

# Update on new cherry rootstock possibilities from Michigan State Univ.

Amy Iezzoni  
Department of Horticulture  
Michigan State University



IFTA Conference, February 2013

# Outline

---

- MSU's candidate cherry rootstocks with sweet cherry scions
- MSU's candidate cherry rootstocks with Montmorency scion
- Pre-commercialization activities for the MSU candidate cherry rootstocks
- What about *Armillaria* resistant rootstocks?



# Extensive cherry germplasm was collected for the MSU program



# Select sweet cherry rootstock candidates from MSU's cherry germplasm collection

## Objective

Identify dwarfing precocious rootstocks that have the potential to increase the profitability of cherry production.

The majority of the funding was provided by the Wash. Tree Fruit Research Commission & the Oregon Sweet Cherry Commission



**From 1997-2001, 100's of seedlings were tested. 93 were selected & planted with Hedelfingen scion in a test block at MSU**



Criteria used to chose selections: tree health & pedigree

Tests used to eliminate selections: rooting of softwood cuttings, PDV & PNRSV hypersensitivity



Dr. Hannah Schmidt, co-developer of the Gisela® series rootstocks, visited MSU in 1997.

**Between 1997-2001, these 93 selections that were free of PDV & PNRSV, were also established in a “mother block” at MSU**



The mother block has served as the maintenance plot for the rootstock germplasm.

