Metalized Reflective Mulch for New Citrus Plantings- From Planting to Harvest in Less Than Three Years

2017 Florida Citrus Show

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by
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What is MRM

MRM is an acronym for Metalized Reflective Mulch. The brand of MRM used in this trial is called Shine N' Ripe XL and is made by Imaflex and was developed especially for use in citrus. It is a heavy duty 3 mil film coated with a protected, reflective layer of aluminum that reflects >80% of solar radiation including: Photosynthetically Active Radiation (PAR), UV light, and Infrared Radiation for > 3 years.

Project Goals-- To Determine the Benefits of Compost and MRM On Newly Planted Grapefruit Trees for:

- Repellency of Asian Citrus Psyllids
- Tree Growth rates
- Crop Yield
- Fruit Size
- Juice Quality
- Cost of Installation
- Production Costs, Revenue and Return

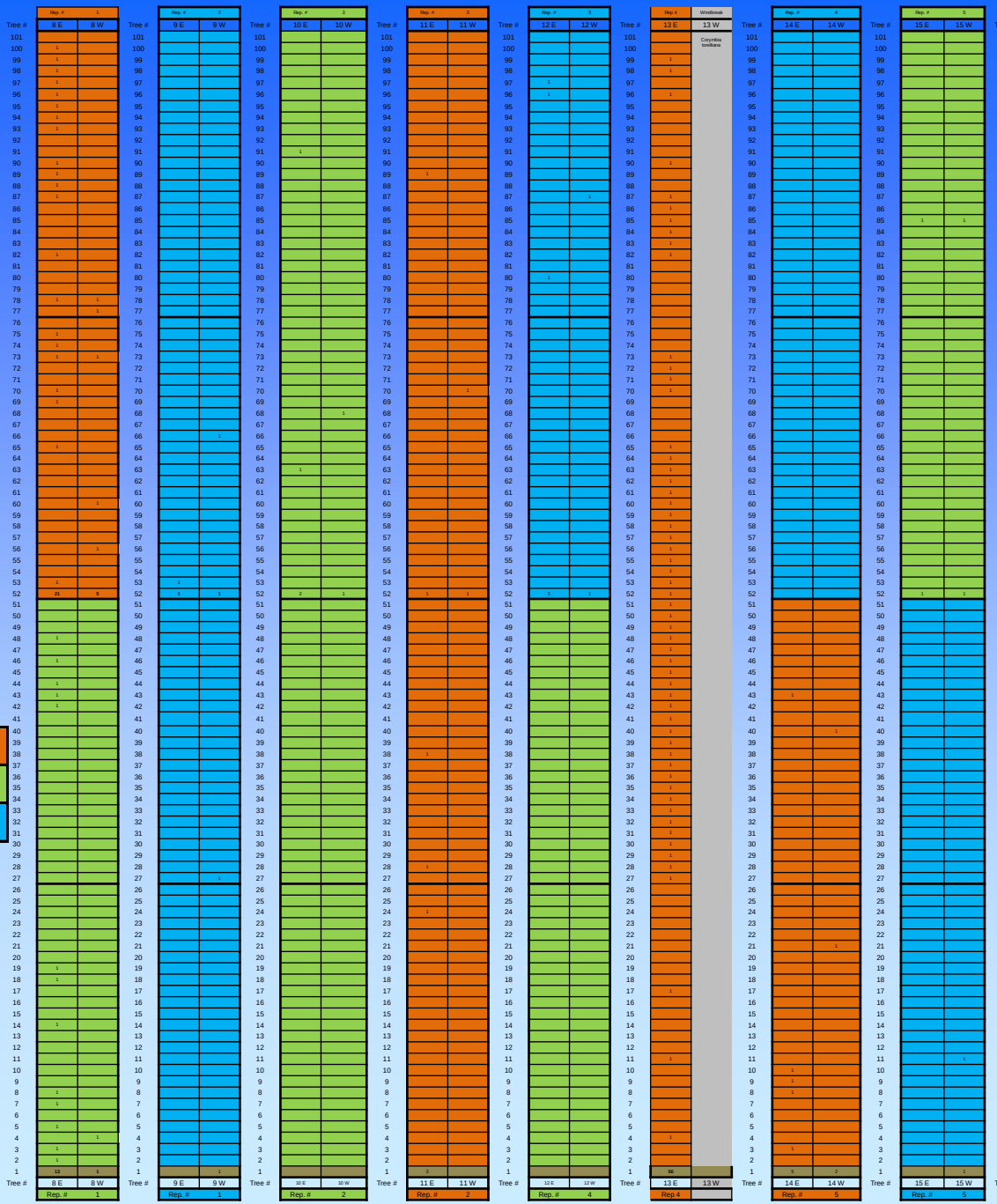
Layout, Treatments & Caretaking

