

STATE OF THE FLORIDA BLUEBERRY INDUSTRY

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Abstract. Florida ranks fifth in cultivated blueberry acreage among blueberry producing states in the U.S. Blueberry acreage has doubled in Florida since the early 1980's, primarily because Florida's early season southern highbush fruit are among the first blueberries to ripen in North America and generally receive very high prices. Southern highbush has replaced rabbiteye as the major blueberry type grown in Florida for the fresh market. 'Sharpblue' and 'Misty' are the principal varieties. Central Florida is emerging as a center of blueberry production as plantings are being developed on upland sites along the Florida ridge as opposed to traditional low-lying flatwoods sites which are higher in soil organic matter, but are usually poorly drained and subject to late spring frosts. The high costs of production per unit area has lead to experimentation with high-density plantings. In the southern production areas where winter chilling is sometimes marginal, experimentation with evergreen production systems is underway. Continued expansion of Florida's blueberry industry is expected because high-quality fruit can be produced when few fresh blueberries are available elsewhere. However, possible future competition from Central America, Mexico and the Caribbean makes it desirable that Florida growers reduce their production costs and expand markets for early-season blueberries if they are to remain competitive.

Florida is a major producer of early-season blueberries. In 1992, the United States Department of Commerce estimated that there were approximately 2000 acres of commercial blueberries on 300 farms in Florida. Results of a national survey conducted by Moore (1993) ranked Florida fifth in cultivated blueberry acreage among blueberry producing states in the U.S. Based on his survey results, Moore projected that blueberry acreage in Florida could more than double to over 5000 acres by the year 2000. This high projected growth rate for Florida is based on the fact that Florida's early-season highbush fruit are the first blueberries to ripen in North America (Lyrene, 1989; Lyrene and Sherman 1977; Sharpe, 1954). However, to date, blueberry acreage in Florida has remained relatively constant throughout the 1990's at about 2000 acres, as earlier-season southern highbush replace rabbiteyes and high-density plantings replace low-density ones.

Major Blueberry Production Areas

U-pick blueberry farms are scattered throughout north, north-central and northwest Florida, primarily near population centers such as Ocala, Gainesville, Tallahassee and Pensacola. Blueberries for fresh fruit shipping are grown in three major areas in Florida. The north-central area includes Alachua, Marion, Putnam and Flagler counties and accounts for approximately 40% of Florida's commercial shipping blueberry acreage. The south-central production area includes Highlands and Hardee counties and consists of ap-

proximately 30% of the total acreage. The newest production area is in central Florida which includes Polk, Orange, Lake and Hillsborough counties. It also contains about 30% of the total blueberry acreage in Florida and may be the area with the most growth potential for the future.

Major Blueberry Varieties Grown in Florida

Florida's commercial fresh fruit blueberry industry began in the early 1980's when about 600 acres of early-season rabbiteyes and about 400 acres of southern highbush were planted (Crocker and Willis, 1989). During the last 5 to 7 years, southern highbush varieties have gradually replaced early-season rabbiteyes. There are two reasons for this: 1) early-season rabbiteyes have been poor producers in peninsular Florida; and 2) southern highbush varieties are earlier-ripening than rabbiteye varieties. Other factors being equal, the earliest southern highbush blueberries ripen about one month earlier than the earliest rabbiteyes (Sharpe and Darrow, 1959; Lyrene and Sherman, 1984; Lyrene and Sherman, 1988).

Market prices for fresh blueberries drop significantly in late May in response to North Carolina's blueberry harvest (Eck and Childers, 1966; Lyrene and Sherman, 1985). When this happens, most Florida growers stop hand-harvesting their fields for fresh fruit shipping. Florida's U-pick blueberry farms grow some of the later-ripening varieties (i.e. 'Powderblue', 'Tifblue', and 'Brightwell') along with some earlier ripening ones such as 'Climax' and 'Chaucer'. However, the majority of Florida blueberries are grown for the fresh fruit shipping market and they are predominately southern highbush. Currently, virtually no rabbiteyes are being planted in Florida for fresh fruit shipping. The major southern highbush varieties grown in Florida are: 'Sharpblue', 'Misty' and 'Gulf Coast'.

