Journal of the American Pomological Society 64(4): 218-225 2010

Productivity Comparison of Fourteen Highbush Blueberry Cultivars in Missouri, 2000-2008

Martin L. Kaps[1], Patrick L. Byers[2] and Marilyn B. Odneal[3]

Abstract

Eleven northern and three southern highbush blueberry (*Vaccinium corymbosum* L.) cultivars were evaluated for productivity at Mountain Grove in south-central Missouri. The planting was established in 1998 on a Viraton silt loam soil amended with organic matter and sulfur, the latter to lower soil pH. Plant spacing was 1.2 m in row and 3 m between rows. Drip irrigation was installed and rows were mulched with wood chips and shredded bark. The highest yielding cultivars were 'Brigitta Blue', 'Darrow', 'Legacy', 'Nelson' and 'Reka', all above 4.0 kg per plant (2000-2008 mean). 'Bluecrop', a standard cultivar in Missouri, yielded 3.3 kg per plant. Marketable yield for all cultivars was 98% (2000-2003 mean). Berry weight for all cultivars was 1.9 g per berry (2000-2006 mean). The cultivar 'Chandler' had the highest berry weight at 3.0 g. Others cultivars 'Brigittia Blue', 'Legacy', 'Nelson' and 'Nui' had berry weights just above 2.0 g. The cultivar 'Reka' was lowest in berry weight at 1.3 g. Basal cane number per plant for all cultivars was 6.4 with a range among cultivars between 1.3 and 22.3 per plant (2003-2006 mean). Plant height and canopy spread for all cultivars were 1.4 and 1.3 m (2000-2006 mean), respectively.

Evaluating blueberry cultivars is an ongoing research project at the State Fruit Experiment Station of Missouri State University. Our trial location at Mountain Grove is 37° 9' N, 92° 16' W at an elevation of 442 m. The mid-continental climate is USDA plant hardiness zone 6a with an average minimum temperature of -20.6 to -23.3°C. Average yearly rainfall is 115 cm. A typical year has a cool, wet spring; hot, humid summer; warm, extended fall; and fluctuating winter temperatures with little or no snow cover. Blueberries grow best in naturally acidic (pH 3.5-5.5), light-textured (sandy loam) soil with high organic matter (3-20%) (6). In the Ozark region of southern Missouri, blueberries are usually gown in soil with higher pH and calcium content, heavier texture, lower organic matter, and shallower depth due to a fragipan (4). Fragipan is a dense subsoil layer (≥15 cm) that is impenetrable to plant roots except along intermittent cracks (5). Slow internal drainage can result from the heavy texture soil and fragipan. While these soil characteristics can often lead to an unproductive highbush blueberry planting, certain cultural practices can be implemented to partially overcome some of these problems. For example, elemental sulfur is used to initially lower soil pH, and acid-forming fertilizer is applied to maintain a lower pH (2, 4, 11). Organic matter is increased prior to planting through cover crop incorporation. Additions of compost, peat moss, and sawdust are also used to increase soil organic matter. Drought effects are reduced through mulching and use of drip irrigation. Poor drainage is overcome by tiling or forming berms along rows. Although highbush blueberries are moderately adapted to our environment, Missouri farmers are interested in growing them because of the diversity and profit they add to their operations. Growers are particularly interested in the productivity of newer cultivars in comparison to older ones. This trial reports on the productivity of eleven northern and three southern highbush blueberry cultivars at Mountain Grove from 2000 through 2008. A previous trial from the station reported on the productivity of older cultivars on a high pH site (7).