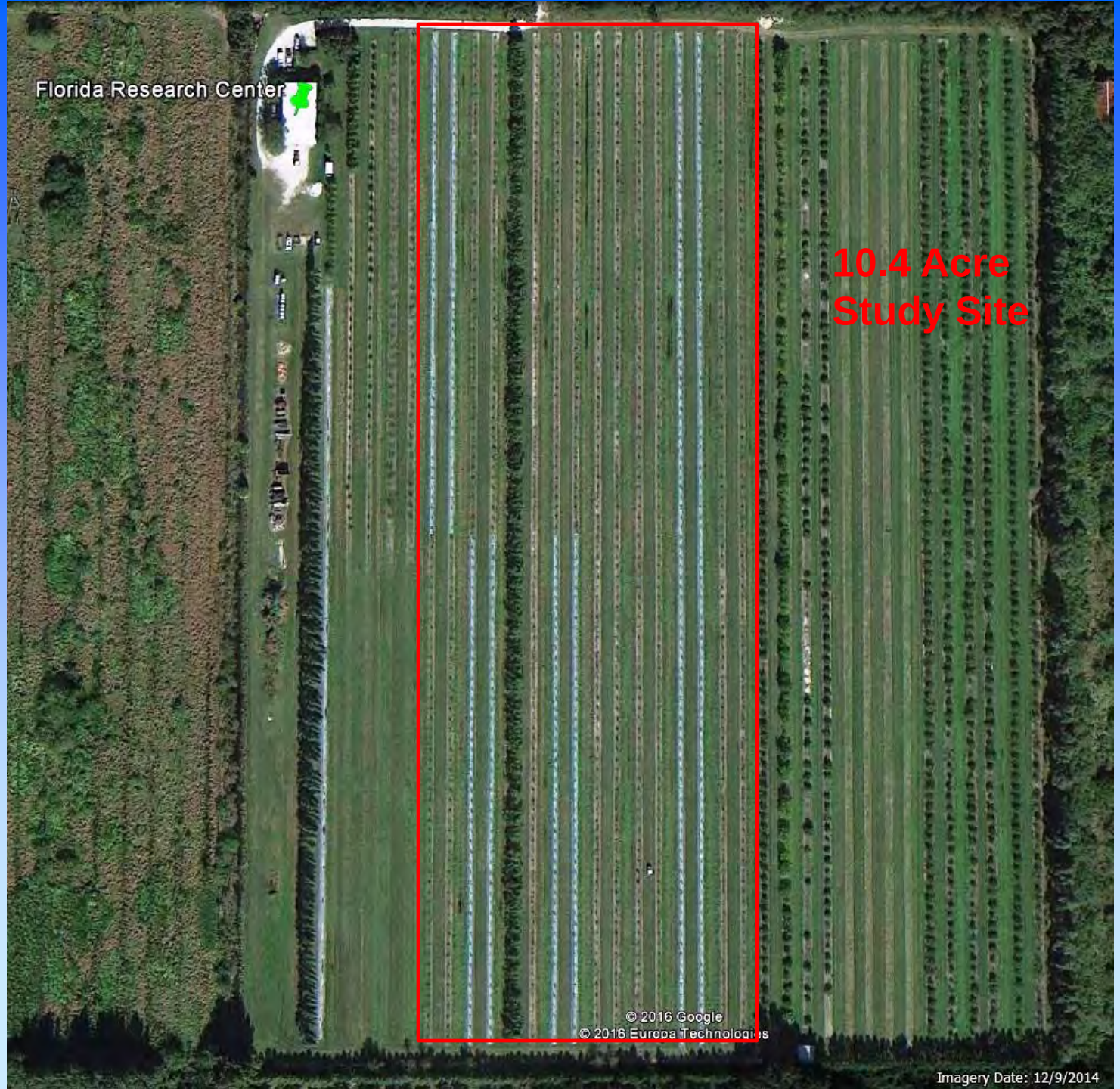
- 7½ 50’ wide Double Beds (Indian River Cty.)
- Planting Density 145 trees/acre (12’ x 25’)
- 3 Treatments (Bare Ground, Compost & Metalized Reflective Mulch (MRM)
- 5 replicates of 100 trees for each of the 3 treatments = 1,500 trees
- All treatments received identical horticultural caretaking i.e. sprays, fertilization, irrigation, etc.
- Insecticidal sprays and neonic soil drenches were made according to IFAS recommendations

Layout

15 plots divided into 3 treatments

Treatments:	Bare Ground
5 Reps	Compost (UPD)
RCB Design	Metallized Reflective Mulch (MRM)




Florida Research Center
10.4 Acre
Study Site
© 2016 Google
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Imagery Date: 12/9/2014

Ground preparation was typical except for burning due to excess and problematic plant debris (wiregrass)

Extra tillage required due to installation of the MRM

Roller was use to firm up soil prior to laying the MRM

MRM* Installation

Kennco Bedding Machine
Ruskin, Fla.