Rabbiteye Production Problems

Early-season rabbiteyes have never exceeded 1000 acres in Florida because yields are low and much of the crop can not be harvested before berry prices drop in late May. Low yields of early-season rabbiteyes are due to a number of problems (Lyrene and Crocker, 1983; Lyrene and Payne, 1992): 1) late-winter and early spring freezes have been more damaging to flower buds, flowers, and fruit than was originally anticipated based on Florida's prior experience with later-flowering mid-season varieties; 2) fungal leaf spot diseases cause early fall defoliation, which reduces the number of flower buds for the following year's crop (Caruso and Ramsdell, 1995); 3) in Florida, many rabbiteyes, including the early-season ones mentioned above, are susceptible to flower bud infestation by the blueberry gall midge. This midge lays its eggs on flower buds prior to bloom. The larvae feed on the inner tissues of the flower bud, destroying it and preventing normal bloom. Heavy midge infestations, which usually follow mild winters, have severely reduced yields of some varieties in some years; and 4) Early-season rabbiteye yields have been low some years as a result of poor fruit set, despite heavy flowering. In most years, this problem is first apparent 2 to 4 weeks after flowering when the young berries fail to increase in size and begin to abscise from the plant. The reason for this problem is not

well understood, but has been attributed to poor pollination and/or poor fertilization of ovules following pollination.

Variety Descriptions

Brief descriptions of commonly grown blueberry varieties in Florida are given below. Additional information on some of these varieties can be found in publications by Eck (1988) and Williamson and Lyrene (1995).

Rabbiteye Varieties. 'Aliceblue' is an early-ripening variety released by the University of Florida in 1977. Its chilling requirement is between 350 and 400 chill units. It is upright and vigorous with high quality fruit of good size, color and firmness. The fruit can be harvested mechanically for the fresh market. 'Aliceblue' is no longer recommended for Florida because of poor flower bud initiation, due to leaf diseases, and erratic fruit set, probably due in part to partial cross-incompatibility with 'Beckyblue'.

'Beckyblue' is an early-ripening variety released by the University of Florida in 1977. Its chilling requirement is about 350 chill units. Early flowering makes 'Beckyblue' susceptible to spring freezes. Fruit have good color, size and firmness and can be harvested mechanically for the fresh market. Leaves are susceptible to several leaf spot diseases which result in reduced flower bud initiation. Yields have been low in peninsular Florida because of low flower bud numbers and poor fruit set.

'Bonita' is an early-ripening variety released by the University of Florida in 1985. Its chilling requirement is about 350 chill units. Plants are moderately vigorous and develop dense bushes with numerous canes. Fruit have good color, size and firmness and can be mechanically harvested for the fresh market. It is moderately susceptible to *Phytophthora* root rot. 'Bonita's yields have been low in peninsular Florida because of low flower bud initiation due to leaf diseases and poor fruit set.

'Climax' is an early-ripening variety released by the University of Georgia in 1976. It has a concentrated harvest season with high quality fruit that are well-adapted to mechanical harvesting for the fresh fruit market. It has fruited more reliably in Florida than 'Beckyblue' or 'Bonita' but its flower buds are highly susceptible to infestation by the blueberry gall midge. Midge infestations may also interfere with normal leafing during the spring growth flush.

'Chaucer' is a high-yielding, early-season variety released for U-pick purposes by the University of Florida in 1985. Its chilling requirement is between 350 and 400 chill units. It is not recommended for mechanical harvest or long distance shipping because of a wet picking scar.

'Brightwell' is a mid-season variety released by the University of Georgia in 1983. Plants are vigorous, upright, and are excellent producers. Fruit are medium in size, high in quality, and can be mechanically harvested for the fresh market. Brightwell is probably the best and most productive rabbiteye for north Florida, but this mid-season variety ripens after fruit prices drop.

'Tifblue' is a mid to late season variety released by the University of Georgia. Plants are vigorous and upright in growth. Fruit are medium-sized, light blue, and firm with good flavor, but tart until fully ripe. Fruit may crack during rainy weather which can be a problem in Florida since harvest is during the rainy season. It has not been as productive in Florida as 'Brightwell' or 'Powderblue'.

