

'Chester Thornless' Blackberry

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'Chester Thornless' is a very vigorous, productive, large fruited, late maturing, moderately winterhardy thornless blackberry cultivar [*Rubus* sp., subgenus *Rubus* (*Eubatus*)] released jointly by the Agricultural Research Service, USDA, the Illinois Agricultural Experiment Station, the Ohio Agricultural Research and Development Center, and the Maryland Agricultural Experiment Station in 1985. It is well adapted south of a line extending from western Maryland, through central Ohio, to Kansas City, Missouri in the eastern United States and to portions of the West Coast of the United States. 'Chester Thornless' is usually more productive than 'Hull Thornless' and, while it is similar in fruit size, color, firmness, quality, and seed size, 'Hull Thornless' is considered to have better flavor. Its fruit does not soften or lose color on hot, sunny and humid days as readily as fruit of other thornless semi-erect cultivars. 'Chester Thornless' has proven to be valuable to pick-your-own and back-yard growers, as well as to wholesale marketers. 'Chester Thornless' was named in recognition of the contributions of Dr. Chester Zych, former fruit researcher at the University of Illinois, who early recognized the merits of this blackberry and encouraged its advance testing and release. The outstanding characteristics of 'Chester Thornless' are plant hardiness and disease resistance, and high yields of large fruit of good quality (Cover; Fig. 1). It is recommended as a replacement for 'Thornfree' in USDA hardiness zones 5-7 and possibly in zones 8 and 9.

'Chester Thornless,' tested as selection SIUS 68-6-17, originated from the cross of SIUS 47 x 'Thornfree' made in 1968 by USDA-ARS geneticist J.W. Hull who selected 'Chester Thornless' at Carbondale, Illinois in 1972 (Fig. 2). This was the same cross that produced 'Hull Thornless' (4). Both cultivars share 'Darrow' as a grandparent as well as having 'Merton Thornless' (43.75%), 'Eldorado' (31.25%), 'Brewer' (12.5%), and 'Brainerd' (12.5%) in their ancestry. Plants of this selection were moved to Urbana, Illinois when work at the USDA Carbondale, Illinois, location was discontinued in 1973. In Urbana (which normally is considered too cold a location for thornless blackberry production), 'Chester Thornless' was the among the hardiest and was the most productive selection in the blackberry trial (Table 1). It did, however, suffer some winter damage during the coldest years at Urbana. R. M. Skirvin provided plants of 'Chester Thornless' to geneticist G. J. Galletta in Beltsville, Maryland, for propagation and broader testing, and to pathologist R. H. Converse, USDA, Corvallis, Oregon, for virus indexing and eradication. 'Chester Thornless' was released to nurseries for propagation in 1985. 'Chester Thornless' was the sixth of the USDA thornless blackberry cultivars to be released from the breeding program that was conducted at Beltsville and Carbondale (the others being the cultivars Smoothstem and Thornfree in 1966, Dirksen Thornless and Black Satin in 1974, and Hull Thornless in 1981).

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'Chester Thornless' has grown and fruited well since 1979 in Maryland (5) and since 1982 in Ohio (2) and Virginia. In a 1991 survey (3), respondents east of the Rocky Mountains showed approximately 87 ha of 'Chester Thornless' planted in 1990. This production area will be increased almost exclusively with 'Chester Thornless' until the year 2000. Other cultivars showed no increase or a decrease. On the Pacific coast, approximately 100 ha of 'Chester Thornless' is grown in the Watsonville area of California, a close second to 'Olallie' in production (C. Fear, pers. commun.). 'Chester Thornless' made up nearly 70% of the semi-erect blackberry cultivars grown in Oregon and was the only major semi-erect cultivar grown in Washington (12). Several growers in the Willamette Valley, Oregon, depend on 'Chester Thornless' for its high productivity (M. D. Hurst, pers. commun.), and at least one grower in British Columbia, Canada, grows 'Chester Thornless' for late-season production (C. Kempler, pers. commun.).

