

## BLUEBERRY CULTIVAR EVALUATION IN SOUTHWEST FLORIDA

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**Abstract.** A high-density blueberry (*Vaccinium corymbosum* L.) planting was established in 1994 at the Southwest Florida Research and Education Center in Immokalee to test the feasibility of producing blueberries in a warm winter climate. 'Gulf Coast', 'Sharpblue', and 'Wannabe' were the three main southern highbush cultivars evaluated, but several other numbered selections from the Univ. of Florida blueberry breeding program were planted nearby to test their potential productivity in south Florida. In 1998, 'Gulf Coast' and 'Sharpblue' yielded 1.45 lbs of fresh blueberries/plant, while 'Wannabe' produced insignificant yield. Yields of ten numbered selections ranged between 0.07 and 3.69 lbs of berries/plant. The selections 87-223, 87-220, and 87-108 yielded 1.27, 2.49, and 3.69 lbs of berries/plant, respectively, making them worthy of further investigation. In 1999, 'Gulf Coast' and 'Sharpblue' yielded only 0.76 and 0.26 lbs of fresh berries/plant. The lower yields were attributed to abnormal air temperatures in autumn/winter 1998-99 compared with 1997-98. In 2000, which had more "normal" pre-bloom air temperatures, 'Gulf Coast' yielded 2.5 lbs of berries/plant.

A southern highbush blueberry planting was established in April, 1994 at the Southwest Florida Research and Education Center (SWFREC) in Immokalee to determine if acceptable blueberry fruit yield and quality could be produced in a warm winter climate. A successful planting would show that a unique early market window exists for southwest Florida, and could form the basis for a southerly expansion of Florida's commercial blueberry industry.

From 1994 through 1998, three low-chill cultivars ('Gulf Coast', 'Sharpblue', and 'Wannabe') were evaluated for their response to pre-plant organic soil amendment (municipal solid waste compost vs. peat) and nitrogen fertilizer rate (75, 150, or 225 lbs N/acre/yr) (Reeder et al., 1994). Six months after planting, plants growing in soil amended with compost outgrew plants growing in soil amended with peat, and plant growth response to N rate was linear (Reeder et al., 1994). The plant canopy volume advantage of the compost soil amendment continued through 2 years after planting (Reeder et al., 1998).

Although a substantial amount of blueberry fruit was produced in the spring of 1996, yield was not quantified until 1997, when the plants had been established for 3 yr. Plants grown with the compost soil amendment yielded 34 to 76%

more fruit than plants grown in peat-amended soil. 'Gulf Coast' produced the earliest fruit and the greatest yield (1.9 lbs/plant), followed by 'Sharpblue' (1.1 lbs/plant) and 'Wannabe' (0.4 lbs/plant) (Obreza et al., 1997). Although less than 4 yrs old at the time, the SWFREC planting demonstrated that these southern highbush blueberry cultivars could flower and fruit in the south Florida climate.

The plants in the experiment described above were surrounded by "border" plants comprised of ten numbered selections of southern highbush blueberry plants from the Univ. of Florida breeding program. These groups of plants were treated similarly as the main test cultivars with respect to fertilization, irrigation, and other horticultural practices. Although they were not planted in replicated plots, a sufficient quantity of each selection existed to enable evaluation of their potential as cultivars suitable for south Florida.

The objectives of this paper are to report fruit yield and harvest season timing of the three main cultivars that occurred beyond 1997, and to evaluate the numbered selections through documentation of their 1998 yield and harvest season timing.

### Materials and Methods

Details of planting establishment and the original experimental treatments were given by Reeder et al. (1994) and summarized by Obreza (1997). Briefly, a parcel of Immokalee fine sand (pH 4.8) was cleared of pine and saw palmetto in 1993. In January 1994, two 50-ft wide by 3 ft high soil beds were formed, followed by installation of an overhead sprinkler irrigation system. In April, a 1-inch layer of an organic soil amendment [either peat or municipal solid waste compost (Bedminster Bioconversion of Tennessee, Inc., Sevierville, TN)] was incorporated into the top 6 inches of soil. Shortly thereafter, blueberry rooted cuttings were planted at a population of 4048 plants/acre (39.4 × 39.4 inch spacing), and a 4-inch depth of pine bark mulch was applied over the entire planting. In November, a netting system was installed to protect fruit from birds.

Three factors were evaluated in the split-split-plot experiment. The main factor was organic soil amendment, either peat or compost. The sub-plot factor was N fertilizer rate, either 150, 225, or 300 lbs N/acre/yr. The sub-sub-plot factor was cultivar, which included 'Gulf Coast', 'Sharpblue', and 'Wannabe'. Each soil amendment × N rate × cultivar combination was replicated seven times in a randomized complete block design. There were seven plants per cultivar in each soil amendment × N rate plot. Other fertilizers applied in addition to N were P at 50 lbs P<sub>2</sub>O<sub>5</sub>/acre/yr, K at 75 lbs K<sub>2</sub>O/acre/yr, and Mg at 25 lbs/acre/yr. The irrigation supply was low-bicarbonate groundwater with a pH of 5.8.

