Effect of bloom and fruit thinning on quality characteristics of ‘Harvester’ and ‘Redglobe’ peach fruit varieties in Georgia

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Introduction

Peach trees are traditionally fruit thinned between 30-45 days after full bloom (AFB) to maximize production efficiency and fruit size. Other thinning times and methods are available. Fruit thinning is the standard management practice used by peach growers due to its consistency. In the last few years, peach growers in Georgia have been evaluating the possibility of using bloom thinning in certain varieties. However, the end result and the effect of weather events (i.e. freezes) have not allowed the determination of benefits and/or losses produced by both methods. Bloom thinning can be done during the pink flower and open blossom stages. This method can be more beneficial than fruit thinning resulting in a 10-30% increase in fruit size and yield and a reduction of labor cost needed to thin fruit (Byers and Lyons, 1984, 1985).

Objective

Compare the efficiency of bloom and fruit thinning in Georgia peach production as measured by labor use, fruit characteristics, and overall yield.

Plant Material

Trees of ‘Harvester’ and ‘Redglobe’ peaches budded to ‘Guardian’ rootstock were established in 2008 at the USDA ARS Southeastern Fruit and Nut Research Lab, Byron, GA. A total of approx. 145 trees of ‘Harvester’ and 310 trees of ‘Redglobe’ were planted.

In 2014, three treatments were evaluated: no thinning, bloom thinning (at first pink stage or full bloom), and fruit thinning (38 days AFB). Bloom thinning consisted of removing flower buds in first pink stage (just before bud break) or after full bloom by rubbing the fruiting wood and flower buds by hand (Fig. 2). Fruit thinning consisted of removing fruitlets by hand.

A split plot randomized complete block design, with varieties as main plots, were used. A total of seven blocks, with 5-6 replicates randomly assigned per treatment per block (tree as a replicate). Plots were maintained using the recommended procedures in the Southeastern peach, nectarine, and plum pest management and culture guide.

Materials and Methods

Variables. Flowering and ripening dates were recorded for each variety. The time necessary to thin a whole tree per treatment was measured using a digital timer. The personnel used for thinning work at commercial peach productions. Data for fruit per scaffold and tree trunk diameter were measured. Measurements were taken on one scaffold that was labeled per tree. Fruit were harvested once they reached commercial maturity. Multiple harvests were done and total yield was measured per tree.

Five fruit were selected randomly and rated individually per tree during harvest. Fruit were evaluated for several characteristics: blush (%), redness in the flesh (%), peach fuzz (1-9 scale, 1=undesirable and 9=almost none), fruit tip (1-9 scale, 1=highly pronounced and 9=almost none), firmness (1-9 scale, 1=soft and 9=highly firm), split pit, weight (g), and perimeter (mm). The subjective 1-9 scale represented value of 1 = undesirable to 9 = optimal. Blush and redness in flesh were rated as percent coverage. Split pit was rated as present or absent.

Data analyses. Data analyses were performed using the PROC GLM procedure in SAS Software v.9.4 (Cary, NC). Mean comparisons for each treatment were performed using LSD test, p-value ≤0.05.

References

Byers, R.E and Jr. C.G. Lyons. 1984. Flower thinning of peach with desiccating chemicals. HortScience 19:545-546.
Byers, R.E and Jr. C.G. Lyons. 1985. Peach flower thinning and possible sites of action of desiccating chemicals. J. Amer. Soc. Hort. Sci. 19:545-546.

