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Southern Highbush Blueberry Cultivars from the University of Florida[1]

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Introduction

Blueberries are native to eastern North America and are one of the few crop plants that originated here. The woods and swamps of Florida are populated with at least eight wild blueberry species, including the highbush blueberry (*Vaccinium corymbosum)*, the rabbiteye blueberry *(Vaccinium virgatum),* and the evergreen blueberry (*Vaccinium darrowii*). No area of the state lacks wild blueberries, except where soil pH is above 6.0.

Efforts to breed new blueberry cultivars that were adapted to Florida's mild winter climate and would ripen in April and May began in the 1950s, under the direction of Professor Ralph Sharpe at the University of Florida. By crossing northern highbush cultivars with *Vaccinium* species found throughout Florida and the southeastern United States, Sharpe developed a new type of blueberry known as the southern highbush. Southern highbush blueberries combine the fruit quality and productivity of highbush blueberries with the low chilling requirement necessary to produce a crop in the Florida climate. In 1976 and 1977, the University of Florida blueberry breeding program released three southern highbush blueberry varieties ('Sharpblue', 'Flordablue', and 'Avonblue') that were bred specifically for Florida's mild climate and showed promise for producing early ripening, high-quality fruit. By 1983, a small blueberry shipping industry was established in Florida. Because these southern highbush blueberries ripened earlier than blueberries from other areas, they brought very high prices. High prices and ready markets have led to the expansion of Florida's blueberry acreage. Between 1982 and 2012, Florida blueberry acreage has increased from less than 1,000 acres to over 4,500 acres, and additional plantings are anticipated. During the 1980s and early 1990s, more than half of the Florida blueberry acreage consisted of rabbiteye varieties. Beginning in the early to mid-1990s, most new blueberry plantings in Florida consisted of southern highbush. Currently, with the exception of small U-pick farms, Florida's blueberry acreage is comprised almost entirely of southern highbush varieties developed by the University of Florida breeding program.

As many new southern highbush plantings have come into bearing, annual statewide blueberry production has steadily increased from about 1.5 million pounds in the early 1990s to over 23 million pounds in 2011. Fresh fruit prices have remained high for early ripening southern highbush varieties. However, production problems have been numerous and severe. Although many aspects of blueberry growing in Florida are better understood than they were in the 1990s, blueberries remain a difficult crop to grow in Florida. Very early flowering makes southern highbush blueberries quite susceptible to late winter/early spring freezes. Southern highbush blueberry plantings without overhead irrigation for frost protection frequently lose their crops as far south as Highlands County. Because of their early ripening season, southern highbush blueberries are particularly

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attractive to birds, especially cedar waxwings (Figure 1). Bird damage has been quite severe on some farms. Recently, new diseases such as necrotic ring blotch (Figure 3) and bacterial leaf scorch (Figure 4) have been observed in commercial blueberry plantings in Florida. Although potentially profitable, blueberry fields can be expensive to establish. Prospective southern highbush growers should be aware of establishment costs such as freeze protection, which requires overhead irrigation, and soil preparation, which usually requires large quantities of pine bark.

Figure 1. A flock of cedar waxwings feeding on southern highbush blueberries
Credits: Jeff Williamson

The major incentive for growing blueberries in Florida is the excellent market window available for blueberries that ripen before May 15. In recent years, blueberries have been planted in the Southern Hemisphere for shipping to the Northern Hemisphere during the period from November to March. Southern highbush blueberries are being planted along the Gulf Coast from south Georgia to east Texas, and in California and Mexico. Nevertheless, the market period from April 1 to May 10 is still available almost exclusively to Florida growers, and fruit prices are usually high until mid-May, when harvest of the Georgia and North Carolina crops rapidly increase market volumes.

Cultivars

Many improved southern highbush cultivars have been developed by the University of Florida breeding program since the initial releases of 'Sharpblue', 'Flordablue', and 'Avonblue' in the mid-1970s. Today there are more blueberry cultivar choices available for Florida growers than ever before, but in every case, cultivar selection involves weighing the advantages and disadvantages of a cultivar relative to the grower's needs. Unfortunately, there are no perfect cultivars suited for every location and management system. The following discussion categorizes southern highbush cultivars into four groups: (1) major cultivars; (2) secondary cultivars; (3) new options; and (4) historical cultivars. Proper cultivar selection is critical to a successful blueberry enterprise, and growers should seek information from multiple sources, including their local county Extension office.