'Powderblue' is similar to 'Tifblue' in season, appearance and harvesting characteristics. It can be used to pollinate 'Tifblue' and 'Brightwell'. Brightwell has been one of the most reliable producers in Florida but does not ripen before fresh fruit prices drop.

Southern Highbush Varieties. 'Sharpblue' is a very early-season variety released by the University of Florida in 1976. It is the industry standard for its early season, and it is the most widely-planted southern highbush variety in Florida. The fruit are large with good flavor, but fruit for the fresh market must be hand harvested. Overhead irrigation is suggested because of its early bloom period. Sharpblue is moderately susceptible to *Phytophthora* root rot, stem blight, and several leaf spot diseases. In Florida, 'Sharpblue' ripens most of its crop before the late May drop in berry prices.

'Misty' is a very early variety with good fruit size and quality, and a dry picking scar. It is currently the major pollinizer for 'Sharpblue'. Young 'Misty' plants tend to flower heavily and leaf poorly in the spring. This combination results in a heavy berry set with insufficient leaves to support the crop, and renders 'Misty' plants highly vulnerable to blueberry stem blight. For the first two years after planting, flowers and young fruit should be removed from 'Misty' plants before spring growth begins. Dormant pruning may be required on older plants to thin flower buds and adjust crop loads for adequate plant vigor.

'Gulf Coast' is a 1987 release from the USDA. Plants are vigorous, semi-upright with medium productivity. Fruit ripen approximately with 'Sharpblue' and are large, firm, and have good flavor. It has been used successfully as a cross-pollinator for 'Sharpblue' as far south as Orlando. Stems often remain attached to the fruit at harvest. This presents problems in the packinghouse that are so severe that most commercial growers have abandoned 'Gulf Coast' except as a pollinizer for 'Sharpblue'.

'O'Neal' is a 1987 release from North Carolina State University which is suggested only for extreme north and north-west Florida because of its relatively high chilling requirement. Plants are vigorous with large, firm fruit with excellent picking scars.

'Wannabe' is a newly recognized variety of uncertain origin. It usually blooms several weeks after 'Sharpblue' and 'Flordablue' but ripens with 'Sharpblue' in extreme north Florida because of a short bloom to ripe period. Although 'Wannabe' shows some potential for extreme north Florida, little performance information is currently available, and its chilling requirement appears too high to permit profitable production in most of the Florida peninsula.

Possible Trends for the Future

Variety selection. As Florida growers attempt to capitalize on early-season market prices (mid-April through late May), they will most likely continue to grow southern highbush varieties. Acreage of early-season rabbiteyes, which ripen later (mid-May through early June), will probably show little increase until better varieties are available. 'Sharpblue' and 'Misty' are currently the major southern highbush varieties, but both have serious deficiencies. They will gradually be replaced during the next five to 10 years as superior varieties become available from the University of Florida breeding program.

Site selection. Site selection criteria have changed in Florida. With the advent of earlier-ripening but also earlier-flower-

Table 1. Blueberry varieties that are being grown in Florida.

Variety	Mean January temp ^a		Mean date of first harvest ^b	Berry size	Shipping quantity	Potential use in Florida ^c		Major problem
	°F	°C				Shipping	U-pick	
Rabbiteye								
Chaucer	57	14	May 20	Large	Low	Low	High	Stem scar
Beckyblue	57	14	May 22	Large	High	Medium	Low	Low yield
Aliceblue	57	14	May 22	Large	Med to High	Medium	Low	Low yield
Climax	57	14	May 25	Medium	High	Medium	Medium	Leafs poorly
Bonita	57	14	May 27	Large	High	Medium	Low	Low yield
Brightwell	57	14	June 3	Large	High	Medium	High	Not early
Woodard	57	14	June 3	Large	Low	Low	High	Won't ship or freeze
Tifblue	56	13	June 15	Medium	Medium	Low	Medium	Late ripe
Briteblue	57	14	June 15	Large	High	Low	High	Late ripe
Powderblue	57	14	June 15	Large	High	Low	High	Late ripe
Southern highbush								
Sharpblue	63	17	May 1	Large	Medium	High	Medium	Soft when hot
Gulf Coast	63	17	May 1	Large	Medium	Medium	Medium	Stemmy fruit
Misty	63	17	May 5	Large	High	Medium	Low	Poor leafing
Wannabe	56	13	May 5	Large	High	Medium	Low	Phytophthora, high chill
O'Neal	55	13	May 5	Large	High	Medium	Low	High chill

^aOn sites with this mean January temperature or lower, good flowering and fruiting should occur in the absence of spring freezes.

