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Optimizing Fruit Spacing in Florida Peach Production

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Peach (*Prunus persica* L.) production in the state of Florida has garnered much attention as a profitable alternative crop for growers seeking farm diversification. To produce the quality of fruit required to meet market and consumer demands, several intensive production practices must be completed at the proper time. Marketable fruit size ranges from 2.25-inch (5.7 cm) diameter to >2.5-inch (6.4 cm) diameter, with growers receiving premium prices as they are able to produce larger fruit. Four fruit-thinning treatments (unthinned, 10.2-cm (4 inch) spacing, 15.2-cm (6 inch) spacing, and 22.9-cm spacing (9 inch) were applied to three different varieties ('Flordaprince', 'Tropicbeauty', and 'UFBeauty') located at Water Conserv II (Winter Garden, FL), and one variety ('Flordaprince') in Citra, FL during the 2010 growing season. In 2011, 'UFBeauty' was replaced by 'UFSun' at Water Conserv II and a 30.5-cm (12 inch) spacing was added. Harvest of all cultivars occurred at commercial maturity and was divided into three categories: large fruit [6.4-cm (2.5 inch) diameter and greater], marketable fruit [5.7-cm (2.5 to 2.25 inch) diameter] and small, non-marketable fruit [less than 5.7-cm (2.25 inch) diameter]. In both locations, fruit spaced at the wider spacings were larger. The greatest amount of non-marketable fruit was produced when trees were not thinned. Thus, these results indicate the fruit should be thinned with 6 to 9 inches between fruit for maximum size and profitability.

The Florida peach industry has significantly expanded in the past 5 years and has increased from less than 300 acres to approximately 900 acres with several more planned for establishment. Peach production has become an attractive option for citrus growers hard hit by several diseases such as bacterial canker [*Xanthomonas campestris* pv. *citri* (Hasse) Dye], Huanglongbing (citrus greening caused by *Candidatus* Liberibacter asiaticus), and recently citrus black spot (Manjunath et al., 2008; Schubert and Sun, 2003; Schubert et al., 2010). The transition from management of a citrus grove to that of a stone fruit orchard involves significant increase in cultural practices including pruning, blossom or fruit thinning, increased scouting for diseases and pests, and multiple-day harvests.

Horticultural practices that positively affect fruit quality must be employed with the proper technique and timing to produce optimal sized fruit. Peach fruit exhibits a double sigmoidal growth curve with an exponential increase in dry weight (stage I), followed by a lag phase during pit hardening (stage II), and a final fruit swell during which fruit reach their maximum size (stage III) (Chalmers and van den Ende, 1977). Fruit must be thinned prior to pit hardening to be most effective in developing maximum diameter, one of the main criteria for the top USDA grade of fruit (USDA, 2011).

In Florida, peach orchards utilize hand labor to thin the cropload to gain maximum fruit size. Hand labor within the orchard is one of the most expensive costs and must be directed with care to achieve desired results (Martín et al., 2010). Thus thinning efforts must be timed correctly to be most efficient with limited labor resources.

The objective of this demonstration was to investigate the effect of four different thinning strategies on fruit diameter for four different low-chill peach varieties.

Materials and Methods

Peach thinning experiments were conducted at the University of Florida Plant Sciences Research and Education Unit (PSREU) in Citra, FL in 2010, and at the Mid-Florida Citrus Foundation Research Unit (MFCF) in Winter Garden, FL in 2010 and 2011. Four thinning treatments were applied: unthinned (control), 10.2-cm (4 inch) spacing, 15.2-cm (6 inch) spacing, and 22.9-cm (9 inch) spacing on single replicate trees of 'Flordaprince' in 2010 at PSREU. In addition, these treatments were duplicated on single replicate trees of 'Flordaprince', 'TropicBeauty', and 'UFBeauty' at MFCF in 2010 with 'UFSun' replacing 'UFBeauty' in 2011. In addition, the smallest spacing [10.2 cm (4 inch)] was replaced with a larger 30.5-cm (12 inch) spacing at MFCF in 2011. Trees were fertilized and irrigated as recommended by University of Florida Extension (Ferguson et al., 2007).

Thinning treatments were applied in the spring of 2010 (PSREU and MFCF) and 2011 (MFCF) (Table 1) (England and Atwood, 2010). Fruit were harvested at commercial maturity as appropriate for the melting ('Flordaprince' and 'TropicBeauty') or non-melting flesh variety ('UFBeauty' and 'UFSun') (Table 1). At harvest, fruit were separated into three categories: small (less

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Table 1. Thinning dates in 2010–2011 for peach varieties at the Plant Sciences Research and Education Unit (PSREU) in Citra, FL and the Mid-Florida Citrus Foundation (MFCF) in Winter Garden, FL.