Major Cultivars

For well over a decade, 'Star', 'Emerald', and 'Jewel' comprised the backbone of the Florida blueberry industry. While there is a trend toward planting newer cultivars that address specific needs such as increased earliness and the potential for mechanical harvest, the majority of planted blueberry acreage in Florida still consists of these three cultivars.

Figure 2. 'Star'
Credits: Jeff Williamson

'Star' (US Plant Patent 10,675**)** (Figure 2) was released by the University of Florida as a patented cultivar in 1995. Since its release, 'Star' has been widely planted in the northern production areas of Florida and in southeast Georgia. 'Star' has a slightly higher chill requirement (cool temperature exposure during winter dormancy needed to resume normal growth in the spring) than most other cultivars grown in Florida, and it is less likely to bloom in January or early February. In Alachua County, the average date on which 'Star' reaches 50% bloom is February 23. The first half of the crop is normally ripe by April 26. 'Star' leafs well in Gainesville and southeastern Georgia, but is less vigorous and smaller in stature than many cultivars. 'Star' has a very short bloom-to-ripe interval and has a relatively compressed harvest season of about three weeks. Berries are easy to harvest by hand, and the quality is excellent with regards to size, firmness, and scar. Due to its slightly higher than average chill requirement, 'Star' appears to be best adapted to north Florida and southeastern Georgia. 'Star'

has not performed well south of Ocala, Florida, where it tends to produce few flowers and has weak growth.

Note: Although 'Star' has historically been a major cultivar for Florida and south Georgia, its ability to survive in the field has recently come into question due to a relatively high incidence of bacterial leaf scorch (Figure 4) caused by the bacterium *Xylella fastidiosa* and its apparent susceptibility to blueberry necrotic ring blotch virus (Figure 3).

Figure 3. 'Star' blueberry showing symptoms of necrotic ring blotch
Credits: Jim Olmstead

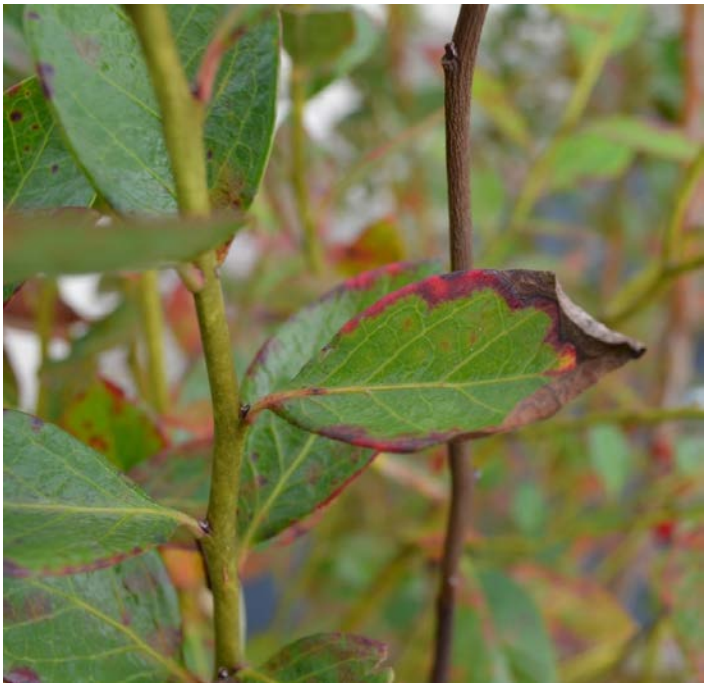

Figure 4. 'Star' blueberry showing symptoms of bacterial leaf scorch
Credits: Jim Olmstead

Because of these problems new plantings of 'Star' have declined significantly and it is no longer recommended for new plantings in Florida.

