

## NEW BUSH BEAN CULTIVARS FOR MIAMI-DADE COUNTY

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**Abstract.** Bush beans are an important and usually profitable vegetable crop produced for the fresh market in Miami-Dade County. Improved cultivars are needed that yield well during the production season from September to mid-April, or in some years to mid-May. Growers need to know which cultivar is likely to perform best in a given period of the growing season. Six new or not locally planted cultivars ('Dusky', 'Ambra', 'Capricorn', 'Thoroughbred', 'Charon', and 'Caprice') were compared to 'Leon' and 'Opus' in a randomized complete block design with four replications. The beans were planted on 18 December 2003, the harshest period for bean production, and harvested on 19 February 2004. Yields in declining order were 'Leon', 'Dusky', 'Opus', 'Ambra', 'Capricorn', 'Thoroughbred', 'Charon', and 'Caprice', but not all differences were significant statistically. The yields of 'Thoroughbred', 'Charon', and 'Caprice' would have benefited by allowing several additional days prior to harvest. To determine performance during the latter part of the growing season, all of the above cultivars

plus 'Greenback' were planted on 4 March 2004. In this late winter planting, 'Ambra', 'Dusky', and 'Greenback' had the highest yields. 'Dusky' yielded second best in both seasons, and this was the only cultivar to perform very well irrespective of the time of planting. In addition, 'Dusky' has dark green, tender, and straight pods, which are favored by the market.

Bush beans (*Phaseolus vulgaris* L.) are an important traditional vegetable crop in Miami-Dade County with harvested acreage fluctuating between 12,000 and 21,000 acres during 1980-1998 (Degner et al., 2000; Li et al., 2001). Since 1985, Miami-Dade has been Florida's leading producer of snap beans, and accounts for more than 50% of the state's production. Yields in Miami-Dade average about 185 bushel per acre. The production and marketing cost in 1999-2000 was approximately \$18 per bushel or \$3,329 per acre for an acceptable yield of 185 30-lb bushel per acre (Smith and Taylor, 2001). Beans produced in Miami-Dade County are sold for the fresh market nationwide during the winter. In the 1997-98 season, revenues from snap beans in Miami-Dade County—spurred by record yields and high prices—soared to \$73.5 million, making snap beans the highest revenue generating vegetable crop for the county that year (Degner et al., 2000).

Since bush bean is a 50 to 60-day crop, it can be planted and harvested several times during the season (Hochmuth et al., 2003). Beans can be rotated with squash (*Cucurbita pepo* L.), boniato [*Ipomoea batatas* (L.) Poir.], cucumber (*Cucumis sativus* L.), tomato (*Lycopersicon esculentum* L.), and eggplant (*Solanum melongena* L.). The harvest season extends from November to the middle of May. Bush beans are harvested by hand or by mechanical harvesters. Mechanical harvesting is efficient, but loses 10% to 25% of the pods.

The planting season extends from September to mid-March. If planted later, the risk is high that bean golden mosaic virus (BGMV) will damage the crop, since at that time the density of the whitefly vector of this virus is high. In addition the risk of rust diseases increases in the late season. However, if late-season market demand is strong, some growers may risk

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late planting. Of great importance to growers are varieties that produce well and reliably throughout the period, September through April. The major varieties currently grown in Miami-Dade County are the bush beans, 'Opus', 'Leon', 'Bronco', and 'Ambra'.

The purpose of this study was to evaluate a number of new varieties for their suitability for production in Miami-Dade County.

