FRESH MARKET TOMATO BREEDING:
VISIONS OR FOLLY

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The Tomato Marketplace

• Who decides what types of tomato varieties get bought and sold?
• How many of the tomato buyers have asked any tomato breeders our opinions?
• Where are the rich entrepreneurs who want to market novel tomato products?
• Can we get some dialogue going with these mysterious people?
Tomato Breeders are which of the following?

• A) Pawns subject to the whims of clueless business people, administrators and lawyers
• B) An angry mob that doesn’t like to be called pawns
• C) The secret envy of molecular geneticists and plant pathologists
• D) It is not politically correct to say anything about this topic
“Innovation has nothing to do with how many R & D dollars you have. When Apple came up with the MAC, IBM was spending at least 100 times more on R & D. It’s not about money. It’s about the people you have, how you’re led, and how much you get it.”

--Steve Jobs
Novel Breeding Ideas: the good, the bad and the ugly

- Many turn out to be bad ideas - unexpected roadblocks and/or costs
- Some are good but no one bothers to market the finished product
- Occasionally they work and the rewards are huge - is the risk worth it?
MINILEE AND MICKYLEE

Two Icebox-Type Watermelon Cultivars with Excellent Fruit Quality and Resistance to both Anthracnose and Fusarium Wilt

J.M. Crall

Agricultural Experiment Station
Institute of Food and Agricultural Sciences
University of Florida, Gainesville
J. M. Davidson, Dean for Research
FLORIDA STAYSWEET
A High-Quality sh₂ Sweet Corn Hybrid

EMIL A. WOLF

Agricultural Experiment Stations
Institute of Food and Agricultural Sciences
University of Florida, Gainesville
F. A. Wood, Dean for Research
LET’S TAKE A LOOK AT FRESH MARKET TOMATOES!
Israeli, Florida experts work to solve common problems

MIRIAM WIDMAN
Herald Business Writer

Nachum Kedar is an example of international cooperation.

The 64-year-old Israeli scientist is conducting tests on tomatoes at the Gulfcoast Research Center off State Road 70 to solve problems both Israel and Florida face.

"In Israel, we have a lot of problems with breeding tomatoes," he said.

"Some of them don’t look so nice," adding the problem stems from a "blossom end" that’s too large. The blossom end is on the opposite side of the stem.

"In Florida they have a little bit of the same problem," he added. "Quite a big percentage of tomatoes are not sold because of this problem. "We have something in common."
TYPES OF TOMATOES TYPICALLY IN THE USA SUPERMARKET 2011

- LARGE ROUND-Field grown
- LARGE ROUND-Greenhouse grown
- TOMATOES ON THE VINE (TOV)-Greenhouse grown
- PLUM TOMATOES-field grown
- COCKTAIL TOMATOES-Compari, Amarosa etc.-Greenhouse grown
- GRAPE TOMATOES-Field grown
- HEIRLOOMS-Ugly Ripe
<table>
<thead>
<tr>
<th>CHARACTERISTIC</th>
<th>JUDGE</th>
<th>HANDLER/FOOD</th>
<th>SERVICE</th>
<th>CONSUMER</th>
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<tbody>
<tr>
<td>APPEARANCE</td>
<td>XX</td>
<td>XX</td>
<td>XX</td>
<td>XX</td>
</tr>
<tr>
<td>FIRMNESS</td>
<td>XX</td>
<td>XX</td>
<td>XX</td>
<td>XX</td>
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<tr>
<td>SHELF LIFE</td>
<td>X</td>
<td>XXX</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>RIPENING BEHAVIOR</td>
<td>XX</td>
<td>XX</td>
<td>X</td>
<td>X</td>
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<tr>
<td>TEXTURE</td>
<td></td>
<td></td>
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<td>XX</td>
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<tr>
<td>NUTRITION</td>
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<td></td>
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<td>X</td>
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<tr>
<td>FLAVOR</td>
<td></td>
<td></td>
<td></td>
<td>XXX</td>
</tr>
<tr>
<td>FRUIT SIZE</td>
<td>XX</td>
<td>XXX</td>
<td>XX</td>
<td></td>
</tr>
<tr>
<td>YIELD</td>
<td>XXX</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DISEASE RESISTANCE</td>
<td>XXX</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EASE OF HARVEST</td>
<td>XX</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
TOMATO FLAVOR NOTES

