Pomegranate Variety Evaluation, Breeding, and Genetic Research

Zhanao Deng

UF UNIVERSITY of FLORIDA IFAS

UF UNIVERSITY of FLORIDA IFAS - GCREC

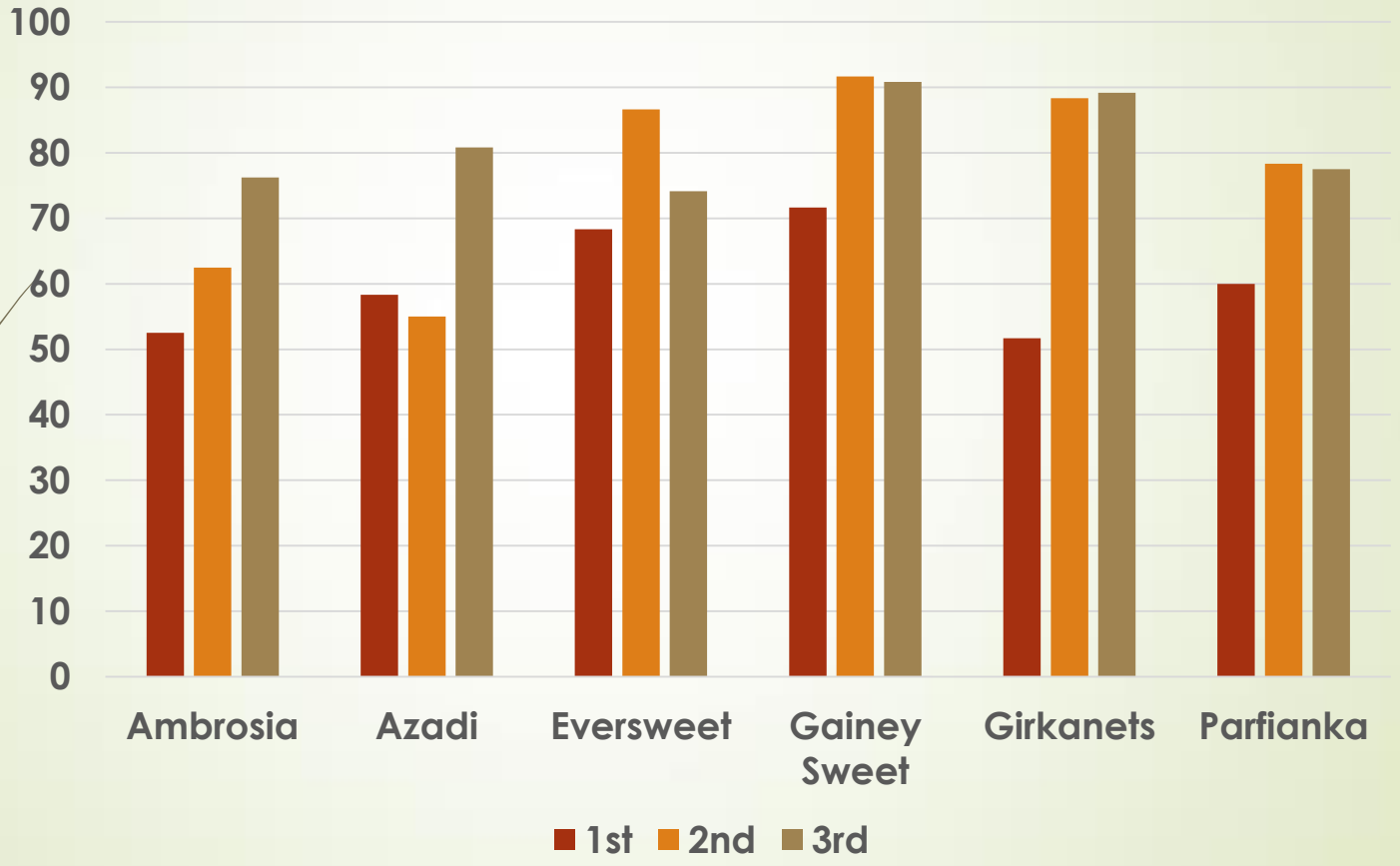
Pomegranate Variety Evaluation

- Variety block (row 1-3):
  - ~50 varieties
  - 1-3 plants per variety, not replicated
- Replicated trial 1:
  - 17 varieties
  - Replicated 3x, 2 plants/plot → 6 plants/var.
- Replicated trial 2:
  - 15 varieties, replicated 3x, 1 plant/plot