[1] Corresponding author, Research Professor, State Fruit Experiment Station of Missouri State University, 9740 Red Spring Rd., Mountain Grove, MO 65711

[2] Extension Horticulture Specialist, Greene County, University of Missouri, 833 Boonville, Springfield, MO 65804

[3] Horticulture Advisor, State Fruit Experiment Station of Missouri State University, 9740 Red Spring Rd., Mountain Grove, MO 65711

Materials and Methods

The soil at Mountain Grove is a Viraton series (Oxyaquic Fragiudalf). Viraton is characterized by a silt loam topsoil and silty clay loam subsoil with varying amounts of chert (stoniness) and a fragipan at 40 to 90 cm depth. This layer limits rooting depth in tree fruits, but highbush blueberry has shallow roots and would be less affected. Soil permeability to water is medium above the fragipan, but low below the fragipan; water holding capacity is low. Topsoil is naturally acidic, but pasture management often leads to the soil being limed to raise pH. Soil is also underlain by limestone.

A permanent ground cover of tall fescue (*Festuca arundinacea* Shreb.) was plowed and disced. A summer cover of buckwheat (*Fagopyrum esculentum* Moench) and a winter cover of cereal rye (*Secale cereale* L.) were used to increase soil organic matter and suppress weeds prior to planting in 1996 and 1997. The site had not been previously planted to blueberry. Soil was sampled and tested for nutrients and pH. Macronutrients were in the medium to high range; pH was 6.8; and organic matter was 2.5%. Sulfur at the rate of 1,272 kg/ha (i.e. 115 kg/0.09 ha planting area) was broadcast on the field to lower soil pH. Weathered sawdust was spread along the planting rows to increase organic matter. These amendments were cultivated into the soil. Berms 30 cm high by 1.2 m wide were formed along the row with a disc. Bluegrass (*Poa pratensis* L.) was seeded between rows. Prior to planting in 1998, organic matter was 3.6 % and pH was 5.8.

Nitrogen as ammonium sulfate was banded along the row at 78 kg/ha annually. Additionally, the fertilizer, 27N-9P-18K plus sulfur and micronutrients (Blueberry Special, SDT Industries, Winnsboro, LA), was injected through the drip irrigation system at 47 kg/ha annually over 10-12 weeks. Eleven northern and three southern highbush blueberry (*Vaccinium corymbosum* L.) cultivars from several breeding programs were evaluated in this trial (Table 1). The cultivars, year introduced, origin, type and harvest season are listed. Holes were dug and moist sphagnum peat moss (3.8 L) was mixed into each planting hole. Plants

Table 1. Highbush blueberry cultivars, year introduced, origin, and harvest season planted at Mountain Grove, Mo., 1998-2008.

Cultivar	Year introduced	Origin	Type	Harvest season
Bluecrop	1952	NJ-USDA	northern highbush	mid
Brigitta Blue	1977	Australia[z]	northern highbush	late
Chandler	1994	NJ-USDA	northern highbush	late-mid
Collins	1959	NJ-USDA	northern highbush	early
Darrow	1965	NJ-USDA	northern highbush	late
Duke	1987	NJ-USDA	northern highbush	early
Legacy	1993	NJ-USDA	southern highbush	late
Nelson	1988	NJ-USDA	northern highbush	late-mid
Nui	1989	New Zealand[y]	northern highbush	early-mid
Ozarkblue	1996	Arkansas[x]	southern highbush	late-mid
Reka	1989	New Zealand[y]	northern highbush	early-mid
Sierra	1988	NJ-USDA	northern highbush	early-mid
Summit	1996	North Carolina[w]	southern highbush	late-mid
Toro	1987	NJ-USDA	northern highbush	early-mid

[z]Hort. Res. Inst., Knoxfield, Victoria
[y]Moanatuatua Res. Farm, Hamilton
[x]Univ. of Arkansas, Fayetteville
[w]NC State Univ., Plymouth

Table 2. Yield (kg) per plant of highbush blueberry cultivars at Mountain Grove, Mo., 2000-2008. No crop was harvested in 2007 due to a spring freeze event.

