

John R. Stommel

***Genetic Improvement of Fruits &
Vegetables Laboratory***

**USDA, ARS, Henry A. Wallace
Beltsville Agricultural Research Center
Beltsville, MD**

Tomato Fruit Firmness Attributes

S. lycopersicum x
S. galapagense
introgressions



Plant Material

Firm

02L1370	<i>S. lycopersicum</i> syn. <i>L. esculentum</i>
Ohio 8245	<i>S. lycopersicum</i> syn. <i>L. esculentum</i>
01L648-8	<i>S. galapagense</i> syn. <i>L. cheesmanii</i> f. <i>minor</i>
01L652-11	<i>S. galapagense</i> syn. <i>L. cheesmanii</i> f. <i>minor</i>

Soft

99L115-4	<i>S. lycopersicum</i> syn. <i>L. esculentum</i>
00L161-12	<i>S. lycopersicum</i> syn. <i>L. esculentum</i>

Firmness

Compression: compression force
deformation curves

Puncture: force
required to penetrate
outer pericarp using 4-
mm cylindrical probe



S. Lycopersicum x *S. galapagense* Introgressions:

Diallel analysis

- Firmness not adequately measured by a single variable; compression force best approximated hand feel
- GCA principal source of genetic variation; genetic variation additive
- Heritability high (narrow sense)
- Puncture force subject to significant env x hybrid influence
- (+) relationship between compression & fresh wt; ns puncture

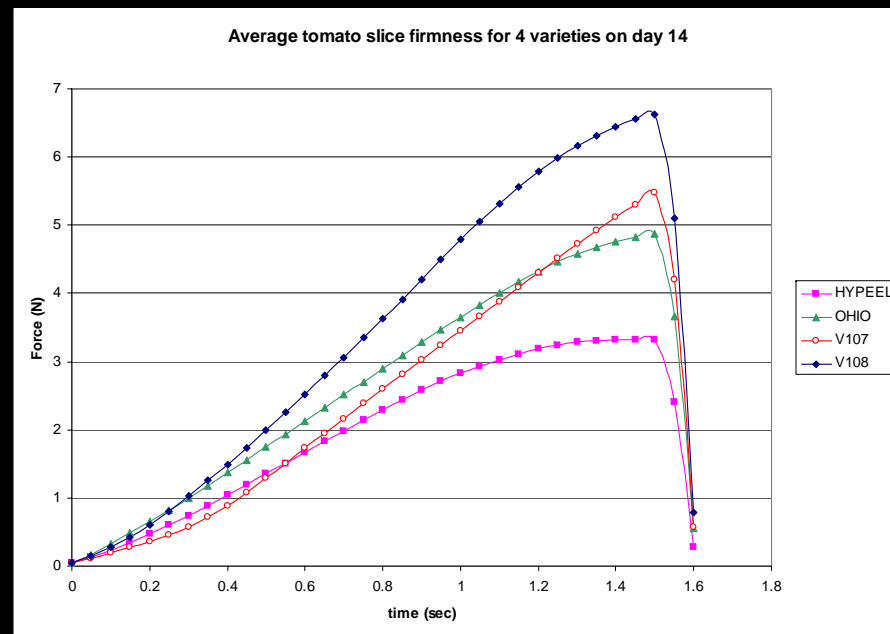
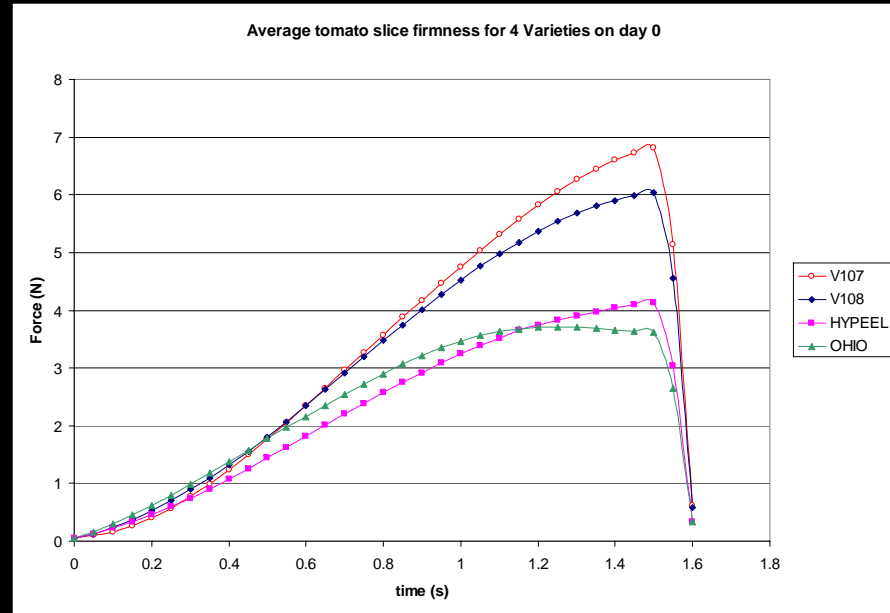