Figure 5. 'Emerald'
Credits: Jeff Williamson

'Emerald' (US Plant Patent 12,165) (Figure 5) was released by the University of Florida in 1999, and is currently one of the most widely planted cultivars in north-central and central Florida, with smaller plantings in southeast Georgia. 'Emerald' combines a vigorous, upright to spreading bush with high yield potential and large, high-quality berries. 'Emerald' flowers open uniformly, and it produces abundant leaves but may benefit from hydrogen cyanamide applications. 'Emerald' has a low enough chill requirement to be adapted to most regions of peninsular Florida where commercial blueberry production occurs. Because the plants are highly vigorous when planted on suitable soils, 'Emerald' is capable of carrying heavy crops and is generally considered one of the highest yielding cultivars grown in Florida. 'Emerald' normally reaches full bloom in early to mid-February, and overhead irrigation is needed to protect flowers and fruit from freezes in February and March. Fruit clusters are tight and do not ripen uniformly, which makes 'Emerald' more difficult to handpick than many cultivars. 'Emerald' is considered a mid-season cultivar for Florida with an extended harvest season. First harvest occurs a few days earlier for 'Emerald' than for 'Star' in north-central Florida. About 90% of the fruit of 'Emerald' is normally ripe between April 19 and May 15 in Gainesville. During heavy production years, fruit prices may decline enough in mid- to late May so that growers make decisions not to harvest the last remaining 'Emerald' fruit.

Figure 6. 'Jewel'
Credits: Jeff Williamson

'Jewel' (US Plant Patent 11,807) (Figure 6) was released from the University of Florida breeding program in 1998, and it is often planted in combination with 'Emerald' in central and north-central Florida, where it is well adapted. The plant is upright, vigorous, high yielding, and survives well in commercial fields. However, 'Jewel' is highly susceptible to blueberry rust leaf spot (Figure 7), and a thorough summer spray program is usually necessary to prevent early fall defoliation.

Figure 7. Jewel showing symptoms of rust leaf spot disease
Credits: Jim Olmstead

'Jewel' fruit (Fig. 6) are slightly smaller and softer than 'Emerald', but they are acceptable for commercial packing and shipping. Yield potential is high, and internal berry quality is very good, although berries tend to remain tart until fully ripe. 'Jewel' is considered a mid-season cultivar for Florida. 'Jewel' typically flowers about February 16 in north-central Florida. The first commercial harvest date is usually before April 10, and harvest is typically finished by May 12.

Figure 8. 'Springhigh'
Credits: Jim Olmstead

'Springhigh' (U.S. Plant Patent 16,476) (Figure 8) was released by the University of Florida in 2004. It has become popular as an earlier-ripening addition to 'Emerald' and 'Jewel', especially in central and south-central Florida. It blooms about a week and a half before 'Star' and begins ripening approximately nine days before 'Star'. Fruit are large and have excellent flavor, but have less waxy bloom, making them appear darker than average, and fruit are softer than most other commercial cultivars. The pack-out for 'Springhigh' has been reduced in some years because of a higher than average incidence of soft berries. Picking at frequent intervals during the harvest season is usually necessary to minimize the occurrence of soft fruit in packing and grading lines.

'Primadonna' (US Plant Patent 20,181) (Figure 9) was released in 2005 by the University of Florida. It blooms early and ripens early, about 7 to 10 days before 'Star'. Its berries are large and have excellent flavor. Because of the early maturity and apparent low chilling requirement for the flower buds, 'Primadonna' has been planted in central Florida. In these areas, 'Primadonna' may leaf poorly in some years without the benefit of hydrogen cyanamide. However, hydrogen cyanamide often injures 'Primadonna'

flower buds following low-chill winters. 'Primadonna' has a tendency to produce well some years but not others for reasons that defy a clear explanation.

