

CALABAZA YIELD AND SIZE AT TWO SPACINGS WHEN GROWN ON VARIOUS PLASTIC MULCHES AS A SECOND CROP

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Abstract. Experimental hybrid SS13, a semi-bush tropical pumpkin (calabaza), *Cucurbita moschata*, was grown in 2000 in Apopka, Fla., on polyethylene-mulched raised beds with drip irrigation to evaluate the effects on yield and fruit size of 3- and 4-foot spacings. There were seven black mulches at two thicknesses, two black on white, two white, three silver, two blue, and one each of black, olive, red, green, and brown for a total of 28 types of mulch. Plots were 50 feet long with four replications in a randomized complete block design. Transplanting to the field, after a crop of tomato and pepper, occurred on 6 September. An early freeze occurred on 22 November, terminating vine growth and fruit development. Fruit diameter ranged between 3.6 and 8.3 inches and was not affected by mulch type. The 4-foot spacing was higher than the 3-foot spacing in fruit diameter, number of fruit, and fruit weight per plant. But, the 3-foot spacing had a higher yield per acre than the 4-foot spacing (367 vs 317 cwt.)

Calabaza [*Cucurbita moschata* (Duchesne ex Lam.) Duchesne ex Poir.] is in the Cucurbitaceae or squash family (Maynard and Olsen, 2000). It is known by several common names: tropical pumpkin, West Indian pumpkin, green pumpkin, Cuban pumpkin, and Cuban squash (Cooper et al., 1998; Stephens, 1988). Calabaza is a common vegetable throughout the Caribbean, Central and South America, and southern Florida (Meadows, 1998; Unander and Varcla-Ramirez, 1988; Volin and Matthews, 1979). Calabaza fruit grow on a very long, vining plant, reaching 50 ft (Spence, 1998). Semi-bush experimental hybrids have been developed in Florida and evaluated along with the vining type (Hochmuth and Davies, 1999).

The objectives of this study were to evaluate a new semi-bush type of calabaza as a second crop when grown in the fall on several colors and two thicknesses of polyethylene mulch and to determine yield and size effects by 3- and 4-ft in-row spacings.

Material and Methods

Twenty-eight types and/or colors of polyethylene mulch were laid 7 Mar. 2000 for a spring tomato (*Lycopersicon esculentum* Mill.) and pepper (*Capsicum annuum* L.) crop. The mulches were eight black 1 mil, seven black 0.8 mil, three silver (non-reflecting), two black-on-white, two white, two blue, and one each of olive, red, brown and green. Plots were 50 ft long and replicated four times in a randomized complete

block design. Seed of calabaza experimental hybrid SS13 from Dr. Bruce Carl's breeding program were planted 21 Aug. 2000 into trays placed in a greenhouse. They were transplanted to the field 6 Sept. 2000. The mulched beds were 5 ft apart and five plants were spaced at 3 ft and five plants at 4 ft in the row per mulch treatment for each replication. Irrigation and fertilization were applied daily by drip tape. A once a week insect and disease spray schedule was followed. Early plant growth was estimated at 23 days after transplanting (DAT) by counting the number of small, medium, and large plants. A freeze on 22 Nov. 2000 terminated vine growth and fruit development 77 DAT. Individual weight and diameter of marketable fruit were collected. Data were analyzed by analysis of variance and means were compared using Duncan's Multiple Range test, 5% level.

Results and Discussion

Early plant growth (23 DAT) was affected by mulch color (Table 1). Blue, olive, and silver-colored mulches had significantly more small plants than the other colors. The black 1 mil and 0.8 mil, red, and olive had significantly more medium-sized plants, and the black-on-white, white, and green had significantly more large plants than the other colors. There were no significant differences in early plant growth between the 3- and 4-ft spacings across all mulch colors and thicknesses, but the 4-ft spacing had significantly more small plants ($P \leq 10\%$; Table 2).

How fall-grown calabaza responded to the different plastic mulches at 3- and 4-ft in-row spacings is found in Table 3. Twenty-five of the 28 plastic mulches were not significantly different for marketable yield and 24 were not different for the average fruit weight at the 3-ft spacing. Yield was significantly less when grown on one of the two blue, one of the three silver, and on the red mulches. Average fruit weight was less on the black-on-white 65%, white, one of the three silver, and the red mulches. Yield ranged from 300 to 416 cwt. per

Table 1. Plastic mulch color effects on early calabaza growth. MREC-Apopka, Fla., 29 Sept.2000.

Color	No. plastics	No./plot		
		Small	Medium	Large
Blue	2	6 a ^c	17 b	17 b
Olive	1	5 a	23 a	12 bc
Silver	3	5 a	16 b	19 b
Red	1	3 bc	24 a	13 bc
Black .8 mil	7	2 bc	25 a	13 bc
Black 1 mil	8	3 bc	26 a	11c
Brown	1	3 bc	19 b	17 b
White	2	3 bc	14 bc	23 a
Black/White	2	2 bc	13 c	25 a
Green	1	1 c	16 b	23 a

^cMean separation within columns by Duncan's Multiple Range Test, 0.05 level.