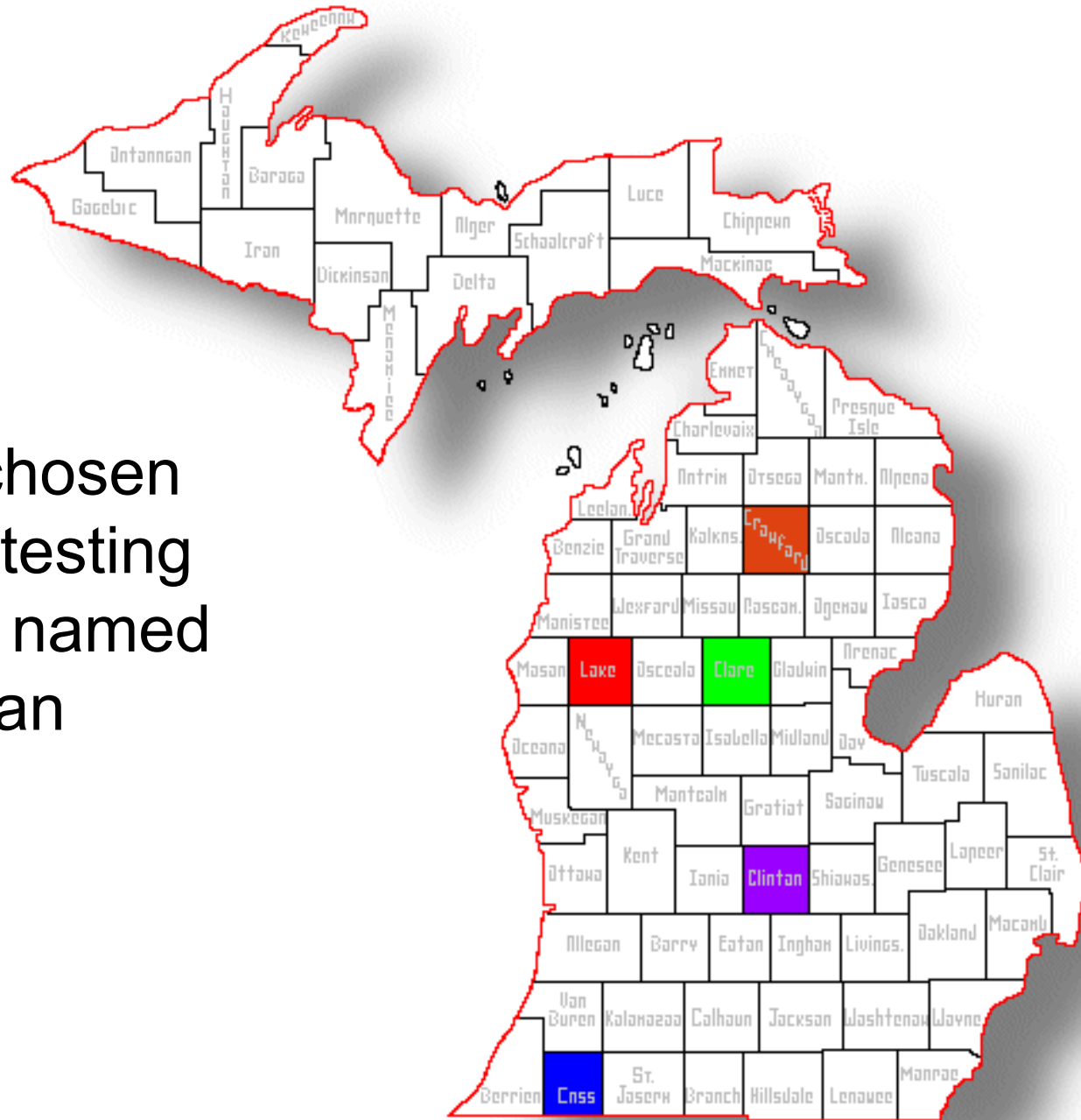


# First rootstock selections were made from results from the Mich. plot

- Original grafted trees of the MSU candidate rootstocks were planted at MSU's Clarksville Research Center from 2001 to 2004.
- A set of 11 potential candidate rootstocks was selected in 2007.



The cherry rootstocks chosen for the next testing phase were named after Michigan counties.





# **The plot in Prosser, Wash. WSU – Roza Research Station**

264 trees of the test rootstock selections grown at Willow Drive Nursery were planted at the WSU-Prosser Roza Farm in Spring 2009.

Liner production at MSU



WSU – Roza plot



# **The plot in Prosser, Wash. WSU – Roza Research Station**

---

## **ACKNOWLEDGEMENT**

Plot oversight & data collection

- Matt Whiting (WSU)
- Tom Auvil (WTFRC)