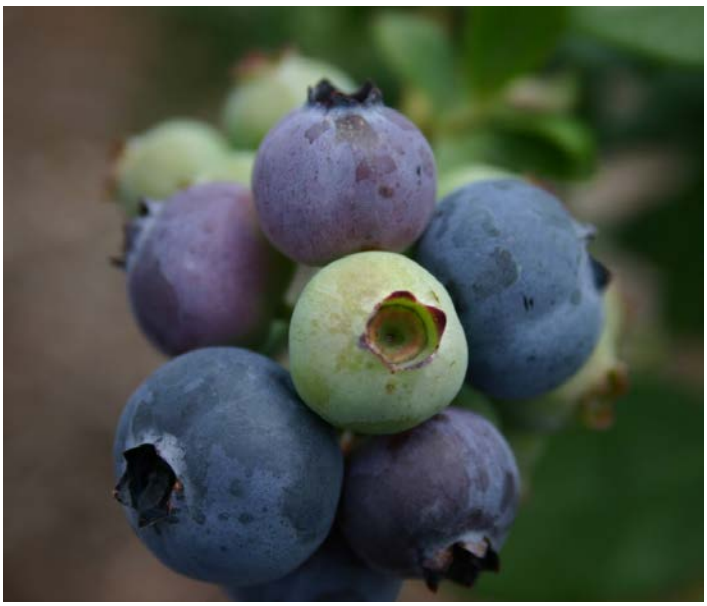

Figure 9. 'Primadonna'
Credits: Jim Olmstead

Secondary Cultivars

'Snowchaser' (US Plant Patent 19,503) (Figure 10) was released in 2005 by the University of Florida. It is the earliest ripening cultivar grown commercially in Florida. 'Snowchaser' has a very low chilling requirement that usually results in early bloom (early to mid-January in Gainesville), making it particularly susceptible to late winter and early spring freezes. Berries usually begin ripening about 20 days before 'Star', when berry prices are typically high. Thus, very early season production is the main objective when growing this cultivar. 'Snowchaser' produces medium-sized fruit with excellent flavor and good postharvest characteristics. Its field survival is considered marginal because of its susceptibility to stem blight.

Figure 10. 'Snowchaser'
Credits: Jim Olmstead

'Windsor' (US Plant Patent 12,783) was released by the University of Florida in 2000 (Figure 11). It is vigorous, with stout stems and a semi-spreading growth habit. In Alachua County, the mean date of 50% open flowers is February 23. 'Windsor' leafs out strongly as it begins to flower, and this strong leafing enables it to support a large crop. The average date for the first commercial hand harvest of 'Windsor' in Alachua County is April 15, and 50% of the berries are normally ripe by April 28. 'Windsor' berries are very large, especially early in the harvest season. Berries from the first half of the harvest average about 2.4 grams on young vigorous plants. Berry color is similar to 'Star' and the berries are firm and have excellent flavor. Although 'Windsor' grows and fruits well, it has lost favor among growers because of the deep picking scar that can tear at harvest, and this can increase packing costs and reduce postharvest fruit quality. There have been reports of greater than average susceptibility of 'Windsor' to hydrogen cyanamide injury.

Figure 11. 'Windsor'
Credits: Jeff Williamson

'Scintilla' (US Plant Patent 19,233) (Figure 12) was released by the University of Florida in 2007. It is a vigorous, semi-upright plant that produces a medium yield of large berries with excellent color, scar, firmness, and flavor. The berries are in loose clusters and easily harvested by hand. 'Scintilla' has a longer fruit development period, as it typically blooms before 'Star', while its harvest is considered mid-season in Florida. 'Scintilla' appears to have above average

susceptibility to *Phytophthora* root rot and leaf spots, and its long-term field survival is unknown.

Figure 12. 'Scintilla'
Credits: Jim Olmstead

'Farthing' (U.S. Plant Patent 19,341) (Figure 13) was released by the University of Florida in 2007. It is vigorous and has a compact growth habit with numerous branches. Flowering occurs after 'Emerald' and 'Jewel' but before 'Star'. 'Farthing' flowers profusely and sets heavy crops, which begin ripening along with 'Star' but continue for about six weeks, similar to 'Emerald'. Berry size is usually medium, due to heavy crop loads, but can be large with lighter crops. Berry firmness is exceptional, with a nearly crisp texture. Scar and flavor are good. Berry color is darker than average, with below average uniform color development at ripening, due to a tendency for the stem end of the berry to remain red or purple, especially when plants are carrying heavy crops. Preliminary trials suggest that 'Farthing' may have above average mechanical harvest potential compared to other southern highbush cultivars currently grown in Florida.

