



Peach production and what we have learned

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Peach Research and Extension Specialist, Horticulture, UGA



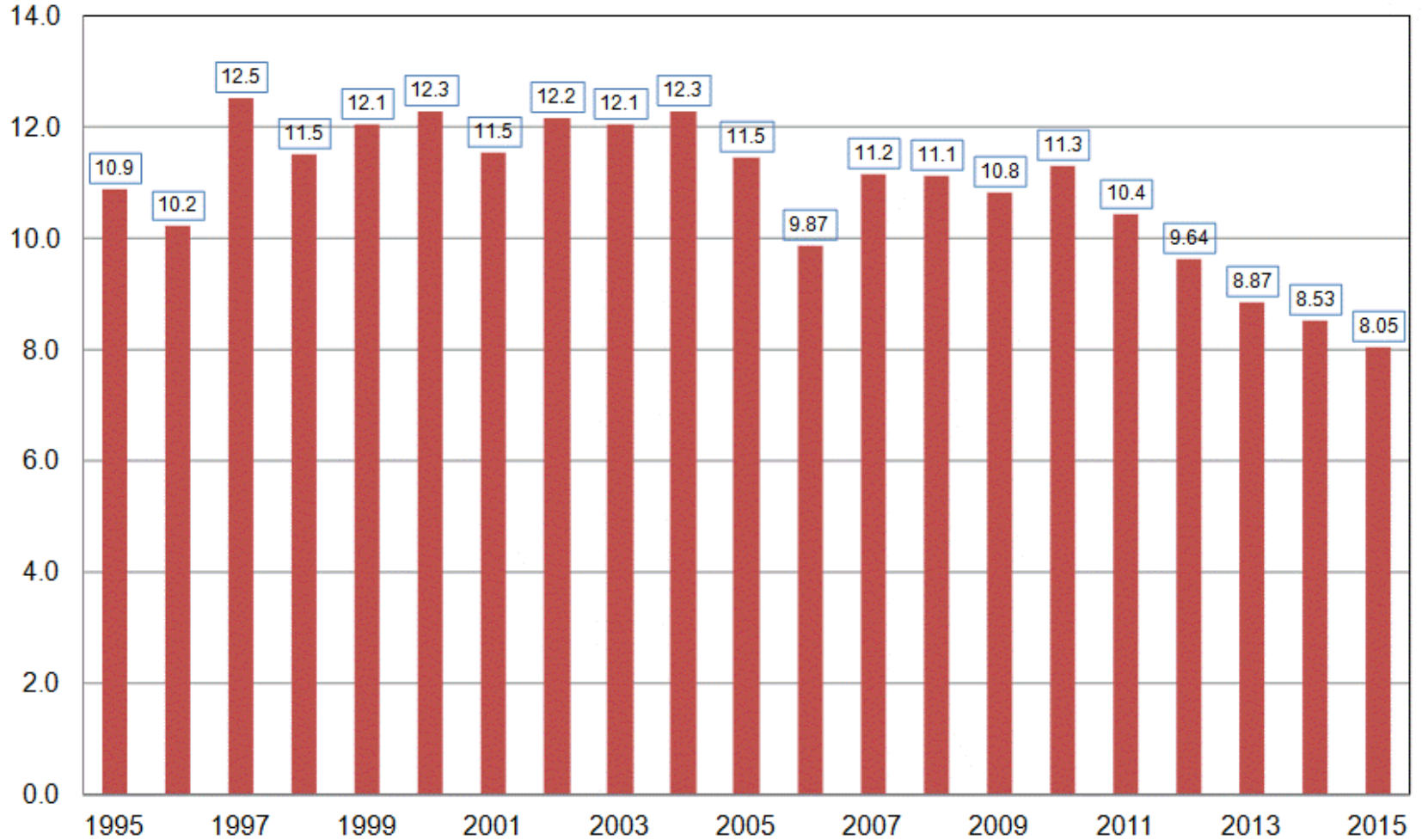
UNIVERSITY OF
GEORGIA

World Peach Production

Countries	2012		
	Area harvested (Ha)	Yield (Hg/Ha)	Production (tonnes)
China, mainland	770000	155844	12000000
Italy	71012	187521	1331621
United States of America	56365	187852	1058830
Spain	50000	149440	747200
Greece	44100	172381	760200
India	37500	66667	250000
Mexico	33216	49032	162866
Turkey	28362	202993	575730
Egypt	26611	107171	285194
Argentina	26000	111538	290000
Democratic People's Republic of Korea	21500	55116	118500
Iran (Islamic Republic of)	20000	250000	500000
Chile	20000	162500	325000
Brazil	19155	121632	232987
Australia	19000	52875	100462
Algeria	18657	95399	177986
Tunisia	16000	80000	128000
Pakistan	15500	36129	56000
Republic of Korea	14357	120219	172599
Tajikistan	14000	19643	27500
France	11923	231084	275521