Location	Cultivar	Thinning dates	Harvest dates
PSREU	Flordaprince	15, 22 Mar. 2010	12, 14, 19, 21, 26, 31 May 2010
MFCF	Flordaprince	19, 31 Mar.; 9 Apr. 2010; 23 Feb., 14 Mar., 4 Apr. 2011	30 Apr.; 7, 13, 20 May 2010; 12, 20, 26, 29 Apr. 2011
	TropicBeauty	19, 31 Mar.; 9 Apr. 2010; 18 Feb., 16 Mar., 4 Apr. 2011	7, 13, 20, 27 May 2010; 10, 18 May 2011
	UFBeauty	9 Apr. 2010	20, 27 May 2010
	UFSun	23 Feb., 14 Mar., 4 Apr. 2011	20, 29 Apr., 18 May 2011

Table 2. Thinning results for three classes of fruit diameter: small (<2¼ inch), medium (2¼–2½ inch), and large (>2½ inch) of the peach cultivar 'Flordaprince' in two locations in north central Florida (2010) and central Florida [2010–2011; (England and Atwood, 2010)]. Fruit thinning treatments were unthinned (control), 4 inch (10.2 cm), 6 inch (15.2 cm), and 9 inch (22.9 cm) in 2010. In 2011, the 4-inch spacing was replaced with a larger 12-inch (30.5 cm) spacing (England and Atwood, 2010).

Location and year	Treatment	Small fruit	Medium fruit	Large fruit	Total yield	% Marketable
PSREU[z] (2010)	Unthinned	39.1	15.6	2.6	125.9	31.7
	4 inch	27.1	58.2	7.7	93.0	70.9
	6 inch	22.5	29.2	3.3	55.1	59.1
	9 inch	44.0	12.8	19.3	76.0	42.2
MFCF[y] (2010)	Unthinned	12.9	7.9	2.5	23.4	44.7
	4 inch	8.3	11.5	7.2	27.0	44.1
	6 inch	5.6	11.5	10.6	27.7	79.9
	9 inch	5.7	9.3	8.0	23.0	75.2
MFCF[y] (2010)	Unthinned	99.1	0.3	0	99.4	<1%
	6 inch	50.2	7.1	0.9	58.2	13.7
	9 inch	34.6	12.5	2.7	49.8	30.6
	12 inch	35.9	12.1	1.0	49	26.7

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[y]Mid-Florida Citrus Foundation Research Unit, Winter Garden, FL (central Florida).

than 57.2 mm or 2¼ inch), medium [57.2 mm (2¼ inch) to 63.5 mm (2½ inch)], and large fruit [greater than 63.5 mm (2½ inch)].

Results and Discussion

Previous results from thinning experiments at MFCF indicated that larger spacings between fruit were advantageous to increasing the fruit diameter, specifically those spacings of 6 inches and 9 inches (Table 2; England and Atwood, 2010). However, in 2010 at PSREU, the greatest percentage of marketable fruit was found when 'Flordaprince' fruit were spaced at 10.2 cm (4 inch) between fruit (Table 2). Marketable fruit includes fruit with diameters from 57.2 cm (2¼ inch) to 63.5 cm (2½ inch)and greater. A trend towards larger fruit with wider spacings between individual fruit was observed as indicated by increasingly larger total yield in the larger classes (Table 2). This is of significance, as growers receive a premium for large diameter fruit (e.g., above 2½ inches) early in the season.

In 2011, 'Flordaprince' fruit at MFCF exhibited larger fruit diameter with increasing fruit spacing (Table 2). Fruit with spacings of 22.9 cm (9 inch) and 30.5 cm (12 inch) had a greater percentage of marketable fruit (27% to 31%) than the unthinned control (0.3%). 'UFBeauty', 'UFSun', and 'Tropicbeauty' fruit diameter responded similarly to increasing the spacing between fruit and exhibited larger diameters at spacings of 22.9 cm (9 inch) and 30.5 cm (12 inch) (Tables 3–5).

Total yield was lowest for 'UFSun' in 2011 (Table 4). This cultivar appeared to be particularly sensitive to irrigation deficits,

Table 3. Thinning results for three classes of fruit diameter: small (57.2 cm; <2¼ inch), medium (57.2–63.5 cm; 2¼–2½ inch), and large (63.5 cm; >2½ inch) of the peach cultivar 'UFBeauty' at the Mid-Florida Citrus Foundation Research Unit (MFCF) in Winter Garden, FL in 2010. Fruit thinning treatments were unthinned (control), 10.2-cm (4 inch), 15.2-cm (6 inch), and 22.9-cm (9 inch) spacing.