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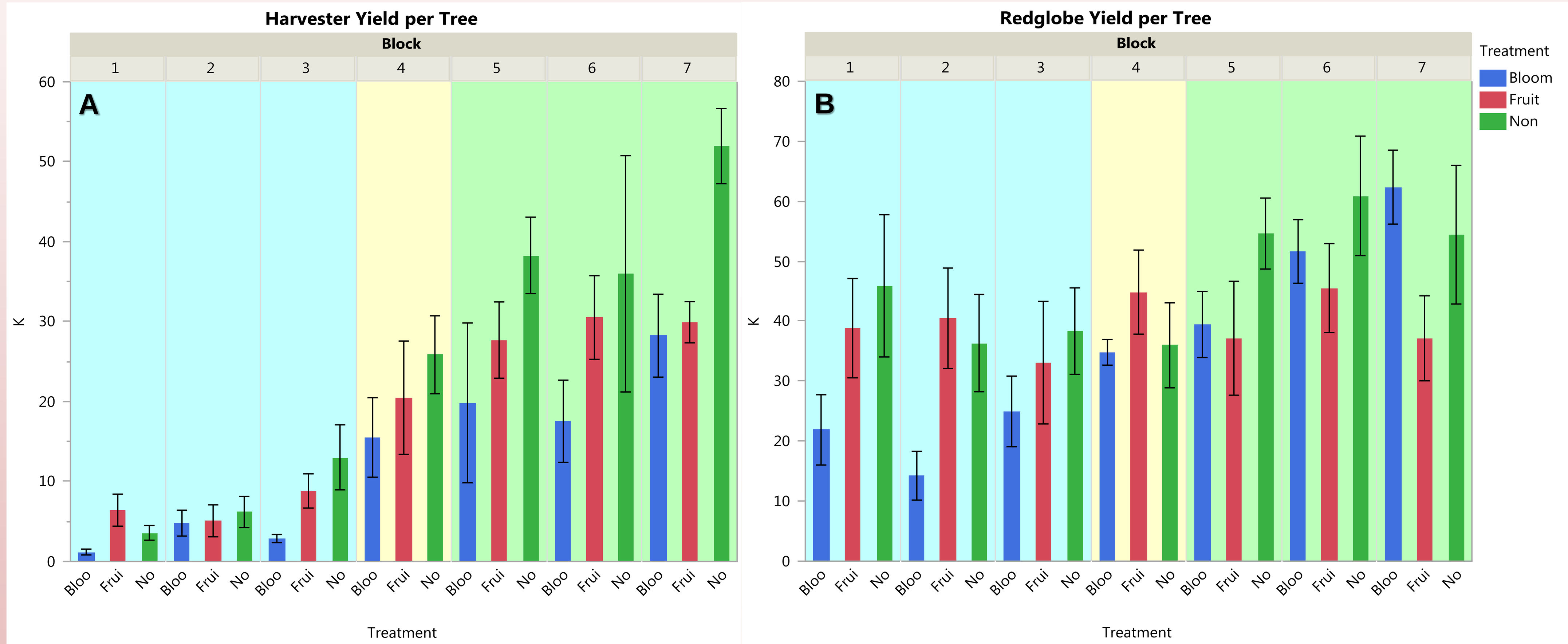

Fig. 1. Total yield (kg) per tree for A) ‘Harvester’ and B) ‘Redglobe’ peach varieties in Byron, GA after three thinning treatments: non-thinning (green bars), fruit thinning (red bars) and bloom thinning (blue bars). Ground elevation across blocks decreases from block 7 (highest point in the field) to block 1 (lowest point in the field). Freeze damage (fruit loss) in 2014 season is represented by background color with light blue (high damage), yellow (medium damage) and light green (low damage).

Table 1. ANOVA for ‘Harvester’ and ‘Redglobe’ varieties[z].

Harvester

ANOVA - Data with all the blocks (p-value)

Source	Blush	Red in flesh	Fuzz	Tip	Firmness	Split pit	Weight	Perimeter
Block	0.302	0.542	0.388	0.003	0.038	0.133	<.0001	<.0001
Treatment	0.737	0.687	0.985	0.104	0.348	0.114	0.455	0.538
Tree	0.194	0.605	0.065	0.350	0.757	0.236	0.020	0.028
Fruit(Tree)	0.963	0.001	0.089	<.0001	0.615	<.0001	0.999	0.998
Block*Treatment	0.194	0.118	0.042	0.830	0.763	0.113	0.199	0.323

Source	Yield 1	Yield 2	Total Yield	Time	Fruit per Scaffold	Trunk Diameter
Block	<.0001	<.0001	<.0001	<.0001	<.0001	0.690
Treatment	<.0001	0.284	<.0001	<.0001	<.0001	0.758
Tree	0.832	0.513	0.336	0.502	0.469	0.273
Block*Treatment	0.016	0.999	0.365	<.0001	0.017	0.466

ANOVA - Data with blocks 1,2,3 — High Freeze Damage (p-value)

Source	Blush	Red in flesh	Fuzz	Tip	Firmness	Split pit	Weight	Perimeter
Block	0.534	0.868	0.595	0.006	0.697	0.608	0.168	0.335
Treatment	0.512	0.613	0.146	0.113	0.700	0.219	0.752	0.489
Tree	0.358	0.056	0.008	0.636	0.545	0.040	0.012	0.024
Fruit(Tree)	0.732	0.000	0.986	0.001	0.883	0.003	0.522	0.296
Block*Treatment	0.377	0.599	0.541	0.465	0.370	0.172	0.021	0.055