Peach Production United States

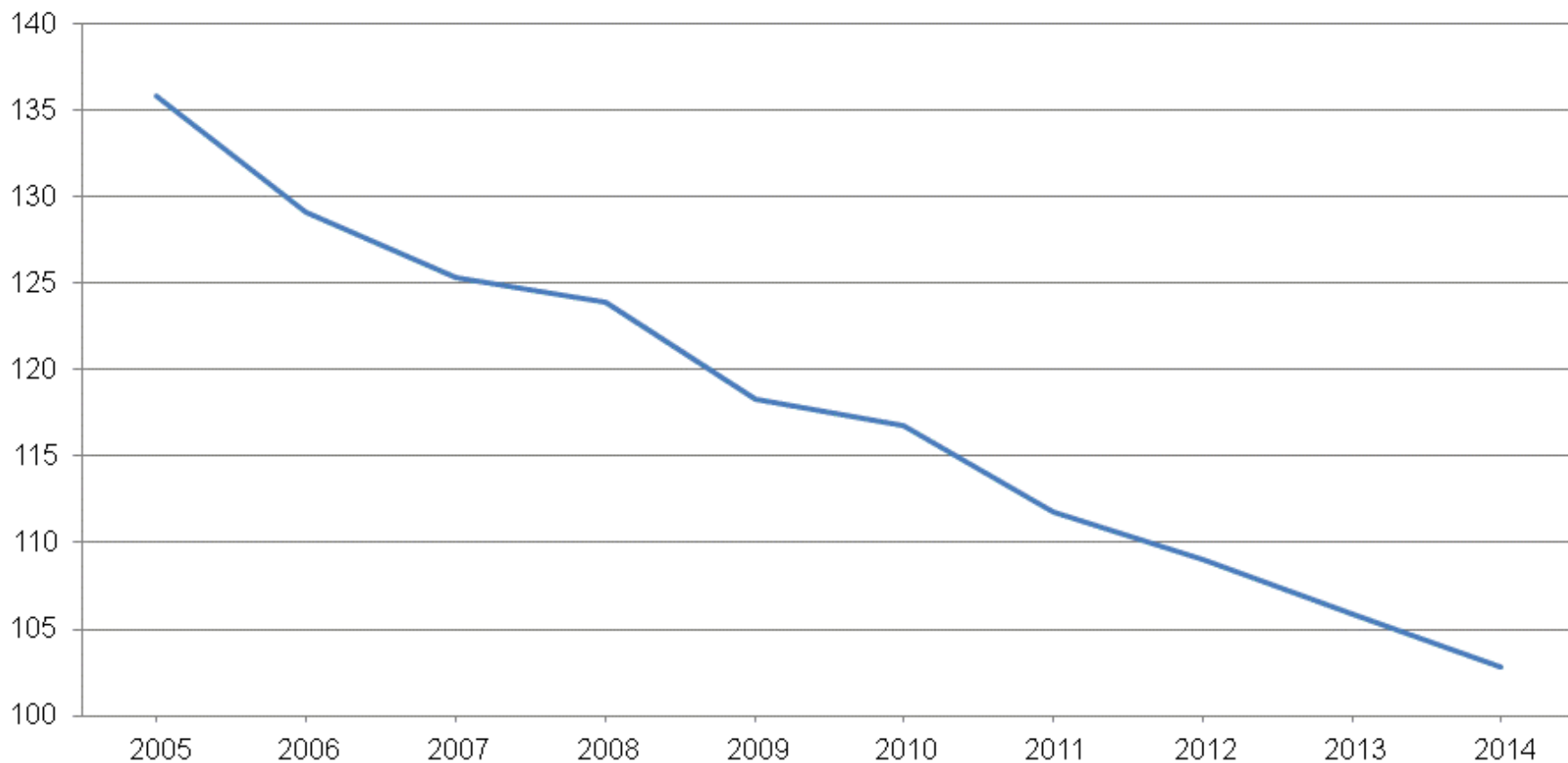
Thousand Tons





Peach Bearing Acreage United States: 2005-2014

(000) Acres



General Information

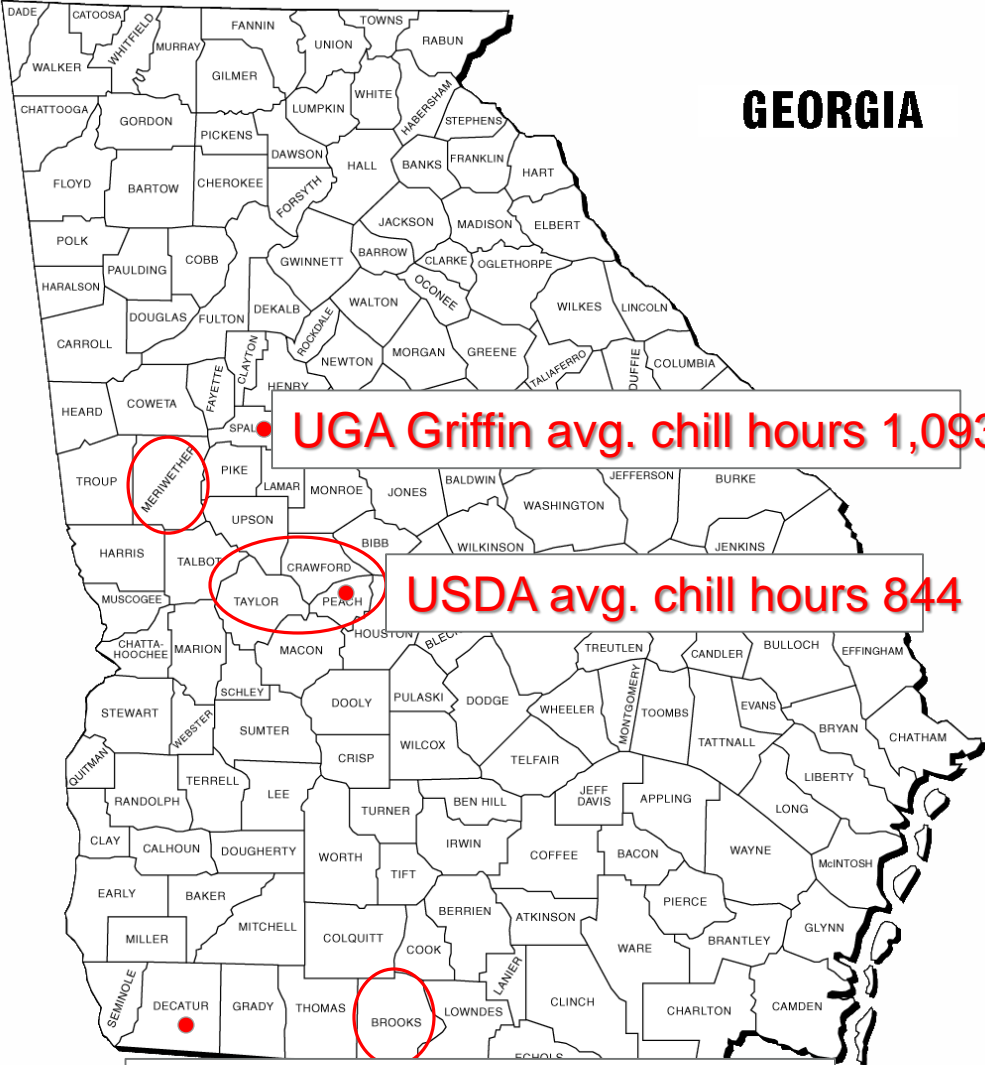
- Georgia ranks 3rd in the US in peach production.
- 40,600 tons with 10,300 acres with total value of \$35M (USDA- NASS, 2015).
- Ranks 36th across all the GA commodities.
- Part of Georgia since the 1800's – Peach State.

General Information

- Peach mostly for fresh consumption (some canning).
- There are five growers that account for 90% of the GA industry.
- Approximately 40-60 varieties grown – season starts middle of May until the end of August.



GEORGIA



UGA Griffin avg. chill hours 1,093

USDA avg. chill hours 844

UGA-USDA-UF avg. chill hours 589

Carl Vinson Institute of Government
University of Georgia

Chilling Requirements

- Use www.weather.uga.edu to determine chill hours for your area
 - Hours between 32⁰F and 45⁰F or below 45⁰F
- Range should be from October to February
- Choose varieties with chill requirements within 200 hours of average.
- If you are north of Brooks county avoid cultivars that start with Florda- or Gulf-



USDA-ARS Southeastern Fruit & Nut Tree Laboratory

Byron, Peach County, Georgia

Average Chilling Hours Calculator

From:

To:

Calculate

From October-1	To February-6	Number of Hours
2016	2017	497
2015	2016	599
2014	2015	937
2013	2014	1007
>Temp <= 45 °F		

Pre-Plant Considerations

Site Selection

- Spring frost major limiting factor
- Elevated relative to surrounding land (cold air drainage)
- Direction of the slope affects orchard performance
 - North facing slope less prone to spring frost
- Well drained medium textured soil
 - Moderate fertility
- Minimum rooting depth of 30 to 36”



Source: AMCORD



Pre-Plant Considerations

Site Selection

- Take note of predominant vegetation around (soil conditions and tell you about drainage).
- Peach trees cannot tolerate waterlogged soils for an extended period of time (planting in berms)
- Water availability and access (VERY IMPORTANT!)
- History of peach trees before (possible problem with nematodes, etc).
 - Oak root rot a problem in GA and SC



onddoctor.com/200
illaria-root-rot-aka-
gus-of-almond/



Pre-Plant Considerations

Soil Preparation

- Soil sample 6 – 12 months ahead of winter planting
- One sample at the 8” depth and one for 8-16” should be taken
- Use dolomitic limestone to adjust pH in subsoil and top 8”
- Application of Phosphorous should be done prior to planting as well
- Nematode samples
- Control weeds (non-persistent herbicide)





Ag & Environmental Services Labs



Soil, Plant, and Water Laboratory
 2400 College Station Road
 Athens, Georgia 30602-9105
 Website: <http://aesl.ces.uga.edu>

Sample
8''

Soil Test Report

(CEC/CEA Signature)

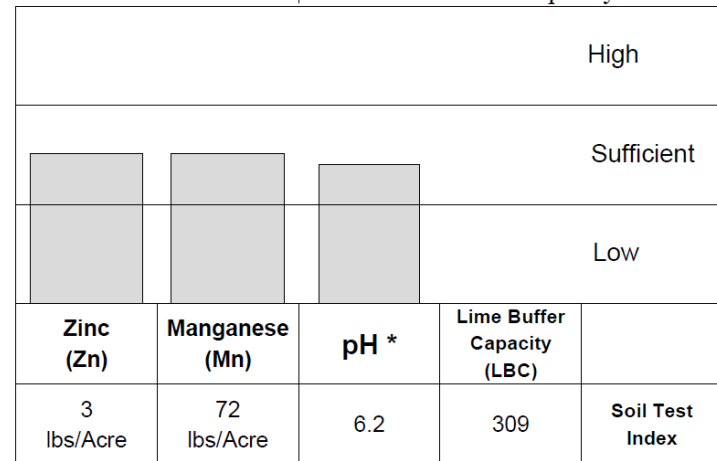
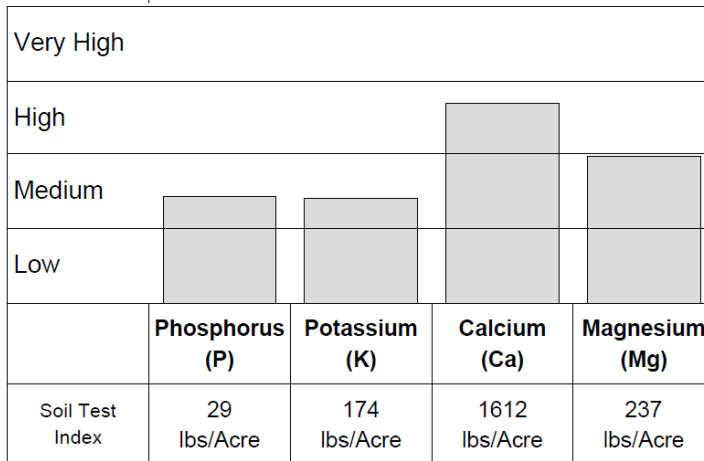
Sample ID

Client Information Chavez, Dario Horticulture, Stress Physiology Griffin, GA 30224 Sample: 1A Crop: Peaches (non-bearing)	dchavez@uga.edu	Lab Information Lab #17757 Completed: Dec 23, 2015 Printed: Dec 23, 2015 Tests: S1 S6 S13 S20N	Contact Soil, Plant, and Water Laboratory 2400 College Station Road Athens, GA 30602 ph: 706-542-5350 e-mail: soiltest@uga.edu
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Results

Mehlich I Extractant

UGA Lime Buffer Capacity Method*



Recommendations

Can't find a specific grade of fertilizer? Try our Fertilizer Calculator: <http://aesl.ces.uga.edu/soil/fertcalc/>

Limestone	Nitrogen (N)	Phosphate (P ₂ O ₅)	Potash (K ₂ O)	Sulfur (S)	Boron (B)	Manganese (Mn)	Zinc (Zn)
0 tons/Acre	See Comments	30 lbs/Acre	60 lbs/Acre	--	--	--	--

Recommended pH: 6.0 to 6.5

*For information on how the Soil, Plant, and Water Laboratory measures and reports pH and makes lime recommendations, see <http://aesl.ces.uga.edu/soil/SoilpH.html>.



Ag & Environmental Services Labs



Soil, Plant, and Water Laboratory
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 Athens, Georgia 30602-9105
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Sample 8-16''

Soil Test Report

Sample ID

(CEC/CEA Signature)

Client Information Chavez, Dario Horticulture, Stress Physiology Griffin, GA 30224 Sample: 1B Crop: Peaches (non-bearing)		dchavez@uga.edu	Lab Information Lab #17749 Completed: Dec 23, 2015 Printed: Dec 23, 2015 Tests: S1 S6 S13 S20N	Contact Soil, Plant, and Water Laboratory 2400 College Station Road Athens, GA 30602 ph: 706-542-5350 e-mail: soiltest@uga.edu
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Results

Mehlich I Extractant

UGA Lime Buffer Capacity Method*

Very High				
High				
Medium				
Low				
	Phosphorus (P)	Potassium (K)	Calcium (Ca)	Magnesium (Mg)
Soil Test Index	11 lbs/Acre	125 lbs/Acre	1168 lbs/Acre	243 lbs/Acre

					High
					Sufficient
					Low
	Zinc (Zn)	Manganese (Mn)	pH *	Lime Buffer Capacity (LBC)	
	1 lbs/Acre	52 lbs/Acre	6.5	268	Soil Test Index

Recommendations

Can't find a specific grade of fertilizer? Try our Fertilizer Calculator: <http://aesl.ces.uga.edu/soil/fertcalc/>

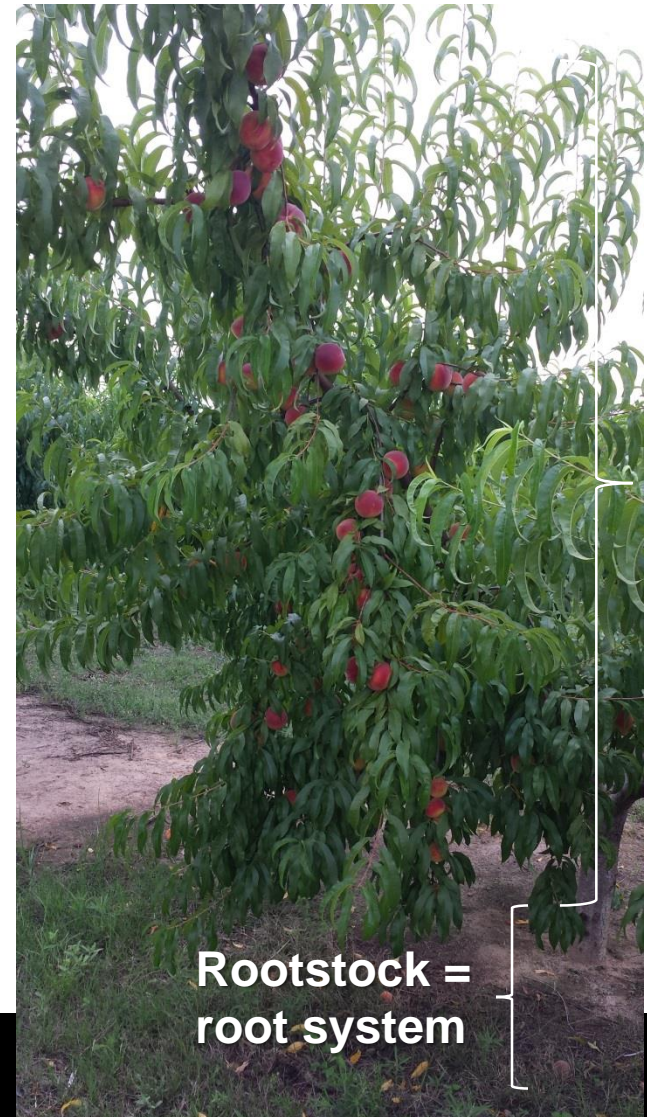
Limestone	Nitrogen (N)	Phosphate (P₂O₅)	Potash (K₂O)	Sulfur (S)	Boron (B)	Manganese (Mn)	Zinc (Zn)
0 tons/Acre	See Comments	60 lbs/Acre	70 lbs/Acre	--	--	--	--

Recommended pH: 6.0 to 6.5

*For information on how the Soil, Plant, and Water Laboratory measures and reports pH and makes lime recommendations, see <http://aesl.ces.uga.edu/soil/SoilpH.html>.