In Maryland, 'Chester Thornless' flowers with 'Hull Thornless,' but ripens its fruit later, at about the same time as 'Thornfree'. In Urbana, Ill., 'Chester Thornless' ripens with and after 'Smoothstem' and later than 'Dirksen Thornless' and 'Thornfree' (Table 1). In Clarksville, Ark., 'Chester Thornless' ripens 18-21 days later than 'Shawnee' and 14-18 days later than 'Navaho' (J. Clark, pers. commun.). In Lane, Okla., 'Chester Thornless' ripens 4-5 weeks later than 'Arapaho' and 'Shawnee' (P. Perkins-Veazie, pers. commun.). In Watsonville, Calif., 'Chester Thornless' requires a longer cold period than 'Olallie' and may only begin to break when 'Olallie' is in flower, thus 'Chester Thornless' ripens later than 'Olallie,' filling an important late-production niche (C. Fear, pers. commun.). In Oregon, harvests of 'Chester Thornless' begin in late July, about a week later than 'Hull Thornless' and 10-14 days earlier than 'Thornless Evergreen,' and continue into October (1). 'Chester Thornless' in British Columbia is very late, harvests

begin in late August and extend into October (C. Kempler, pers. commun.).

Yields of 'Chester Thornless' vary with production area; a 2-year mean of 30 kg/plant in Urbana (Table 1) and 4.9 kg/plant in the second fruiting-year in Silver Spring, Md. (14), a 3-year mean of 4.2 t/ha at Wooster and 11.2 t/ha at Ripley, Ohio (2), 22-27 t/ha in a Virginia planting established in 1982 and still producing (A. Geyer, pers. commun.), 11-22 t/ha in a planting established in 1989 in the Willamette Valley, Oregon (M. D. Hurst, pers. commun.) and as much as 34 t/ha at another Oregon location (12).

Mean mass of 'Chester Thornless' fruit averaged 5.0 g for each of two years from micropropagated plants and 5.1-5.5 for standard-propagated plants grown in Beltsville, Md. (14); 6.7 g for fruit produced in Urbana, Ill. (Table 1), 4.5, 5.2, and 8.2 g for fruit produced in 1994, 1995, and 1997, respectively, at Clarksville, Ark. (J. Clark, pers. commun.), and 5.5 g for fruit produced in Aurora, Ore. (1), but only 3.5 g when grown in Lane, Okla. (P. Perkins-Veazie, pers. commun.). Drupelet set of 'Chester Thornless' ovules ranged from 50-63% in 1993 and 44% in 1994 and a positive but weak correlation was found between drupelet number and fruit mass (13). Seeds of 'Chester Thornless' fruit are relatively small for semi-erect cultivars, averaging 3.26 mg/seed compared to 4.46 and 3.70 for 'Hull Thornless' and 'Black Satin,' respectively (1) and similar in size to seed of the erect cultivars Arapaho and Navaho (P. Perkins-Veazie, pers. commun.).

'Chester Thornless' fruit juice yield, total pectin, and total anthocyanin and soluble solids content of the juice were found to be as high as in fruit of 12 other thornless blackberry cultivars and selections grown in Maryland (11), but somewhat lower than that of several trailing blackberry cultivars grown in Oregon (1). Titratable acidity of the juice of 'Chester Thornless' was less than that of 'Thornfree' and 'Smoothstem' (11) and similar to that of 'Boysen' and 'Olallie' (1). 'Chester Thornless' fruit grown in Oklahoma were