Tomato Firmness:

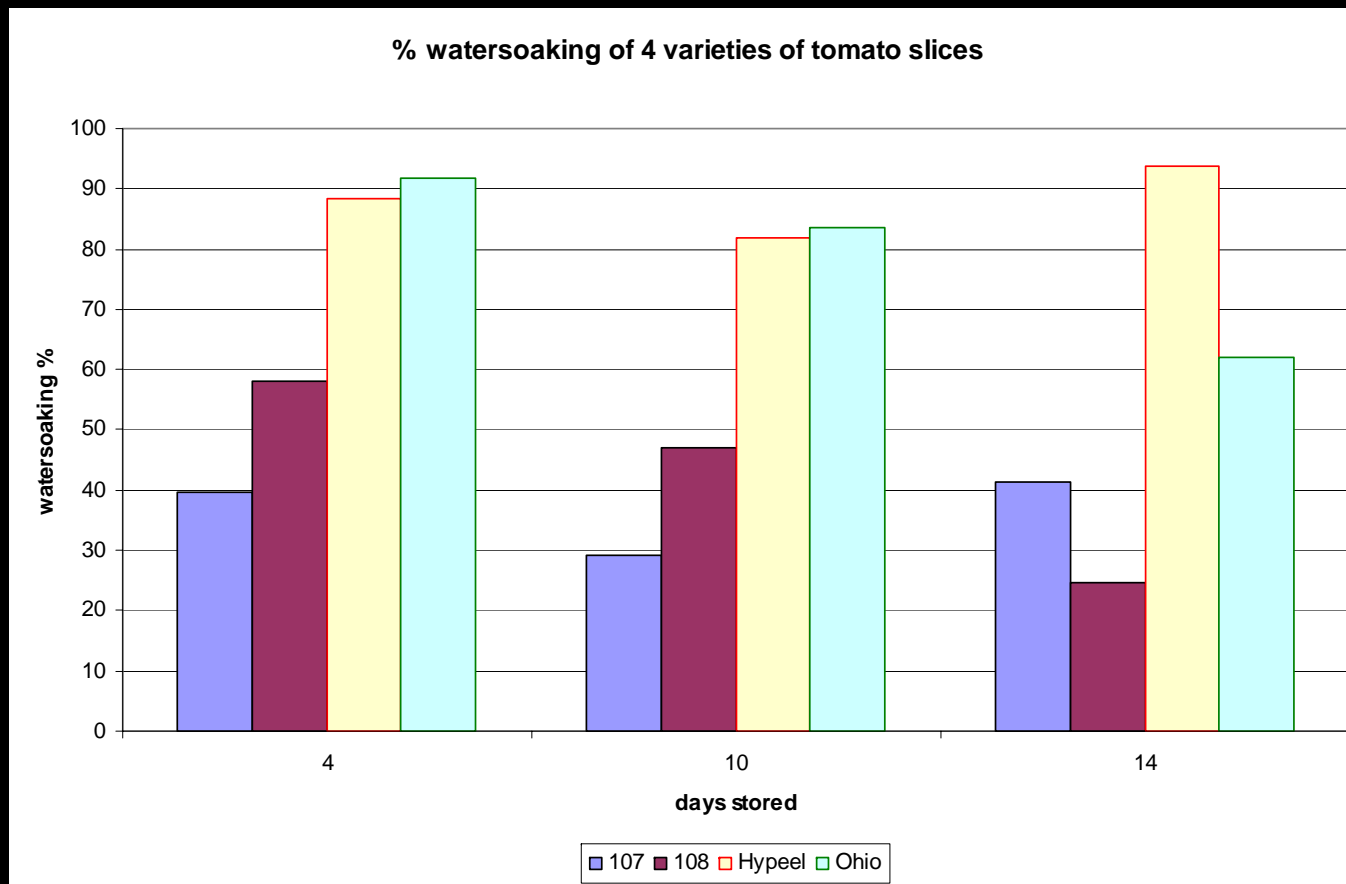
Fresh cut tissue integrity



Fresh Cut Tomato: tissue firmness



Fresh Cut Tomato: tissue watersoaking



Fresh Cut Tomato

#107



#108



Hypeel



Ohio

14 Day
old
sliced
fruit

Fresh Cut Tomato

- **Firm lines: displayed firmer texture
developed less water soaking**
- **Firm lines maintained distinct tomato aroma vs.
commercial checks**
- **Firm lines afforded improved quality and shelf-
life of fresh-cut tomatoes**

Mapping populations:

General combining ability

	<i>Compression</i>	<i>Puncture</i>	<i>Fr wt</i>	<i>Dry wt</i>
Firm				
01L648-8	(+)	(+)	ns	ns
02L1370	(+)	(ns)	(+)	(+)
Soft				
00L161-12	(-)	(-)	(-)	(-)
99L 115-4	(-)	(-)	ns	ns

Inbred backcross mapping populations: 150 IBLs

01L648-8 x 00L161-12 $\longrightarrow \longrightarrow$ BC₂S₄

02L1370 x 99L115-4 $\longrightarrow \longrightarrow$ BC₂

Tomato Anthracnose



Objective:
Identify molecular markers linked to quantitative trait loci that influence tomato anthracnose fruit rot resistance

