

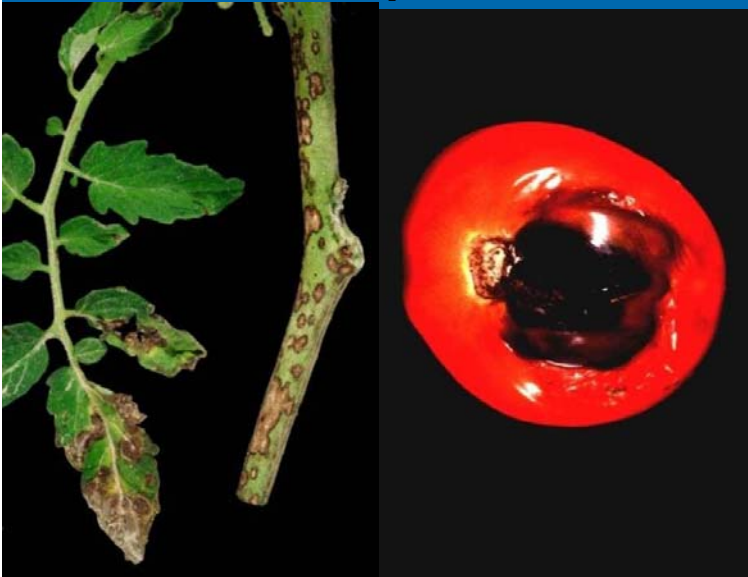
Late Blight (LB)- *Phytophthora infestans*



Defoliating Diseases of Tomato in Temperate Climates

- All cause defoliation & loss of yield/ quality
- weather conditions, other horticultural factors determine which disease dominates
- Must control all 3 diseases to protect yield & fruit quality

Early Blight (EB) *Alternaria tomatophila*



Septoria Leaf Spot (SLS) *Septoria lycopersici*



SLS Resistance

- SLS causes heavy foliar damage on plants homozygous for genetic control of LB and EB.
- Combine SLS resistance with genetic control of LB and EB to control tomato defoliating diseases in traditional & organic tomato production.
- Screened sources SLS resistance over several generations, developed line fixed for SLS resistance.
 - 071733-1 and 071733-4 are the SLS resistant sister lines
 - derived from populations developed by V. Poysa tracing back to *L. pimpinellifolium* / *L. hirsutum*

Impact of SLS Resistance on Lesions, Pycnidia & Pycnidiospores

071733-1 SLS Resistance



0.6 mm lesion length
0.3 pycnidia/lesion
1.6 pycnidiospores/lesion

Supersonic: SLS Susceptible



2.1 mm lesion length
14 pycnidia/lesion
70 pycnidiospores/lesion

F1 hybrid heterozygous for resistance have
1.1 mm lesion length and 5.8 pycnidia/lesion

Breeding Step



F2 SLS selected
Summer 2008



2 SLS GH screens
select F3 progenies
Homozygous for SLS



Regrow the 3 F3
seed lots, select
plants for Ph3,
Ph2, and EB
resistance

F2 from 071733-1



12 F3 SLS resistant seed lots,
better horticultural type



3 F3 SLS homozygous Seed Lots retained



6 Selections homoz. Ph3 + Ph2, and
EB resistant

1 Selection homoz. Ph3, heteroz. Ph2,
EB resistant



Summer 2009: screen 7 F4 populations for SLS and EB,
fruit size/horticultural characters

Fix first tomato lines resistant to EB/LB/SLS

Septoria Leaf Spot Contributors

Martha A. Mutschler Lab

Post Doctoral Fellow Stella Zitter

Res. Support. Peter Hyde, Stephen Southwick, & Christina Westerling

Technician Darlene DeJong

Thomas Zitter Lab

Technician Jessica Drennan

Germplasm Contribution: Dr. Vaino Poysa

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Many Pests Are Controlled by Acylsugar From the Wild Tomato, *S. pennellii*

Some of Pests Controlled

Potato aphid

Green peach aphid

Silverleaf whitefly (*Bemisia*)

Greenhouse whitefly

Fruitworm

Tomato fruitborer

Armyworm

Leafminer

Tomato Psyllids

Spider mites

Tomatoes are attacked by many insects

- Direct damage and vectoring virus

Acylsugars provides an effective alternative form of control.