Source	Yield 1	Yield 2	Total Yield	Time	Fruit per Scaffold	Trunk Diameter
Block	0.168	0.009	0.031	0.124	0.045	0.258
Treatment	0.029	0.036	0.016	<.0001	0.109	0.688
Tree	0.536	0.747	0.761	0.719	0.728	0.232
Block*Treatment	0.073	0.253	0.169	0.020	0.178	0.267

ANOVA - Data with blocks 5,6,7 — Low Freeze Damage (p-value)

Source	Blush	Red in flesh	Fuzz	Tip	Firmness	Split pit	Weight	Perimeter
Block	0.621	0.784	0.760	0.159	0.680	0.371	0.040	0.162
Treatment	0.584	0.445	0.562	0.288	0.321	0.660	0.246	0.320
Tree	0.176	0.956	0.022	0.420	0.232	0.858	0.011	0.043
Fruit(Tree)	0.891	0.033	0.001	<.0001	0.572	0.002	0.998	1.000
Block*Treatment	0.331	0.206	0.227	0.874	0.837	0.069	0.370	0.369

Source	Yield 1	Yield 2	Total Yield	Time	Fruit per Scaffold	Trunk Diameter
Block	0.008	0.656	0.281	0.667	0.000	0.978
Treatment	0.000	0.371	0.002	<.0001	<.0001	0.327
Tree	0.879	0.363	0.253	0.855	0.355	0.602
Block*Treatment	0.558	0.993	0.729	0.324	0.154	0.688

RedGlobe

ANOVA - Data with all the blocks (p-value)

Source	Blush	Red in flesh	Fuzz	Tip	Firmness	Split pit	Weight	Perimeter
Block	0.076	0.001	<.0001	0.005	<.0001	<.0001	<.0001	<.0001
Treatment	0.283	0.000	0.078	0.086	0.004	<.0001	<.0001	<.0001
Tree	0.642	0.010	0.000	0.132	0.003	0.035	0.036	0.022
Fruit(tree)	0.926	0.191	1.000	<.0001	0.173	<.0001	0.956	0.982
Block*Treatment	0.184	0.001	0.012	0.000	0.029	0.000	<.0001	<.0001

Source	Yield 1	Yield 2	Yield 3	Total Yield	Time	Fruit per Scaffold	Trunk Diameter
Block	0.027	0.171	<.0001	0.001	0.019	<.0001	0.450
Treatment	0.000	0.321	0.003	0.029	<.0001	<.0001	0.702
Tree	0.982	0.938	0.262	0.442	0.723	0.329	0.916
Block*Treatment	0.329	0.737	0.283	0.138	0.074	0.145	0.019

ANOVA - Data with blocks 1,2,3 — High Freeze Damage (p-value)

Source	Blush	Red in flesh	Fuzz	Tip	Firmness	Split pit	Weight	Perimeter
Block	0.599	0.108	<.0001	0.328	<.0001	0.086	0.059	0.097
Treatment	0.304	0.015	0.308	0.103	0.640	0.808	0.069	0.101
Tree	0.232	0.169	<.0001	0.048	0.234	0.170	0.039	0.020
Fruit(tree)	0.745	0.984	1.000	<.0001	0.050	<.0001	0.915	0.956
Block*Treatment	0.024	0.003	0.016	0.020	0.040	0.315	0.387	0.463

Source	Yield 1	Yield 2	Yield 3	Total Yield	Time	Fruit per Scaffold	Trunk Diameter
Block	0.138	0.650	0.775	0.720	0.616	0.112	0.920
Treatment	0.020	0.225	0.007	0.011	<.0001	0.007	0.246
Tree	0.069	0.867	0.390	0.471	0.978	0.673	0.676
Block*Treatment	0.297	0.886	0.742	0.849	0.779	0.596	0.049

ANOVA - Data with blocks 5,6,7 — Low Freeze Damage (p-value)

Source	Blush	Red in flesh	Fuzz	Tip	Firmness	Split pit	Weight	Perimeter
Block	0.127	<.0001	0.003	0.001	0.070	0.658	0.613	0.632
Treatment	0.335	0.088	0.124	0.160	<.0001	<.0001	<.0001	<.0001
Tree	0.250	0.008	0.001	0.045	0.003	0.001	0.377	0.374
Fruit(tree)	0.905	0.009	1.000	<.0001	0.230	<.0001	0.985	0.994
Block*Treatment	0.561	0.877	0.091	<.0001	0.587	0.537	0.029	0.036

Source	Yield 1	Yield 2	Yield 3	Total Yield	Time	Fruit per Scaffold	Trunk Diameter
Block	0.013	0.090	0.502	0.334	0.186	0.019	0.319
Treatment	0.010	0.395	0.019	0.042	<.0001	<.0001	0.137
Tree	0.737	0.923	0.369	0.553	0.405	0.468	0.745
Block*Treatment	0.273	0.328	0.811	0.510	0.687	0.872	0.631

[z]Freeze damage (fruit loss) in 2014 season is represented by background color with light blue (high damage), and light green (low damage). White background color represents analyses with all the blocks. Red font represents p-value ≤0.05.

