1996. Sweet blackberries without the thorns. New York Times, Patents column, 5 Feb. 1996.

Skirvin, R. 1983. A novel method to remove blackberry thorns. Illinois Res. 25:8–11.