*Shine N' Ripe XL® is a product of Imaflex Inc., CANADA

MRM Installation

Planting Details

P. D. 3-17-14

Irrigation

Each tree was equipped with two Bowsmith 2GPH Drippers
Part no. SB20

Water Saturation for prolonged periods

1. Phytophthora
2. Soil drench application problems

Weed Issues

Fire Ants can be a problem
but was remedied with Extinguish Plus

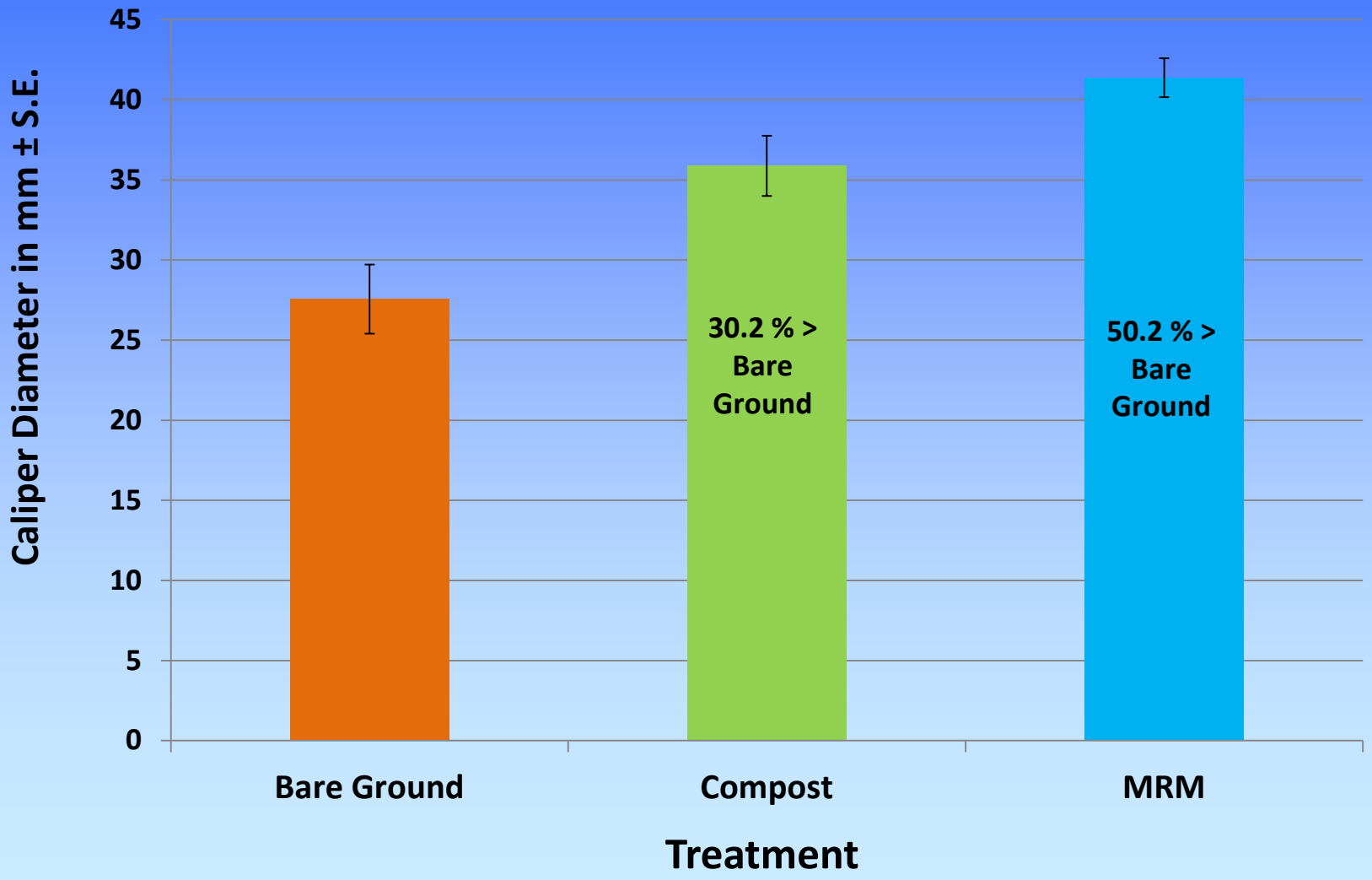

110 days post planting
07/05/2014


212 days post planting
10/15/2014

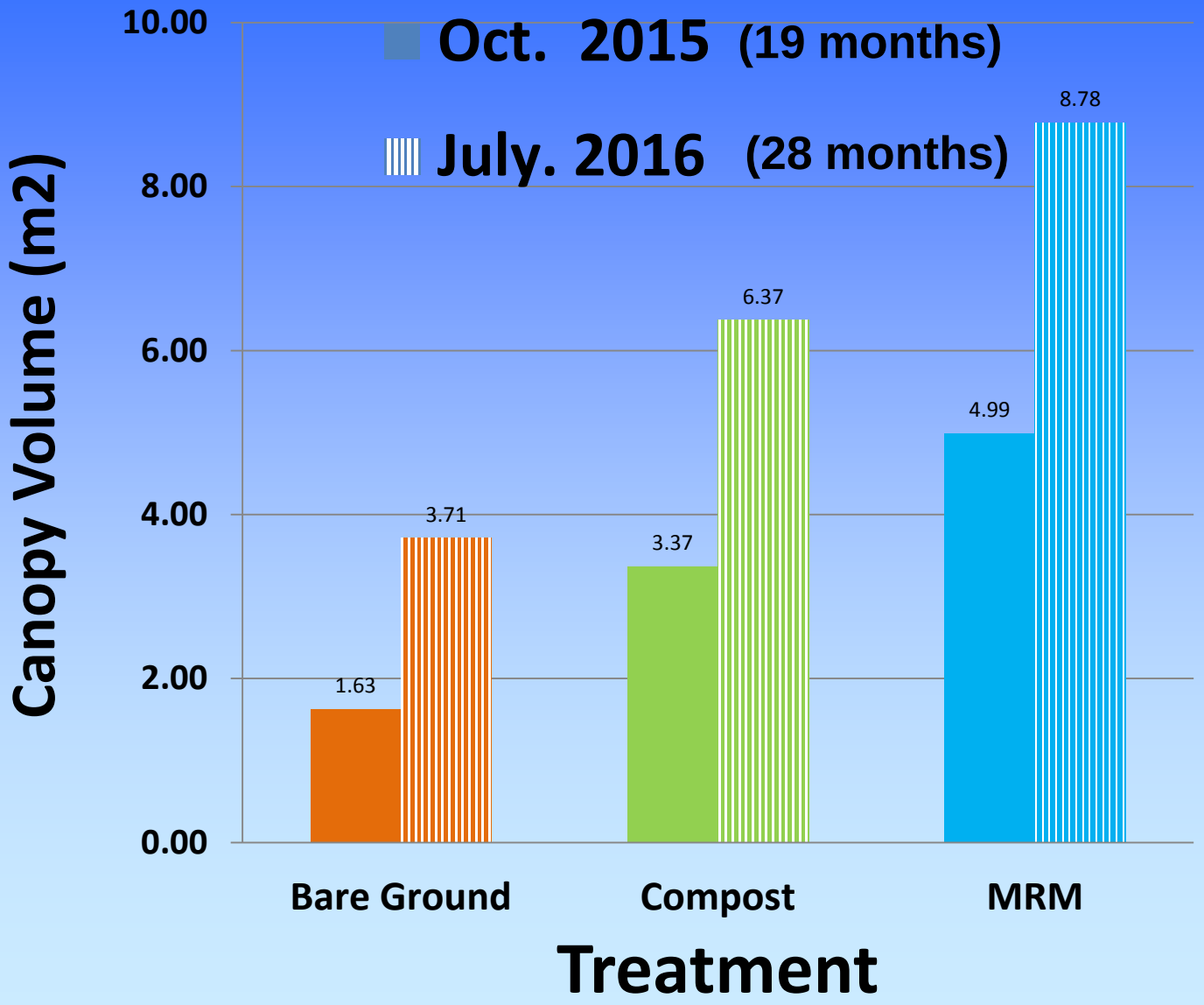

452 days post planting
06/12/2015


604 days post planting
11/11/2015

Increase in Trunk Caliper from 5/8/14 to 10/7/14 (150 days)