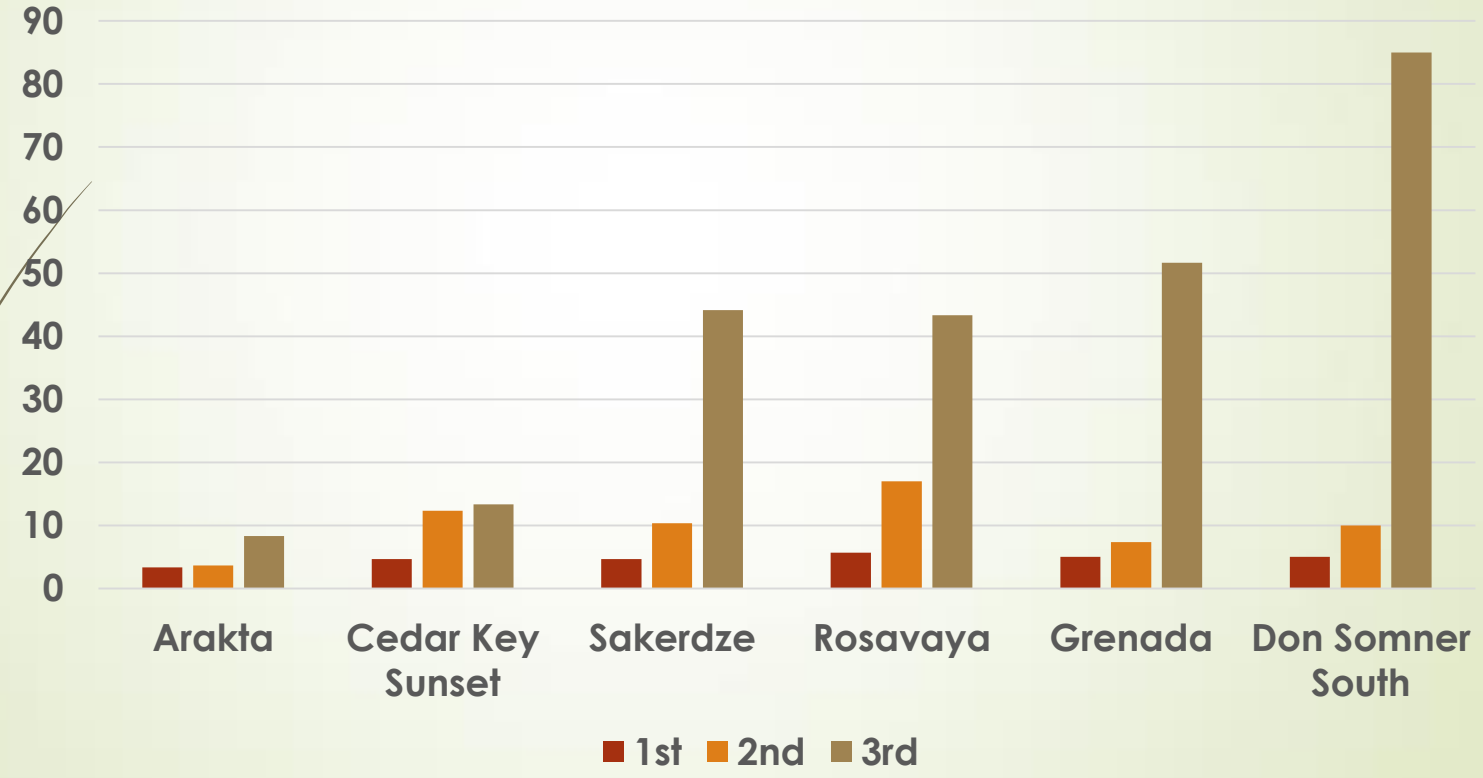
Difference in Susceptibility to Leaf Spots Under Natural Disease Pressures

