



Effect of gibberellic acid (GA3) and aminoethoxyvinylglycine (AVG) on late-season peach [*Prunus persica* (L.) Batsch] varieties in middle Georgia



THE UNIVERSITY OF GEORGIA
COLLEGE OF AGRICULTURAL &
ENVIRONMENTAL SCIENCES



Dario J. Chavez*¹, and Jeff Cook*²

¹University of Georgia, Department of Horticulture, Griffin Campus, Griffin, GA, 30223.

²University of Georgia Cooperative Extension. Area Peach Agent. Fort Valley, GA, 31030.

Introduction

The peach ripening season in middle Georgia spans five months beginning in the middle of May and concluding in early September. Approximately, 60 different peach varieties are currently being grown in Georgia and ripen throughout this market season in which each variety is available for one to two weeks. Within the season, there are time points when variety ripening times may not overlap thus producing several days in which no fruit is available. This is clearly a problem in peach production in middle Georgia for certain late season varieties. Plant growth regulators (PGRs) are widely used in apples, cherries, and other fruits. Gibberellic acid (GA3) and aminoethoxyvinylglycine (AVG) treatments in stone fruit have shown to increase fruit firmness, inhibit/decrease ethylene production, delay maturity and shift harvest windows, and reduce fruit drop (Byers, 1997; Cline, 2006).

Objective

Study the effect of GA3 and AVG on delaying maturity, increasing fruit firmness, and shifting the ripening window of two late season ripening varieties.

Materials and Methods

Plant materials. Trees of 'Early August Prince' (850 CU) and 'Ruston Red' (850 CU) peaches budded to 'Guardian' rootstock were established in 2007 and 2001, respectively. 'Early August Prince' variety was used from two farms in Pearson Farms and Lane Southern Orchards, Fort Valley, GA. 'Ruston Red' variety was available in one farm in Lane Southern Orchards, Fort Valley, GA. A total of approx. 20 acres per variety were available. Plots were maintained using the recommended procedures in the Southeastern peach, nectarine, and plum pest management and culture guide.

Applications. ProGibb® is 4% gibberellic acid (GA3 - promotes growth and elongation of cells) liquid formulation and Retain® is 15% aminoethoxyvinylglycine (AVG - ethylene inhibitor) soluble powder formulation, both produced by fermentation. In 2014, plant growth regulators were applied with an airblast sprayer (333g/A of Retain®, 20fl oz/A of ProGibb® 4% in a 100 gal/A spray volume, and organosilicone adjuvant 0.1% v/v). Applications were made on early-mid June, approximately 2-4 weeks before fruit harvest. Control plots were left untreated at the same locations for comparisons. A total of three replications, single tree plots, were used for treated and untreated comparisons. Trees were not commercially harvested until the project was over.

Variables. Sample fruit was harvested from treated and untreated trees and fruit characteristics were taken. Fruit was harvested on July 8th, 11th, 14th, 17th, 21st, 24th, 28th, 31st, and August 8th for 'Early August Prince' and on July 8th, 11th, 14th, 17th, and 21st for 'Ruston Red'. Five fruit per plot were harvested and kept in a cooler with ice overnight to be evaluated the following day. Each fruit was rated individually. 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; kgf, N, N/g), split pit, flesh to pit length (mm), 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. Firmness was measured using a 1-9 scale and the Wagner Model FT 30 fruit penetrometer with the FT 516 tip (8mm diameter).

Data analyses. Data analyses were performed using the PROC GLM procedure in SAS Software (Cary, NC). Mean comparisons for each treatment were performed using Fisher's protected LSD test, p-value <0.05.

References

Byers, R.E 1997. Peach and nectarine fruit softening following aminoethoxyvinylglycine sprays and dips. HortScience 32:86-88.

Cline, J.A. 2006. Effect of aminoethoxyvinylglycine and surfactants on preharvest drop, maturity, and fruit quality of two processing peach cultivars. HortScience 41:377-383.