'Sweetcrisp' (US Plant Patent 20,027) (Figure 14) was released by the University of Florida in 2005. 'Sweetcrisp' berries are medium to large and have exceptional firmness, medium blue color, and a remarkably sweet flavor. As the name indicates, 'Sweetcrisp' fruit have a unique crisp texture that has scored favorably in consumer acceptance trials. The postharvest characteristics of the berries are excellent, as is their ability to hang on the bush for extended periods of time without significant loss of quality. Fruit detach easily from the bush and have dry picking scars. 'Sweetcrisp' has shown higher than average potential for mechanical harvesting, although due to low fruit-detachment force, there is a tendency for immature green fruit to detach during mechanical harvesting. Plants survive well in the field but have a vigorous, sprawling growth habit, which makes them somewhat difficult to manage. 'Sweetcrisp' has a relatively high chilling requirement and is

Figure 13. 'Farthing'
Credits: Jim Olmstead

Figure 14. 'Sweetcrisp'
Credits: Jim Olmstead

best adapted from Gainesville north into southeast Georgia. Yield potential is only medium, which is a major reason 'Sweetcrisp' is not widely grown commercially in Florida.

New Blueberry Cultivar Options from the University of Florida

Meadowlark (US Plant Patent 21,553) (Figure 15) was released in 2009 by the University of Florida. It is vigorous, with an upright growth habit and narrow crown (Figure 16), and has the ability to leaf strongly during bloom and carry a heavy crop. Berries ripen very early (about 10 days before 'Star') with a mean date of April 24 for 50% ripe berries in Windsor, Florida. Berries are large to medium-large, depending on the crop load, and berry clusters are loose and easy to harvest because of their exceptionally long pedicels and peduncles. Berries have a mild flavor and are somewhat darker than average. Uniform color development at ripening is below average, with a tendency for red or purple color to persist at the stem end while the rest of the berry is fully blue. Berry firmness is very good. Meadowlark appears to have above average mechanical harvest potential compared to most other southern highbush cultivars currently grown in Florida. Recent observations suggest that Meadowlark may have greater than average susceptibility to bacterial leaf scorch.

Figure 15. Meadowlark
Credits: Jim Olmstead

Figure 16. Meadowlark has an upright growth habit
Credits: Jim Olmstead

Flicker (US Plant Patent 21,554) (Figure 17) was released by the University of Florida in 2009. Flicker is a vigorous, upright to spreading plant with potential for evergreen production in central and south-central Florida and deciduous production as far north as Gainesville, Florida. The mean dates for 50% open flowers and 50% ripe berries in Windsor, Florida, are February 3 and April 30, respectively. Early harvest in central Florida can be achieved by maintaining the previous year's leaves as long as possible (evergreen production) and not applying hydrogen cyanamide. However, production in this manner results in an extended harvest season, often lasting from early March through May. High vigor enables Flicker to carry a heavy crop, although there have been reports of poor young plant establishment from

Figure 17. Flicker
Credits: Jim Olmstead

liners. The reason for this is still unknown, but Flicker may not tolerate "wet feet" well or may be more susceptible to Phytophthora root rot than many southern highbush cultivars. Berries are large, light blue, and in loose clusters that are easy to harvest by hand. Berries are firm with good flavor and a dry picking scar. Berries tend to retain their quality for an extended period while on the bush.

Kestrel (US Plant Patent 21,719) (Figure 18) was released by the University of Florida in 2009. Kestrel^{T} is a low-chill cultivar that blooms early and ripens very early. In Windsor, Florida, the mean date of 50% open flowers is January 30 and the mean date of 50% ripe berries is April 22. The bush resembles 'Star' but leafing is earlier and more prolific. Berries are medium to large, averaging 2.29 g/berry. They have excellent flavor and low detachment force. Early leafing and flowering make Kestrel particularly susceptible to late freezes. Kestrel is suggested for trial as evergreen production from Port Charlotte, Florida, to Orlando, Florida, deciduous production from Tampa, Florida to Orlando, Florida, and under tunnels in Gainesville, Florida.