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

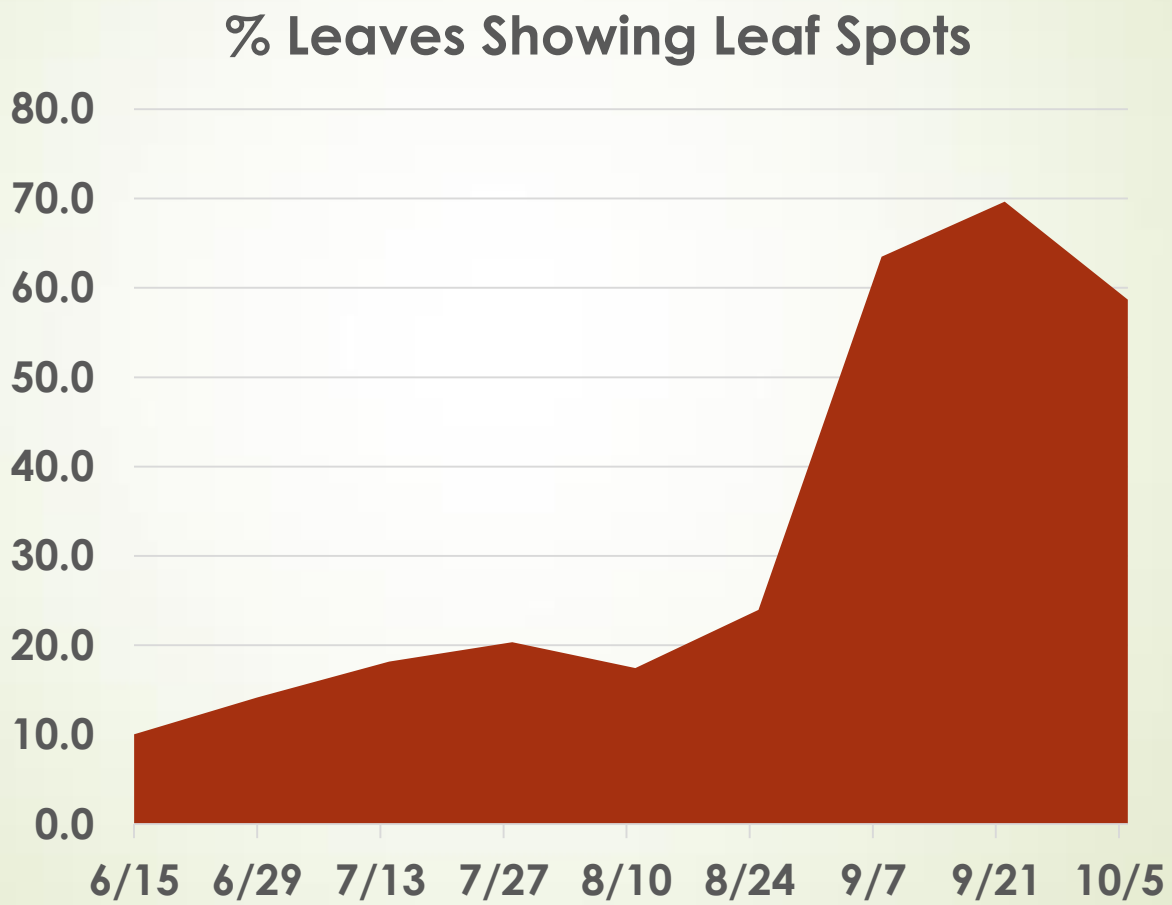
Highly Susceptible Varieties



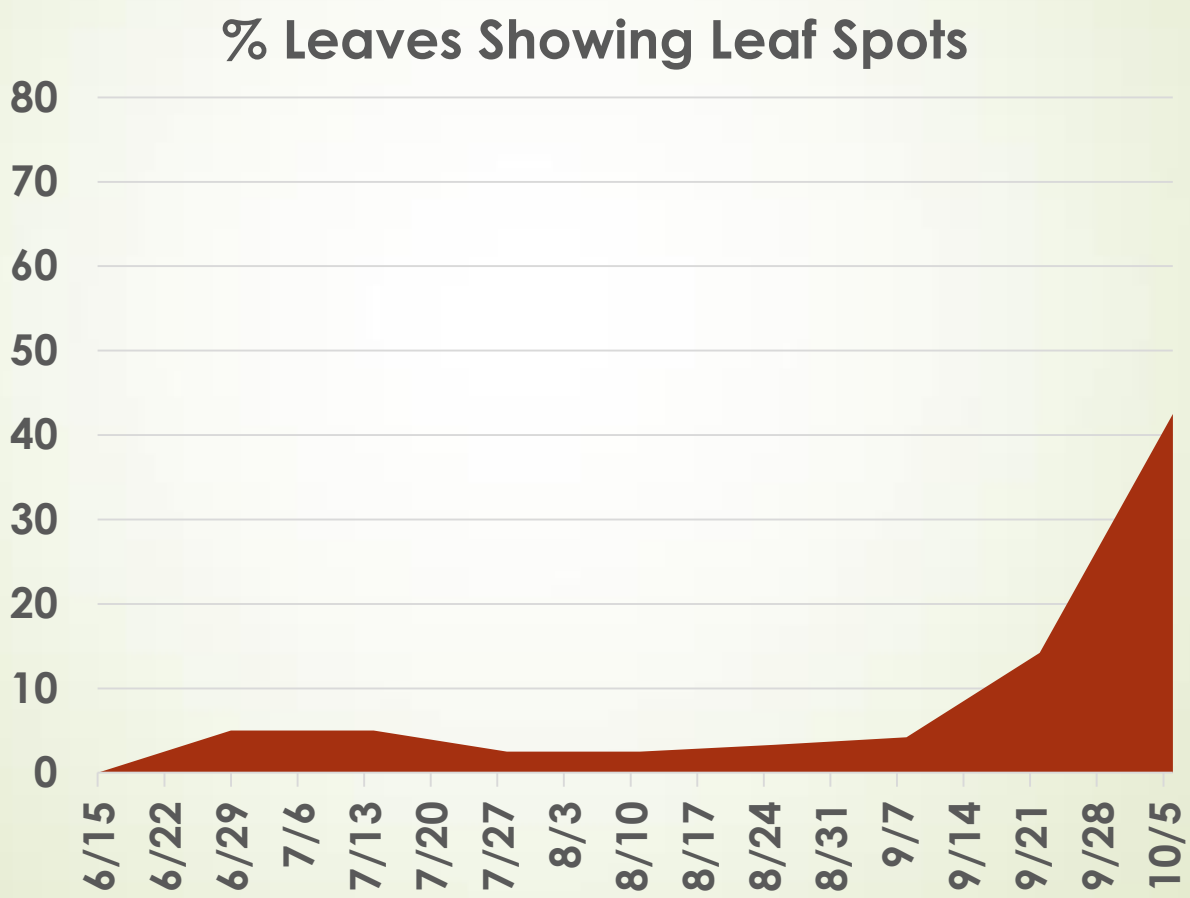
Resistant and Moderately Resistant Varieties



Leaf Spot Severity in 2017 (All Varieties)



Leaf Spot Severity in 2017 ('Arakta' & 'Cedar Key Sunset')



‘Arakta’, & Other Indian Varieties

- Bhagwa: HS, most popular in India
- Mridula: HS
- Rosavaya: MR?

Developing Artificial Inoculation Procedures to Confirm Resistance

- *Colletotrichum*: 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 (1st Batch)