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Table 2. Plant spacing effects on early calabaza growth. MREC-Apopka, Fla., 29 Sept. 2000.

Spacing (ft)	No. plants		
	Small	Medium	Large
3	35	315	
4	51	283	225
	ns ^a	ns	ns

^ans—Mean separation within columns are not significant by Duncan's Multiple Range Test, 0.05 level. The number of small plants were significant at 0.10 level.

acre (15 to 20.8 tons per acre). The average marketable fruit weight ranged from 4.5 to 5.6 lb.

There were more differences at the 4-ft in-row spacing. Yield was not significantly different among 17 of the 28 plastic mulches and 24 did not differ in average marketable fruit weight. Yield ranged from 234 to 388 cwt per acre (11.7 to

Table 3. Yield and average weight of fall grown calabaza on plastic mulch when spaced 3- and 4-feet apart. MREC-Apopka, Fla., Nov. 2000.

Plastic	Yield (cwt/acre)		Ave. wt./fruit (lb)	
	3 ft	4 ft	3 ft	4 ft
B190782-1	416 a ^a	345 abc	5.0 abc	5.5 ab
B1903400-8	396 ab	352 abc	5.1 abc	5.1 abc
B190340-1	396 ab	356 ab	5.0 abc	5.3 abc
B19717-8	343 ab	332 a-d	5.2 abc	5.2 abc
B190340-8	390 ab	329 a-e	5.0 abc	5.0 abc
B190795-8	382 ab	343 abc	5.2 abc	4.9 abc
B190580-1	381 ab	325 a-e	5.0 abc	5.3 abc
B19717-1	381 ab	345 abc	5.2 abc	5.3 abc
Silver 12239	380 abc	311 b-f	5.1 abc	5.3 abc
Blue 160911	376 abc	303 b-g	4.9 abc	5.0 abc
Green thermic	375 abc	316 a-f	5.6 a	5.2 abc
B190795-1	375 abc	327 a-e	5.2 abc	5.6 a
M/B190580-8	372 abc	388 a	5.3 abc	4.8 bc
B190790-8	372 abc	331 a-d	4.9 abc	5.3 abc
B/W 65%	370 abc	276 c-g	4.7 bc	5.3 abc
B/W 52%	367 abc	347 abc	5.0 abc	5.0 abc
B190340-1	365 abc	338 abc	5.2 abc	5.1 abc
B109790-1	364 abc	362 ab	5.5 ab	5.5 ab
White LR92416	360 abc	247 fg	4.5 c	4.8 bc
Black M/B190580	359 abc	308 b-f	5.0 abc	5.4 abc
Brown thermic	358 abc	290 b-g	5.2 abc	5.2 abc
B190782-8	354 abc	339 abc	5.2 abc	5.2 abc
Silver 3LR92322	352 abc	356 ab	5.2 abc	5.3 abc
Olive thermic	352 abc	264 d-g	5.0 abc	4.8 bc
White 110844	351 abc	297 b-g	4.8 abc	4.7 c
Blue 92415	333 bc	256 e-g	4.8 abc	5.1 abc
Silver UVPE M/B	316 bc	256 e-g	4.6 c	5.2 abc
Red UV150619	300 c	234 g	4.5 c	4.9 abc

^aMean separation within columns by Duncan's Multiple Range Test, 0.05 level.

Table 4. Yield, fruit per plant, average fruit weight, and average fruit diameter of fall-grown calabaza at 3- and 4-foot plant spacings. MREC-Apopka, Fla., Nov. 2000.

In-row spacing (ft)	Yield (cwt./acre)	No./plant	Average	
			Wt. (lb)	Diameter (in)
3	367 a ^a	2.5 b	5.0 b	6.4 b
4	317 b	2.8 a	5.2 a	6.5 a

^aMean separation within columns by Duncan's Multiple Range Test, 0.05 level.

19.4 tons per acre). The average fruit weight by plastic mulch treatment ranged from 4.7 to 5.6 lb.

In general, for 3- and 4-ft spacings, the black plastic mulches produced the highest marketable weights and the heaviest average fruit, and the blue, silver, and red colors were the lowest. The blue, olive, and silver mulches also had more small plants at 23 DAT. Olive, black, and red mulches produced more medium-sized plants early, but the red mulch produced less total marketable weight. There was not a good correlation between early plant size and marketable yield and average marketable fruit weight. Fruit diameter ranged between 3.6 and 8.3 in, but was not affected by mulch color (data not shown). The 3-ft spacing had a higher marketable yield, fewer fruit per plant, less weight per fruit, and the same diameter as the 4-ft spacing (Table 4). The 4-ft spacing had fewer total plants per acre, accounting for the lower yield, but the plants produced more and heavier fruit per plant without a significant increase in fruit diameter.

In a spring variety trial, semi-bush calabaza yield ranged from 15,450 to 30,492 lb per acre (155 to 305 cwt per acre) (Hochmuth and Davies, 1999), which compares well with the fall production range of 234 to 416 cwt per acre found in this study.

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