Pomegranate Variety Evaluation, Breeding, and Genetic Research

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Pomegranate Variety Evaluation

- Variety block (row 1-3):
  - ~50 varieties
  - 1-3 plants per variety, not replicated

- Replicated trial 1:
  - 17 varieties
  - Replicated 3x, 2 plants/plot $\rightarrow$ 6 plants/var.

- Replicated trial 2:
  - 15 varieties, replicated 3x, 1 plant/plot
Difference in Susceptibility to Leaf Spots Under Natural Disease Pressures

- 44 varieties
- No pesticides or fungicides
- Visual evaluations in 2016, and 2017
Highly Susceptible Varieties

![Bar chart showing susceptible varieties: Ambrosia, Azadi, Eversweet, Gainey Sweet, Girkanets, Parfianka. The chart compares 1st, 2nd, and 3rd positions.]
Resistant and Moderately Resistant Varieties

- Arakta
- Cedar Key Sunset
- Sakerdze
- Rosavaya
- Grenada
- Don Somner South

Legend:
- 1st
- 2nd
- 3rd
Leaf Spot Severity in 2017 (All Varieties)

% Leaves Showing Leaf Spots

- 6/15
- 6/29
- 7/13
- 7/27
- 8/10
- 8/24
- 9/7
- 9/21
- 10/5

Graph showing the percentage of leaves showing leaf spots from June 15 to October 5, 2017.
Leaf Spot Severity in 2017 ('Arakta’ & ‘Cedar Key Sunset’)

% Leaves Showing Leaf Spots
‘Arakta’, & Other Indian Varieties

- **Bhagwa**: HS, most popular in India
- **Mridula**: HS
- **Rosavaya**: MR?
Developing Artificial Inoculation Procedures to Confirm Resistance

- **Colletrotrichum**: 3 isolates
- **Cercospora**
- **Detached leaves**
- **In-planta inoculations**
Pomegranate Variety Trials

- Planted 3/29, re-set 5/8
- Varieties flowered in Year 1
  - Borris #2
  - Christina
  - Girkanets
  - Kala Bala Miursal
  - Larkin
- Varieties set fruit in Year 2
  - Borris #2
  - Larkin
Breeding Populations (1\textsuperscript{st} Batch)

- Selected 15 varieties as breeding parents in 2014
- Made 16 crosses among 11 varieties in 2014
- \sim2,000 progeny in orchard in fall 2015
- Some seedlings began flowering and fruiting in fall 2016
- Being screened for leaf spot resistance
Breeding Populations (2nd Batch)

- Parental varieties
  - 2 resistant varieties (1 dooryard, 1 Indian variety)
  - 1 moderately resistant variety (local)
  - 3 susceptible varieties with good fruit quality
- 33 crosses in 2017
- Expected to have 3000 - 5000 progeny
- Will screen them for resistance
  - Cercospora & Colletotrichum-incited leaf spots
- Plan to select 1,000 - 1,500 progeny
Pomegranate Variety Trials in Other Countries

- **Italy**
- **Greece:** ~120 acres (2000) → 4000 acres (2016)
- **Australia**
  - ~300 varieties from Iran
  - Some are tolerant of flooding
- **China**
  - East Coastal areas: Humid, rainy
  - Soft-seeded varieties
Pomegranate Breeding & New Varieties

- Israel (Dr. Doron Holland)
  - Very active, multiple breeding objectives
  - Acco (Akko)
  - Neta, Emek, Shani-Yonay, Kamel, (Wonderful), Black
  - Early Aug. to Mid Nov.
ARO pomegranate cultivars

SHANI-YONAY

KAMEL

EMEK

NETA

Dr. Doron Holland, ARO, Israel
Future ARO pomegranate cultivars

Very early hybrids

High quality late hybrids

Early sour hybrids

Dr. Doron Holland, ARO, Israel
Pomegranate Breeding & New Varieties

- Spain
  - Mollar
  - Purple Queen (sweet, mid-Aug.)
  - Mely (mid to late Sept.)
  - MR-100 (productive sweet, early to late Oct.)
  - Kingdom (biggest semi-acid, late Oct. to end of Nov.)
  - BigFul

- India
  - Resistant to Xanthomonas
Genetic Research to Speed up Breeding

- Major efforts to develop & use new genetic tools
- Sequenced the genome of ‘Wonderful’ in Israel and two genomes in China (parts list of pomegranate genes)
- Molecular markers for variety identification
- Molecular markers for breeding and selection
  - Plant height (2)
  - Fruit weight (4), size (2)
  - Aril color (5), weight (5),
  - Total solids (2), acidity (1)
- Sequence the genomes of some U.S. varieties?
- Use molecular markers to select new pomegranates with better disease resistance, fruit and aril color, sweetness, etc.?
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