See Peaches (non-bearing) Fact Sheet

Parts of a grafted tree



Varieties

- Chilling requirement is #1 consideration
 - Hours between 32⁰F and 45⁰F
 - Measured from October 1st to February 10th.
- Bacterial Spot resistance #2
- Other considerations
 - Melting vs. non melting
 - Flesh color
 - Freestone vs. Clingstone
 - Ripening Dates



Ripening Dates

- In Georgia fruit ripen from Early May to September (~60 varieties)
- Choose varieties to spread out harvest over desired market window (1-2 weeks of harvest)

Recommended Cultivars

Table 1. Recommended peach varieties grown in Georgia and South Carolina in the order of their harvest period. Each variety is described by harvest period, chilling requirement, flesh color (yellow or white), flesh texture (melting or non-melting), pit attachment (clingstone, semi-clingstone, or freestone), and bacterial spot susceptibility (susceptible/resistant)

Harvest Period	Chill	Variety	Flesh Color / Flesh Texture / Pit Attachment / Bacterial Spot
Late April	Low chill, <600 hours	Flordadawn*	Yellow / Melting / Clingstone / Resistant
Early May	Low chill, <600 hours	Gulcrest*	Yellow / Non-melting / Semi-clingstone / Resistant
		Flordacrest*	Yellow / Melting / Semi-clingstone / Resistant
Mid May	Low chill, <600 hours	Flordaking*	Yellow / Melting / Clingstone / Resistant
		Gulfking*	Yellow / Non-melting / Semi-clingstone / Resistant
Mid May	Moderate chill, 600-750 hours	Regal	Yellow / Melting / Semi-clingstone / Highly Susceptible
Late May	Low chill, <600 hours	Gulfprince*	Yellow / Non-melting / Clingstone / Highly Resistant
Late May	Moderate chill, 600-750 hours	Springprince	Yellow / Non-melting / Clingstone / Moderately Susceptible
		Empress	Yellow / Melting / Clingstone / Moderately Susceptible
		Goldprince	Yellow / Melting / Clingstone / Resistant

Rootstock Selection

Rootstock	Ring Nematode Tolerance <i>Mesocriconema xenoplax</i>	PTSL Tolerance	Root-knot resistance <i>Meloidogyne incognita</i>	Oak Root Rot Resistance <i>Armillaria</i>
Lovell	Fair	Fair-Good	Susceptible	Susceptible
Halford	Fair	Fair-Good	Susceptible	Susceptible
Nemaguard	Poor	Poor	Resistant	Susceptible
Guardian	Fair-Good	Very Good	Resistant	Susceptible
MP-29	Very Good	Very Good	Resistant	Resistant
Sharpe	Likely ??	Good	Resistant	Resistant
Flordaguard	Poor	Fair-Good	Resistant	Susceptible

- Southern growers need to consider Nemaguard or Guardian
- New rootstocks have been developed to fight oak root rot
- Reputable nurseries should know their rootstock



Incorrect selection of rootstock



<http://www.ars.usda.gov/is/AR/archive/nov11/nematodes1111.htm>

Management

- Orchard design
- Tree planting
 - Training
- Fruit thinning
- Tree Training
- Nutrition



Orchard Design

- Most common spacing 18' X 20' (121 trees/A)
 - Can be decreased to accommodate smaller orchards and equipment
- Plant across slope
- Microjet or drip irrigation (normally is installed after planting – currently testing)



Tree Planting/Training (year 1)

- Bare root trees
 - Plant at same depth as in the nursery
 - Remove top 1/3 of whip
 - Be sure to leave healthy buds above graft union



Tree Training (year 2)

- Begin to develop 3-4 main scaffold limbs
 - 18-24" above the ground
 - Choose limbs with wider crotch angles
- Limbs arranged around the trunk
 - Within 6" vertically
- Remove suckers from base of trunk
- Remove vigorous "water spouts" from the center of the tree



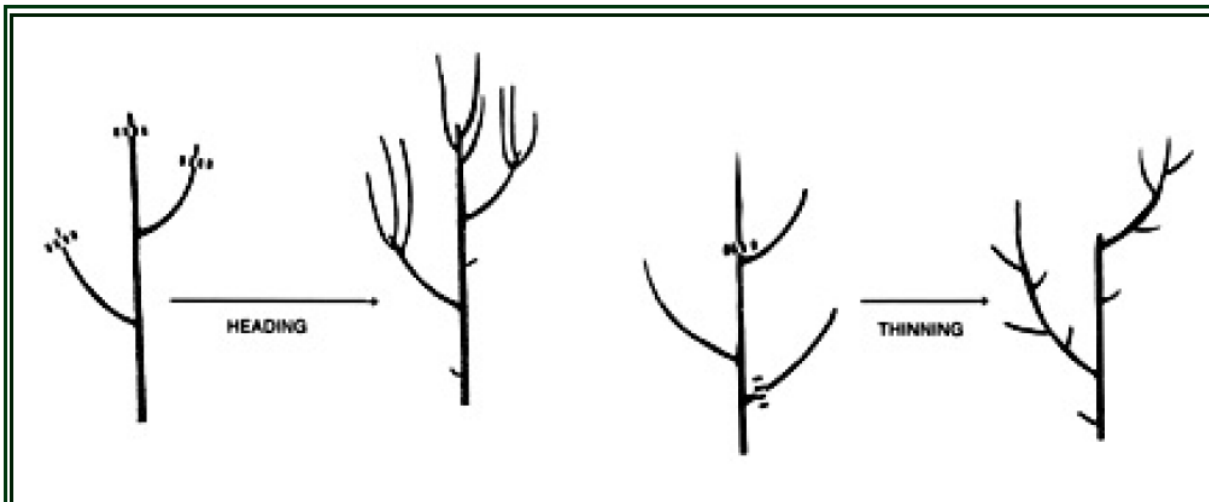


Figure 4. Heading (left) removes a portion of the shoot or limb, stimulating branching below the cut. Heading is most useful for stimulating branching at specific locations when training young trees. Thinning (right) removes an entire shoot or limb to its point of origin or to a side limb. Thinning is the least invigorating type of cut with the least effect on reducing fruit production. Thinning cuts are most useful for promoting fruit production and for maintenance pruning.

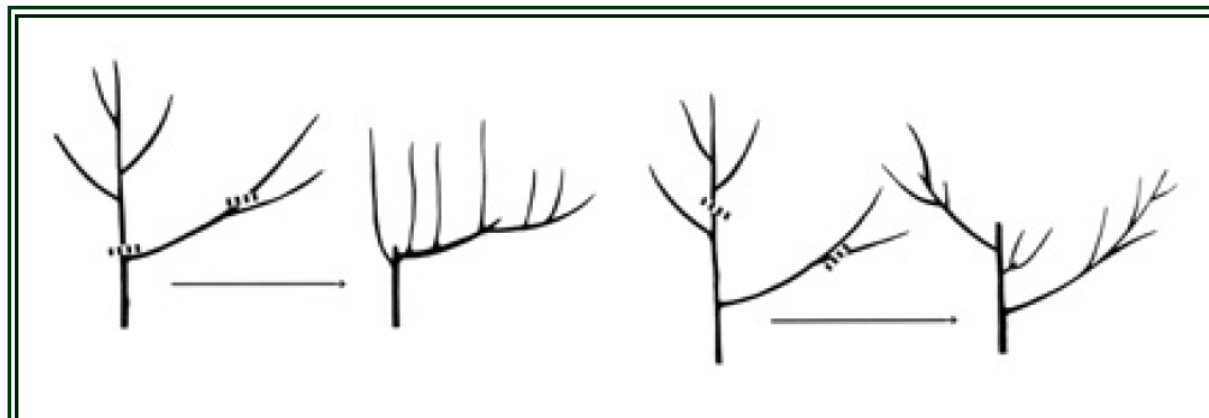
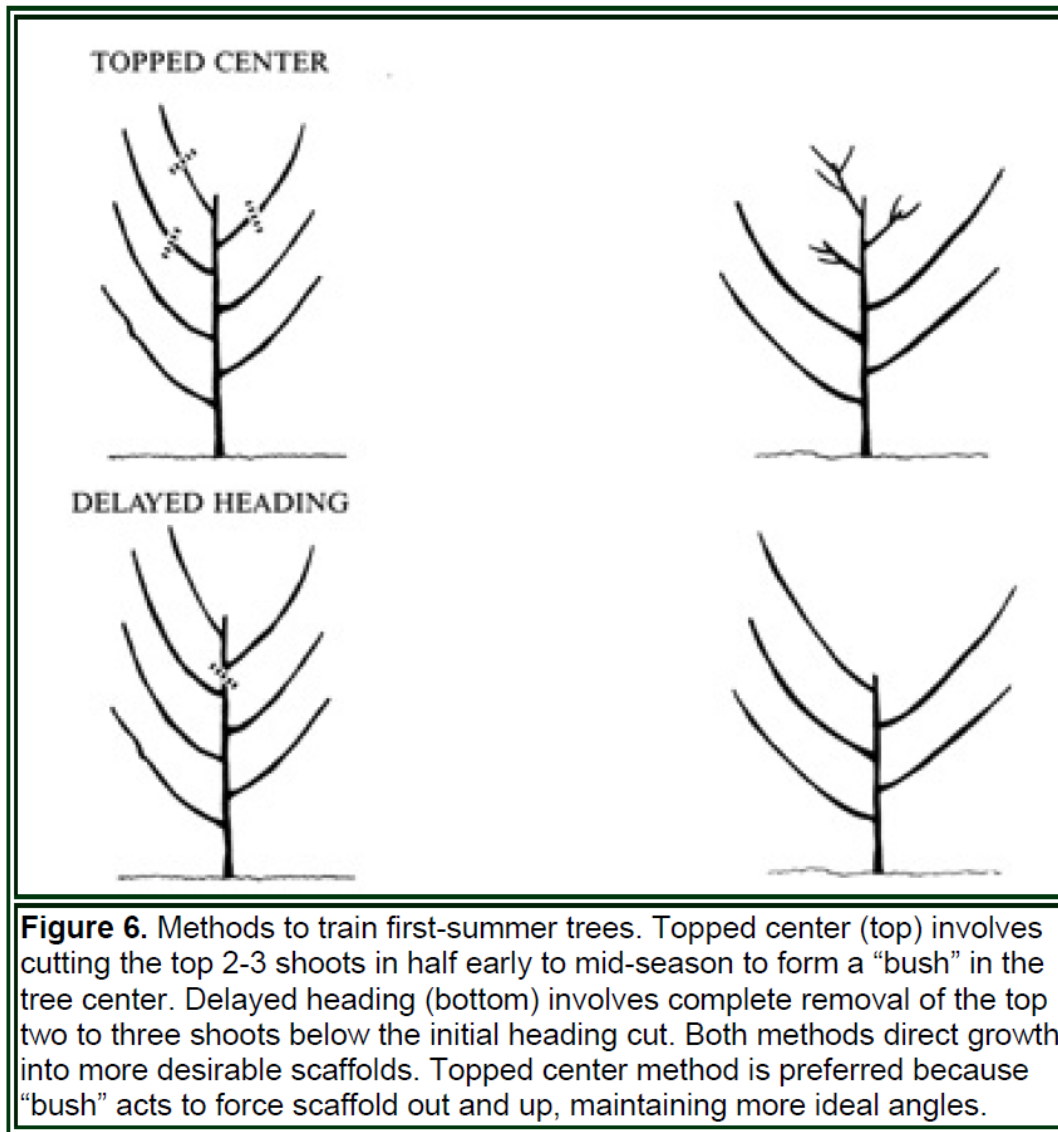


