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PRODUCTION AND CONSUMER ACCEPTANCE OF AN 'ORANGE TYPE' SPAGHETTI SQUASH IN FLORIDA

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Abstract. **'Hasta La Pasta' spaghetti squash (*Cucurbita pepo* L.) seeds were sown at 6, 12, 18, 24, or 30 inch within-row spacings (WRS) during 1993, 1994, and 1995 at the Indian River Research and Education Center, Ft. Pierce, FL. Fruit size and yield were evaluated during the 3-year trial. Fruit number and weight per plant decreased linearly or cubically as WRS increased in each trial. As WRS increased, fruit number and weight per acre decreased quadratically during 1993 and linearly during 1994. In 1995, fruit number per acre decreased quadratically with no effect on fruit weight as WRS increased. Mean fruit size (lb/fruit) increased linearly and percent small fruit (<1 lb) decreased linearly as WRS increased for each trial. Our data suggest that increasing plant population per acre (narrower WRS) generally resulted in increased fruit yield but at the expense of smaller fruit. After the 1993 trial, the fruit were placed in a customer-acceptance taste test conducted in cooperation with a local supermarket. Consumers found appearance, taste, and texture of the 'orange type' spaghetti squash to be very good and indicated they would purchase this variety of squash again.**

'Hasta La Pasta' is a unique hybrid spaghetti squash (*Cucurbita pepo* L.) This spaghetti variety features compact bush plants with small, oblong, deep orange fruit, 7 to 8 inches long (Anonymous, 1996) with a rich orange flesh or "spaghetti" (Fig. 1.). Minimal information is available on the production of spaghetti squash in Florida. Choosing an optimum plant population for any crop is one of the major decisions a vegetable grower must make (Stoffella et al., 1985). Higher plant populations have resulted in increased yields of bell pepper (Everett and Subramanya, 1983; Stoffella et al., 1984), squash (Powell et al., 1993), celery (Stoffella et al., 1985), tomatoes (Stoffella et al., 1988), and cabbage (Stoffella and Fleming, 1990) in Florida. However, at high plant populations, fruit size has generally been smaller due to more plant-plant competition for water, nutrients, and light. Fruit quality has also been reduced at higher plant populations due to more insect and/or disease pressure. Paris (1993) reported a greater preference by consumers for 'orange type' as compared with 'Vegetable Spaghetti' squash when marketed in three supermarkets in Florida. The purpose of this investigation was to evaluate the influence of within-row spacing (WRS) on fruit yield and size and consumer preference of 'orange type' spaghetti squash.

Materials and Methods

Experiments were conducted at the Indian River Research and Education Center, Fort Pierce, FL during 1993, 1994, and 1995 to evaluate the effect of five WRS. Soil type was an Oldsmar fine sand (sandy, siliceous, hyperthermic Alfic Arenic Haplaquods). Raised beds, 8 inches high and 44 inches wide, were spaced on 7 ft centers. A fertilizer consisting of 27N-48P-22K lb/acre was incorporated into the beds. Additional fertilizer, 103N-67P-202K lb/acre, was applied to the bed surface in two bands, 24 inches apart and 1 inch deep, in grooves on each bed shoulder. Beds were then covered with white (1993) and black (1994 and 1995) polyethylene plastic mulch. Different plot areas were used for each of the three seasons.

'Hasta La Pasta' squash seeds were sown in hills, 3 seeds/hill, in the center of each bed and thinned to one plant/hill upon emergence (Table 1). WRS ranged from 6 inches (12,446 plants/acre) to 30 inches (2,489 plants/acre) (Table 2). Plots consisted of 12 plants each. A randomized complete block experimental design was used with each WRS treatment replicated four times for all 3 trials.

Subsurface irrigation was provided throughout the growing seasons. Weekly applications of insecticides and fungicides were used for preventive control of insects and diseases. Paraquat was used to control weeds between the beds. All chemicals were used according to recommended label instructions.

The center 8 plants of each plot were harvested once (Table 1), and fruit from each plot were counted and weighed. Mean fruit yields were calculated on a per plant and per acre basis. Mean fruit size (lb/fruit) and percent small fruit (<1 lb) were calculated for each plot. Each variable was subjected to an analysis of variance within each trial. Main effects of WRS were separated into linear, quadratic, or cubic contrasts. Statistical analyses were conducted using the Statistical Analysis System (SAS) computer program (SAS Institute, 1988).

Harvested marketable fruit during the 1993 season were marketed at a local supermarket. Promotion with special signs and microwave cooked samples for tasting was conducted. Consumers completed an appearance, taste, and texture survey after sampling the 'orange type' squash.

Results and Discussion

Within-row plant spacing significantly affected yield variables in all three trials, except total fruit weight per acre in 1995 (Table 3). Total fruit per acre increased, linearly or qua-

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Fig. 1. 'Hasta La Pasta' spaghetti squash prior to harvest at the Indian River Research and Education Center, Fort Pierce, FL.