Acknowledgments

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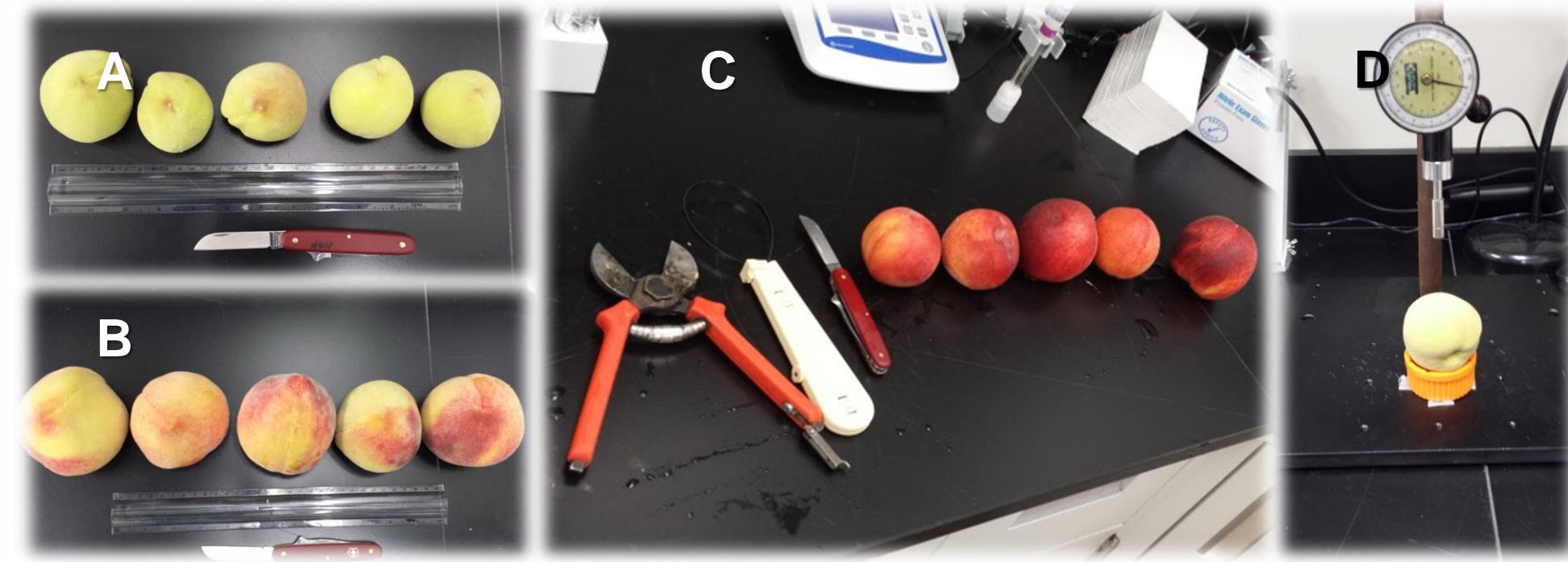


Fig. 1. 'Early August Prince' fruit: A) immature, B) before ripening, and C) commercial ripening. D) Firmness measured using the Wagner Model FT 30 fruit penetrometer with the FT 516 tip (8mm diameter).