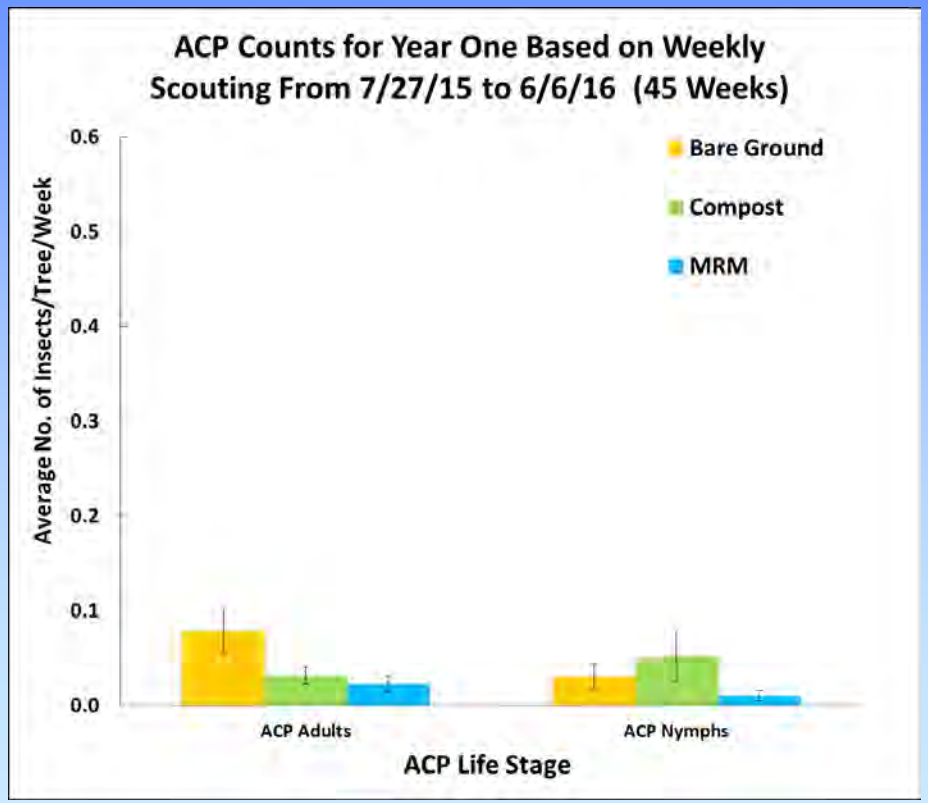


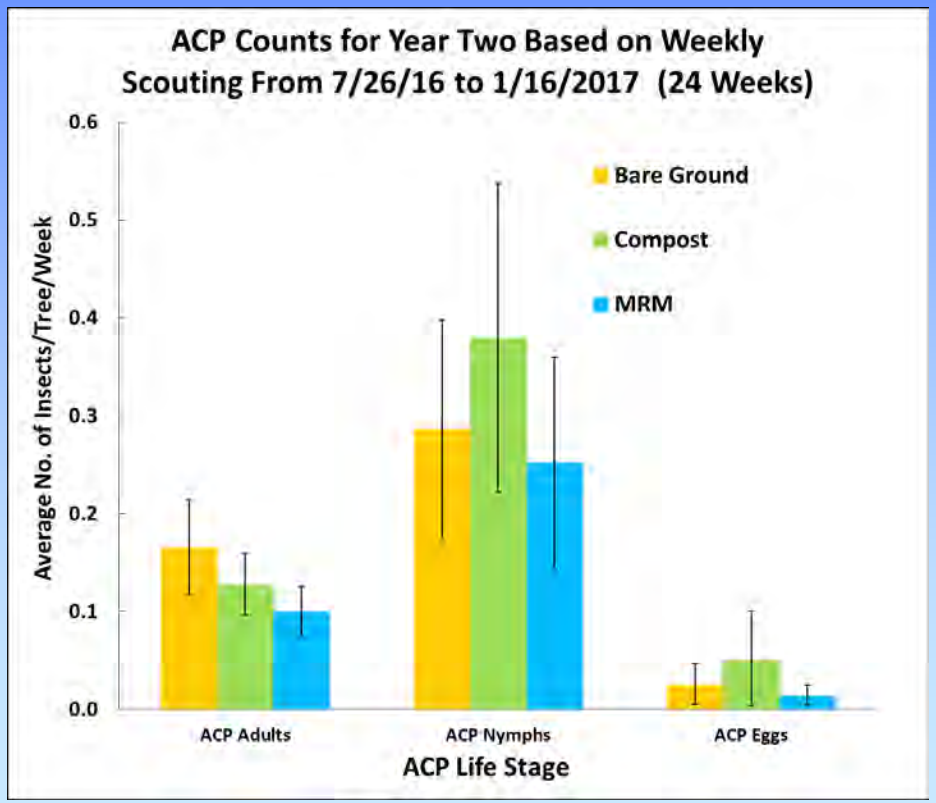
Growth Increase by Canopy Volume



Differences in growth rates were dramatic

Weekly Number of Asian Citrus Psyllids Observed per Tree for Each of the Three Treatments From 7/27/15 to 1/16/17





Fruit Size & Yield were Determined with IRREC's Portable Optical Fruit Sizing Machine and the able handling and management of Jerry Britt.