Treatment	Small fruit (kg)	Medium fruit (kg)	Large fruit (kg)	Total yield (kg)	% Marketable
Unthinned	18.2	23.0	7.5	48.7	62.7
4 inch	15.6	19.2	3.1	37.9	58.8
6 inch	3.8	9.2	8.8	21.8	82.5
9 inch	2.7	5.6	9.2	17.5	52.4

Table 4. Thinning results for three classes of fruit diameter: small (57.2 cm; <2¼ inch), medium (57.2–63.5 cm; 2¼–2½ inch), and large (63.5 cm; >2½ inch) of the peach cultivar 'UFSun' at the Mid-Florida Citrus Foundation Research Unit (MFCF) in Winter Garden, FL in 2011. Fruit thinning treatments were unthinned (control), 15.2-cm (6 inch), 22.9-cm (9 inch) and 30.5-cm (12 inch) spacing.

Treatment	Small fruit (kg)	Medium fruit (kg)	Large fruit (kg)	Total yield (kg)	% Marketable
Unthinned	40.9	1.9	0	42.8	4.4
6 inch	21.5	13.9	2.9	38.3	42.9
9 inch	17.2	11.1	1.9	30.2	43.0
12 inch	15.9	17.8	5.5	39.2	59.5

Table 5. Thinning results for three classes of fruit diameter: small (57.2 cm; <2¼ inch), medium (57.2–63.5 cm; 2¼–2½ inch), and large (63.5 cm; >2½ inch) of the peach cultivar 'TropicBeauty' at the Mid-Florida Citrus Foundation Research Unit (MFCF) in Winter Garden, FL in 2010–2011. Fruit thinning treatments were unthinned (control), 4 inch (10.2 cm), 6 inch (15.2 cm), and 9 inch (22.9 cm) in 2010. In 2011, the 4-inch spacing was replaced with a larger 12-inch (30.5 cm) spacing (England and Atwood, 2010).

Year	Treatment	Small fruit (kg)	Medium fruit (kg)	Large fruit (kg)	Total yield (kg)	% Marketable
2010	Unthinned	35.3	8.8	1.4	45.5	22.5
	4 inch	15.9	14.0	5.1	35.0	54.6
	6 inch	17.1	25.3	10.3	52.7	67.5
	9 inch	16.0	14.0	1.8	31.8	49.8
2011	Unthinned	63.3	1.6	0	64.9	2.5
	6 inch	26.9	38.4	14.2	79.5	66.2
	9 inch	17.9	25.7	7.4	51.0	54.9
	12 inch	13.8	25.4	11.9	51.1	73.3