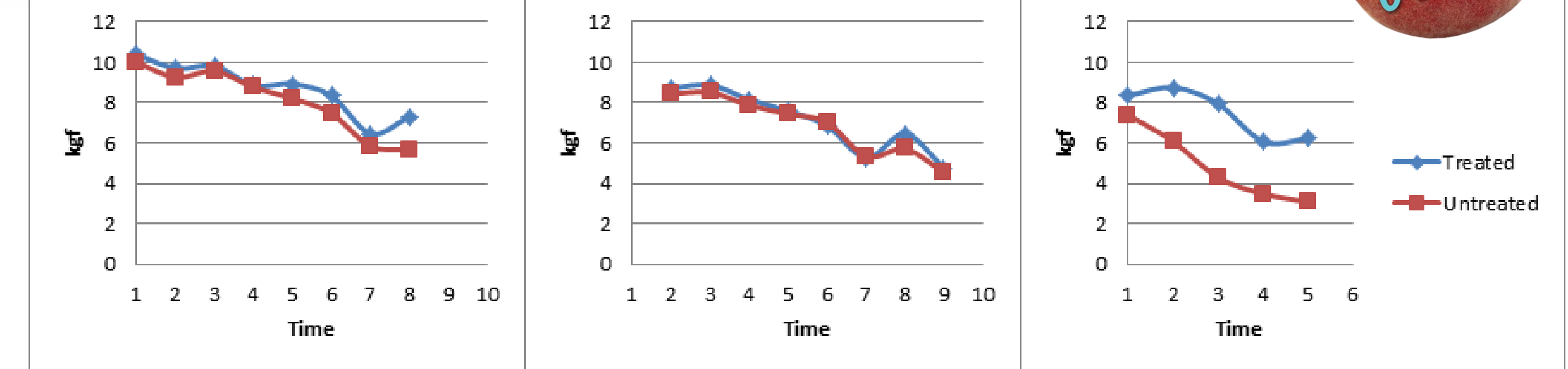


Fig. 2. Fruit firmness (kgf) measured using a penetrometer in the ProGibb® and Retain® trial for A) 'Early August Prince' in Lane Southern Orchards, Fort Valley, GA, B) 'Early August Prince' in Pearson Farms, Fort Valley, GA, and C) 'Ruston Red' in Lane Southern Orchards, Fort Valley, GA.

Table 1. ProGibb® and Retain® trial measured by fruit characteristics in Fort Valley, GA during 2014 peach season^{2,3,4}.

'Early August Prince' in Lane Southern Orchards, Fort Valley, GA																								
Time	Time	Grower	Treatment	N Obs	Blush	redflesh	fuzz	tip	firmness	firmS1	firmS2	firmAVE	firmS1N	firmS2N	firmAVEN	firmS1Nperg	firmS2Nperg	firmAVENperg	splitpit	fleshpitS1	fleshpitS2	fleshpitAVE	weight	Perimeter
7/8/2014	1 Lane	TREAT	15	5.33	0.00	8.00	6.13	9.00	10.43	10.33	10.38	102.25	101.34	101.80	1.06	1.05	1.05	0.27	16.27	16.67	16.47	99.84	56.73	
7/8/2014	1 Lane	UNT	15	3.33	0.00	7.67	6.47	9.00	9.96	10.00	9.98	97.68	98.07	97.87	1.03	1.04	1.03	0.47	15.73	16.13	15.93	97.39	56.80	
7/11/2014	2 Lane	TREAT	15	8.67	3.33	7.00	4.87	9.00	9.64	9.77	9.71	94.54	95.85	95.19	0.95	0.97	0.96	0.47	16.80	16.07	16.43	104.20	58.20	
7/11/2014	2 Lane	UNT	15	9.33	6.67	7.00	4.53	9.00	9.29	9.23	9.26	91.07	90.49	90.78	0.89	0.89	0.89	0.20	16.40	16.67	16.53	104.03	58.27	
7/14/2014	3 Lane	TREAT	15	10.00	9.33	6.67	5.07	9.00	9.81	9.81	9.81	96.17	96.24	96.21	0.81	0.80	0.81	0.53	17.33	17.27	17.30	124.12	62.00	
7/14/2014	3 Lane	UNT	15	7.33	8.67	7.00	5.07	7.67	9.68	9.44	9.56	94.93	92.58	93.76	0.80	0.79	0.80	0.40	17.00	17.00	17.00	119.39	61.33	
7/17/2014	4 Lane	TREAT	15	10.00	10.00	7.33	5.53	9.00	8.89	8.81	8.85	87.22	86.43	86.82	0.66	0.66	0.66	0.40	18.00	19.20	18.60	137.73	64.27	
7/17/2014	4 Lane	UNT	15	10.67	6.67	6.67	5.33	9.00	8.89	8.64	8.77	87.22	84.73	85.97	0.76	0.74	0.75	0.27	18.33	18.47	18.40	118.13	61.40	
7/21/2014	5 Lane	TREAT	15	18.00	10.00	6.67	6.00	8.93	9.26	8.59	8.92	90.81	84.21	87.51	0.58	0.54	0.56	0.40	18.93	19.93	19.43	161.11	67.87	
7/21/2014	5 Lane	UNT	15	18.00	10.00	7.33	6.93	8.93	8.51	7.89	8.20	83.42	77.34	80.39	0.50	0.47	0.48	0.53	20.93	21.67	21.30	169.28	69.53	
7/24/2014	6 Lane	TREAT	15	22.00	10.00	7.33	5.67	9.00	8.28	8.39	8.34	81.20	82.31	81.76	0.45	0.46	0.46	0.27	20.67	20.87	20.80	180.64	70.73	
7/24/2014	6 Lane	UNT	15	20.67	10.00	7.67	5.40	9.00	7.51	7.42	7.46	73.62	72.77	73.19	0.40	0.39	0.40	0.13	21.80	21.33	21.57	187.70	71.87	
7/28/2014	7 Lane	TREAT	15	50.67	10.00	7.00	6.60	8.67	6.83	6.09	6.46	66.95	59.69	63.32	0.33	0.29	0.31	0.27	21.73	22.27	22.00	205.96	74.60	
7/28/2014	7 Lane	UNT	15	53.33	10.00	7.00	7.00	8.87	6.02	5.65	5.84	59.04	55.44	57.24	0.28	0.26	0.27	0.27	22.60	21.93	22.27	215.26	76.13	
7/31/2014	8 Lane	TREAT	15	67.33	10.00	7.00	7.33	9.00	7.38	7.23	7.30	72.38	70.87	71.62	0.36	0.35	0.35	0.20	22.93	22.80	22.87	207.86	74.47	
7/31/2014	8 Lane	UNT	15	58.00	10.00	7.00	6.93	8.67	5.59	5.77	5.68	54.85	56.55	55.70	0.27	0.28	0.28	0.00	23.33	22.93	23.13	205.56	74.67	