Data collected from each tree (80/treatment) included the total number of fruit and the weight and diameter of each individual fruit harvested. The diameter data were used to develop a fruit size distribution curve for each tree which then was used to calculate yield as boxes/tree. Fruit diameters were converted to State standard sizes for grapefruit.
(Data: courtesy Dr. Brian Boman)

Representative tree crop for each treatment prior to harvesting 12/14/16

Bare Ground
0.62 Boxes/Tree

Compost
0.83 Boxes/Tree

MRM
1.18 Boxes/Tree

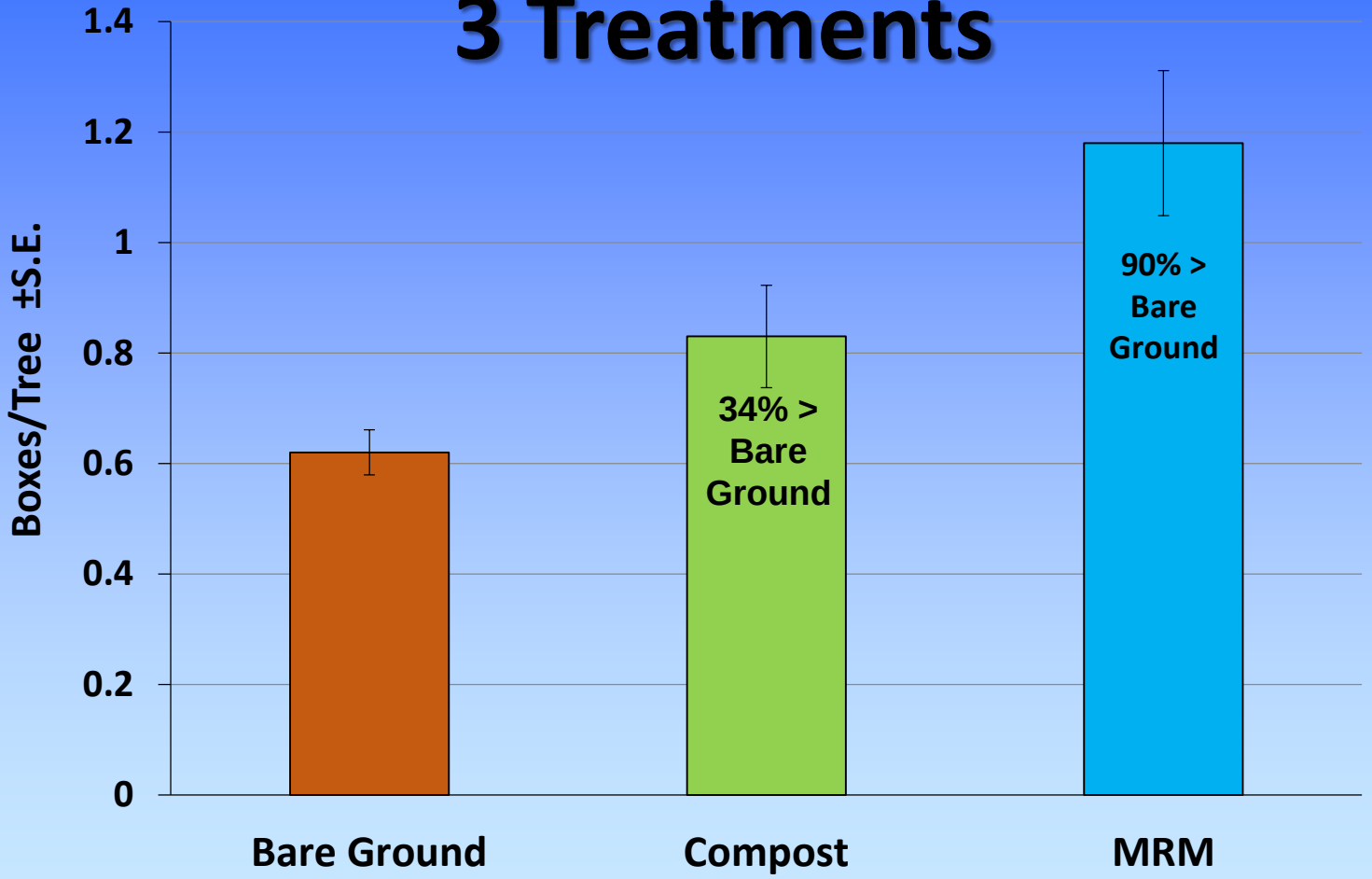
Yield in Boxes/Tree for the Three Treatments

Treatment	Boxes/Tree ±S.E.	% Increase in Yield over Bare Ground
Bare Ground	0.62 ±0.04 a	
Compost	0.83 ±0.09 b	34%
MRM	1.18 ±0.13 c	90%

No. of observations per treatment = 80 single trees

Means with the same letter within the same column are not significantly different ($P < 0.05$) based on SAS GLM Procedure.