^bFirst 20% of crop ripe in Gainesville, FL

^cValues only apply to region of best adaptation for each clone in Florida.

ing varieties, damage from late winter and early spring freezes has been severe. Some new plantings are being established in high (warm) sites along the central Florida ridge, as opposed to low-lying, flatwoods sites which are usually high in soil organic matter but also subject to spring frosts and poor soil water drainage. These upland soils are predominately sand and usually require preplant incorporation of organic matter and sometimes adjustment of soil pH. Many such sites previously occupied by citrus are located in Lake, Polk and Highlands counties along Florida's central ridge. Growers who plant on well-drained, sandy soils of the ridge and irrigate from the Florida aquifer must deal with problems caused by bicarbonates in the irrigation water. On well-drained sandy soils, blueberries require frequent irrigation. Most water pumped from deep wells in Florida contains high concentrations of dissolved calcium and magnesium carbonates. Typical values are 5 to 7 milliequivalents/liter bicarbonates (Kidder and Hanlon, 1985). Applying 20 acre-inches of water with 7 milliequivalents/liter bicarbonates is equivalent to adding 1575 pounds of pure calcium carbonate per acre. On sands, with low buffering capacities, this results in a rapid rise in soil pH, and bicarbonate toxicity causes the plants to become very unthrifty. Possible solutions include injection of acid into irrigation water, or use of surface water with low bicarbonate concentrations (Kidder and Hanlon, 1985).

One system being tried by commercial growers on high, well-drained sandy ground is to spread a layer of ground pine bark 15 to 20 cm deep and grow the plants directly in the bark. Under these conditions, the plants can grow rapidly, but the costs of the bark is high and irrigation and fertilization procedures must be adjusted to suit the pine bark medium.

High-density plantings. The high costs of establishment per unit area due to preplant soil preparation, bird netting, and overhead irrigation for freeze protection has stimulated interest in high-density plantings. The feasibility of high-density blueberry plantings in Florida is currently being evaluated by growers and University of Florida researchers.

Evergreen blueberry production. The feasibility of evergreen blueberry production systems is being evaluated by growers and University of Florida researchers in the southern blueberry-growing areas of Florida (Reeder, et al., 1994). With this system of production, flowering occurs earlier than normal (usually beginning in December). The resulting harvest begins earlier than usual and extends over a longer period of time. The advantages and disadvantages of this system have not been thoroughly investigated.

Future Challenges

Superior blueberry varieties are needed for Florida. Some of the characteristics being tested and selected for are: better shipping quality; ease of harvesting; improved resistance to Phytophthora root rot, blueberry stem blight, and leaf spot diseases; improved vigor; and better leafing in the spring.

The Florida highbush blueberry industry has developed despite production problems because Florida growers can produce high-quality fruit when few fresh berries are available. High prices received for this fruit have made some farms profitable even with relatively low yields. However, high prices encourage competition. Competition from Central America, Mexico, and the Caribbean will eventually develop if prices remain high. The best long-term defense for Florida growers is through higher yields per acre, lower production costs, and development of the currently under-exploited market for early blueberries.

A strong commitment to growing blueberries is needed by Florida growers. Large investments of time and resources are required to grow blueberries profitably in Florida. Many Florida blueberry growers are small, part-time growers with limited resources. Some other growers are wealthy investors who may not fully appreciate farming and the risks inherent to it.

Conclusion

The future for commercial blueberry production in Florida is promising. Historically, blueberry prices have been high

during Florida's shipping season, which usually begins during the second half of April and ends during late May. There is great opportunity for market expansion of early-season blueberry production, especially if production costs can be reduced through higher yields per acre. Prices were generally good in 1995 when production was moderately high. Better varieties should be available to the Florida blueberry industry within the next few years. Extensive on-farm testing is underway to evaluate selections from the University of Florida blueberry breeding program.

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