Results

- A freeze occurred the day after the bloom thinning was done. The elevation/freeze damage across the field was represented by the blocks within the experiment. The blocks (1,2,3) in the lower part of the field had a higher freeze damage in comparison with blocks (5,6,7) (Table 1; Figs. 1, 3, and 4).
- Although thinning time was reduced in approx. 50% when comparing fruit thinning and bloom thinning, the use of bloom thinning decreased the overall yield per tree for blocks with high freeze damage (Fig. 4).
- Differences between varieties were present. ‘Harvester’ was more susceptible to the freeze damage than was ‘Redglobe’ during that freezing event.
- Blocks (5,6,7) with low freeze damage showed lower time for thinning per tree, higher or equivalent yield per tree, higher fruit weight (only for ‘Redglobe’) than the standard fruit thinning procedure.

Fig. 2. Comparisons between bloom thinned and non-thinned peach limbs. A) ‘Redglobe’ non-thinned, B) ‘Redglobe’ thinned, C) ‘Harvester’ non-thinned, and D) ‘Harvester’ thinned.

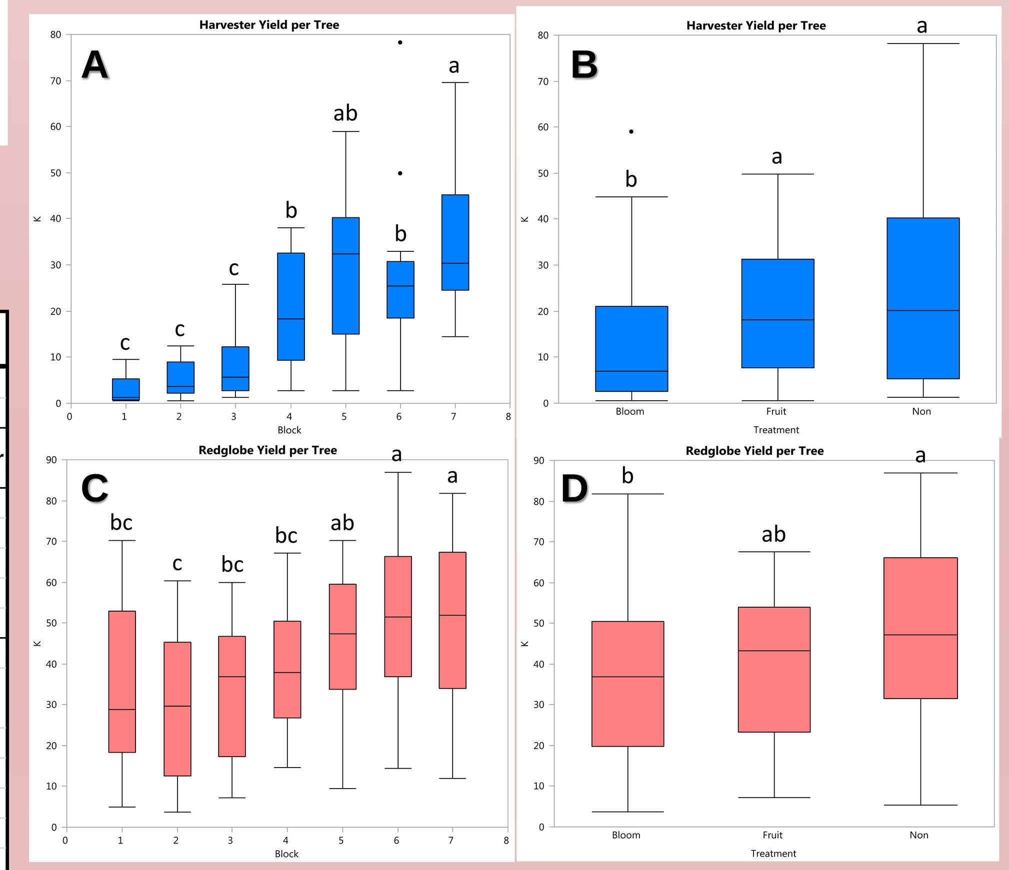

Fig. 3. Average yield per tree (kg) for ‘Harvester’ variety among A) blocks and B) treatments; and ‘Redglobe’ variety among C) blocks and D) treatments. Analyses based on all blocks. Similar letters within a chart are not significantly different, Fisher’s LSD test, α=0.05.