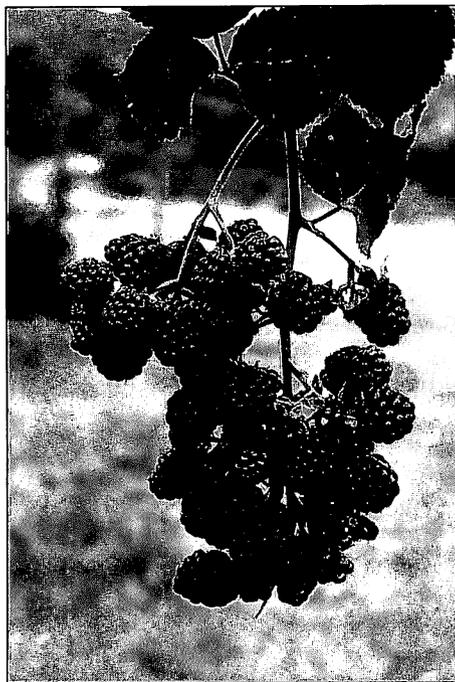


Figure 1. Fruit of 'Chester Thornless' blackberry, Beltsville, Maryland, 1997

more acid and had greater anthocyanin contents than 'Navaho' fruit (P. Perkins-Veazie, pers. commun.). Color absorbance (at 535 nm) of 'Chester Thornless' fruit (0.861) was similar to that of 'Olallie' (0.886) and 'Boysen' (0.838) and greater than that of 'Hull Thornless' (0.662) and 'Black Satin' (0.775) (1). 'Chester Thornless' fruit had relatively high fruit anthocyanin content, similar to or greater than

that of 'Dirksen Thornless,' 'Hull Thornless,' and 'Smoothstem' fruit (10, 11).

Flavor of 'Chester Thornless' fruit is affected by local growing conditions. Concentrations of important fruit volatile components (carvone, isoborneol, myrtenol, nonanal, octanol, 2-heptanol, and 4-terpineol) of 'Chester Thornless' fruit were greater when grown in Oregon than that of fruit grown in Oklahoma, but ethanol (an odorless but aroma enhancing compound) concentrations were greater in Oklahoma-grown fruit than in Oregon-grown fruit (P. Perkins-Veazie, pers. commun.). In Oregon, the flavor and aroma of fresh 'Chester Thornless' fruit was described as good for an Eastern thornless cultivar, as good or better than fruit of 'Navaho' and 'Shawnee' fruit, but not as good as those qualities of trailing blackberry cultivars Evergreen and Marion (C. Finn, pers. commun.). In fruit puree tests and IQF tests, 'Chester Thornless' rated with 'Evergreen' and as good or better than 'Kotata' and 'Black Butte' for color and appearance (C. Finn, pers. commun.).

'Chester Thornless' fruit were found to have a good to excellent shelf-life, longer than that of 'Hull Thornless' or 'Smoothstem' fruit and that shelf-life apparently was related inversely to fruit ethylene evolution rates; 'Smoothstem' fruit had the shortest shelf-life and were the most "climacteric" while 'Chester Thornless' had the longest shelf-life and were the least "climacteric" of the cultivars evaluated (16). Also, 'Chester Thornless' fruit do not leak their juice in cold storage as

Table 1. Winter injury ratings, harvest period, yields and individual fruit mass of 'Chester Thornless' and other thornless blackberry cultivars at the University of Illinois Pomology Research Center, Urbana-Champaign, Illinois in 1975 and 1976.²

Cultivar	Winter injury rating ¹		Harvest period (1975)	Yield (kg/plant)		Fruit mass (g)
	1975	1976		1975	1976	
Chester Thornless	none	slight	7/28-9/23	27.0	31.1	6.7
Dirksen Thornless	none	none	7/18-8/15	4.3	9.9	6.0
Thornfree	slight	moderate	7/18-8/26	9.2	18.0	5.0
Black Satin	slight	slight	7/21-9/8	17.6	6.5	6.6
Smoothstem	severe	severe	8/6-9/9	8.9	11.5	5.0

¹Single-plant observation trials. Plants spaced 2.4 m apart in rows 3 m apart.