Cultivar	2000	2001	2002	2003	2004	2005	2006	2008	2000-08 mean
Bluecrop	1.6 abc[z]	2.6 a	3.1 ab	5.2 ab	5.6 abc	2.7 ab	4.0 abc	1.6 d	3.3 abcde
Brigitta Blue	2.4 a	2.2 ab	3.2 ab	6.0 a	7.0 ab	2.7 ab	4.7 ab	9.7 a	4.7 a
Chandler	1.8 abc	2.4 ab	3.1 ab	5.7 a	4.8 abc	4.0 ab	5.1 ab	3.5 bcd	3.8 abcd
Collins	0.6 de	0.8 b	1.7 b	2.5 b	3.2 bc	1.6 b	1.9 c	2.8 cd	1.9 e
Darrow	1.5 bc	1.9 ab	3.4 ab	5.1 ab	5.4 abc	3.6 ab	5.7 ab	6.3 abcd	4.1 abc
Duke	1.9 ab	2.0 ab	3.3 ab	3.6 ab	3.5 abc	3.7 ab	2.5 c	2.7 cd	2.9 bcde
Legacy	1.9 ab	1.9 ab	3.3 ab	5.8 a	7.2 a	3.2 ab	3.5 b	8.3 ab	4.4 ab
Nelson	1.6 abc	2.8 a	3.8 a	5.9 a	6.8 ab	4.9 a	6.3 a	7.3 abc	4.9 a
Nui	1.6 bc	1.3 ab	2.8 ab	4.9 ab	4.4 abc	3.7 ab	3.0 b	5.6 abcd	3.4 abcde
Ozarkblue	1.4 bc	1.8 ab	3.6 ab	3.7 ab	5.6 abc	4.0 ab	4.1 abc	4.2 bcd	3.5 abcde
Reka	1.0 cde	2.5 ab	3.8 a	6.2 a	5.6 abc	5.2 a	4.0 abc	6.5 abcd	4.3 ab
Sierra	1.6 bc	1.8 ab	2.4 ab	4.3 ab	4.2 abc	1.3 b	2.2 c	2.3 cd	2.5 cde
Summit	0.5 e	1.5 ab	2.5 ab	3.8 ab	2.6 c	2.7 ab	3.3 b	3.1 bcd	2.5 de
Toro	1.3 bcd	1.9 ab	2.8 ab	2.9 ab	2.1 c	1.5 b	2.4 c	3.8 bcd	2.3 de
Mean	1.5	2.0	3.1	4.7	4.8	3.2	3.8	4.8	3.5

[z]Means in a column not followed by a common letter are significantly different by Tukey-Kramer HSD, $P \leq 0.05$.

were set between 3-7 April 1998 at a 1.2 m in row and 3 m between row spacing. Drip irrigation (1.9 L/hr emitters) was used to supplement rainfall during the growing season. Soil drying was monitored with tensiometers and irrigated to maintain tensions between -0.30 and -0.60 MPa. Rows were mulched with wood chips and shredded bark and the mulch was renewed annually to maintain a 10 to 15 cm mulch depth. The experiment was designed as a randomized complete block with four replications of three plants for each cultivar. Dormant season pruning was done annually to encourage upright fruiting canes (4).

Each cultivar was hand harvested twice a week over 4 to 5 weeks. Yield was summed for all pickings within a harvest year and reported for the years 2000 through 2008. Cull fruit weight per plant was also summed for all pickings within the harvest years 2000 through 2003. A marketable yield percentage was determined by the formula [(total yield – cull fruit weight)/total yield X 100]. Fifty berries per plant were weighed at each picking to obtain an average. Berry weight average for all pickings within a harvest year was determined and reported for the years 2000 through 2006. Basal cane number was counted in the dormant season and reported for the years 2003 through 2006. Before dormant pruning, plant height was measured from the crown through the center of the plant. At the same time canopy spread was measured both within and between rows and averaged. Plant height and spread are reported for the years 2000 through