Tomato Anthracnose Resistance

S. lycopersicum

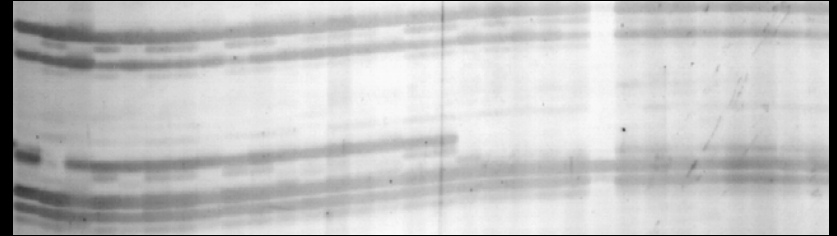
115-4 - PI 272636 (resistant)

US28 - Anthracnose susceptible



Figure 2. Fruit of resistant *L. esculentum* line 115-4 (left) showing absence of lesion development and a susceptible line (right) displaying large lesions 6 days post-inoculation.

Tomato Anthracnose Resistance



- **Genetic characterization**
 - **quantitative mode of inheritance**
 - **additive genetic variance**
 - **moderate heritability**



Anthracnose QTL Identification

- **Resistance-linked markers in four linkage groups (LOD 3.0)**
- **Recombinant inbred line genotyping (244 RILs)**

Value-Added Tomatoes

- *Germplasm evaluation/genetic characteriation*
- *Germplasm development*
- *Technology transfer*



Tissue-specific Carotenoid Content:

- **Inheritance studies**
- **Expression of key genes that influence carotenoid content**
- **Genetic stocks**



Mapping Populations:

- F_2
- Inbred backcross line (147 IBLs)