²Winter injury rating: slight, 15-50 cm dieback; moderate, 51-100 cm dieback; severe, 101-150 cm dieback.

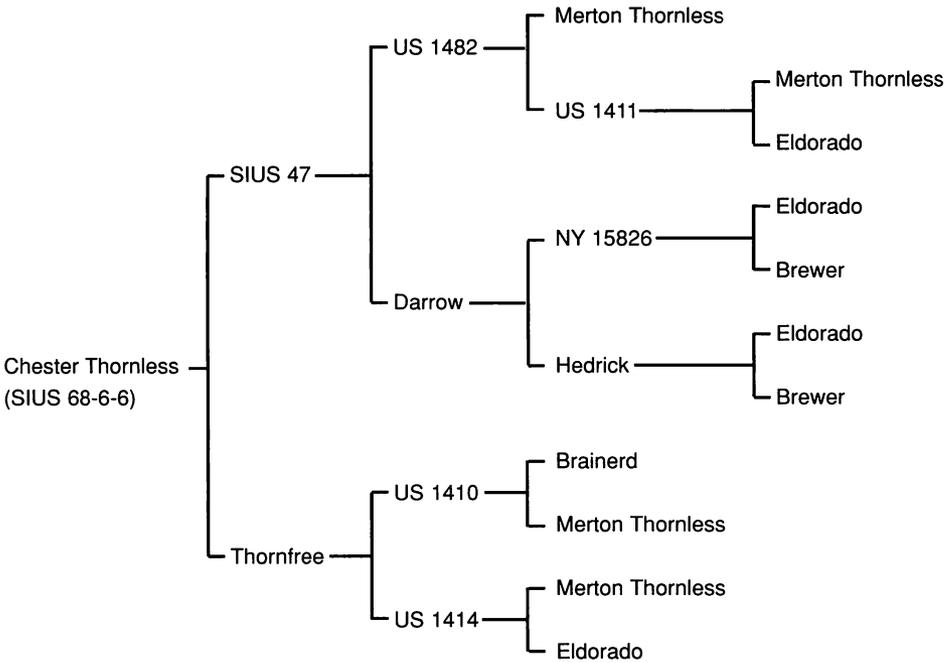


Figure 2. Pedigree of 'Chester Thornless' Blackberry.

much as other blackberry cultivars. High fruit yields, intense color, firm fruit "skin", acceptable flavor, and the relatively long shelf-life of 'Chester Thornless' fruit have been instrumental in gaining a shipping market for this cultivar across the United States. In addition, although 'Chester Thornless' fruit is subject to a high percentage of drip-loss following freezing and thawing, the fruit retain their fresh appearance with little collapse of the drupelets, providing an acceptable product for frozen desert toppings and similar uses (10). The percentage of "red drupe" occurrence following freezing among 'Chester Thornless' fruit was similar to that of 'Navaho' and 'Arapaho' fruit and less than that of 'Choctaw' and 'Shawnee' fruit (P. Perkins-Veazie, pers. commun.).

Canes of 'Chester Thornless' are semi-erect after the first year of recumbent growth and are genetically thornless. In this tetraploid plant, thornlessness is determined by a recessive gene at a single

locus (s = spineless) with the nulliplex genotype being thornless (6). The spineless gene ultimately was derived through 'Merton Thornless' from *Rubus rusticanus* var. *inermis* Willd. 'John Innes' (4, 6). Cane growth of 'Chester Thornless' is exceptionally vigorous, growing 3-4 m in a season in some areas and nearly twice that in other areas. This character and high productivity of 'Chester Thornless' was inherited from 'Himalaya Giant' through 'Brainerd' (7), which contributes to its adaptability and high productivity and vigor on the West Coast as well as in eastern North America. In addition, 'Chester Thornless' is one parent of the 'Illini Hardy' blackberry, and of several promising selections in the USDA bramble breeding program at Beltsville.