2006. Data were analyzed by ANOVA and means separated by Tukey-Kramer HSD (PASW Statistics, SPSS, Chicago, IL).

Results and Discussion

Bloom time occurred the first through third week of April during most years of the trial. It was observed that southern highbush cultivars 'Legacy', 'Ozarkblue' and 'Summit' did not bloom earlier than northern highbush cultivars of the same harvest season. Open highbush blueberry blossoms can sustain a -1.7 °C temperature with little damage but start becoming injured at -3.3 °C (3). Another report stated -2.8 °C as the critical temperature for open highbush blueberry blossoms (9). Our frost free date is April 20th, so there is always the potential for blossom loss. This occurred in 2007 when temperature dropped to -8.3 °C on April 7th and the entire crop was lost.

Yield averaged for all cultivars was 3.5 kg (2000-2008 mean) per plant (Table 2). A previous trial reported the five year mean yield for all cultivars of 2.1 kg per plant (7). A comparable five year mean yield in this present trial was 3.2 kg per plant. This increase from the previous trial could be due to more favorable weather, better site preparation, more productive cultivars, better planting management or any combination of these. Highbush blueberry cultivar trials in other states have shown higher, comparable or lower yields which undoubtedly are related to the plant adaptation to regional climates and soils (6, 8, 10).

In our previous highbush blueberry cultivar trial, soil pH increased over time because of the high exchangeable calcium in the soil (7). Acidification of the irrigation water with sulfuric acid to pH 5.0 was implemented in the present planting, which helped counter the buffering effects of the soil. Combined with the use of acidifying fertilizers, we successfully grew healthier and more productive plants on a less than ideal site (2, 4, 11).

Several cultivars had yields suitable for commercial production in Missouri (Table 2). The highest yielding cultivars were 'Brigitta Blue', 'Darrow', 'Legacy', 'Nelson' and 'Reka', all above 4.0 kg per plant (2000-2008 mean). Intermediate yielding cultivars were 'Bluecrop', 'Chandler', 'Nui' and 'Ozarkblue' all above 3.0 kg per plant. The remaining culti-

Table 3. Marketable yield[z] (%) of highbush blueberry cultivars at Mountain Grove, Mo., 2000-2003.

Cultivar	2000		2001		2002		2003		2000-03 mean	
Bluecrop	94.3	b[y]	99.5	a	97.2	abc	99.8	a	97.7	ab
Brigitta Blue	95.7	ab	99.0	ab	95.1	bc	100.0	a	97.5	b
Chandler	95.7	ab	96.3	b	98.6	a	100.0	a	97.7	ab
Collins	96.1	ab	98.7	ab	97.7	ab	98.4	c	97.7	ab
Darrow	97.8	a	99.4	a	98.4	a	100.0	a	98.9	a
Duke	98.1	a	97.6	ab	98.8	a	98.2	c	98.2	ab
Legacy	96.6	ab	98.9	ab	97.1	abc	100.0	a	98.2	ab
Nelson	97.2	ab	99.0	ab	99.0	a	100.0	a	98.8	a
Nui	95.0	b	98.5	ab	98.7	a	98.2	c	97.6	ab
Ozarkblue	96.2	ab	98.0	ab	98.5	a	99.6	ab	98.1	ab
Reka	96.6	ab	99.5	a	97.3	abc	99.3	b	98.2	ab
Sierra	94.9	b	98.8	ab	97.4	ab	100.0	a	97.8	ab
Summit	97.6	ab	99.0	ab	93.7	c	100.0	a	97.6	ab
Toro	97.2	ab	98.2	ab	97.3	ab	99.3	b	98.0	ab
Mean	96.4		98.6		97.5		99.5		98.0	

[z] Marketable yield = (total yield - cull fruit weight)/total yield x 100.
[y] Means in a column not followed by a common letter are significantly different byTukey-Kramer HSD, $P \leq 0.05$.

Table 4. Berry weight (g) of highbush blueberry cultivars at Mountain Grove, Mo., 2000-2006.