# Four of the MSU rootstock candidates looked promising (WSU-Prosser, Spring 2011, trees planted 2009)

**Gi6**



**CASS**



**CLARE**



**CLINTON**



**LAKE**



**Based on year 2012 evaluations of Bing flowering and fruiting, 5 of the MSU rootstocks look promising.**

**Gi5**



**CASS**



**CLARE**



**CLINTON**



**LAKE**

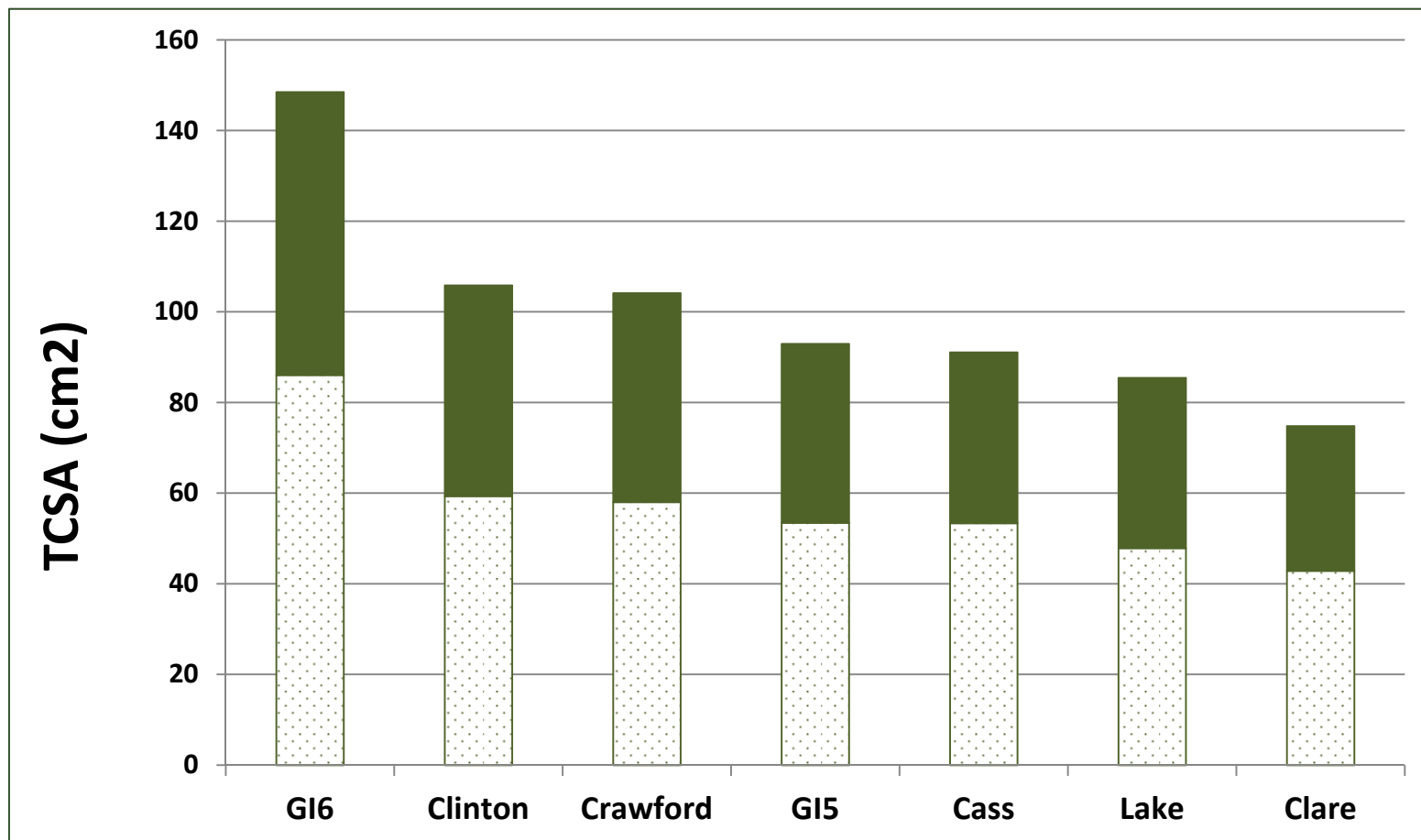


**CRAWFORD**



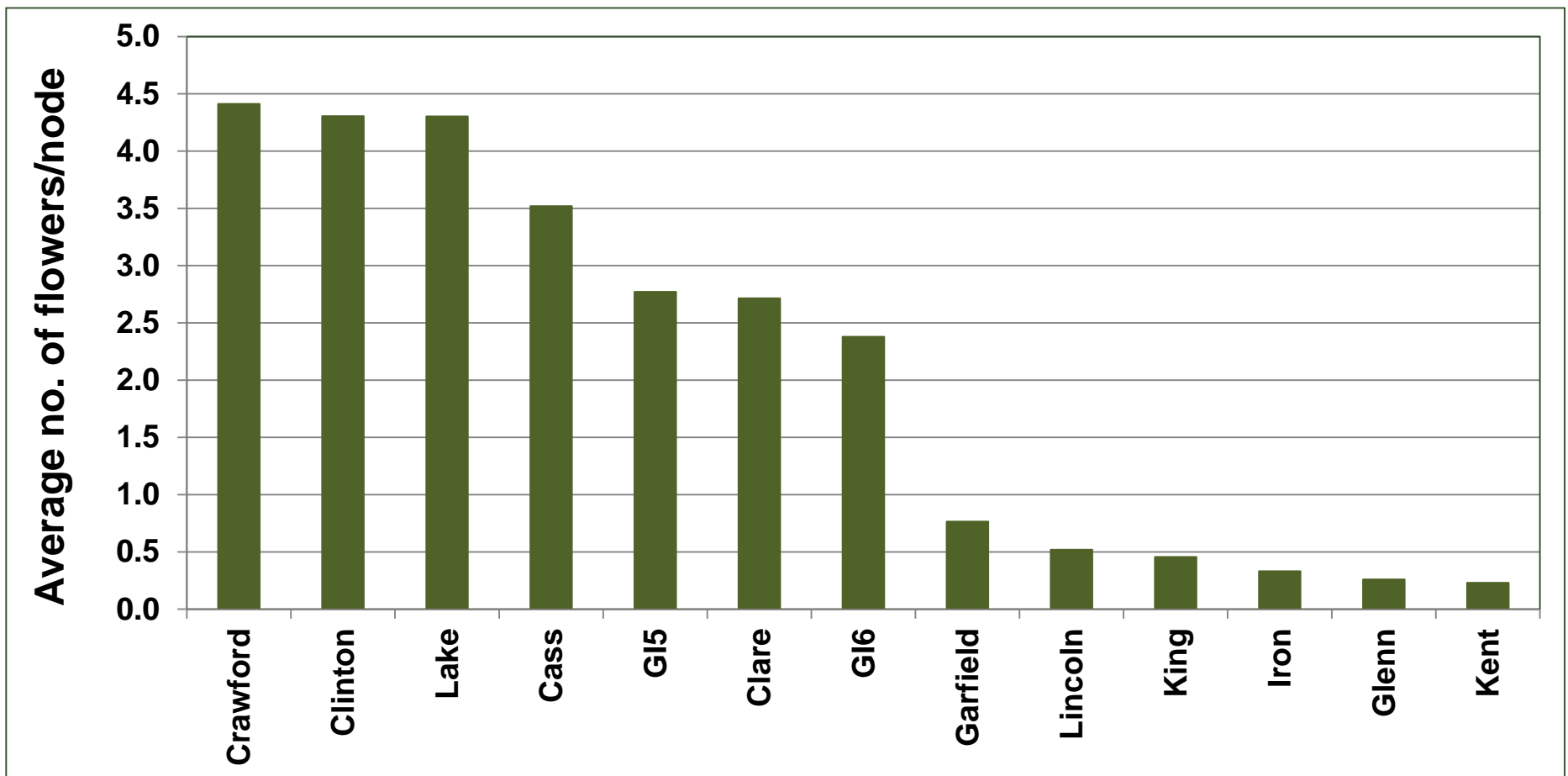
# Trunk cross sectional area (TCSA; cm<sup>2</sup>) of 5 MSU rootstock candidates, Gi 5, and Gi 6