'Chester Thornless' can be readily propagated by tip layering, by rooting one-node softwood cuttings (17), or by micropropagation (14). Vigorous-growing 'Chester Thornless' plants most often are

trained on variations of the standard vertical (or "I") trellis with two or more trellis wires between posts and primocanes and fruiting canes trained along the wires. Fruiting laterals are allowed to develop on both sides of the trellis. However, other systems are being developed and evaluated for mechanical harvesting that encourage development of divided canopies with a nearly horizontal plane of fruit production (15). These are the "Y" (with stationary cross-arms) and the rotatable "Y" (with a movable cross-arm). In a comparison of these systems in Kearneysville, West Virginia, hand-harvested 'Chester Thornless' plants produced significantly more fruit (18.3 kg/plant) on the "I" trellis than on either the stationary "Y" or rotatable "Y" trellises (2.1 and 12.3 g/plant, respectively) (F. Takeda, pers. commun.).

Diseases.

In a Beltsville, Maryland, study of the six thornless blackberry cultivars developed by the USDA, 'Chester Thornless' was one of the most resistant to a severe cane blight caused by *Botryosphaeria dothidea* (Moug.:Fr.) Ces. & de Not. (8). In Illinois, 'Chester Thornless' was found to be as susceptible to fire blight, caused by *Erwinia amylovora* (Burr.) Winslow et al., as are several other thornless blackberry cultivars (9). Observations in British Columbia suggest that 'Chester Thornless' is resistant to crown gall, caused by *Agrobacterium* sp. (C. Kempler, pers. commun.).

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'Earlysweet' Black Raspberry

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Index words: *Rubus* breeding.

'Earlysweet' is a vigorous, flavorful, early maturing black raspberry released by the Agricultural Research Service, U.S. Department of Agriculture in 1996. 'Earlysweet' is the first commercial hybrid to contain germplasm from the eastern and western United States black raspberry species *Rubus occidentalis* L. and *R. leucodermis* Dougl., respectively. 'Earlysweet', tested as US 1631, was selected by G. J. Galletta at Beltsville, Maryland in 1983 from a progeny of Oregon-US 1725 ('Haut' x *Rubus leucodermis*) open pollinated seed collected for the USDA at Corvallis, Oregon, by H. J. Swartz in 1980. ORUS 1725 was a superior black raspberry selection bred by F. J. Lawrence of the USDA at Corvallis.

'Earlysweet' has been tested in a number of locations in Beltsville, and has proven to be hardy, regular bearing, vigorous, attractive, condensed in ripening season, productive and flavorful. 'Earlysweet' is semi-erect and crown forming in habit. All canes are heavily armed, the prickles being numerous and pointing down at a 45° angle. Primocanes are glaucous and green, floricanes are a deep purple-brown, and laterals are medium green. The floricanes bear 10 to 12 fruit in compact clusters (Fig. 1) along the apical two

to four nodes of lateral branches. The berries are round conic in shape with thick drupelets, and are firm and sweet and medium to large in size. 'Earlysweet' is usually among the first raspberries to ripen at Beltsville; the tendency for early ripening is commonly seen in *R. leucodermis* derivatives. In unreplicated observation plantings, 'Earlysweet' was as productive or more so than standard black raspberry cultivars. Plants of 'Earlysweet' have not shown symptoms of disease during their evaluation period. 'Earlysweet' was released to nurseries in 1996, and it is expected to be well adapted to the Mid-Atlantic and adjoining regions and to the Pacific Northwest.

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We gratefully acknowledge Harry Jan Swartz, University of Maryland, College Park, whose seed collecting in Corvallis, Oregon, resulted in the selection and introduction of the 'Earlysweet' black raspberry.

Availability

'Earlysweet' has not been patented. The USDA does not have plants of 'Earlysweet' for general distribution. Contact J. L. Maas, USDA/ARS, Fruit Laboratory, 10300 Baltimore Blvd., Beltsville, MD 20705, for nursery plant sources.

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