### Materials and Methods

Randomized complete block design trials each with four replicates were conducted on well-tilled Krome gravelly loam soil on a commercial farm near Florida City, Fla. Each plot was 18 ft long with three rows spaced 30 inches apart. S-metolachlor (Syngenta, Greensboro, N.C.), imidacloprid (Bayer CropScience, Research Triangle Park, N.C.), azoxystrobin (Syngenta), and KeyPlex (Morse Enterprises Ltd., Inc., Miami, Fla.) were preplant incorporated. Immediately prior to seeding, 650 lbs/acre of 7-11-14 fertilizer was incorporated into the soil. Each bush bean cultivar was seeded with 30 inches between rows and 2 inches between plants within the row. A side dressing of 650 lbs/acre of 8-8-16 fertilizer was applied at 25 d after seeding in the winter trial, and at 21 d after seeding in the spring trial. Dyna-Gro foliar fertilizer containing micronutrients (Stoller Chemical of Florida, Inc., Eustis, Fla.) was applied at 1 quart·acre<sup>-1</sup> in a tank mix with insecticides and fungicides (spinosad, Dow AgroSciences, Indianapolis, Ind.; oxamyl, DuPont Crop Protection, Wilmington, Del.; and chlorothalonil, Syngenta) seven times during the growing season. The plantings were irrigated with water drawn from the Biscayne aquifer by means of a water cannon. The first trial received 4.3 inches of rainfall, and second trial received 2.2 inches.

For the first trial, the seeds were planted on 18 Dec. 2003, and harvested 63 d later on 19 Feb. 2004, while for the second trial the seeds were planted on 4 Mar. 2004 and harvested 57 d later on 28 Apr. 2004.

In the first trial, six new or not locally planted cultivars, 'Dusky', 'Ambra', 'Capricorn', 'Thoroughbred', 'Charon,' and 'Caprice', were compared to 'Leon' and 'Opus'. In the second trial 'Greenback' was added to this list.

In order to obtain yield data, entire plants were removed from a 10-foot section of the middle row of the plot, placed into a plastic bag, and stored overnight in a refrigerated room. Then all of the pods were removed and divided into marketable yield and culls. Twenty pods from each cultivar were selected at random and their dimensions, shape, color, and degree of seed development were determined.

### Results

During the rigorous winter months, 'Leon' was the highest yielding cultivar while 'Dusky' and 'Opus' were almost tied for second place (Table 1). The statistical analysis shows uncertainty in concluding that the yield of 'Leon' is significantly higher than that of 'Dusky'. However, the conclusion that the yield of 'Leon' is better than that of 'Opus' is established at the 95% level of probability.

During the late-winter-early-spring period, 'Ambra' was the highest yielding cultivar, while 'Dusky' and 'Greenback' finished in the second and third places, respectively (Table 2). The statistical analysis shows uncertainty in concluding that the yield of 'Ambra' is higher than that of 'Dusky'. How-

Table 1. Yields of bush bean cultivars seeded on 18 Dec., 2003.

Cultivar	Yield in 30-lb boxes/acre
Leon	245 a
Dusky	203 ab
Opus	198 bc
Ambra	177 bcd
Capricorn	176 bcd
Thoroughbred	154 cd
Charon	135 d
Caprice	53 e

Means within a column followed by the same letter do not differ significantly ( $P > 0.5$ ; Duncan's Multiple Range Test).

ever the conclusion that the yield of 'Ambra' is higher than that of 'Greenback' is established at the 95 percent level of probability.

The characteristics of the pods are recorded in Table 3. 'Caprice' and 'Dusky' had the darkest green pods. Attractive shape and size, good quality, and tenderness characterized the pods of 'Capricorn', 'Charon', 'Dusky', 'Leon', 'Caprice', and 'Thoroughbred'. The pods of 'Ambra', 'Greenback', and 'Opus' were slightly tough. All of the cultivars included in these trials are susceptible to BGMV. Symptomatic plants were found only in the second trial, and the frequencies of infection are shown in Table 2.

### Discussion

The yields of 'Thoroughbred', 'Charon', and 'Caprice' would have benefited by allowing several additional days prior to harvest. In particular, 'Caprice' needed a considerably longer period to reach harvest maturity, since the pods of 'Caprice' had only grown to 2 inches in length by the day of harvest in the first trial. However, growers tend to favor cultivars with the shortest preharvest time requirement, since rapidly developing cultivars require fewer pesticide applications than those developing more slowly.