Yield in Boxes/Tree for 3 Treatments



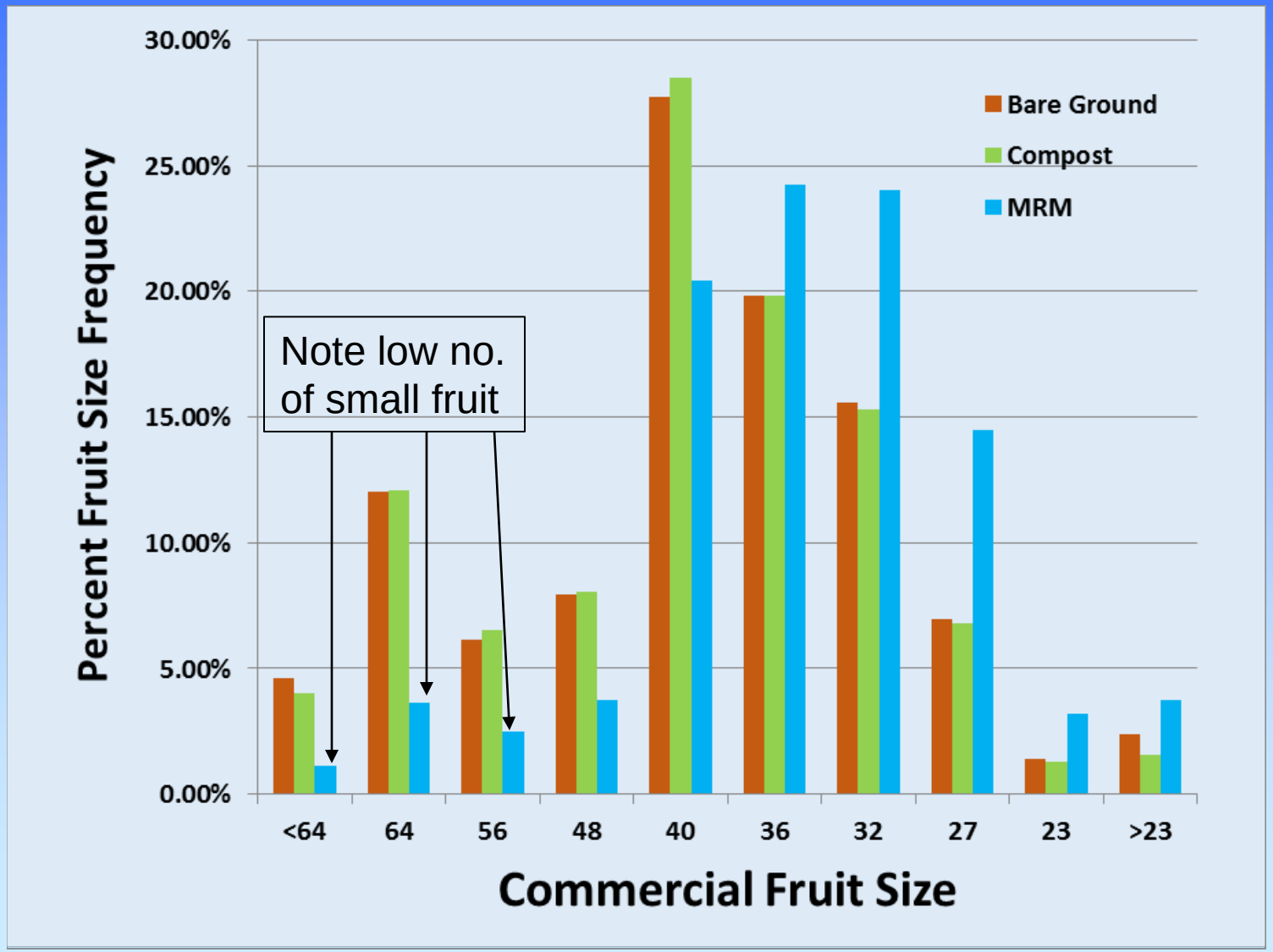
No. of observations per treatment = 80

No. of Fruit/Tree & Fruit Size

Treatment	Avg. No. of Fruit/tree >64		% Increase in No. of Fruit/Tree over Bare Ground
Bare Ground	46.1	a	
Compost	62.8	b	36%
MRM	78.1	c	69%

Treatment	Avg. Fruit Dia./Tree (mm)		% Increase in Fruit Size over Bare Ground
Bare Ground	102.5	a	
Compost	104.4	b	2%
MRM	110.2	b	8%

Fruit Size Frequency Measurements on 12/14/16



Fruit Quality on 10/17/16

Average fruit juice quality and fruit weight of 20 fruit from 3 treatments: Bare Ground, Compost and Metalized Reflective Mulch (MRM)