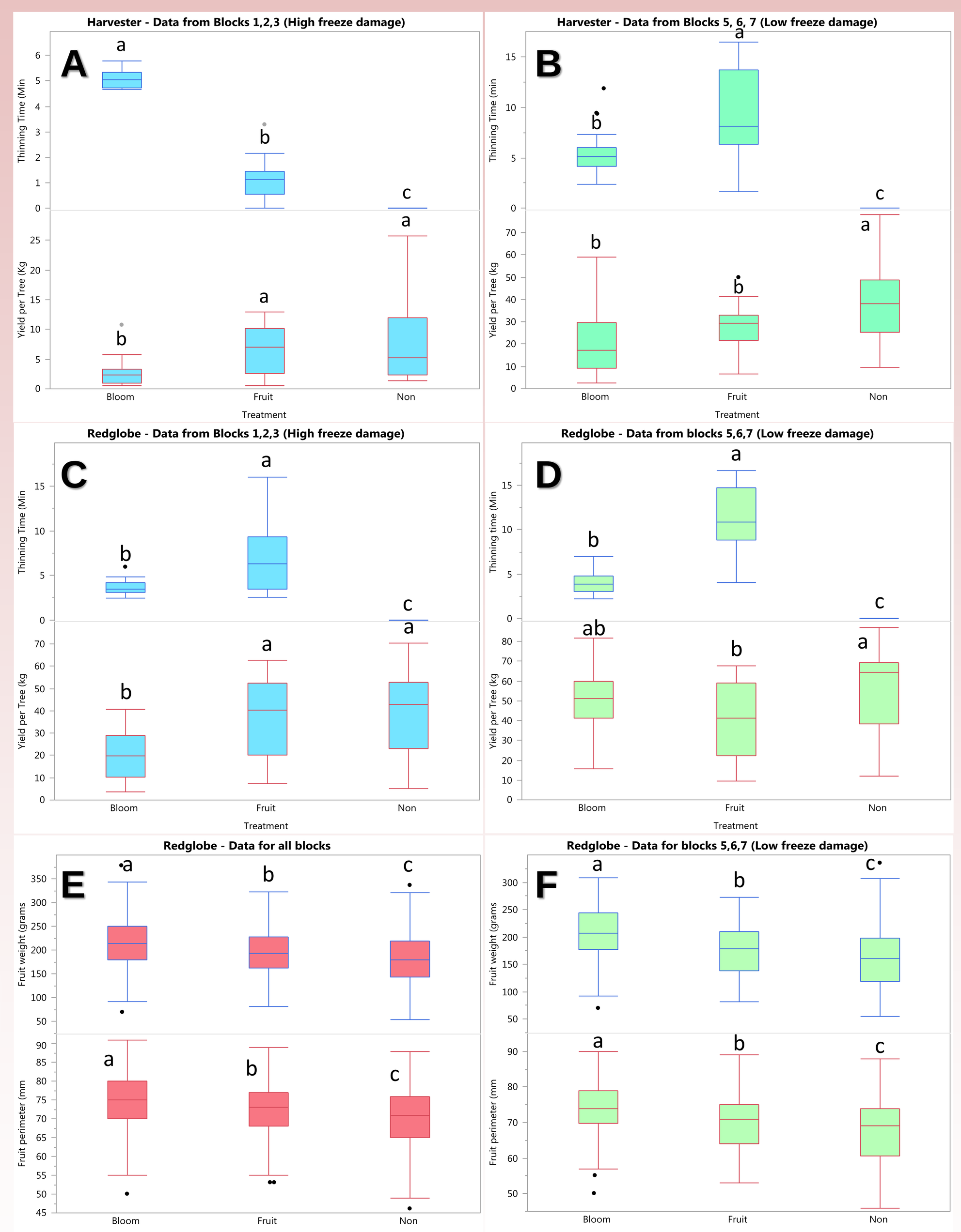

Fig. 4. Thinning treatment comparisons for thinning time and yield for ‘Harvester’ for A) high (blocks 1,2,3) and B) low (blocks 5,6,7) freeze damage. Thinning treatments comparisons for thinning time and yield for ‘Redglobe’ for C) high (blocks 1,2,3) and D) low (blocks 5,6,7) freeze damage. Thinning treatments comparisons for fruit weight and perimeter for ‘Redglobe’ for E) all blocks and F) low (blocks 5,6,7) freeze damage. Fisher’s LSD test, α=0.05.