The top bars indicate mean TCSA recorded on 9 July 2012. The bottom bar is the mean TCSA measurement on 28 September 2011. Therefore, the green bar indicates the TCSA increase during the first part of the 2012 growing season.



# 2012 flowering data

Five MSU rootstocks had more flowers per node than Gi6





# Fruitlets were thinned by removing every other fruit on May 25, 2012

**Bing/GI6 before thinning**



**Bing/GI6 after thinning**



**Bing/Clinton before thinning**



**Bing/Clinton after thinning**



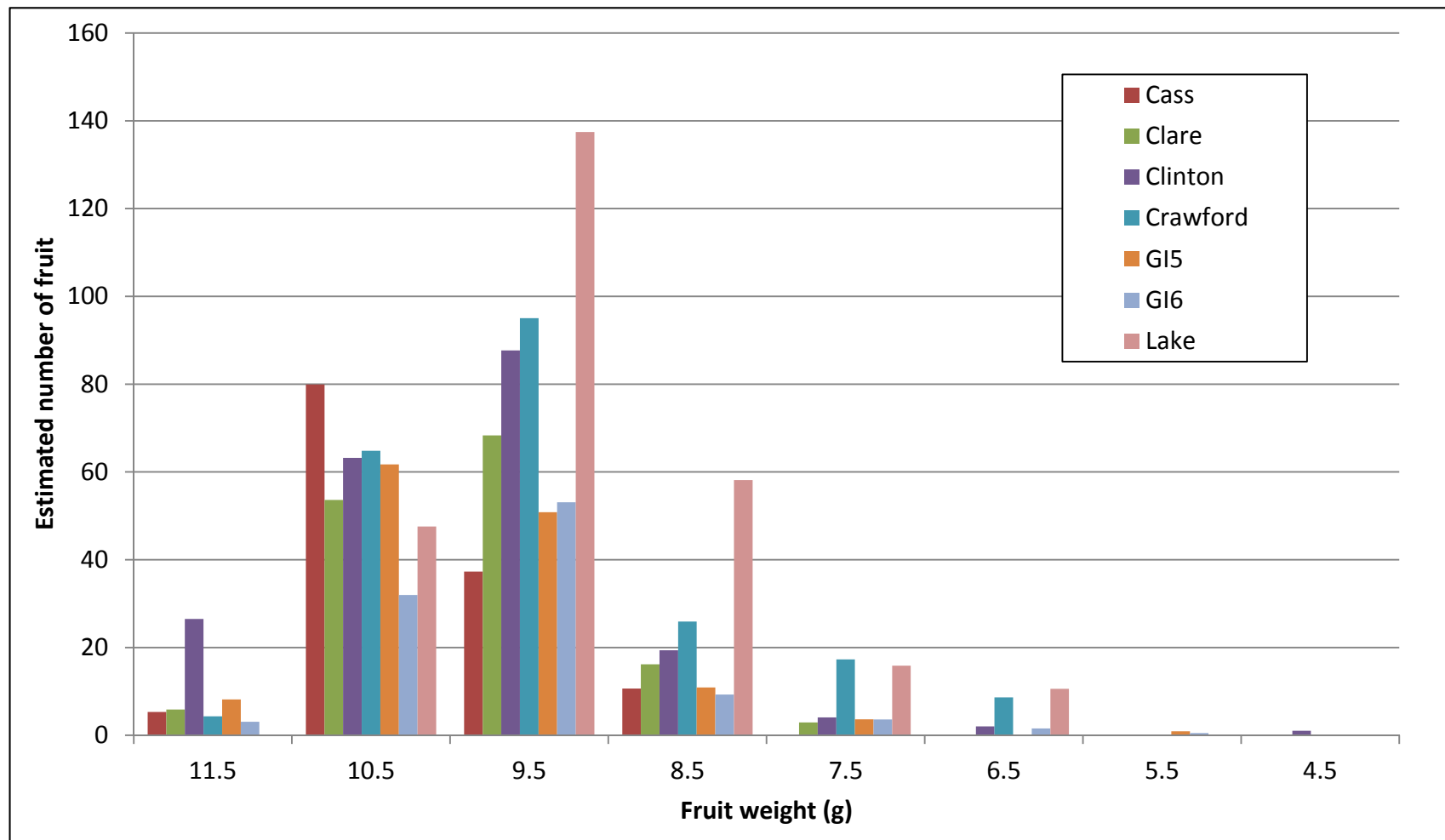


# 2012 harvest of the WSU-Roza plot & fruit evaluation at the WTFRC Wenatchee lab



# 2012 fruit data

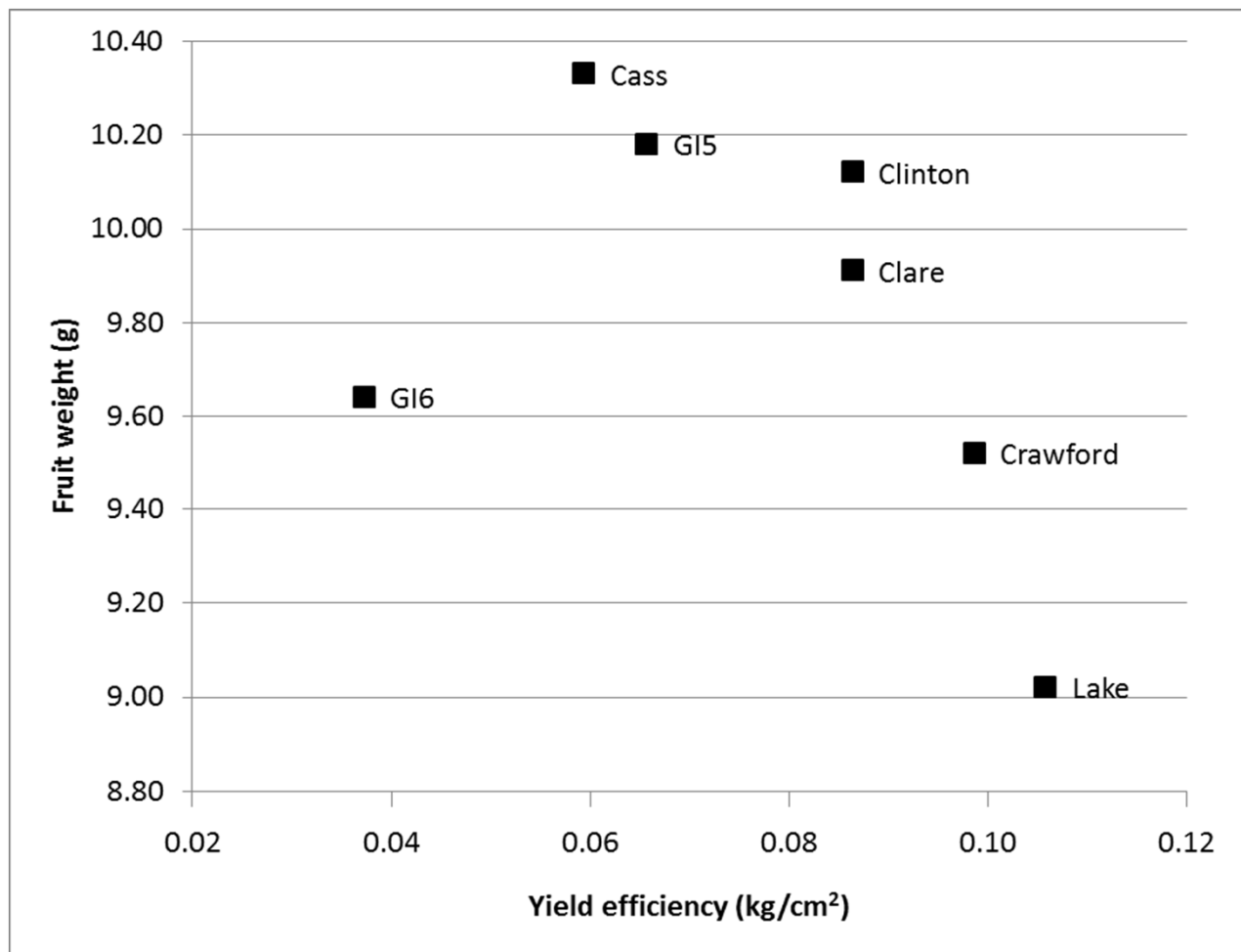
Fruit weight distribution for MSU rootstocks and Gi5 and Gi6