Treatment	Avg. Fruit Weight (g)	Juice vol. per fruit (cc)	Juice wt. per fruit (g)	Brix	Acid (%)	TSS/TA Ratio	Juice content (w/w)	Pounds-solids*
Bare Ground	403.0 a	212.0 a	205.4 a	8.54	1.10	7.79 a	51.0% ab	3.69 a
Compost	393.1 a	202.9 a	196.0 a	8.09	1.12	7.22 b	49.8% a	3.43 b
MRM	420.1 b	224.8 b	218.3 b	8.09	1.09	7.43 ab	52.0% b	3.57 ab
P Values*	0.0015	0.0002	0.0002	0.0837	0.4230	0.0300	0.0244	0.0448

*Means with the same letter within the same column are not significantly different (P = 0.05) based on Duncan's multiple range test SAS.

*Pounds solids calculated using the % juice content and assuming 85lb grapefruit per box.

Data: Courtesy of Dr. Mark Ritenhour and Dr. Cuifeng Hu, IRCREC

Average fruit color of 10 fruit for each treatment

Treatment	a/b	Hue	Chroma
Bare Groumd	0.11	83.86	46.82 a
Compost	0.11	83.64	46.49 a
MRM	0.15	81.56	46.01 a
P Values*	0.101	0.0934	0.3956

Data: Courtesy of Dr. Mark Ritenhour and Dr. Cuifeng Hu, IRCREC

Bare Ground Costs

Land Preparation for Bare Ground

Grove Practice	Equipment Cost/Acre	Materials Cost/Acre
Mow	$ 13.17	
Herbicide	$ 16.50	$ 27.69
12' Disk	$ 13.17	
Tilage with Rotovator	$ 41.60	
Install poly tubing & emitters	$ 125.71	$ 392.59
Tree planting @ $1.40 ea.	$ 203.00	
	$ 413.15	$ 420.28
	Total Cost per acre	**$ 833.43**

Compost Application Costs

Land Preparation and Compost Application

Grove Practice	Equipment Cost/Acre	Materials Cost/Acre
Mow	$ 13.17	
Herbicide	$ 16.50	$ 27.69
12' Disk	$ 13.17	
Tilage with Rotovator	$ 41.60	
Apply Compost (3.75 tons/acre)	$ 37.50	$ 75.02
Install poly tubing & emitters	$ 125.71	$ 392.59
Tree planting @ $1.40 ea.	$ 203.00	
	$ 450.65	$ 495.30
	Total Cost per acre	**$ 945.95**
	Additional Cost for Compost	**$ 112.52**

MRM Installation Costs

Land Preparation and MRM Istallation

Grove Practice	Equipment Cost/Acre	Materials Cost/Acre
Mow	$ 13.17	
1st Herbicide	$ 16.50	$ 27.69
Burn	$ 42.00	
1st Disk 12'	$ 13.17	
2nd Herbicide	$ 16.50	$ 27.69
2nd Disk 12'	$ 13.17	
Tilage with Rotovator	$ 41.60	
Roll flat with roller	$ 12.00	
MRM Installation*	$ 60.00	
Shine N' Ripe XL		$ 457.62
Install poly tubing & emitters	$ 125.71	$ 392.59
Tree planting @ $1.40 ea.	$ 203.00	
Additional planting cost @ $0.80	$ 116.00	
	$ 672.82	$ 905.59
	Total Cost per acre	**$ 1,578.41**
	Additional Cost for MRM	**$ 744.98**

Amortized Costs of MRM	
Cost per year with 3 yr. life span	**$ 248.33**
Cost per year with 5 yr. life span	**$ 149.00**

Based on 145 trees/acre 12' x 25' planting density

Cost of Production, Revenue and Return

Treatment	Price/Field Box Back to the Tree (56% Packout)	Boxes/ Tree	Boxes/Acre @ 145 trees/acre	Revenue Per Acre	Production Cost/Acre	Net Return Per Acre	Application or Installation Costs	Net Return/Acre Minus Installation Costs
Bare Ground	$ 12.78	0.62	90	$ 1,149	$ 1,858	$ (709)	N/A	$ (709)
Compost	$ 12.78	0.83	120	$ 1,538	$ 1,858	$ (320)	$ 112.52 *	$ (433)
MRM	$ 12.78	1.18	171	$ 2,187	$ 1,858	$ 328	$ 248.33 †	$ 80

* Compost applied Annually

† MRM Installation Amortized 3 Years

Acknowledgements

IMAFLEX INC.

YARA

Knowledge grows

Richard Chandler
Planting & Irrigation
Arapaho Citrus Management

Kerley
CROP VITALITY