Figure 5. Bench cut (left) is formed by pruning a vigorous, upright limb to a more horizontal limb. Due to loss of apical dominance in the horizontal limb, vigorous water sprouts develop at the “bench.” Correct method is to thin to limbs that are more similar in angle (right) to maintain some apical dominance. Scaffolds should be trained to a 45° angle in early years to minimize need for severe bench cuts.



Source: Southeastern Peach Growers Handbook



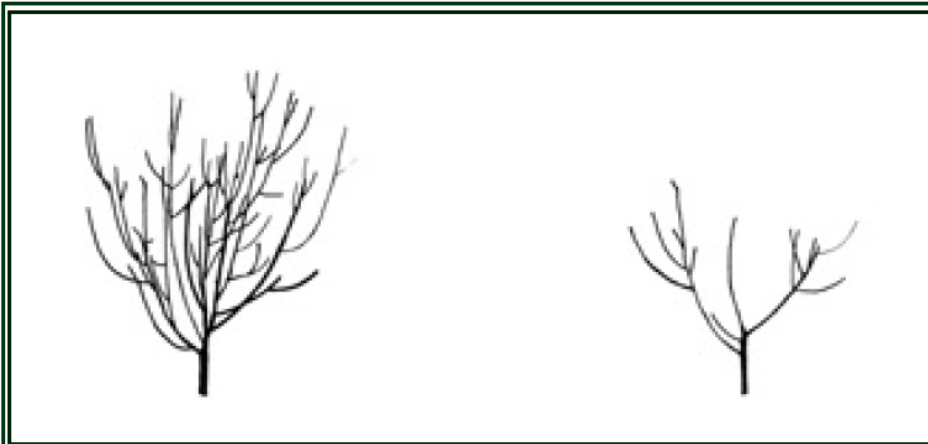


Figure 7. One-year old tree before (left) and after (right) first-year dormant pruning. Select three to four well-spaced primary scaffolds, ideally spaced several inches apart vertically. Prune primary scaffolds to laterals (which form secondaries) at around two to three feet from the crotch. Thin out vigorous upright shoots in center but leave some weaker laterals.



Figure 8. Two-year old tree before (left) and after (right) the second-year dormant pruning. Select secondary scaffolds at two to three feet from the crotch. Thin out low and horizontal shoots and excessively vigorous shoots growing toward the center. Maintain scaffolds at a 45° angle, minimizing the use of severe bench cuts.

Source: Southeastern Peach Growers
Handbook



Tree Training (Year 3+)

- Maintain scaffold limbs form and height
- Annual removal of water sprouts and sucker in season
- Pruning to manage fruiting wood and fruit load should be done prior to bloom
- Space fruiting wood for fruit sizing and light penetration



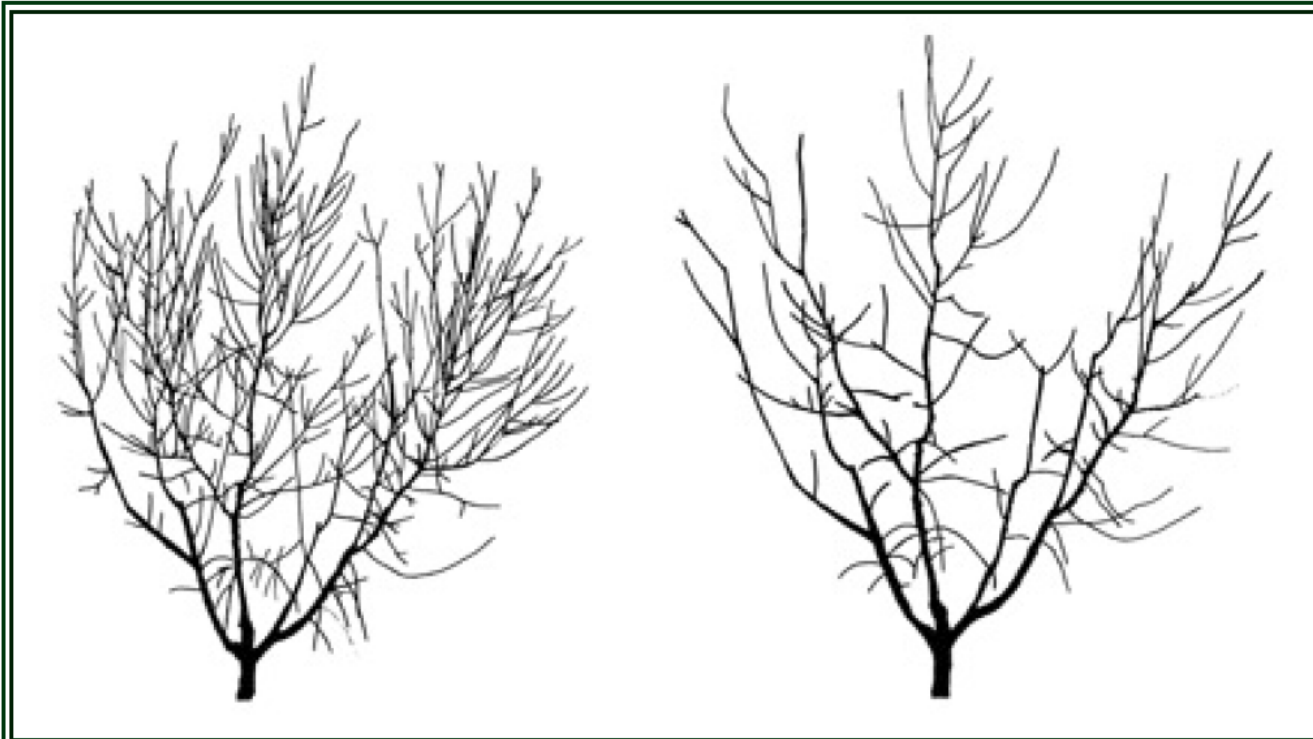


Figure 9. Four-year old tree before (left) and after (right) pruning in the dormant season. Fruiting wood is thinned out to reduce the crop load. Health of fruiting wood is maintained throughout the tree by adequate light penetration. Thin branches back towards scaffolds to encourage new shoot growth close to scaffolds. Light summer pruning may be useful to maintain light penetration in tree centers, maintaining health of fruiting wood throughout the tree.

Source: Southeastern Peach Growers Handbook



Fruit Thinning

- Increase yield per tree and fruit size
- Improves return bloom and bud set
- Improves tree health
 - Over-cropped trees are more susceptible to disease, cold injury and have a shorter life span
- Timed after last damaging cold event (optimal before 40 DAB)





Nutrition

- Leaf samples to be collected for foliar analyses after harvest (around July /August)
- Select the same tree to follow year after year
- Fertilization (based on growth and foliar analyses)
 - First year: March 1lb of 10-10-10 per tree, May 1lb of calcium nitrate, and July 1lb of calcium nitrate.
 - Second year: March 2lb of 10-10-10 per tree, May 1.25lb of calcium nitrate, and July 1.25lb of calcium nitrate.
 - Third year: maintain (unless deficiency) add postharvest appl.



Insect Pests



- Scale insects

- San jose
- White Peach Scale

- Borers

- Peach Tree Borer
- Lesser Peach tree Borer



- Fruit Feeders

- Plum Curculio
- Stink Bugs
- Sap Beetles
- Thrips?



Lesser Peachtree Borers (LPTB)

Synanthedon pictipes

- Gum and frass in wounds
- Attacks scaffold limbs from crotch up
- Particularly bad at large pruning wounds and cold injury sites



Lesser Peachtree Borer Control

- Egg laying from March to November
- Pyrethroids suppress LPTB
- Chlorpyrifos in post harvest cover spray is necessary.