Cultivar	2000	2001	2002	2003	2004	2005	2006	2000-06 mean
Bluecrop	1.6 bcd[z]	2.0 cde	1.9 bc	1.7 bc	1.7 c	1.4 c	1.2 bc	1.6 f
Brigitta Blue	2.0 ab	2.4 bc	2.3 b	2.2 ab	1.8 c	2.1 b	1.7 ab	2.1 c
Chandler	2.5 a	3.5 a	3.7 a	3.2 a	2.9 a	3.0 a	2.1 a	3.0 a
Collins	1.6 bcd	1.8 de	1.5 c	1.5 bc	1.5 cd	1.4 c	1.2 bc	1.5 f
Darrow	1.6 bcd	1.7 de	1.8 bc	1.9 b	1.6 cd	1.6 bc	1.5 bc	1.7 ef
Duke	1.5 cd	2.0 cd	1.8 bc	1.6 bc	1.6 cd	1.5 c	1.4 bc	1.6 f
Legacy	1.9 b	2.3 cd	2.4 b	1.9 b	1.8 c	1.8 bc	1.7 ab	1.9 d
Nelson	2.0 b	2.3 cd	2.2 bc	2.2 ab	1.8 c	1.7 bc	1.7 ab	2.0 cd
Nui	2.0 ab	2.9 b	2.5 b	2.5 ab	2.2 b	2.1 b	1.8 a	2.3 b
Ozarkblue	1.8 bc	2.1 cd	2.2 bc	2.0 b	1.6 cd	1.9 b	1.5 bc	1.9 d
Reka	1.2 d	1.4 e	1.5 c	1.2 c	1.3 d	1.3 c	1.1 c	1.3 g
Sierra	1.8 bc	2.0 cd	2.0 bc	1.4 c	1.8 c	1.5 c	1.2 bc	1.7 ef
Summit	1.9 bc	2.4 bc	2.4 b	1.9 b	1.7 c	1.5 c	1.3 bc	1.9 d
Toro	2.2 a	2.1 cd	2.0 bc	1.8 b	1.8 c	1.3 c	1.7 ab	1.8 de
Mean	1.8	2.2	2.2	1.9	1.8	1.7	1.5	1.9

[z] Means in a column not followed by a common letter are significantly different by Tukey-Kramer HSD, $P \leq 0.05$.

vars, 'Collins', 'Duke', 'Sierra', 'Summit' and 'Toro' were below 3.0 kg per plant. Highbush blueberry cultivars generally increased in yield over the first five years (2000-2004) of the planting (Table 2). A decline occurred in 2005 and 2006 with a recovery for some cultivars in 2008, a year after the 2007 crop loss.

Cull fruit weights were low for all cultivars in this trial, which resulted in high marketable yields. A marketable yield over all cultivars was 98% (2000-2003 mean) and no cultivar was below 93% in those years (Table 3). Blueberry fruit remain well-attached on the bush during ripening and harvest (4, 11). This cull rate along with timely harvest intervals should allow growers to obtain similarly high marketable yields.

Berry weight was highest during the second and third years (2001 and 2002 yearly means) of the planting when yields were still increasing (Table 4). Berry weight decreased after this. A decline in yields during 2005 and 2006 did not bring about an increase in berry weight. Plant size and density were greater in later years which may have contributed to lower fruit weight due to shading. The cultivar 'Chandler' had the highest berry weight at 3.0 g per berry (2000-2006 mean). The cultivars 'Brigittia Blue', 'Legacy', 'Nelson' and 'Nui' were just above 2.0 g per berry. Most of the remaining cultivars were between 1.6 and 2.0 g per berry. The lowest (≤ 1.5 g) berry weights were obtained from the cultivars 'Collins' and 'Reka'. The high yields of 'Reka' combined with small berry size made this cultivar slow and tedious to hand pick.