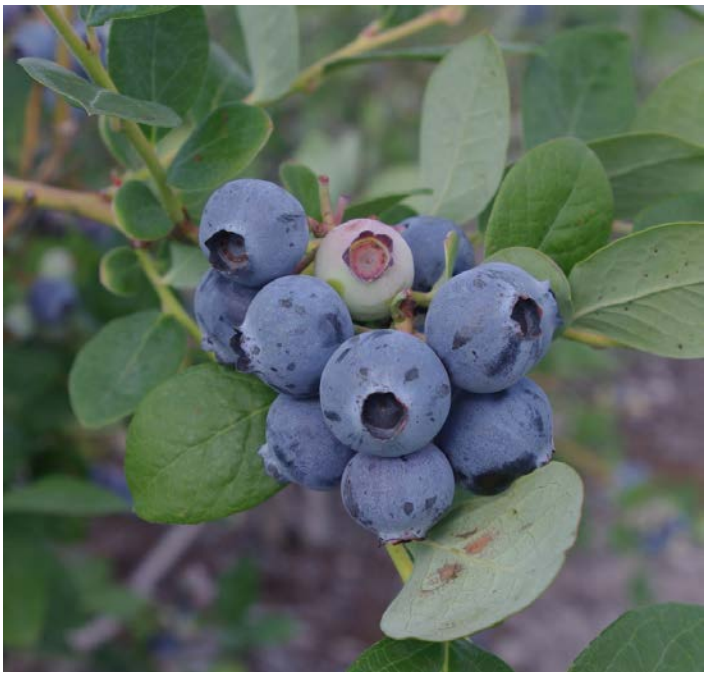

Figure 18. Kestrel
Credits: Jim Olmstead

Chickadee (US Plant Patent 21,376) (Figure 19) was released by the University of Florida in 2009. Chickadee is a very early ripening cultivar with a very low chilling requirement. It is suggested for trial in deciduous production systems in central Florida. The plant is upright, with stout stems and twigs, and has a narrow, almost monopodial, base. Plants are prone to uprooting from heavy ice loads during freeze protection. The mean date of 50% open flowers in Windsor, Florida, is January 28, and the mean date of 50% ripe berries in April 15. The early bloom requires overhead freeze protection in most areas of Florida. Berries are large (avg. 2.36 g/berry), sweet with low acidity, and have a firm to semi-crisp texture. Berry quality is maintained on the bush longer than for most other cultivars grown in Florida. Yield potential has been only medium on Chickadee, but its low chill requirement and early maturity may find use in central Florida.

Figure 19. Chickadee
Credits: Jim Olmstead

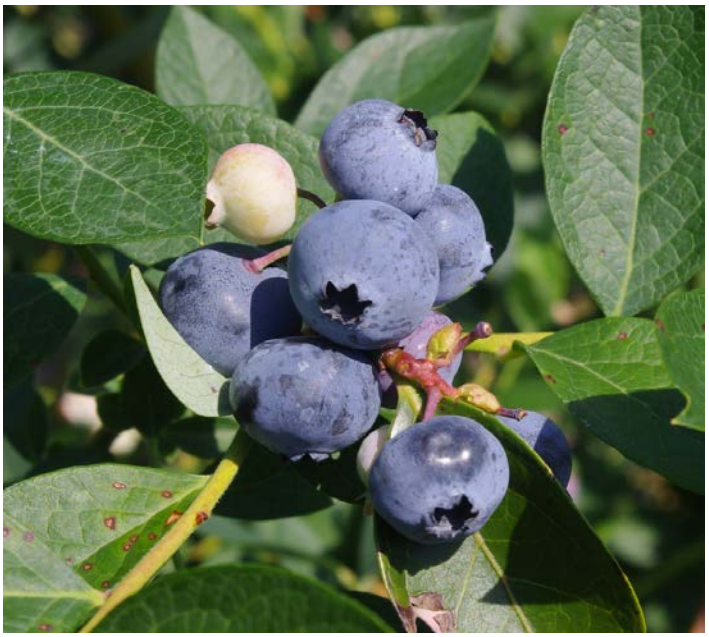

Figure 20. Bobolink
Credits: Jim Olmstead

Bobolink (US Plant Patent 21,377) (Figure 20) was released by the University of Florida in 2009. It is a vigorous, upright plant with excellent field survival and high yield potential. Berries of Bobolink are of high quality, large (2.75g/berry), sweet when first blue, and have a very low fruit detachment force. The mean date of 50% open flowers in Windsor, Florida, is February 10, and the mean date of 50% ripe berries is April 23. This maturity date is very similar to 'Star', and the superior plant vigor, health, and productivity of Bobolink may allow it to someday replace much of the 'Star' acreage. To date, very few plantings of Bobolink have been established.