# 2012 fruit data

Average yield efficiency and fruit weight for MSU rootstocks and Gi5 and Gi6



# Relative tree sizes for 9 commercial cherry rootstocks & the 5 MSU candidate cherry rootstocks

Gi 12, Mazzard, Colt  
Maxma 14, Mahaleb

Gisela 6  
Krymsk 5

Krymsk 6

Gisela 5

90+%

80-90%

60-80%

50-60%

40-50%

35-40%

Clinton

Lake, Cass  
Crawford

Clare



# Outline

---

- MSU's candidate cherry rootstocks with sweet cherry scions
- MSU's candidate cherry rootstocks with Montmorency scion
- Pre-commercialization activities for the MSU candidate cherry rootstocks
- What about *Armillaria* resistant rootstocks?



# Tree production for the Michigan plantings: Liner & tree production at Duarte Nursery & Willow Drive Nursery

Duarte Nursery:

Tissue culture to  
greenhouse liner  
production



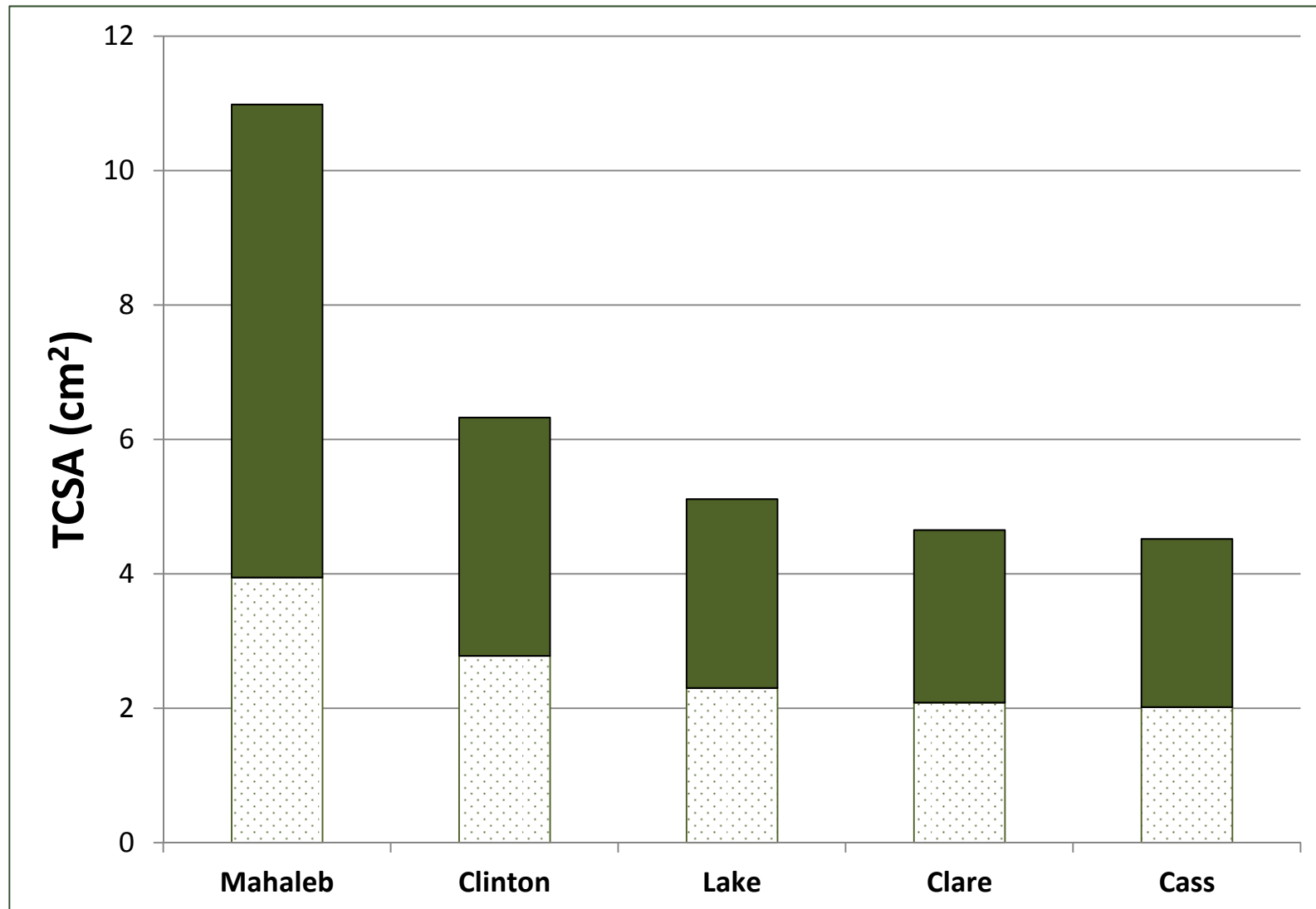


# Montmorency on 9 MSU candidate rootstocks planted in Spring 2011 at MSU's NWMHRS



Control = mahaleb rootstock. Standard tree spacing.  
Photo taken on August 20, 2012