Basal cane number is a measure of a plant's ability to produce new shoots from its base, which is desirable for plant renewal (4, 11). A higher number implies more vigor or growth potential; however, this can also result in many weak, thin canes that make poor renewals. 'Reka' had 22 canes (2003-2006 mean); many were weak and thin, and were removed during pruning (Table 5). Conversely, a low number is not desirable because it results in few renewals. The cultivars 'Chandler', 'Collins', 'Duke', 'Nelson' and 'Toro' had below 3 canes per plant. These cultivars would likely benefit from higher fertility levels to promote additional cane growth. The remaining cultivars 'Bluecrop', 'Brigitta Blue', 'Darrow',

Table 5. Basal cane number of highbush blueberry cultivars at Mountain Grove, Mo., 2003-2006.

Cultivar	2003		2004		2005		2006		2003-06 mean	
Bluecrop	2.5	bcd[z]	5.0	d	5.8	de	3.3	c	4.1	cde
Brigitta Blue	3.5	bcd	6.8	cd	8.5	cd	6.5	b	6.3	c
Chandler	1.3	bcd	1.0	d	1.5	e	1.3	c	1.3	e
Collins	0.8	d	2.8	d	3.5	de	2.3	c	2.3	de
Darrow	5.3	ab	13.8	bc	14.5	b	7.5	b	10.3	b
Duke	0.8	cd	2.0	d	2.3	de	2.3	c	1.8	e
Legacy	2.5	bcd	6.0	d	6.5	cd	4.3	c	4.8	cd
Nelson	1.3	bcd	3.3	d	3.3	de	1.8	c	2.4	de
Nui	4.8	abc	16.3	b	16.5	b	9.3	b	11.7	b
Ozarkblue	6.8	ab	14.5	b	14.5	b	9.3	b	11.3	b
Reka	14.0	a	28.0	a	28.0	a	19.0	a	22.3	a
Sierra	2.5	bcd	4.8	d	5.0	de	3.5	c	4.0	cde
Summit	3.8	abc	4.5	d	4.3	de	2.3	c	3.7	cde
Toro	3.5	bcd	2.0	d	3.3	de	2.3	c	2.8	de
Mean	3.8		7.9		8.4		5.3		6.4	

[z] Means in a column not followed by a common letter are significantly different by Tukey-Kramer HSD, $P \leq 0.05$.

'Legacy', 'Nui', 'Ozarkblue', 'Sierra' and 'Summit' produced between 3 and 11 canes which should provide sufficient renewals.

Plant height and canopy spread for all cultivars were 1.4 and 1.3 m (2000-2006 means), respectively (Tables 6 and 7). The tallest cultivars were 'Brigitta Blue', 'Legacy' and 'Nelson' at 1.6 m or more. The shortest cultivars were 'Collins', 'Duke', 'Nui', 'Sierra' and 'Toro' at 1.3 m or below. The cultivars 'Bluecrop', 'Chandler', 'Darrow', 'Ozarkblue', 'Reka' and 'Summit' were intermediate. Most cultivars filled their allotted space of 1.2 m between plants in row. Those exceeding this figure by very much were crowding adjacent plants. Similarly, plant canopy spread between rows made access difficult for some cultivars. Height measurement was positively correlated to spread and yield (data not shown). Those cultivars that were tallest usually had wider canopy spread and greater yield. Based on 2006 canopy spread, the cultivars 'Brigitta Blue', 'Darrow', 'Legacy' and 'Nui' would likely benefit from wider spacing in and between rows.