1. BITTER
2. MUSTY (DIRTY SOCKS)
3. ASTRINGENT (DELTA)
4. ETHANOLIC (MTOH)
5. METALLIC
6. SOUR (OVERRIPE)
7. VEGETATIVE (GRASSY)
8. BLAND
9. SWEET
10. ACID
11. BALANCED
12. FRUITY/FLORAL
Parents of Tasti-Lee Hybrid

- Tasti-Lee
- Fla7907
- Fla8059
Tasti-Lee™ (‘Fla. 8153’) Features

✓ Seed Available from Bejo Seeds
✓ -Contact Greg Styers:
  ✓ Email: G.styers@bejoseeds.com
  ✓ Phone: 805-689-1627
✓ High Lycopene crimson \( (og^c) \) gene
✓ Superior Flavor
✓ Heat-Tolerant
✓ Fusarium Wilt Race 1, 2, & 3 Resistant
✓ Candidate For Premium Tomato Market
Overall Flavor Sensory Panel Data
Fall 2004 (GCREC) and Winter 2005 (TREC)

Rated on a scale of 1-9 where higher numbers mean better flavor

<table>
<thead>
<tr>
<th>Variety</th>
<th>Overall Flavor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fall ‘04</td>
</tr>
<tr>
<td>Fla. 8408</td>
<td>5.77 a&lt;sup&gt;y&lt;/sup&gt;</td>
</tr>
<tr>
<td>Tasti-Lee</td>
<td>5.35 a</td>
</tr>
<tr>
<td>Sanibel</td>
<td>-</td>
</tr>
<tr>
<td>Florida 47</td>
<td>4.43 b</td>
</tr>
<tr>
<td>Florida 91</td>
<td>4.35 b</td>
</tr>
<tr>
<td>Solar Fire</td>
<td>3.74 bc</td>
</tr>
<tr>
<td>Ugly Ripe</td>
<td>3.35 c</td>
</tr>
</tbody>
</table>

<sup>Z</sup> Ugly Ripe was store bought, all other harvested table ripe in Fall ’04 and breaker in Winter ’05

<sup>Y</sup> Mean separation in columns by Duncan’s multiple range test at p < 0.1
### Sensory Panel Data
Balm, Spring 2005

Rated on a scale of 1-9 where higher numbers mean better flavor or more sweetness or acidity

<table>
<thead>
<tr>
<th>Variety</th>
<th>Overall Flavor</th>
<th>Sweetness</th>
<th>Acidity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fla. 8393</td>
<td>5.38 a&lt;sup&gt;Y&lt;/sup&gt;</td>
<td>4.52 ab</td>
<td>5.28 a</td>
</tr>
<tr>
<td>Tasti-Lee</td>
<td>5.35 a</td>
<td>4.62 a</td>
<td>4.41 b</td>
</tr>
<tr>
<td>Fla. 8408</td>
<td>5.17 a</td>
<td>4.83 a</td>
<td>3.79 b</td>
</tr>
<tr>
<td>Florida 47</td>
<td>4.00 b</td>
<td>3.93 bc</td>
<td>3.76 b</td>
</tr>
<tr>
<td>Store-F</td>
<td>3.59 b</td>
<td>3.66 c</td>
<td>2.74 c</td>
</tr>
<tr>
<td>Ugly Ripe</td>
<td>3.35 b</td>
<td>3.55 c</td>
<td>3.90 b</td>
</tr>
</tbody>
</table>

<sup>Z</sup> All harvested at table ripe stage except Store F and Ugly Ripe were store bought

<sup>Y</sup> Mean separation in columns by Duncan’s multiple range test at p < 0.1
Flavor Summary for ‘Tasti-Lee’ at Release in 2006

Sensory panel:

- Consistent performance, always in most preferred group, significantly better than Florida 47 and any other commercial variety in 6 of 7 panels, always more preferred than store-bought samples.

- Chemistry: Tendency to be higher in soluble solids but especially sugars, good acid balance, nothing clear on volatiles yet (need to analyze further).
Tasti-Lee

Fla. 8570
### Marketable yield, fruit size, and culls for tomato hybrids grown at Pine Island Farms, Dade County, Florida. Winter 2010.