In June 1996, the plants were top-pruned to a height of 3 ft. The following spring (1997), blueberries were hand-harvested five times. Mature fruits were removed from all plants in each plot and weighed. In June 1997, the plants were side-pruned but not top-pruned. Yield in spring 1998 was measured on 'Gulf Coast' and 'Sharpblue' across 12 harvest dates. We also measured the yield of the numbered selection border plants

Table 1. Main cultivar fresh blueberry yield as affected by pre-plant soil amendment, 1998.

Pre-plant soil amendment	Mean fresh berry yield <sup>1</sup>	
	Gulf Coast	Sharpblue
Compost	1.61 a	1.62 a
Peat	1.29 b	1.26 b

<sup>1</sup>Means within columns are significantly different ( $P < 0.05$ ) according to Duncan's multiple range test.

that year. All plants were top-pruned to a height of 3 ft in July 1998. 'Gulf Coast' and 'Sharpblue' yields were measured across 14 harvest dates in spring 1998. Plants were not pruned in summer 1999. 'Gulf Coast' yield (compost plots only) was measured across nine harvest dates in spring 2000. 'Gulf Coast' and 'Sharpblue' yield data were statistically analyzed using Statistical Analysis System software (SAS Institute, Inc., 1985).

### Results and Discussion

Although the 'Wannabe' cultivar produced a plant canopy volume comparable with 'Gulf Coast' and 'Sharpblue' (Reeder et al., 1998), it produced only 0.4 lbs fresh berries/plant in 1997. In 1998, it produced no significant yield even though vegetative growth remained strong. Based on this performance and a lack of productivity observed in other Florida trials, 'Wannabe' was deemed an unsuitable blueberry cultivar. 'Gulf Coast' and 'Sharpblue' produced acceptable although slightly lower yields in 1998 compared with 1997 (Table 1). As in 1997, 'Gulf Coast' produced mature berries about 2 weeks earlier than 'Sharpblue' in 1998. The compost pre-plant soil amendment continued to positively influence blueberry yield compared with peat, even though 4 yrs had passed since the amendments were applied.

The number of plants harvested for each numbered selection ranged from 7 to 45. Yield of these plants varied from a low of 0.07 to a high of 3.69 lbs/plant (Table 2). Compared with the mean yields of 'Gulf Coast' and 'Sharpblue' (across soil amendment treatments), the numbered selections that performed the best were 87-223, 87-220, and 87-108. The most prolific variety in the entire planting was 87-108, which produced the both the earliest fruit and the longest harvest season of any cultivar, including 'Gulf Coast' and 'Sharpblue' (Fig. 1). There were subtle differences in the timing of berry

Table 2. Fresh blueberry yield by cultivar, 1998.

Cultivar	No. of plants harvested	Mean fresh berry yield
		lbs/plant
87-166	30	0.07
91-199	12	0.13
91-234	7	0.18
91-251	13	0.29
91-158	7	0.77
91-191	21	0.82
91-58	11	0.82
87-223	31	1.27
Sharpblue	24	1.44
Gulf Coast	294	1.45
87-220	45	2.49
87-108	39	3.69

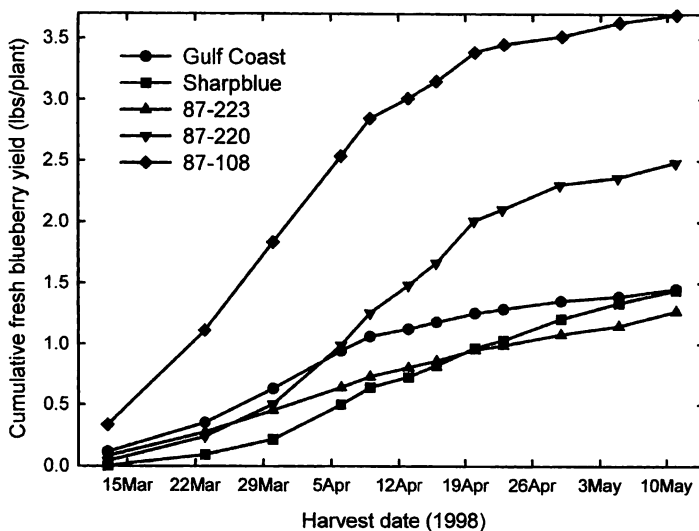


Figure 1. Blueberry fruit yields and timing of harvests for five blueberry cultivars.

maturity for the cultivars shown in Fig. 1. Approximate mid-season 1998 harvest dates were 31 Mar for 87-108, 1 Apr for 'Gulf Coast', 7 Apr for 87-223, 9 Apr for 'Sharpblue', and 10 Apr for 87-220.

'Gulf Coast' yield and harvest season varied considerably from 1997 through 2000 (Fig. 2). Total annual yields ranged between 0.7 and 2.5 lbs fresh berries/plant. The earliest harvest season was in 1998, and the latest was in 1999. The approximate mid-season harvest dates were 30 Mar in 1997, 1 Apr in 1998, 5 May in 1999, and 3 Apr in 2000. Year-to-year yield variation was most likely due to differential response to pruning method and climatic fluctuations (air temperature and rainfall patterns). The autumn and winter of 1998-99 were particularly abnormal, with the autumn warmer than average and the late winter cooler than average. We feel that this was a major cause of the late harvest season and low yield that occurred in 1999.