- Selected 15 varieties as breeding parents in 2014
- Made 16 crosses among 11 varieties in 2014
- ~2,000 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)

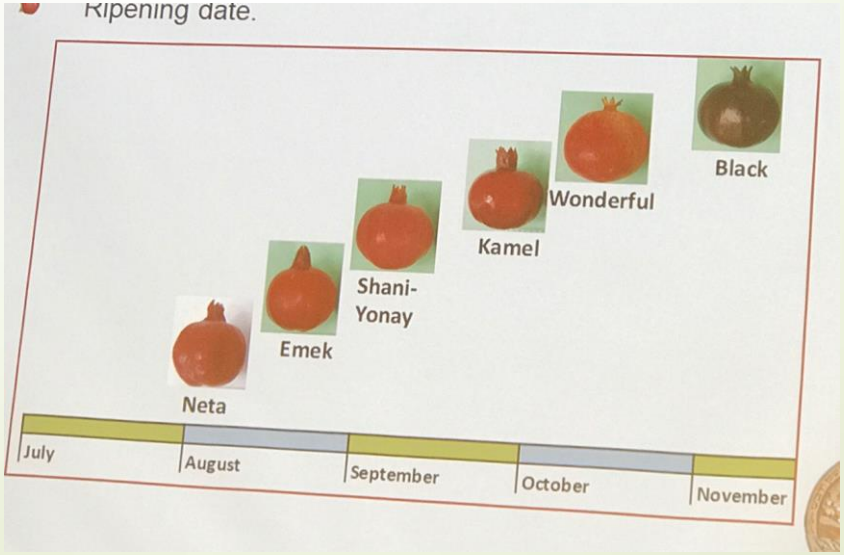
- Parental varieties
  - 2 resistant varieties (1 dooryard, 1 Indian variety)
  - 1 moderately resistant variety (local)
  - 3 susceptible varieties with good fruit quality
- 33 crosses in 2017
- Expected to have 3000 - 5000 progeny
- Will screen them for resistance
  - *Cercospora & Colletotrichum*-incited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