<table>
<thead>
<tr>
<th>Hybrid</th>
<th>Marketable yield (25 lb box/A)</th>
<th>Fruit size (g)</th>
<th>Culls (% by wt.)</th>
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<tbody>
<tr>
<td>Fla. 8314</td>
<td>1806 a^z</td>
<td>144 e</td>
<td>29 d</td>
</tr>
<tr>
<td>Fla. 8455</td>
<td>1538 ab</td>
<td>183 ab</td>
<td>32 cd</td>
</tr>
<tr>
<td>Tasti-Lee</td>
<td>1529 ab</td>
<td>154 de</td>
<td>33 b-d</td>
</tr>
<tr>
<td>Sanibel</td>
<td>1478 ab</td>
<td>175 bc</td>
<td>43 ab</td>
</tr>
<tr>
<td>Fla. 8787</td>
<td>1301 ab</td>
<td>187 ab</td>
<td>41 a-c</td>
</tr>
<tr>
<td>Florida 47</td>
<td>1267 ab</td>
<td>195 a</td>
<td>41 a-c</td>
</tr>
<tr>
<td>Tribeca</td>
<td>1242 b</td>
<td>162 cd</td>
<td>48 a</td>
</tr>
</tbody>
</table>

^z Mean separation in columns by DMRT at P ≤ 0.05.
TBRT ’06: Why Tasti-Lee Will Not Succeed

1) There is no category for such a tomato and it will not get shelf space
2) No one is interested in such a tomato, it is a threat to present business practices
3) The flavor is not good enough to make a difference
4) Etc.
TBRT ’06: Why Tasti-Lee Will Succeed, Change the Entire Fresh Market Tomato Industry and Usher in World Peace

1) Good Marketing Strategy Employed
2) Good Field Production, Reliability
3) Consistent Superior Flavor and Color Quality
4) Health Aspects
The next best thing:
Does Jay Scott hold the future of decent store-bought tomatoes in his hands?

By Barry Estabrook
Special to The Washington Post
Wednesday, May 5, 2010
Some Highlights From the University of Florida Tomato Breeding Program

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S. F. Hutton
J. W. Strobel
BACK TO THE FUTURE

Salute To 80s
J. Scott’s Vision for the Florida Tomato Industry of the Future

- **Food Service:** Mature green tomato varieties, will be jointless, CGH types that will not be staked and harvested by machine

- **Supermarket:** Vine–ripe tomato varieties of the Tasti-Lee type will be staked and hand harvested
Tasti-Lee: The Present

1. There is supermarket demand-expanding
2. Overall the fruit quality has been very good—will it continue?
3. Selling at $2.49/lb, growers get $1.25/lb.
4. Three growers “all in”, most growers business as usual.
If you have ever eaten a tomato—or ever plan to—you must read Tomatoland. It will change the way you think about America’s most popular ‘vegetable.’ More importantly, it will give you new insight into the way America farms.”

—Ruth Reichl

TOMATOLAND

How Modern Industrial Agriculture Destroyed Our Most Alluring Fruit

BARRY ESTABROOK
Building a better Florida tomato

It may not be a scientific breakthrough on the order of curing cancer, but a University of Florida horticulturist has proven if you build a better tomato, the world may well beat a path to your dinner table. The Tasti-Lee is the result of five years of experimenting, teamwork and patience paying off in a mass market tomato that actually tastes like a tomato. If those sorts of skills can produce a tastier tomato, surely Washington could rely on those values to produce more jobs and a tidier federal budget.

Working out of UF’s research laboratory in Hillsborough County, Jay Scott combined two strains of tomato to create the Tasti-Lee, a rich crimson variety that retains a juicy, flavorful sweetness. Think of the Tasti-Lee as the Gatorade of fruit. For this is not merely some idle culinary curiosity. It is enhanced economic development on the vine. Florida accounts for nearly one-third of all fresh tomatoes grown in the United States and almost all tomatoes harvested during the fall and winter.

With the recent publication of Barry Estabrook’s Tomatoland, a harsh criticism of an agricultural industry that too often grows a rock-hard, bland product engineered more for portability than flavor, Scott’s Tasti-Lee could go a long way toward revitalizing the state’s reputation for quality, consumer-friendly produce.