'Dusky' yielded second best in both seasons. This was the only cultivar to perform well irrespective of the time of planting. 'Dusky' has dark green, tender, and straight pods. 'Leon' yielded high in the winter but not in the spring. Its pods are medium green and of good quality. The yield of 'Ambra' was highest of all during the spring, and its pods have good quality, although they are slightly tough. 'Greenback' yielded well

Table 2. Yields of bush bean cultivars seeded on 4 Mar., 2004.

Cultivar	Yield in 30-lb boxes/acre	Percent of plants with BGMV symptoms
Ambra	385 a	6.6
Dusky	335 ab	2.4
Greenback	300 bc	5.3
Opus	262 c	3.6
Capricorn	259 c	3.3
Thoroughbred	253 c	9.7
Charon	245 c	8.4
Leon	228 c	5.7
Caprice	143 d	4.6

Means within a column followed by the same letter do not differ significantly ( $P > 0.5$ ; Duncan's Multiple Range Test).

Table 3. Characteristics of pods of the various snap bean cultivars. Observations based on examination of 20 pods of each cultivar.

Cultivar	Seed source	*Pod length (cm)	Sieve size	Tip length (cm)	Pod cross section	Seed size	Pod shade of green	Comments about pod shape and quality and timeliness of harvest
Capricorn	Syngenta/Rogers	13.2 ± 1.14	3.5-4	1	round	large	medium-dark	Slightly curved, small bumps, slightly over-mature, could have been harvested 1 day earlier.
Charon	Syngenta/Rogers	12.9 ± 1.10	2.5-3	1.5	oval	small	medium	Nice pods, smooth, no bumps, very tender, could have been harvested 1-2 days later.
Dusky	Syngenta/Rogers	13.1 ± 0.96	2.5-3	1.5	oval	small	dark	Tender (succulent), and straight.
Leon	Syngenta/Rogers	13.1 ± 1.53	2.5-3	1	round	small	medium	Tender pods (succulent), small bumps, straight pods.
Ambra	Harris Moran	13.9 ± 0.99	3	1.5	round-oval	small	medium	Long tips, good quality, but slightly tough.
Caprice	Harris Moran	10.5 ± 1.82	1-3	1.5	round	very small	dark	Very succulent, many small pods, could have been harvested several days later.
Opus	Seminis	12.6 ± 1.88	3-3.5	1	oval	small	light	Good quality, somewhat tough, smooth, and straight.
Thoroughbred	Seminis	12.9 ± 1.35	2.5-3	1	oval	small	medium	Good quality, nice, no bumps, succulent.
Greenback	Shamrock	12.8 ± 1.48	3		round-oval	medium	light-medium	Pods similar to those of Opus, good quality, but somewhat tough.

\*Mean length of 20 pods and the standard deviation is given.

in the spring, but its color is light to medium green and its pods are somewhat tough. Currently, the marketplace appears to favor dark green, tender pods.

### Conclusions

When planted in December, 'Leon', 'Dusky', and 'Opus' were the highest yielding cultivars. However, when planted in March, 'Ambra', 'Dusky', and 'Greenback' had the highest yields. Since 'Greenback' was not included in the December trial, we do not know how it would yield when grown in the winter months. 'Dusky' yielded second best in both seasons, and this was the only cultivar to perform very well irrespective of the time of planting. In addition 'Dusky' has dark green, tender, and straight pods.

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Calif.; 'Ambra' and 'Caprice'), Seminis (Oxnard, Calif.; 'Opus' and 'Thoroughbred'), Shamrock Seeds (Salinas, Calif.; 'Greenback'), and Rogers/Syngenta Seeds, Inc. (Boise, Id.; 'Capricorn', 'Charon', 'Dusky', and 'Leon').

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