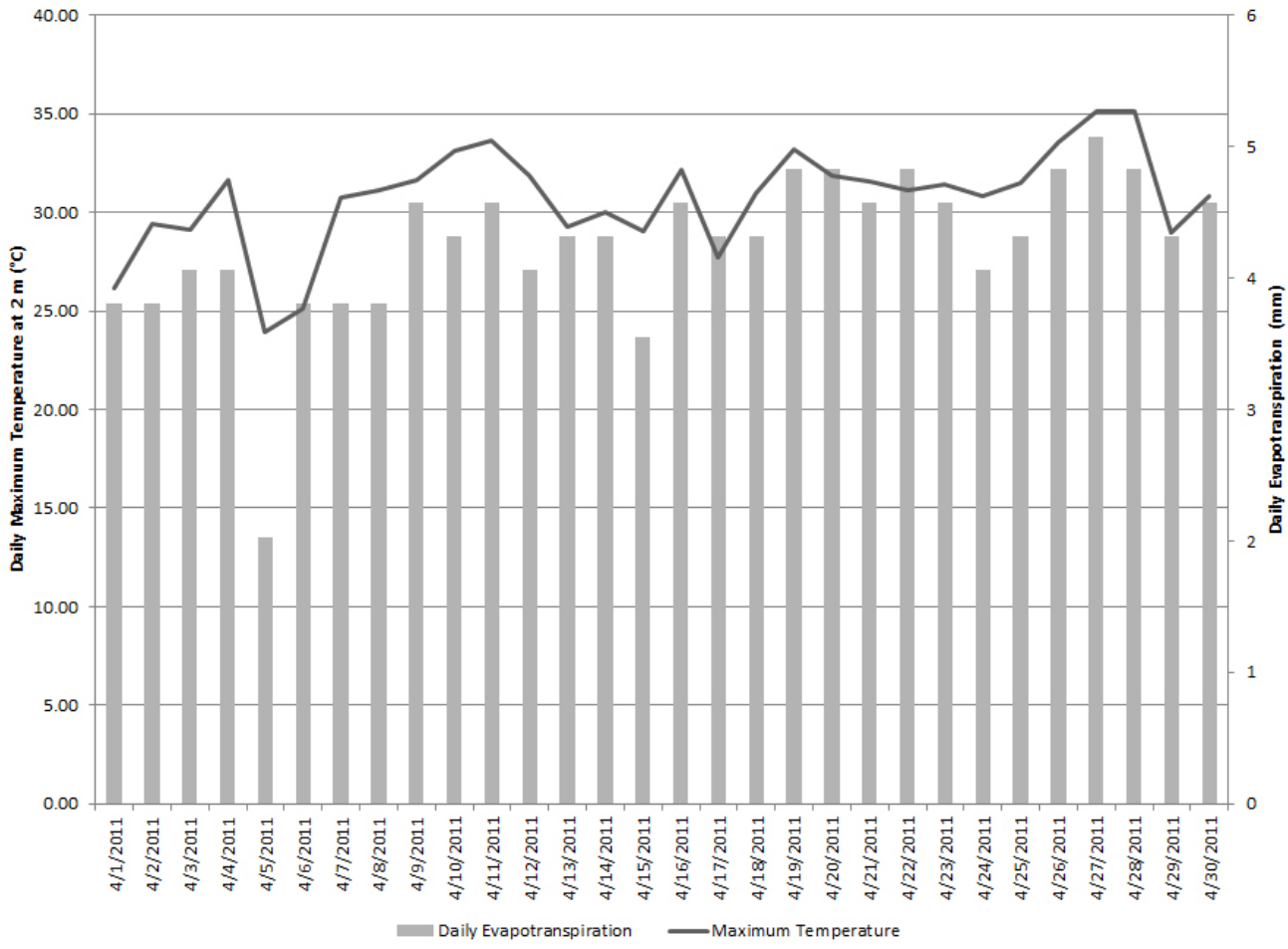

Fig. 1. Daily maximum temperature (°C) and evapotranspiration (mm/day) as recorded in Apr. 2011 from the Avalon station (Florida Automated Weather Network).

while 'Flordaprince' (Table 2) and 'TropicBeauty' (Table 5) did not exhibit this reduction in total yield. An irrigation system malfunction during 17–25 Apr. 2011 caused extreme drought stress, resulting in partial defoliation of 'Flordaprince' and 'UF-Sun' (Fig. 1).

These preliminary observations indicate that wider spacing is beneficial to achieve maximum fruit spacing on low-chill cultivars grown in Florida. Although not one particular thinning treatment resulted in consistently larger fruit diameter, there was a trend towards larger fruit with wider spacing. Thus, thinning is an essential practice that must be employed in Florida orchards to gain maximum economic benefit.

Literature Cited

Chalmers, D.J. and B. van den Ende. 1977. The relation between seed and fruit development in the peach (*Prunus persica* L.). Ann. Bot. 41:707–714.

England, G.K. and R.A. Atwood. 2010. Deciduous fruit crop demonstration area at Water Conserv II Project in central Florida. Fla. State Hort. Soc. 123:18–19.
Ferguson, J., J. Chaparro, J.G. Williamson, R. Rouse, and R. Mizell. 2007. Florida subtropical peaches: Production practices. <http://edis.ifas.ufl.edu/HS348>. Accessed: 4 Nov. 2009.
Manjunath, K.L., S.E. Halbert, C. Ramadugu, S. Webb, and R.F. Lee. 2008. Detection of 'Candidatus Liberibacter asiaticus' in *Diaphorina citri* and its importance in the management of citrus huanglongbing in Florida. Phytopathology 98:387–396.
Martín, B., A. Torregrosa, and J. Garcia Brunton. 2010. Post-bloom thinning of peaches for canning with hand-held mechanical devices. Sci. Hort. 125:658–665.
Schubert, T. and X. Sun. 2003. Bacterial citrus canker, p. 6. Plant Pathol. Circ. No. 377. Florida Dept. of Agr. and Consumer Serv., Tallahassee.
Schubert, T., B. Sutton, and A. Jeyaprakash, 2010. Citrus black spot (*Guignardia citricarpa*) discovered in Florida. Florida Dept. of Agr. and Consumer Serv., Div. Plant Ind., Tallahassee.