Table 1. Seeding and harvesting dates of within-row spacing trials.

Trial	Date		Days to harvest
	Seeded	Harvested	
1993	March 8	June 10	94
1994	September 15	December 5	81
1995	September 21	December 18	89

Table 2. Plant population of within-row spacing treatments.

Within-row spacing (inches)	Plant population (plants/acre)
6	12,446
12	6,223
18	4,149
24	3,112
30	2,489

dratically, as the spacing decreased in all three trials. In two of the 3 trials, total fruit weight per acre increased, quadratically or linearly, as spacing decreased. In the 1995 trial, fruit yields (lb/acre) did not differ among WRS. As WRS increased, average total fruit weight (lb/fruit) increased linearly in each trial (Table 4). Although total fruit yields were highest at 6 inches WRS (over 43,000 lb/acre in 1993), mean fruit size (1.38 lb/fruit) was the smallest as compared with wider WRS. Evidently, the decrease in number of plants per acre (Table 2) and linear or cubic increase in number and weight of fruit per plant and heavier fruit (Table 4) at wider WRS (lower plant populations per acre) were not sufficient to produce yields per acre equivalent to narrower (6 inches) WRS (higher plant populations) which agrees with results reported by Stoffella and Paris (1993) for 'Orangetti' spaghetti squash. Paris et al. (1985) reported fruit yield of 'Orangetti' grown in Israel as 35,680 lb/acre at 6 inches WRS and Stoffella and Paris (1993) reported 28,723 lb/acre at 6 inches WRS when grown in Florida. The 1993 trial produced higher fruit yields at 6 inches WRS (43,346 lb/acre) and declined in 1994 (27,783 lb/acre) and 1995 (22,772 lb/acre).

Non marketable fruit were attributed to small fruit size (< 1 lb), rind and flesh damage from the melonworm [*Dinphania hyalinata* (L.)], exterior fruit discoloration, and immature fruit just prior to harvest. As WRS increased the percent small fruit decreased linearly, 21.7 to 7.7%, 26.2 to 13.5%, and 26.2 to 2.9%, respectively, during each trial (Table 3). At narrower WRS, both yields and percent small fruit were higher. On the other hand, wider WRS decreased total fruit yield, but produced more marketable size fruit decreasing the percent of small fruit.

Table 3. Spaghetti squash yields and percentages of small fruit as influenced by within-row spacing.

Within-Row Spacing (inches)	Fruit Yield		Small Fruit[z] (%)
	no./acre	lb/acre	
	1993		
6	31,491	43,346	21.7
12	23,327	32,696	18.6
18	19,050	28,788	16.8
24	19,926	31,008	14.9
30	18,194	30,904	7.7
Significance[y]	Q**	Q*	L**
	1994		
6	20,605	27,783	26.2
12	14,191	18,714	24.6
18	13,348	19,172	18.6
24	12,053	17,985	13.5
30	11,041	16,295	13.5
Significance	L**	L**	L*
	1995		
6	15,162	22,772	26.2
12	10,692	18,962	4.4
18	9,720	19,115	9.5
24	8,942	20,657	3.1
30	8,008	17,676	2.9
Significance	Q*	NS	L**

[z]Fruit less than 1 lb.
[y]L = linear, Q = quadratic. Significant at 5 (*) or 1% (**) levels, respectively or nonsignificant (NS).

Table 4. Spaghetti squash yields and fruit sizes per plant as influenced by within-row spacing.

Within-Row Spacing (inches)	Fruit Yield		Fruit Size (lb/fruit)
	no./plant	lb/plant	
	1993		
6	2.53	3.49	1.38
12	3.75	5.26	1.41
18	4.59	6.95	1.50
24	6.41	9.98	1.54
30	7.31	12.43	1.70
Significance[z]	L**	L**	L**
	1994		
6	1.66	2.23	1.35
12	2.28	3.01	1.32
18	3.22	4.63	1.44
24	3.88	5.79	1.50
30	4.44	6.55	1.48
Significance	L**	L**	L**
	1995		
6	1.22	1.83	1.48
12	1.72	3.05	1.79
18	2.34	4.61	1.98
24	2.88	6.65	2.33
30	3.22	7.11	2.23
Significance	L**	L**	L*

[z]L = linear. Significant at 5 (*) or 1% (**) levels, respectively.

Table 5. Consumer quality evaluation of 'orange type' spaghetti squash, 1993.[z]

	%				
	Excellent	Very Good	Good	Fair	Poor
Appearance	20.8	68.8	8.4	2.0	—
Taste	20.8	68.8	4.1	6.3	—
Texture	20.8	72.9	4.2	2.1	—

[z]Total of 48 consumer responses. 97.9% of consumers purchasing 'orange type' spaghetti squash indicated they would purchase another.

Consumers indicated the appearance, taste, and texture of the 'orange type' squash were very good, 68.8 to 72.9% (Table 5). Over 97% of the consumers purchasing the 'orange type' squash indicated they would purchase this variety again.

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