Peachtree Borer (PTB) *Synanthedon exitiosa*

- Overwinter as larvae in galleries in the butt of the tree and major roots
- Pupate just below the soil surface
- Emerge mid-to late-summer
- August – September is peak



Peachtree Borer Control

- Two applications of an appropriate insecticide applied as a coarse spray with a handgun to the butt of the tree and up several inches is needed to form barrier.
- Chlorpyrifos, Rimon, Exirel and Altacor provided exceptional control in 2014 trials
- Applications made post harvest and again in early September were effective



Borer Control

- Cover sprays do not adequately control LPTB or PTB
- Stressed trees are more susceptible
- Wounds of all types are highly attractive to both
- Both can easily reduce tree life by greater than 2 years



LPTB and PTB



Area-wide Approach to Mating Disruption Manages Borers Attacking Peach

Ted Cottrell¹ and Dan Horton²

¹USDA, ARS, Byron, GA

²Univ. of GA, Dept. of Entomology, Athens, GA



LPTB injures trunk and scaffold limbs



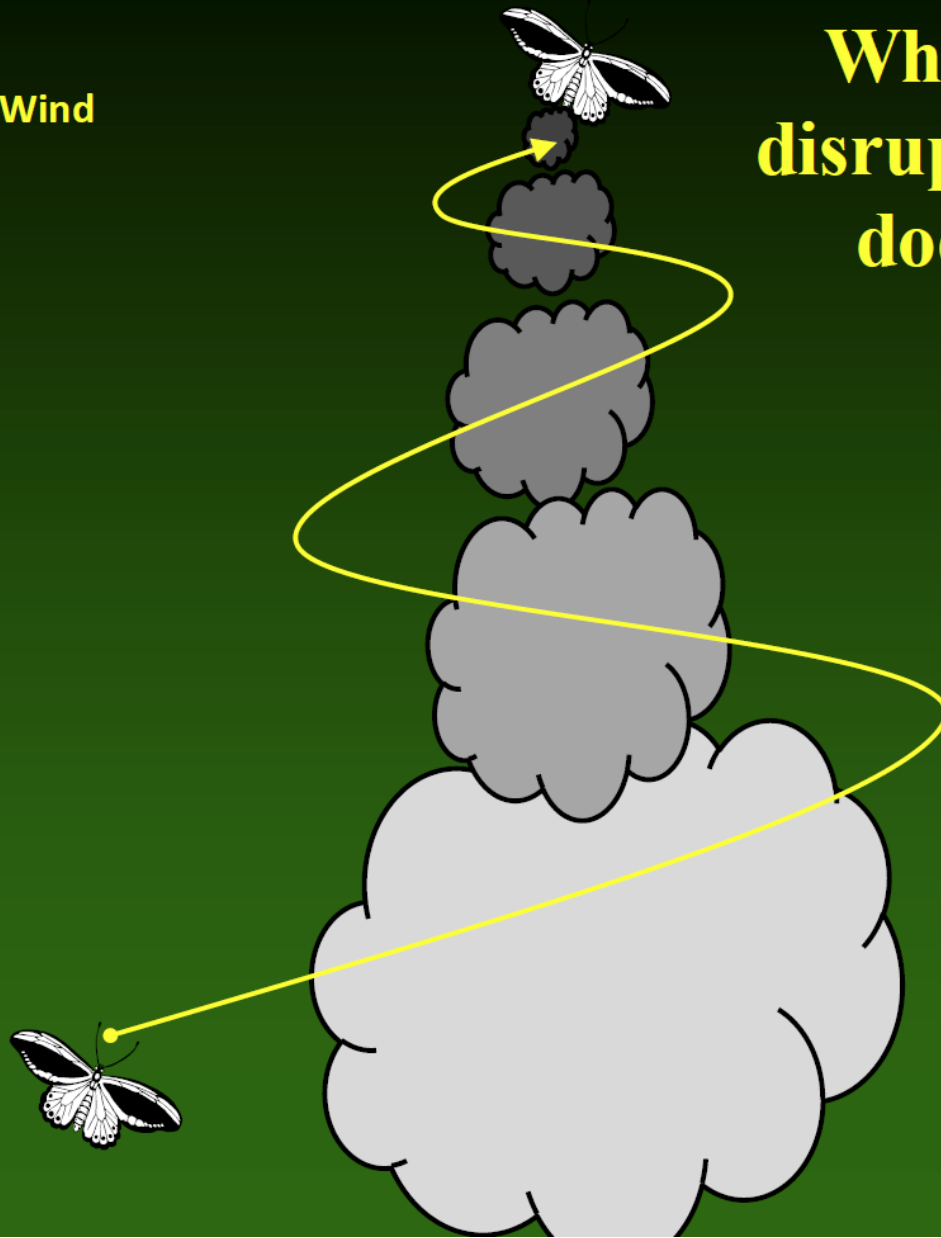
PTB injures roots/base of trunk





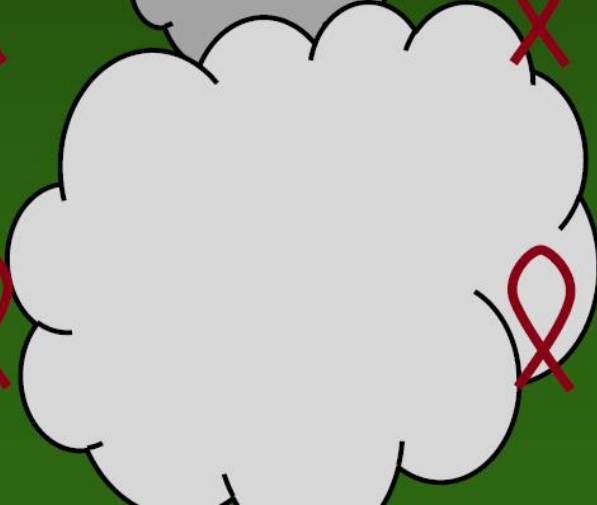
Wind

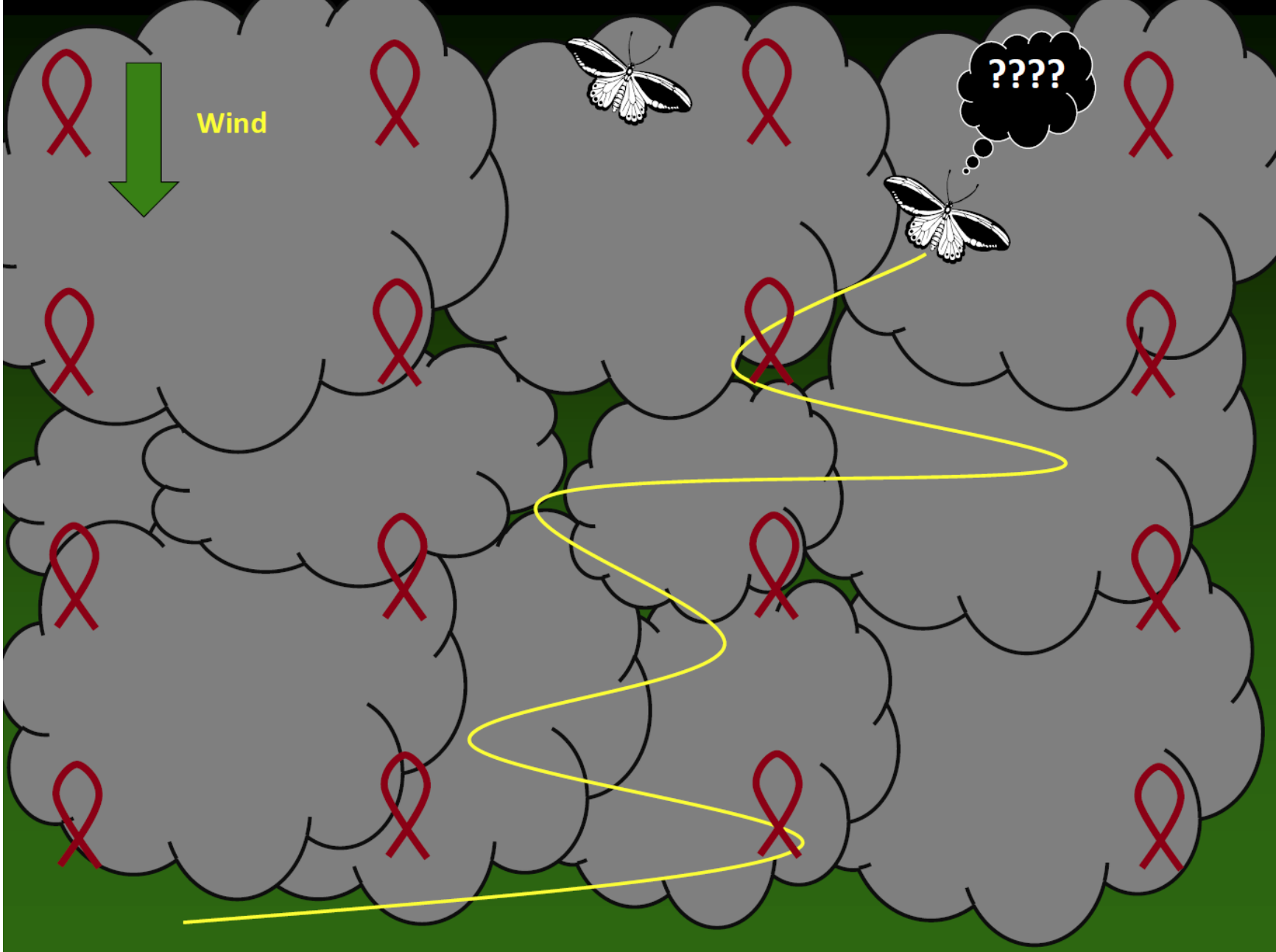
**What is mating
disruption and how
does it work?**





Wind







Season-long dispenser formulated for
the southeast

**2015 and 2016 Area-wide
LPTB/PTB Mating Disruption**



All peach orchards in this area (outlined in blue) were treated with pheromone dispensers in early March (2015 and 2016)

Commercial tree nursery for landscape trees – No *Prunus* spp.

4 X 5.3 miles

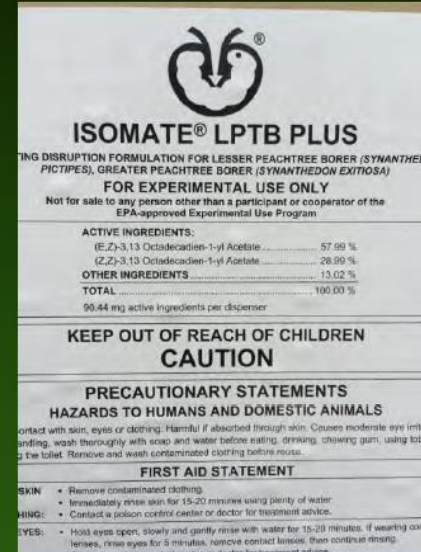
Pecan Orchards

Peach orchard removed before demonstration trial began in 2015.