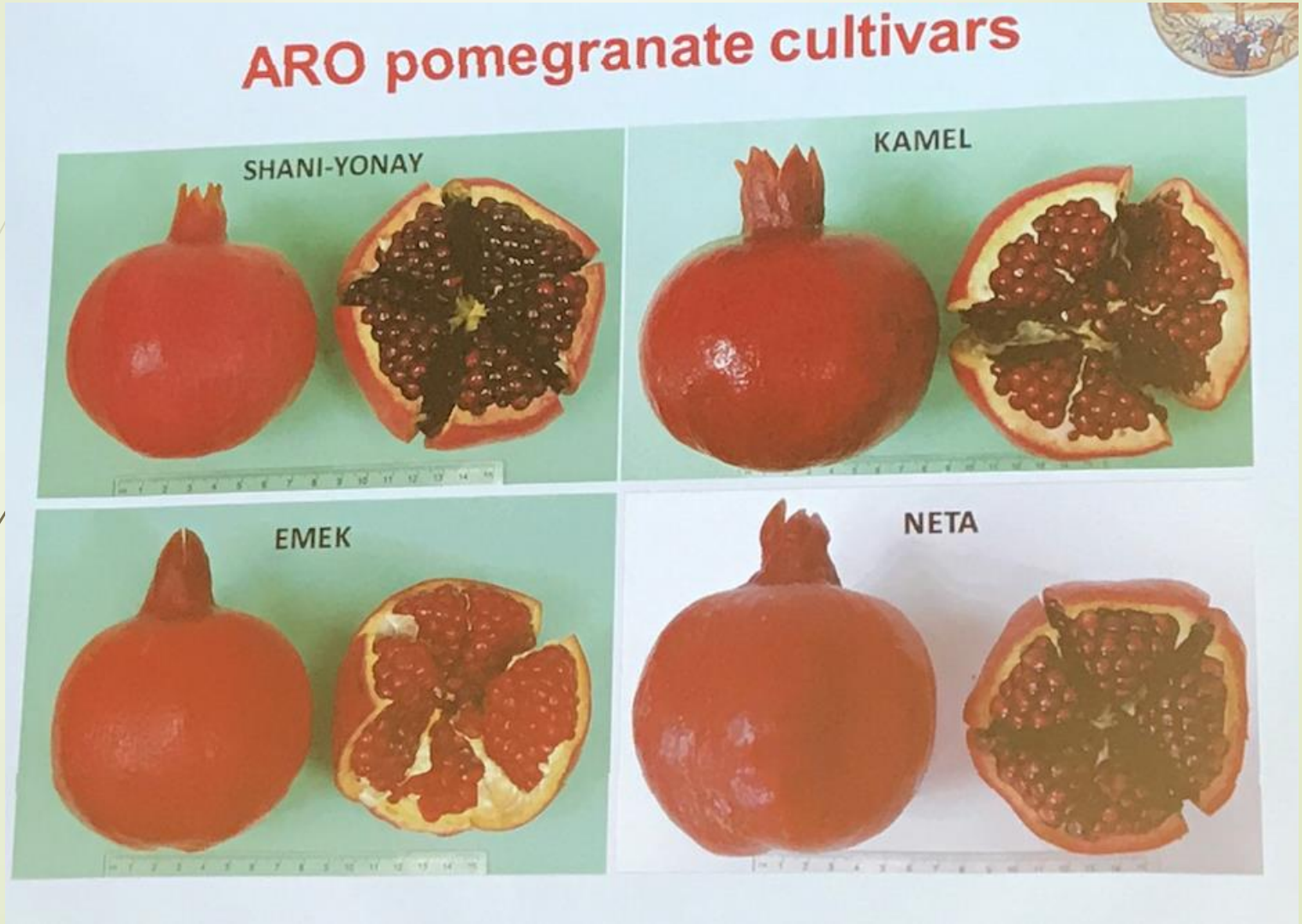
Pomegranate Variety Trials in Other Countries