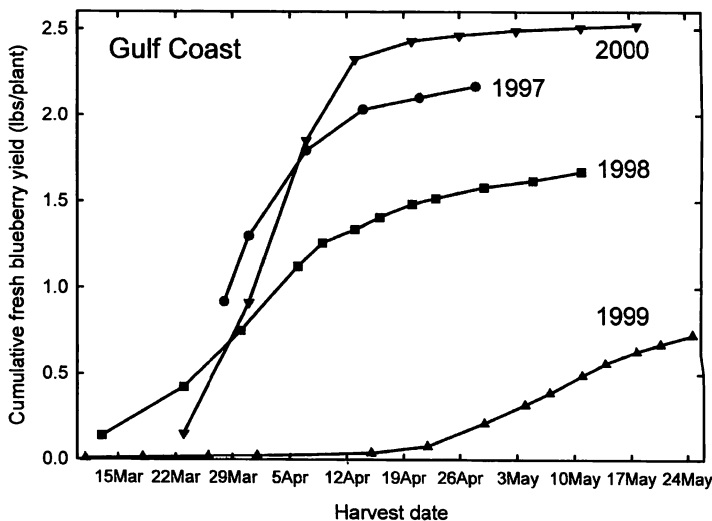


Figure 2. Harvest seasons and blueberry yields for the 'Gulf Coast' cultivar planted on compost-amended soil.

The SWFREC blueberry planting has demonstrated that southern highbush cultivars will produce fruit of acceptable yield and quality in the south Florida climate. Compost proved to be a better soil amendment than peat for adding organic matter. Of the commercially-available cultivars tested, both 'Gulf Coast' and 'Sharpblue' would be candidates for commercial plantings. Of the numbered selections evaluated, 87-108, 87-220, and 87-223 performed the best. The 87-108 cultivar yielded 2.5 times more fruit than 'Gulf Coast' and 'Sharpblue' in 1998, and has been a vigorous, prolific producer each year. Its main drawback that could keep it from becoming a significant commercial variety is a picking scar that tears easily and is somewhat "leaky."

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## FREEZE PROTECTING FLORIDA BLUEBERRIES

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**Abstract.** Blueberries are grown commercially in Florida from La Belle north. The plants are cold-hardy if dormant, but lose cold-hardiness as they come out of dormancy from late January through April. Growers use overhead irrigation to protect the flowers, fruit, and tender spring vegetation from freezes. Critical temperatures below which protection will be needed depend on wind speed, dew point, and the stage of development of the flowers and fruit. Cultivars vary in cold tolerance, even when they appear to be at the same stage of flower development. Pine-bark mulch, dry soils, grass strips between the rows, and planting in 'frost pockets' can increase freeze damage on nights with clear skies, light winds, and low dew point. During severe freezes, with low temperatures, high winds, and low dew point, use of overhead irrigation can increase damage to the crop. Overhead irrigation should not be used if evaporative cooling would exceed the heat produced by ice formation. Thoroughly wetting the ground just prior to the freeze can be useful on certain nights when it is too cold to irrigate during the freeze.

Southern highbush blueberries are grown commercially in Florida from La Belle north to the Georgia line, with most of the production in the area from Plant City to Jacksonville. There is also increasing acreage of southern highbush blue-

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berry in southeastern Georgia around Homerville. The goal of Florida blueberry growers is to harvest blueberries for the fresh market from 1 April to 15 May. During this period, Florida weather is favorable for producing and harvesting high-quality fruit. Cool nights and warm, sunny days increase berry firmness and Brix. Humidity is low, and any dew on the berries dries quickly after sunrise. Extended rains that delay harvest and split the berries are rare. Temperatures are comfortable for workers hand-harvesting the fruit. This season also comes between the end of blueberry harvest in Chile (the major exporter of fresh blueberries to the U.S. from November to March) and the beginning of harvest in the first major production area to the north (southeastern North Carolina about 20 May).

The blueberry varieties grown in Florida require 50 to 70 days to ripen after the flowers open (Lyrene, 1989). The length of this period depends on the variety, and is shortest when the plants are vigorous, heavily leafed, and are carrying a light crop, and when temperatures are above normal during the period between flowering and fruit ripening. Extended cool periods after flowering greatly delay maturation.

Blueberries that ripen in early April come from flowers that are pollinated in early February. Blueberry flowers become vulnerable to hard freezes several weeks before they are pollinated and can be killed by hard freezes in late January. Thus, blueberry flowers in Florida that are not protected from cold are frequently killed by freezes, and yields are often reduced. Overhead irrigation is currently the only method of freeze protection widely used in Florida by commercial blueberry growers. The ice load that accumulates during freeze protection is less damaging to blueberry plants than to citrus. Blueberry plants are more supple than citrus; they also have fewer leaves during the season when freeze protection is needed and accumulate a smaller ice load. Information on the use of overhead irrigation to protect various crops from freezes was presented by Harrison et al., 1972.