# Trunk cross sectional area (TCSA; cm<sup>2</sup>) of 'Montmorency' trees, planted at the NWMHRS





# Relative tree sizes based on trunk cross sectional area (TCSA; cm<sup>2</sup>) of 'Montmorency' trees, NWMHRS

**Mahaleb**



90+%

**Gisela 6\***



60-80%



50-60%

**Clinton**

**Gisela 5\***

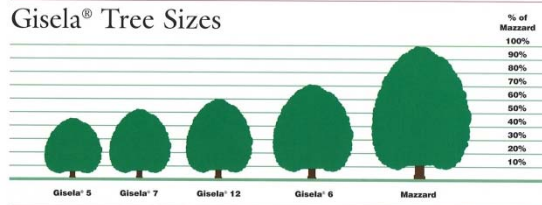


40-50%

**Lake, Cass,  
Clare**

\*From "Gisela® Dwarf Rootstocks"

Gisela® Tree Sizes



## Number of MSU candidate cherry rootstocks in the over the row plot at the NWHRS (planted 2011)

Montmorency/CASS	69
Montmorency/CLINTON	59
Montmorency/LAKE	32
Montmorency/CLARE	21





# Outline

---

- MSU's candidate cherry rootstocks with sweet cherry scions
- MSU's candidate cherry rootstocks with Montmorency scion
- Pre-commercialization activities for the MSU candidate cherry rootstocks
- What about *Armillaria* resistant rootstocks?

# Preventing future problems with rootstock availability & affordability

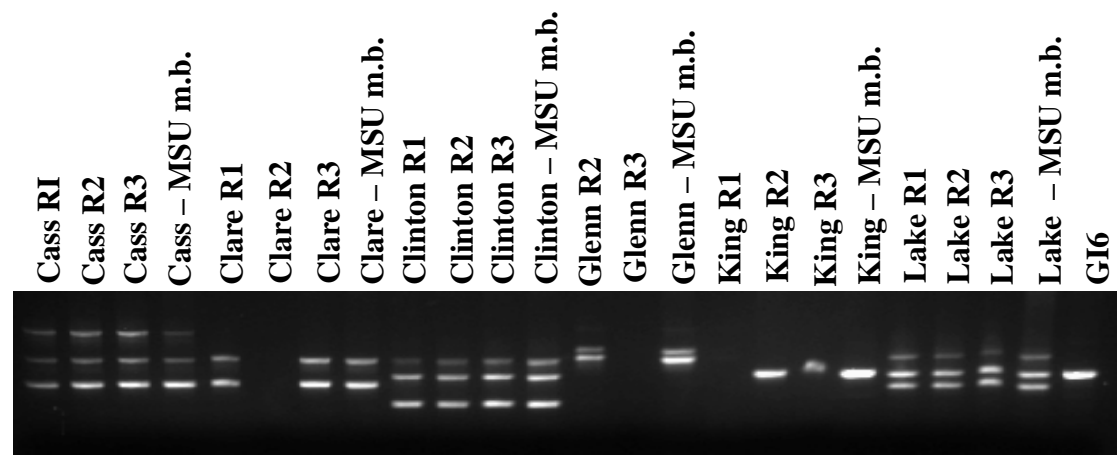
Put together a liner pipeline ahead of time so liner availability and tree cost are not future roadblocks.

Strategy – Get virus certified and genetically verified rootstock material in the hands of liner nurseries as soon as possible.

Virus certification was done at the National Clean Plant Network – Fruit Trees



Genetic verification is done in my MSU lab.





# Rootstock distribution to 7 liner nurseries was accelerated to:

- Provide a mechanism for generating liners for future trials
- Give the nurseries an opportunity to gain experience propagating these rootstocks & making finished trees
- Begin to establish virus certified and genetically verified stock plants in case of commercialization

## Nurseries:

- Cameron Nursery, Eltopia, Wash.
- Copenhagen Farms, Gaston, Ore.
- Duarte Nursery, Hughson, Calif.
- North American Plants, Lafayette, Ore.
- Protree Nurseries, Brentwood, Calif.
- Teak Nursery, Orondo, Wash.
- Willamette Nursery, Canby, Ore.