- 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

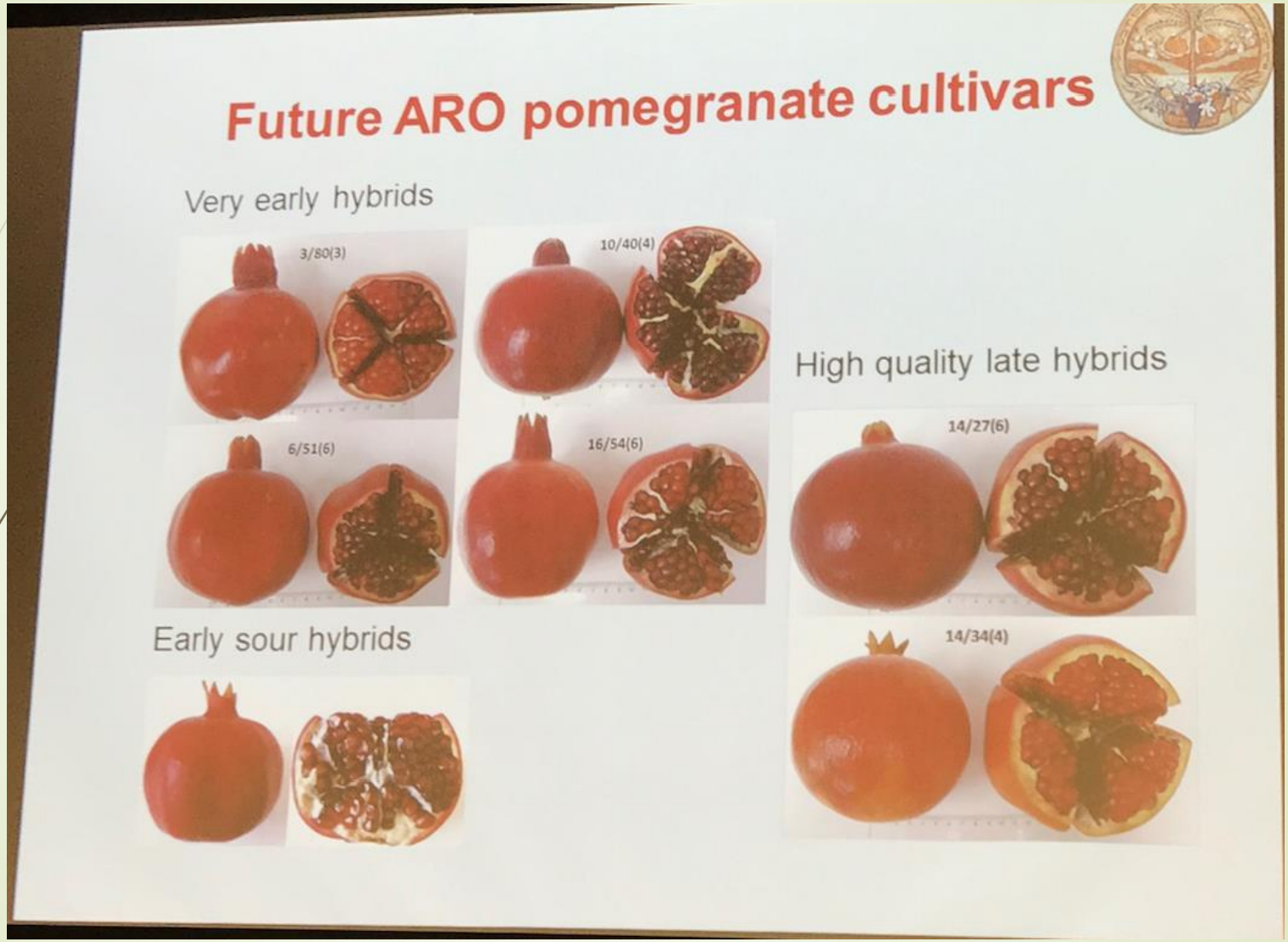
Pomegranate Breeding & New Varieties

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





Dr. Doron Holland, ARO, Israel



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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