Commercial sod grass farm

Isomate LPTB Plus

- Dispenser rate: 150/acre
- Peach Acreage to Treat:
All of it!
- Dispensers applied:
late February/early March
- Pests affected:
LPTB and PTB



The image shows a white product label for Isomate LPTB Plus. At the top is a logo featuring a stylized bird or insect. Below the logo, the product name "ISOMATE® LPTB PLUS" is printed in bold. Underneath, it states "ACTIVE DISRUPTION FORMULATION FOR LESSER PEACHTREE BORER (SYNANTHEDON PICTIPES), GREATER PEACHTREE BORER (SYNANTHEDON EXITIOSA)" and "FOR EXPERIMENTAL USE ONLY". A warning line reads "Not for sale to any person other than a participant or cooperator of the EPA-approved Experimental Use Program".

ACTIVE INGREDIENTS:	
(E,Z)-3,13-Octadecadien-1-yl Acetate	57.99 %
(Z,Z)-3,13-Octadecadien-1-yl Acetate	26.99 %
OTHER INGREDIENTS	
	13.02 %
TOTAL	
	100.00 %

90.44 mg active ingredients per dispenser

**KEEP OUT OF REACH OF CHILDREN
CAUTION**

**PRECAUTIONARY STATEMENTS
HAZARDS TO HUMANS AND DOMESTIC ANIMALS**

Caution: Harmful if absorbed through skin. Causes moderate eye irritation. Avoid contact with skin, eyes or clothing. If contact occurs, wash thoroughly with soap and water before eating, drinking, chewing gum, using tobacco or using the toilet. Remove and wash contaminated clothing before reuse.

FIRST AID STATEMENT

SKIN:	• Remove contaminated clothing. • Immediately rinse skin for 15-20 minutes using plenty of water.
WASHING:	• Consult a poison control center or doctor for treatment advice.
EYES:	• Hold eyes open. Slowly and gently rinse with water for 15-20 minutes. If wearing contact lenses, rinse eyes for 5 minutes, remove contact lenses, then continue rinsing.



Areas marked in black:

Sampled each tree for LPTB wounds and none found during Feb. 2015. Re-sampled all trees again during 2016 and found NO LPTB wounds.

Areas marked in yellow:

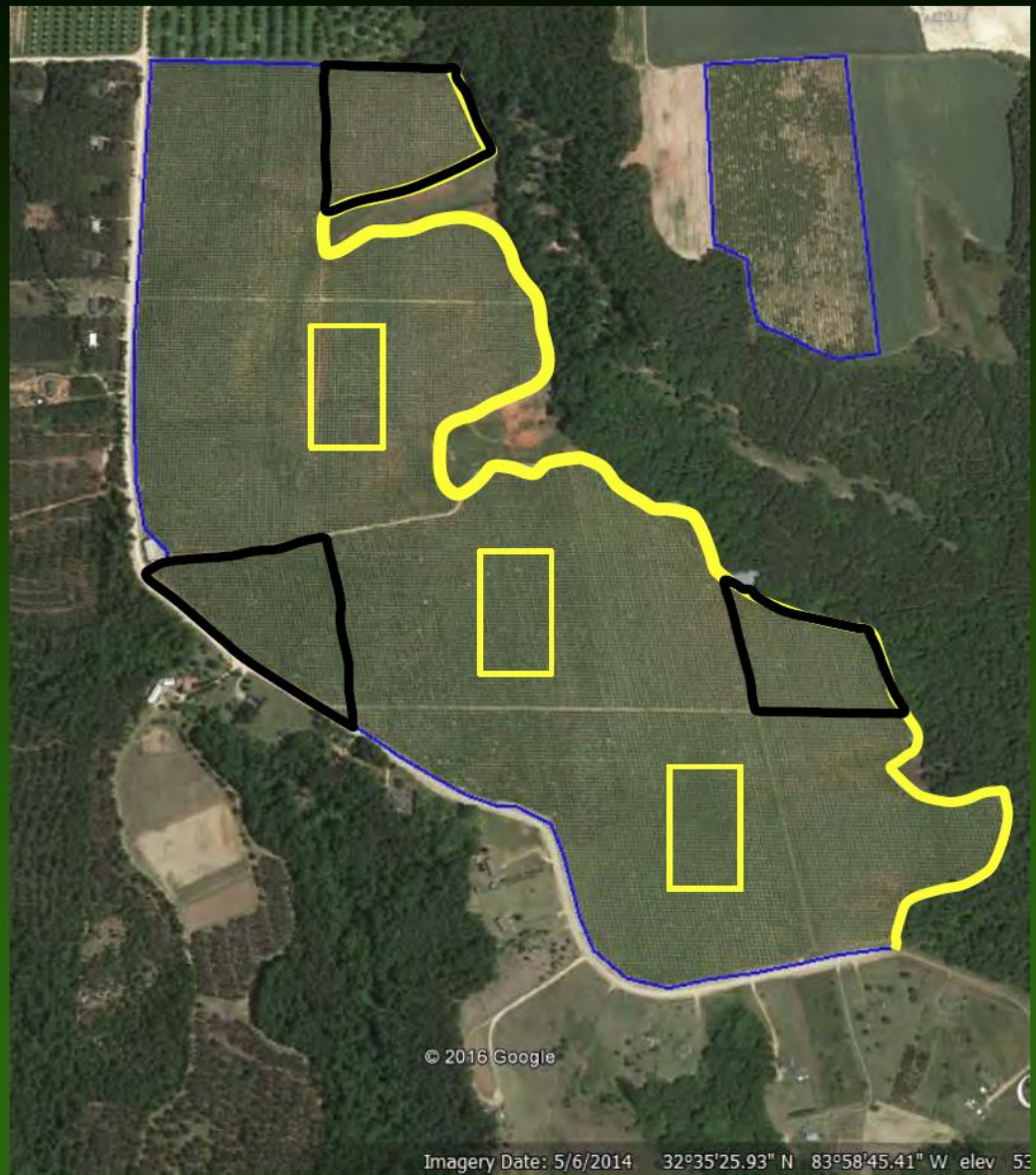
Interior - Sampled all trees for PTB injury during April 2016.

Edge – Sampled all trees, 2 trees deep, along the edge.

Results - Found 0 trees with PTB infestation.

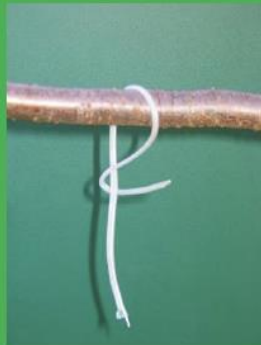
Other orchards were similarly sampled with similar results. In total, only 2 active LPTB wounds were found. No active PTB infestation was found.

Sampling to be done again during winter/spring 2017.



Key Label/Use Points:

- Rate: 150 dispensers per acre
- Apply as high in tree as one can reasonably reach on lateral branches in a uniform manner across the field
- Apply before first flight occurs in spring



Yes



Beneficial Nematodes Are Effective Control Agents for Peachtree Borers

D. Shapiro-Ilan¹, T. Cottrell¹,

R. Mizell², Dario Chavez³ & Jeff Cook³

& D. Horton³



¹USDA-ARS Byron, GA, ²University of FL,
³University of GA



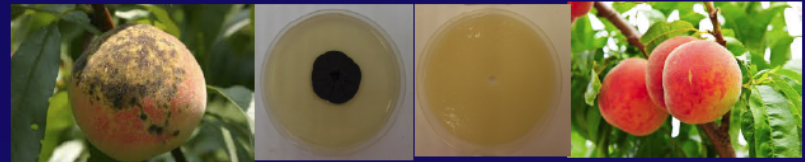
Entomopathogenic Nematodes (EPNs)

- Two genera: *Steinernema* & *Heterorhabditis*
- Safe bio-insecticides exempt from EPA registration
- Applied using standard agricultural equipment
- About 9 species of nematodes are currently commercially available for control of various pests including white grubs, thrips, black vine weevil, chinch bug, fungus gnats, fleas, citrus weevils, black cutworm, small hive beetle, etc. (Shapiro-Ilan et al. 2012, 2014)



EPNs kill their insect host with the help of a partner – symbiotic bacteria

- Bacteria are the primary killing agents & produce antibiotic defenses to protect against other microbial invaders
- Nematodes also contribute to killing the host, suppress the immune system, and act as vectors for the bacteria (bacteria cannot survive in the soil without the nematodes)
- There is a high degree of specificity in the relationship
- The antibiotic byproducts are strongly antifungal and thus being pursued for suppression of plant disease such as brown rot and scab