Amy Iezzoni and Yongqian Chang

# A source of virus-certified & genetically-verified liners for future trials and potential commercialization is being provided:

\* = LAKE, CLARE, CLINTON (2011); √ = CASS (2012)

- \*, √ - Cameron Nursery, Eltopia, Wash. (Todd Cameron)
- \* - Copenhagen Farms, Gaston, Ore. (Christopher Dolby)
- \*, √ - Duarte Nursery, Hughson, Calif. (John Duarte)
- \*, √ - North American Plants, Lafayette, Ore. (Yongjian Chang)
- \* - Protree Nurseries, Brentwood, Calif. (Richard Chavez)
- \*, √ - Teak Nursery, Orondo, Wash. (Tye Fleming & Todd Erickson)
- \* - Willamette Nursery, Canby, Ore. (Devin Cooper)



Budwood of CRAWFORD was sent to the NCPN-FT in fall 2012

## 2012-3 outcomes from this distribution:

- Knowledge of horticultural aspects of liner production
- Sufficient liners for the next rootstock trials





## **Current Activities**

---

Liners of CASS, CLARE, LAKE, CLINTON, & eventually CRAWFORD are being increased to produce liners for future trials.

# Outline

---

- MSU's candidate cherry rootstocks with sweet cherry scions
- MSU's candidate cherry rootstocks with Montmorency scion
- Pre-commercialization activities for the MSU candidate cherry rootstocks
- What about *Armillaria* resistant rootstocks?



# What about *Armillaria* resistant rootstocks?

Are there any existing cherry rootstocks that are resistant to *Armillaria*?

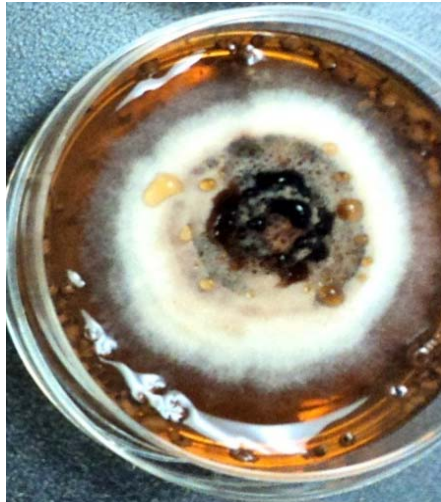
A source of resistance to *Armillaria* was identified by Dr. Hammerschmidt and his group at MSU.

This was initially identified based on good performance in the *Armillaria* plot established adjacent to the North West Station.

*P. maackii* is tolerant to *Armillaria* – images of *Armillaria* fungal growth on bark segments of *P. mahaleb* and *P. maackii*  
(Courtesy of Ray Hammerschmidt and Linzi Kaniszewski)

***P. mahaleb***

**Mature  
tissue**



***P. maackii***



**Periderm**





***Prunus maackii* tree in front of the MSU Law School.  
Flowers were emasculated and pollinated as part of a  
project to breed *Armillaria* resistant cherry rootstocks.**





# ***Armillaria* – seed from crosses done in April 2012**





## Number of hybrid seedlings obtained with *P. maackii* as the mother parent

Cross combinations and number of seeds harvested from *P. maackii* crosses used to breed for *Armillaria* resistance.

Cross	Number of seeds
<i>P. maackii</i> × Clare	16
<i>P. maackii</i> × P12(2)	3
<i>P. maackii</i> × NY54 (mazzard)	5
<i>P. maackii</i> × Montmorency	37
Montmorency × <i>P. maackii</i>	3

# Summary

---

- 5 MSU candidate cherry rootstocks have been identified that increase precocity and reduce tree size in sweet cherry and likely in tart cherry also
- The next step will be to determine if these MSU candidate cherry rootstocks can be used in new production systems resulting in increased profitability
- A source of *Armillaria* resistance has been identified and is being used in breeding



# Acknowledgements

## CONTRIBUTORS

Audrey Sebolt (MSU)

Tom Auvil (WTFRC) & Matt Whiting (WSU)

Nikki Rothwell, Karen Powers, Erin Lizotte and Bill Klein (NWMHRS)

Ray Hammerschmidt & Linzi Kaniszewski (MSU)

## COLLABORATING NURSERIES

Meadow Lake Nursery, Duarte Nursery, Willow Drive Nursery, plus the liner nurseries

## FUNDING

MSU AgBioResearch

Michigan Cherry Committee

NW Horticultural Foundation

Washington Tree Fruit Research Commission

Oregon Sweet Cherry Commission