In conclusion, based on highest mean yields, we recommend the cultivars 'Brigitta Blue', 'Darrow', 'Legacy', 'Nelson' and 'Reka' for southern Missouri blueberry growers. The cultivars 'Chandler', 'Ozarkblue' and 'Nui' are worthy of commercial trial. These all exceeded the productivity of 'Bluecrop', a standard cultivar in Missouri (6, 10). The southern highbush cultivars, 'Legacy' and 'Ozarkblue', performed well in Arkansas and were recommended in that state (1). The southern highbush cultivar 'Summit' was less productive in our trial. 'Chandler' had the highest berry weight, and other high berry weight cultivars were 'Brigitta Blue', 'Legacy', 'Nelson' and 'Nui'. Even though 'Reka' produced high yields, it had lower berry weight. This would make it less desirable to a grower with a U-pick or direct market operation; however, smaller berry size may be acceptable for certain processed or value-added products. 'Chandler' had low basal cane number and 'Reka' produced many weak, thin canes. While these appear to be deficiencies, they may be effectively managed through fertility and pruning practices. Overall, plant health was good with minimal pesticide ap-

Table 6. Plant height (m) of highbush blueberry cultivars at Mountain Grove, Mo., 2000-2006.

Cultivar	2000	2001	2002	2003	2004	2005	2006	2000-06 mean
Bluecrop	1.2 ab[z]	1.5 a	1.7 ab	1.7 ab	1.6 ab	1.6 ab	1.5 ab	1.5 ab
Brigitta Blue	1.2 ab	1.4 ab	1.6 abc	1.7 ab	1.7 a	1.7 a	2.0 a	1.6 ab
Chandler	1.1 ab	1.2 abc	1.5 abc	1.5 ab	1.3 ab	1.3 ab	1.3 ab	1.4 abc
Collins	1.0 b	1.2 bc	1.4 bc	1.4 ab	1.3 ab	1.3 ab	1.3 ab	1.3 bc
Darrow	1.2 ab	1.4 ab	1.5 abc	1.6 ab	1.5 ab	1.5 ab	1.6 ab	1.5 ab
Duke	1.2 ab	1.2 bc	1.3 bc	1.3 b	1.4 ab	1.4 ab	1.4 ab	1.3 bc
Legacy	1.3 a	1.5 a	1.9 a	1.9 a	1.7 a	1.7 a	1.9 ab	1.7 a
Nelson	1.1 ab	1.4 ab	1.6 ab	1.9 a	1.8 a	1.8 a	2.0 a	1.7 a
Nui	0.8 c	1.0 c	1.1 c	1.2 b	1.2 ab	1.2 ab	1.4 ab	1.1 c
Ozarkblue	1.2 ab	1.3 ab	1.5 abc	1.5 ab	1.4 ab	1.4 ab	1.5 ab	1.4 abc
Reka	1.0 b	1.2 bc	1.4 abc	1.5 ab	1.6 ab	1.6 ab	1.6 ab	1.4 abc
Sierra	1.1 ab	1.2 bc	1.4 bc	1.4 ab	1.4 ab	1.4 ab	1.2 ab	1.3 bc
Summit	1.1 ab	1.4 ab	1.5 abc	1.6 ab	1.4 ab	1.4 ab	1.0 b	1.4 abc
Toro	1.0 b	1.2 abc	1.2 bc	1.5 ab	1.0 b	1.0 b	1.2 ab	1.2 c
Mean	1.1	1.3	1.5	1.6	1.5	1.4	1.5	1.4

[z] Means in a column not followed by a common letter are significantly different by Tukey-Kramer HSD, $P \leq 0.05$.

Table 7. Plant spread (m) of highbush blueberry cultivars at Mountain Grove, Mo., 2000-2006.