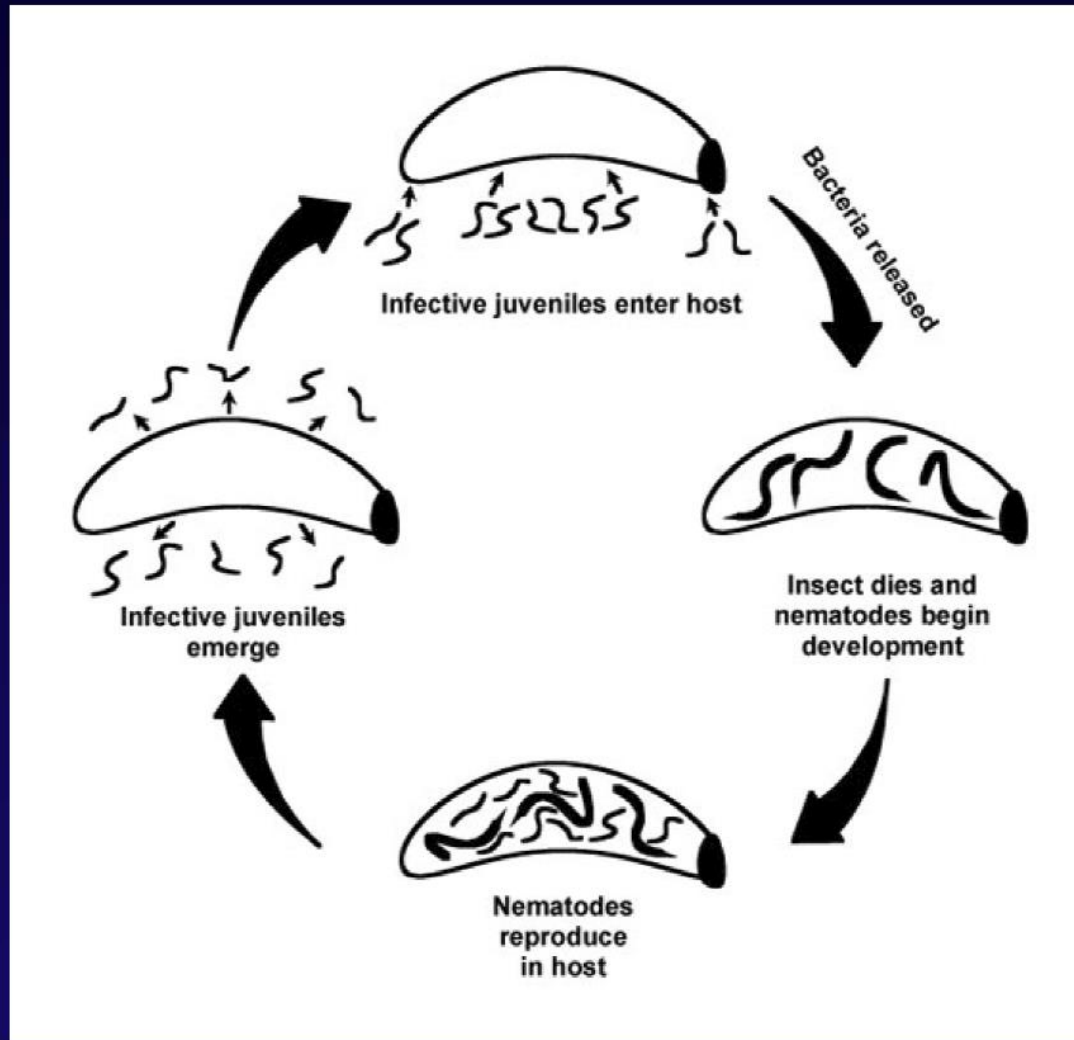


Diagram by Bill Joyner, USDA-ARS

Barricade as an Improved Formulations for Using Nematodes Versus LPTB

- Barricade®, firegel applied after nematodes allowed high levels of LPTB suppression on peach limbs (65-100% control) (Shapiro-Ilan et al. 2010)
- May have broad applications for use vs. other pests/crops
- Potential problem – 2 sprays needed (nematodes & Barricade)
- More recently: Determined if nematodes can be applied effectively in a single spray with a reduced concentration of Barricade



Field Trial vs. LPTB: Quincy, FL

- Treatments:

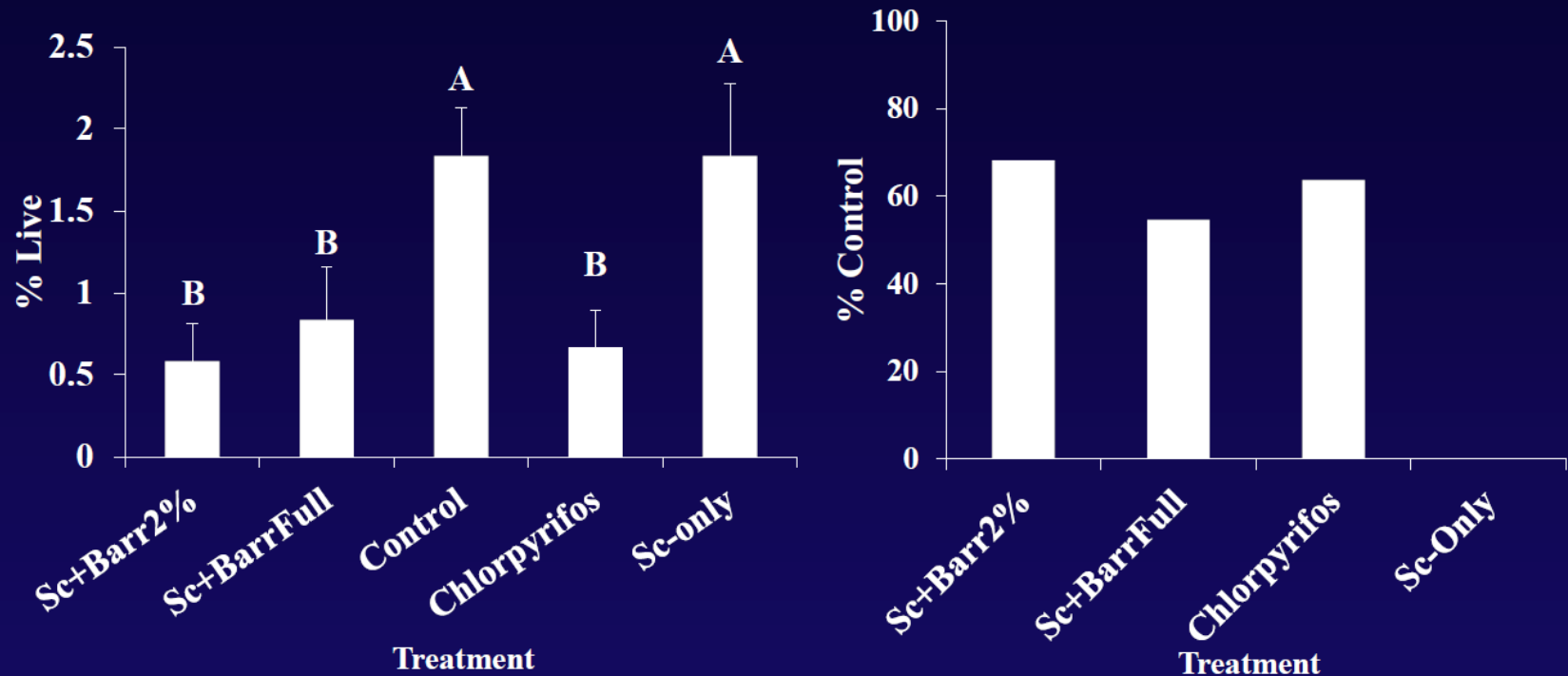
- Nematodes* + Barricade full (4%)
- Nematodes + Barricade 2%
- Nematodes without Barricade
- chlorpyrifos
- Water control



- Apply treatments with hand sprayer to 4 reps of 3 infested wounds (12 wounds total per treatment, RBD)
- Assess live/dead LPTB one week later, 11/12/2013
- Repeat 10/29/2014 in CRD (18-25 wounds per treatment)
- * Commercially produced *S. carpocapsae* (Sc), 1 mill IJs / wound



Field Trial Results 2013



- Nematodes (Sc) + Barricade at full and 2% rates provided control equal to chlorpyrifos



Control PTB – Organic production

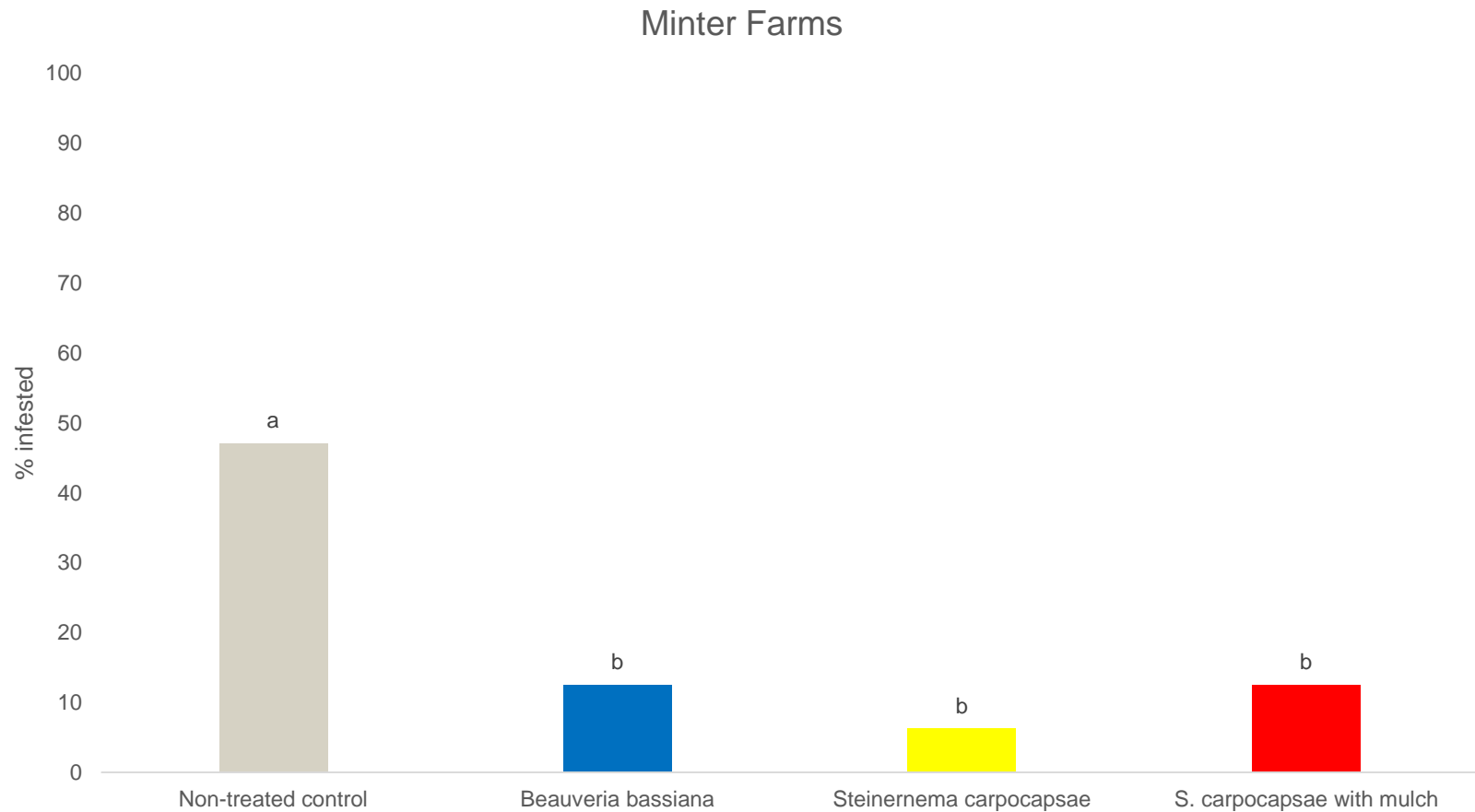
- Organic farm (Minter's farm, Fayetteville, GA)
- Treatments:
 - Nematodes with pine mulch
 - Nematodes only
 - *Beauveria bassiana*
 - Untreated control
- First year data: low infestation (not significant) – 2015



Field inoculations



Results Second year 2016 – PTB control



Application of Entomopathogenic Nematodes

- Nematodes applied 1.5 million per tree both times. They were applied with approx. 500 mL and then watered in with approx. 1 gallon of water. (irrigation every 3-4 days)
- There are currently commercial products available.
- Test to be used or injected in irrigation (could be done easily).