'Early August Prince' in Pearson Farms, Fort Valley, GA																								
Time	Time	Grower	Treatment	N Obs	Blush	redflesh	fuzz	tip	firmness	firmS1	firmS2	firmAVE	firmS1N	firmS2N	firmAVEN	firmS1Nperg	firmS2Nperg	firmAVENperg	splitpit	fleshpitS1	fleshpitS2	fleshpitAVE	weight	Perimeter
7/11/2014	2 Pearson	TREAT	15	12.00	4.00	7.00	5.00	7.67	8.84	8.61	8.72	86.70	84.41	85.55	0.68	0.66	0.67	0.60	17.40	17.60	17.50	130.45	62.47	
7/11/2014	2 Pearson	UNT	30	9.33	8.00	7.50	5.30	9.00	8.52	8.36	8.44	83.52	82.02	82.77	0.61	0.60	0.60	0.60	18.13	18.00	18.07	142.32	64.50	
7/14/2014	3 Pearson	TREAT	15	23.33	8.67	7.67	5.60	9.00	8.95	8.79	8.87	87.74	86.24	86.99	0.56	0.55	0.56	0.60	19.13	19.33	19.23	158.25	67.40	
7/14/2014	3 Pearson	UNT	30	15.33	9.00	6.83	5.57	9.00	8.71	8.31	8.51	85.39	81.50	83.44	0.53	0.51	0.52	0.47	18.47	19.13	18.80	164.14	68.10	
7/17/2014	4 Pearson	TREAT	15	27.33	10.00	7.00	6.20	9.00	8.25	8.05	8.15	80.87	78.91	79.89	0.51	0.49	0.50	0.47	19.67	19.33	19.50	162.32	68.20	
7/17/2014	4 Pearson	UNT	30	27.00	10.00	7.00	5.60	9.00	7.94	7.78	7.86	77.87	76.33	77.10	0.45	0.44	0.45	0.53	20.67	20.50	20.58	177.70	71.17	
7/21/2014	5 Pearson	TREAT	15	46.67	13.33	7.00	5.87	8.60	7.67	7.47	7.57	75.25	73.29	74.27	0.40	0.39	0.40	0.27	21.33	21.33	21.33	196.16	73.00	
7/21/2014	5 Pearson	UNT	30	41.33	10.33	7.00	5.90	8.83	7.61	7.28	7.44	74.63	71.36	73.00	0.38	0.36	0.37	0.50	22.33	22.07	22.20	200.95	73.87	
7/24/2014	6 Pearson	TREAT	15	54.67	10.00	8.00	6.07	8.93	6.77	6.93	6.85	66.36	67.93	67.15	0.29	0.30	0.29	0.27	23.80	24.27	24.03	230.55	77.53	
7/24/2014	6 Pearson	UNT	30	53.67	10.00	7.17	5.77	8.97	7.03	6.99	7.01	68.98	68.58	68.78	0.30	0.30	0.30	0.30	24.50	24.67	24.58	234.07	78.00	
7/28/2014	7 Pearson	TREAT	15	61.33	10.00	7.00	6.67	8.93	5.43	5.11	5.27	53.22	50.15	51.68	0.28	0.26	0.27	0.07	21.93	23.47	22.70	195.99	73.00	
7/28/2014	7 Pearson	UNT	30	55.00	10.00	7.00	6.50	8.80	5.41	5.26	5.34	53.09	51.62	52.35	0.26	0.25	0.26	0.10	24.08	23.77	23.92	206.13	74.60	
7/31/2014	8 Pearson	TREAT	15	68.00	10.67	7.00	6.87	8.93	6.53	6.37	6.45	64.01	62.44	63.22	0.35	0.34	0.34	0.20	24.07	23.80	23.93	191.94	71.93	
7/31/2014	8 Pearson	UNT	30	67.67	10.33	7.00	7.13	8.90	5.72	5.68	5.70	56.13	55.74	55.93	0.30	0.29	0.29	0.20	23.87	24.37	24.12	199.39	73.30	
8/4/2014	9 Pearson	TREAT	15	77.33	16.67	6.67	5.87	8.87	4.43	5.09	4.76	43.48	49.88	46.68	0.18	0.21	0.19	0.07	26.47	26.07	26.27	249.11	80.20	
8/4/2014	9 Pearson	UNT	15	87.14	22.86	6.29	6.43	8.71	4.34	4.74	4.54	42.52	46.51	44.52	0.19	0.21	0.20	0.07	25.36	25.93	25.64	225.89	77.00	