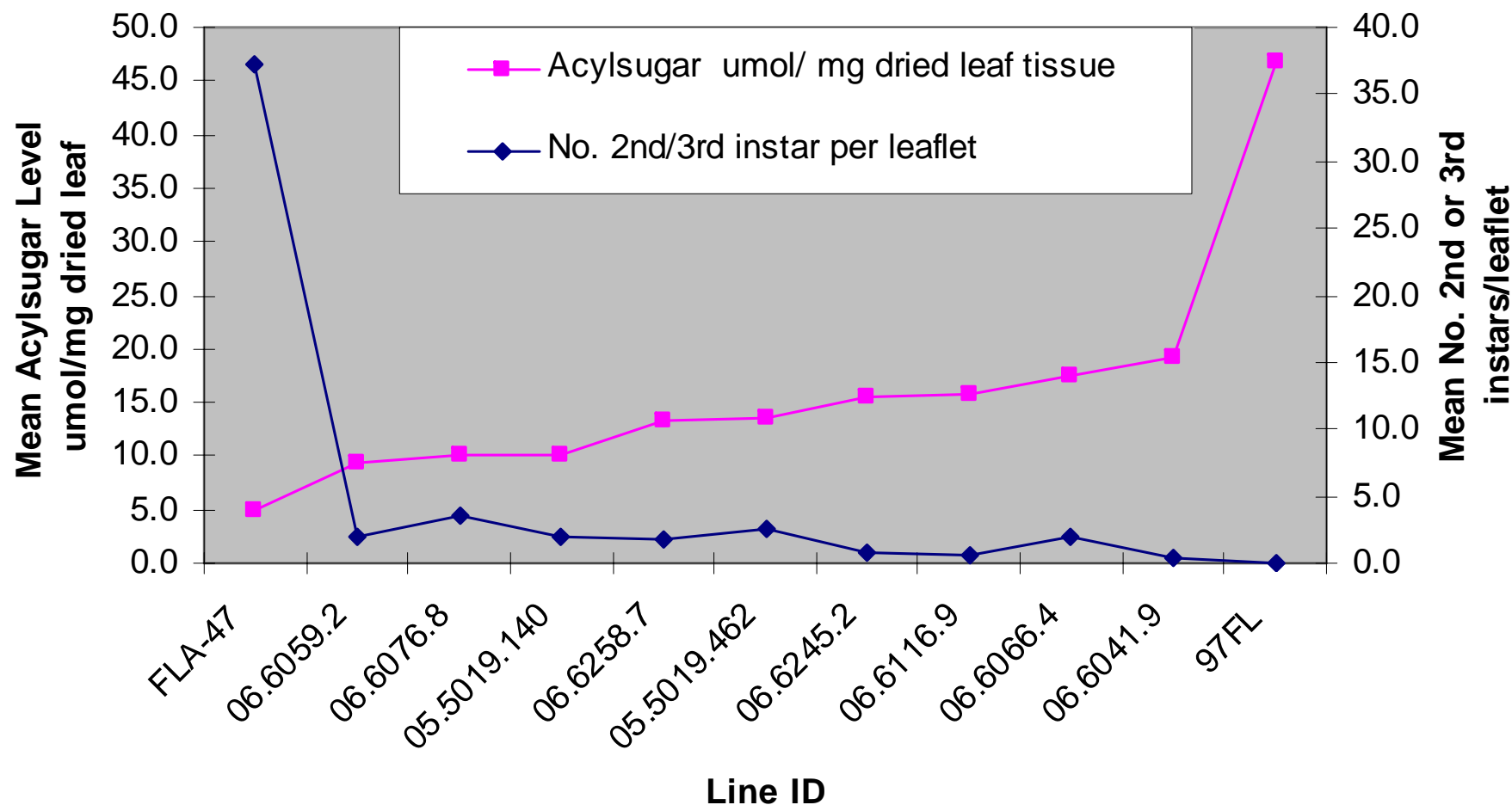
- Is non-volatile, surface, effect on contact
- Is non-toxic, provides deterrence
- Controls many pest species

Tomato Lines producing low to moderate levels of acylsugar created. Working to:

- Raise acylsugar level.
- Combine with virus resistance.
- Modify acylsugar structure.
- Break linkages, improve type.

Control Of Bemisia By 2nd Generation Acylsugar Lines In 2007 Florida Field Trial

Impact of acylsugar level on 2nd/3rd instar Bemisia/leaflet, 2007 Florida Field Trial; FLA-47 tomato control.



Strategy to Raise Acylsugar Level

- Combine known acylsugar QTL from different acylsugar lines into one line:
 - One completed in 2008, for increase of ca. 25%.
 - Another currently in testing may increase by ca. 50%
- Bring in additional QTL from *S. pennellii*:
 - Work in 2009, shows added gene can increase acylsugar levels 2 to 3 x current best line.
 - Will have full data analysis by Sept 2009.
- Bring in gene from a different species:
 - Testing QTL from *S. pimpinellifolium* (from Fernandez-Munoz).

Combine with Insect Resistance and Virus Resistance in Same Line

- SW5: selections fully homozygous SW5 region and acylsugar regions currently in seed production, finished by Aug 2009.
- TY3 (TY1, TY2): BC1F1 selections homozygous for acylsugar regions and heterozygous for TY3 region currently in seed production, finished by Spring 2010.
- SW7: BC1F1 selections homozygous for acylsugar regions and heterozygous for SW7 region currently in seed production, finished by Spring 2010.

Break Linkages, Improve Plant Type

- Modifications of introgressions on chromosomes 5, 10 are in a number of existing acylsugar lines.
- Major problem is large introgression on Chr. 3.
 - Results in 2008/2009 indicate this region may contain 2 QTL, towards ends of the region, ca. 25 cM apart
 - Negative gene is somewhere between 2 QTL
 - Double recombinants isolated, are currently being tested for acylsugar level, improvements in type.

Modify Acylsugar Structure

- Work in BC1F1 and defined crosses show that epistasis involving 3 QTL (chr. 3, 4, 11) controls production of acylglucose vs. acylsucrose
 - Lines with these combinations in production, will take another year.
 - Does type of acylsugar affect level of acylsugar.
- Work in BC1F1 currently determining the QTL affecting length and branching of fatty acids in acylsugars
 - Need this work to determine which to pursue.
 - Relative impact of different fatty acids on acylsugar activity.

Acylsugar Cooperators and Contributors

Martha A. Mutschler Lab

Post Doctoral Fellow: Brian Leckie

Res. Support. Peter Hyde, Stephen Southwick, & Christina Westerling

Technician Darlene DeJong

Andre Kessler (Chemical Ecology)

Research Associate Rayko Halitschke

David Schuster (FSU, Whitefly)

Peter Hanson (AVRDC, TY1, TY2, TY3)

George Kennedy (Entomology, Thrips/SWV)

Mike Stevens (BYU, SW7)

Jay Scott (FSU, TY3)

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