Raven (U.S. Plant Patent 21,374) (Figure 21) was released by the University of Florida in 2009. Bloom and fruit maturity of Raven is similar to 'Star', which is later than most desirable cultivars at this time. Plants have medium vigor and tend to leaf well in the spring. Raven™ is unique in its extremely large fruit size, averaging between 3.5–4.0 g/berry. The fruit are quite firm for the average size, but the stem scar is larger than commercially desirable. Raven plants are not low-chill enough to be grown in central Florida, but the large fruit size and quality may make it an option for U-pick or specialty packages.

Figure 21. Raven
Credits: Jim Olmstead

Other Potential Cultivars

Blueberry production, especially in areas where southern highbush blueberries will be grown, has followed the same pattern of rapid expansion since the early 2000s that has been seen in Florida. As a result, there has been an increase in the number of blueberry breeding programs, both public and private, that are developing southern highbush blueberry cultivars. In the southeastern United States, blueberry breeding programs at the University of Georgia, North Carolina State University, the University of Arkansas, the United States Department of Agriculture Agricultural Research Service (Poplarville, Mississippi, and Beltsville, Maryland), as well as Fall Creek Farm and Nursery in the Pacific Northwest (Lowell, Oregon) have all developed southern highbush blueberry cultivars. None of the cultivars from these other programs are grown in significant acreage at this time. Typically, the cultivars developed at these breeding programs have not had a low enough chilling requirement for Florida production. Likewise, there is a lengthy list of southern highbush blueberry cultivars released from UF/IFAS that are no longer widely grown.

Patented Cultivars: Legal Requirements

The blueberry breeding program at the University of Florida is financed to a large extent by revenues from royalty payments on patented cultivars. The newer cultivars developed by this program are patented. Propagation of these cultivars requires a license from the agency holding the patent. Planting a patented cultivar does not require a license if the plant was purchased from a licensed propagator, but it is always important to retain the documentation you receive from a licensed nursery indicating the plants were legally obtained. Propagation of patented cultivars without a license is a violation of the law, even if you own the plants from which the cuttings are taken. To inquire about licenses for UF/IFAS cultivars, contact Florida Foundation Seed Producers, Inc., PO Box 110200, Gainesville, FL 32611-0200; phone (352) 273-3656; e-mail jwatson@ffsp.net.

Table 1. Characteristics of some southern highbush blueberry cultivars.

	Plant Characteristics							Berry Characteristics						
Cultivar	Central FL	North FL	Vigor	Survival	Flowering	Yield Potential	Season	Size	Color	Scar	Firmness	Flavor	Cluster	Shelf Life
Emerald	8	9	8	7	Mid/early	9	Mid/late	8	8	9	7	7	4	Good
Jewel	9	9	8	8	Mid/early	8	Mid	7	9	9	6	7	6	Good
Star	1	9	6	5	Mid	5	Mid	8	7	9	7	7	8	Excellent
Springhigh	8	6	9	8	Early	7	Early	8	6	8	6	8	7	Soft in hot weather
Primadonna	6	7	8	7	Mid/early	6	Early	7	8	8	6	8	6	Excellent
Windsor	4	9	7	8	Mid	7	Mid	8	8	6	7	8	7	Scar tear
Snowchaser	9	5	8	3	Early	6	Very early	6	8	8	6	9	7	Good
Scintilla	8	6	7	5	Early	6	Early/mid	8	9	9	7	9	8	Excellent
Farthing	7	9	6	8	Mid/late	9	Mid/late	7	6	9	8	7	6	Excellent
Sweetcrisp	3	7	9	8	Mid	5	Mid	6	8	9	9	9	8	Excellent
Meadowlark	7	9	9	7	Early	8	Early	8	7	8	7	6	9	Excellent
Flicker	9	3	8	5	Early	8	Early	8	9	8	7	7	8	Excellent
Kestrel	9	4	7	7	Early	7	Early	7	8	8	8	9	7	Excellent
Chickadee	9	3	6	6	Early	5	Early	8	7	9	8	7	8	Excellent
Bobolink	6	8	9	9	Mid	7	Mid	8	8	8	7	7	8	Unknown
Raven	3	8	7	5	Mid	5	Mid/late	9	8	7	7	8	7	Larger scar
Good: 9+, 8, 7-; Medium: 6, 5, 4; Poor: 3, 2, 1														