Diseases of Peach

- Flower
 - Blossom blight – *Monolinia fructicola*
- Fruit
 - Brown rot - *Monilinia fructicola*
 - Scab – *Fusicladium carpophilum*
 - Anthracnose
- Leaves/Fruit
 - Bacterial Spot
- Trunk
 - Bacterial Canker
 - Armillaria Root Rot (Oak root rot)
 - Phytophthora
 - Fungal Gummosis



Brown Rot



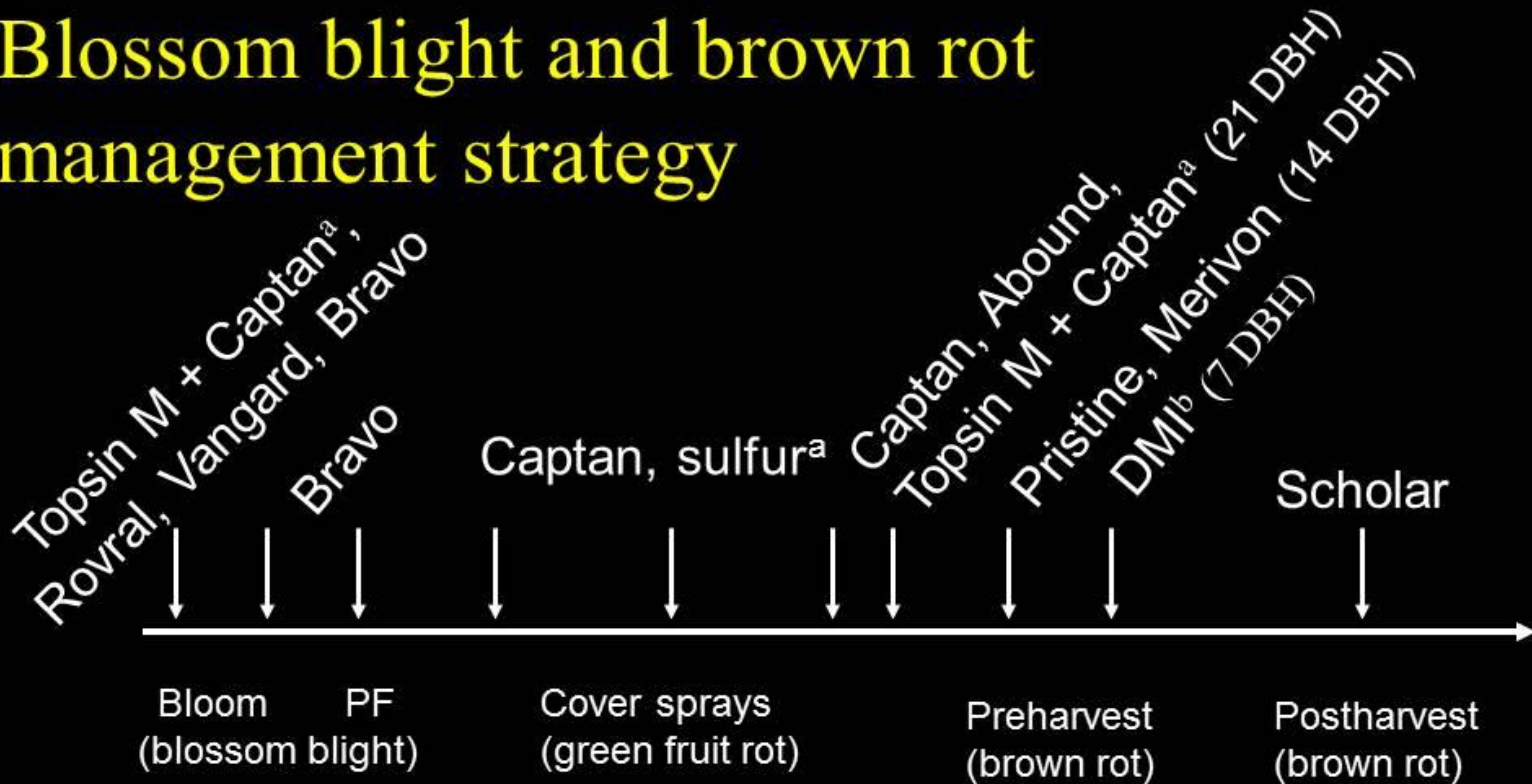
Brown Rot

- Blossom blight first appearance.
- Stem lesions form at base of flower buds
- These infected blooms, stem lesions and infected immature fruit serve as secondary inoculum source to infect mature fruit.
- Removal of inoculum and cover sprays are vital



Blossom Blight/Brown Rot

Blossom blight and brown rot management strategy



^a Topsin M should only be utilized once per year, and it should always be tank-mixed with Captan products for resistance management.

^b If DMI resistance is suspected or documented, use captan instead of sulfur in cover sprays and use the high rate of Elite or Indar preharvest.



Source: Clemson University

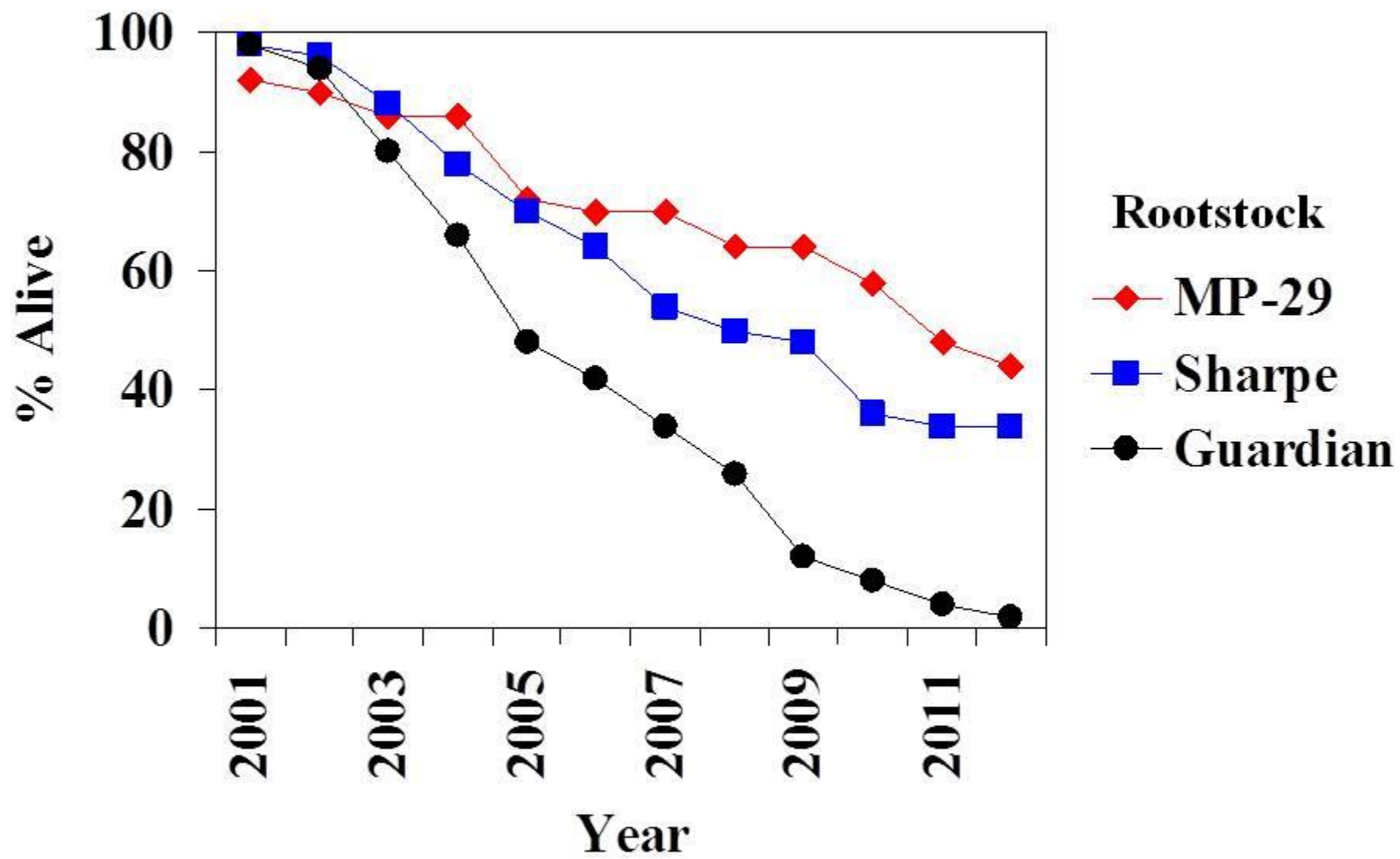
Armillaria Root Rot

- AKA Oak Root Rot
- Commercially available rootstock (previously described)
- Planting Methods? – walking tree technique
- Replant Issues



Source: Clemson University





Nematodes

- Ring (PTSL), Lesion, and Root Knot
- Sample ahead of planting
 - February – April: Primarily for ring
 - September – October: Primarily for root-knot and root-lesion
- Fumigate as needed
- Use of resistant rootstocks
 - Guardian, Nemaguard, MP-29, Flordaguard.



SOUTHEASTERN PEACH, NECTARINE AND PLUM PEST MANAGEMENT AND CULTURE GUIDE

- Pest Recommendations by growth stage
- Easy to understand threshold levels and spray directions
- Pesticide Rating Included

https://secure.caes.uga.edu/extension/publications/files/pdf/B%201171_10.PDF



Acknowledgments

Peach lab members

- Catherine Belisle (former MS student)
- Jun Liu (former MS student)
- Luis Monserrate (former intern and MS student)
- Bruno Casamali (PhD Student)

- Mary Sutton, Gray Strickland, Cierrah Guerrero, Courtney Bagwell, Eric Roldan, and Maybelle Flores (former interns)

- Malgorzata Florkowska (technician)
- Will Westmoreland (technician)
- Leigh Ann Fall (former technician)

UGA

- Jeff Cook
- Phil Brannen
- Mark Czarnota
- Brett Blaauw
- Harald Scherm

USDA-ARS

- Tom Beckman
- Chunxian Chen
- Ted Cottrell
- David Shapiro-Ilan



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Useful links:

<https://blog.extension.uga.edu/peaches/>

<http://www.caes.uga.edu/commodities/fruits/gapeach/>



Questions?

THANKS!