Cultivar	2000	2001	2002	2003	2004	2005	2006	2000-06 mean
Bluecrop	0.9 b[z]	1.2 a	1.3 a	1.4 ab	1.4 ab	1.4 ab	1.4 a	1.3 abcd
Brigitta Blue	1.2 a	1.3 ab	1.2 a	1.5 ab	1.7 a	1.7 a	1.9 a	1.5 ab
Chandler	1.0 b	1.2 abc	1.4 a	1.5 ab	1.2 ab	1.2 ab	1.1 ab	1.3 bcd
Collins	0.9 b	1.1 bc	1.4 a	1.5 ab	1.3 ab	1.2 ab	1.3 a	1.3 bcd
Darrow	1.2 a	1.4 ab	1.4 a	1.6 ab	1.5 ab	1.5 ab	1.5 a	1.4 abc
Duke	1.0 b	1.1 bc	1.1 a	1.3 b	1.3 ab	1.3 ab	1.2 ab	1.2 cd
Legacy	1.3 a	1.5 a	1.4 a	1.7 a	1.6 ab	1.6 ab	1.7 a	1.6 a
Nelson	0.9 b	1.1 ab	1.2 a	1.5 ab	1.4 ab	1.4 ab	1.4 a	1.3 abcd
Nui	1.1 ab	1.2 c	1.2 a	1.5 ab	1.5 ab	1.5 ab	1.6 a	1.4 abc
Ozarkblue	1.1 ab	1.3 ab	1.3 a	1.3 ab	1.4 ab	1.3 ab	1.4 a	1.3 abcd
Reka	1.0 b	1.2 bc	1.2 a	1.4 ab	1.4 ab	1.4 ab	1.5 a	1.3 bcd
Sierra	1.0 b	1.2 bc	1.3 a	1.4 ab	1.4 ab	1.4 ab	1.2 ab	1.3 bcd
Summit	1.1 b	1.3 ab	1.2 a	1.4 ab	1.3 ab	1.3 ab	1.0 ab	1.2 bcd
Toro	1.1 b	1.2 abc	1.2 a	1.4 ab	1.0 b	1.0 b	1.2 ab	1.1 d
Mean	1.1	1.2	1.3	1.5	1.4	1.4	1.4	1.3

[z] Means in a column not followed by a common letter are significantly different by Tukey-Kramer HSD, $P \leq 0.05$.

plication. Marketable yield was high for all cultivars. Growers should realize that some of these cultivars may not be readily available from nurseries because of their current lack of acceptance or the nursery's desire to propagate newer cultivars.

Acknowledgements

The authors thank Missouri State University, Department of Agriculture, and the State Fruit Experiment Station for support of this research.

Literature Cited

1. Carter, P.M., J.R. Clark and R.K. Striegler. 2002. Evaluation of southern highbush blueberry cultivars for production in southwestern Arkansas. HortTechnology 12:271-274.
2. Clark, J.R. 1993. Blueberry fertilization: concepts, methods and research results. Proc. Mo. Small Fruit Conf. 13:119-129.
3. Clark, J.R. and J.N. Moore. 1984. Cold damage to blueberry flowers. Proc. Ark. State Hort. Soc. 105:70-71.
4. Fuqua, B., P. Byers, M. Kaps, L. Kovacs and D. Waldstein. 2005. Growing blueberries in Missouri. Mo. State Univ., Dept. Ag. and State Fruit Exp. Sta. Bull. 44. 47 pp.
5. Grossman R.B. and F.J. Carlisle. 1969. Fragipan soils of the eastern United. States. Adv. Agron. 21:237-279.
6. Hancock, J.F. and A.D. Draper. 1989. Blueberry culture in North America. HortScience 24:551-556.
7. Kaps, M.L. and M.B. Odneal. 1998. Blueberry cultivar evaluation on a high pH site in Missouri. Fruit Var. J. 52:91-95.
8. Korcak, R.F. 1992. Blueberry species and cultivar response to soil type. J. Small. Fruit Vit. 1:11-24.
9. Mainland, M. 1987. Blueberry freeze damage and protection measures. N.C. State Univ. Ag. Ext. Leaflet. No. 201-E. 6 pp.
10. Moore, J.N. 1993. Blueberry cultivars of North America. HortTechnology 3:370-374.
11. Pritts, M.P. and J.F. Hancock (eds.). 1992. Highbush blueberry production guide. NRAES-55. 200 pp. NRAES, Ithaca, NY.