The Tasti-Lee raises expectations Americans should demand from the farmland and the homeland. A country with the innovation and determination to grow a tastier tomato ought to be able to come together to produce a more fertile economy and a more sustainable budget.
## Trait Integration

<table>
<thead>
<tr>
<th>Traits</th>
<th>Recurrent Parents</th>
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<tbody>
<tr>
<td>Ty-2</td>
<td>7770</td>
</tr>
<tr>
<td>Ty-3</td>
<td>7776</td>
</tr>
<tr>
<td>Ty-4</td>
<td>7781</td>
</tr>
<tr>
<td>Ty-5</td>
<td>7804</td>
</tr>
<tr>
<td>(Ty-6)</td>
<td><strong>7907B</strong></td>
</tr>
<tr>
<td>Sw-5</td>
<td>7946</td>
</tr>
<tr>
<td>Sw-7</td>
<td>7949B</td>
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<tr>
<td>Frl</td>
<td>7987</td>
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<tr>
<td>Pto</td>
<td>8000</td>
</tr>
<tr>
<td>Ph-2</td>
<td>8021</td>
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<tr>
<td>Ph-3</td>
<td><strong>8059</strong></td>
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<tr>
<td>(Graywall R)</td>
<td>8083</td>
</tr>
<tr>
<td>(Non-blighting)</td>
<td>8111B</td>
</tr>
<tr>
<td></td>
<td>8124C</td>
</tr>
</tbody>
</table>
Phase 2: A Fruity-Floral ‘Tasti-Lee’

• Working on stable expression of the Fruity-floral flavor note
• Backcross Fruity-Floral into both parents of ‘Tasti-Lee’
• Issues:
  - Inheritance=?
  - How to select for fruity-floral: Yikes!
Modified Backcrossing of Fruity/floral into Tasti-Lee Parents

• Fall ‘05: 2 parents crossed with 5 donors
• Spring ’07: Fla. 8629 selected (7907x8570)F_4
• Fall ’07 (late): 13 pollens crossed=15 F_1’s
• Spring ‘09: 15 F_2’s, 20 plants each, 14 selections, 1 with fruity/floral= Fla. 8792 pedigree= (8059x8629)F_3
• Fall ‘09 8792 determined to be fruity/floral, thus 4 years to get to “BC_3"
<table>
<thead>
<tr>
<th>Pedigree</th>
<th>Overall Flavor</th>
<th>Sweetness</th>
<th>Acidity</th>
</tr>
</thead>
<tbody>
<tr>
<td>7907B x 8630</td>
<td>6.06 a(^z)</td>
<td>5.27 a</td>
<td>4.37 b</td>
</tr>
<tr>
<td>Fla. 8629</td>
<td>6.03 a</td>
<td>5.43 a</td>
<td>4.20 b</td>
</tr>
<tr>
<td>8059 x 8629</td>
<td>5.86 a</td>
<td>4.91 ab</td>
<td>5.11 a</td>
</tr>
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<td>7907B x 8629</td>
<td>5.83 a</td>
<td>5.09 ab</td>
<td>4.49 ab</td>
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<td>Fla. 7907</td>
<td>4.66 b</td>
<td>4.49 bc</td>
<td>4.34 b</td>
</tr>
<tr>
<td>Fla. 8059</td>
<td>4.56 b</td>
<td>4.18 cd</td>
<td>4.68 ab</td>
</tr>
<tr>
<td>Fla. 8153 (Tasti-Lee™)</td>
<td>4.37 b</td>
<td>3.91 cd</td>
<td>4.34 b</td>
</tr>
<tr>
<td>Florida 47</td>
<td>3.66 c</td>
<td>3.60 d</td>
<td>4.09 b</td>
</tr>
</tbody>
</table>

\(^z\) Mean separation in columns by Duncan’s multiple range test at P ≤ 0.1.
General sugars

Cultivar

% gFW
TSS
Total Sugars
Sucrose Equivalence

FL47 7907B(2) 8059(3) 8153 2x8 3x8 2x8630 8629B(8)

% gFW
Fla. 7946
7946 x 8517 selections:
0630

Severity Rating = 2.5
VISIONS OR FOLLY

• With Tasti-Lee we are giving the consumer a voice, at the least it is an interesting experiment

• Could be implications for other produce items if successful

• And if you have gotten this far w/o drowsiness or distain— if there is a conventional way of doing things always consider the opposite as a possibility
Woof Woof $^3$ *
*
"The End" in doggese