'Ruston Red' in Lane Southern Orchards, Fort Valley, GA																								
Time	Time	Grower	Treatment	N Obs	Blush	redflesh	fuzz	tip	firmness	firmS1	firmS2	firmAVE	firmS1N	firmS2N	firmAVEN	firmS1Nperg	firmS2Nperg	firmAVENperg	splitpit	fleshpitS1	fleshpitS2	fleshpitAVE	weight	Perimeter
7/8/2014	1 Lane	TREAT	15	56.00	6.67	7.00	5.00	8.93	8.45	8.25	8.35	82.84	80.94	81.89	0.31	0.30	0.31	1.00	24.87	24.80	24.83	274.66	80.93	
7/8/2014	1 Lane	UNT	15	52.67	10.00	7.00	4.80	8.80	7.49	7.27	7.38	73.42	71.26	72.34	0.27	0.26	0.26	1.00	24.87	25.73	25.30	299.05	84.33	
7/11/2014	2 Lane	TREAT	15	60.00	9.33	6.00	4.67	9.00	8.81	8.70	8.76	86.43	85.32	85.88	0.36	0.35	0.35	0.93	23.93	24.13	24.03	247.15	78.40	
7/11/2014	2 Lane	UNT	15	66.67	10.00	6.00	3.27	8.47	5.66	6.49	6.08	55.51	63.68	59.59	0.20	0.22	0.21	1.00	25.07	25.40	25.23	320.02	85.33	
7/14/2014	3 Lane	TREAT	15	62.67	10.00	6.00	5.00	9.00	7.82	8.05	7.94	76.69	78.98	77.83	0.30	0.31	0.31	0.80	25.27	24.60	24.93	256.61	78.67	
7/14/2014	3 Lane	UNT	15	86.00	9.33	5.67	5.40	8.07	4.63	3.95	4.29	45.44	38.70	42.07	0.16	0.14	0.15	0.93	24.53	24.27	24.40	297.60	83.73	
7/17/2014	4 Lane	TREAT	15	82.00	10.00	6.33	5.13	8.20	6.22	5.93	6.07	61.00	58.12	59.56	0.21	0.20	0.20	0.73	26.53	26.07	26.30	304.90	84.27	
7/17/2014	4 Lane	UNT	15	83.33	10.00	6.00	5.13	6.93	3.76	3.20	3.48	36.87	31.38	34.13	0.15	0.13	0.							