

TOMATO INNOVATION

Breeding & Trialing for Your Finest Harvest

Hensley's SEED CO.
DENVER · COLORADO

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Today’s presenters



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the original research farm

Trial site in USDA zone 5b

200 acres over 11 isolated fields managed with an emphasis on soil heath:

- Wide spacing to facilitate rotations
- Approximately 50% in cover crops annually
- Organic growing techniques and inputs

Teams & Activities:

- Farm Operations & Maintenance
- Greenhouse Operations
- Product Development
- Seed Productions
- Breeding



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Original-source 2023 Farm, Maintenance, & Greenhouse Teams

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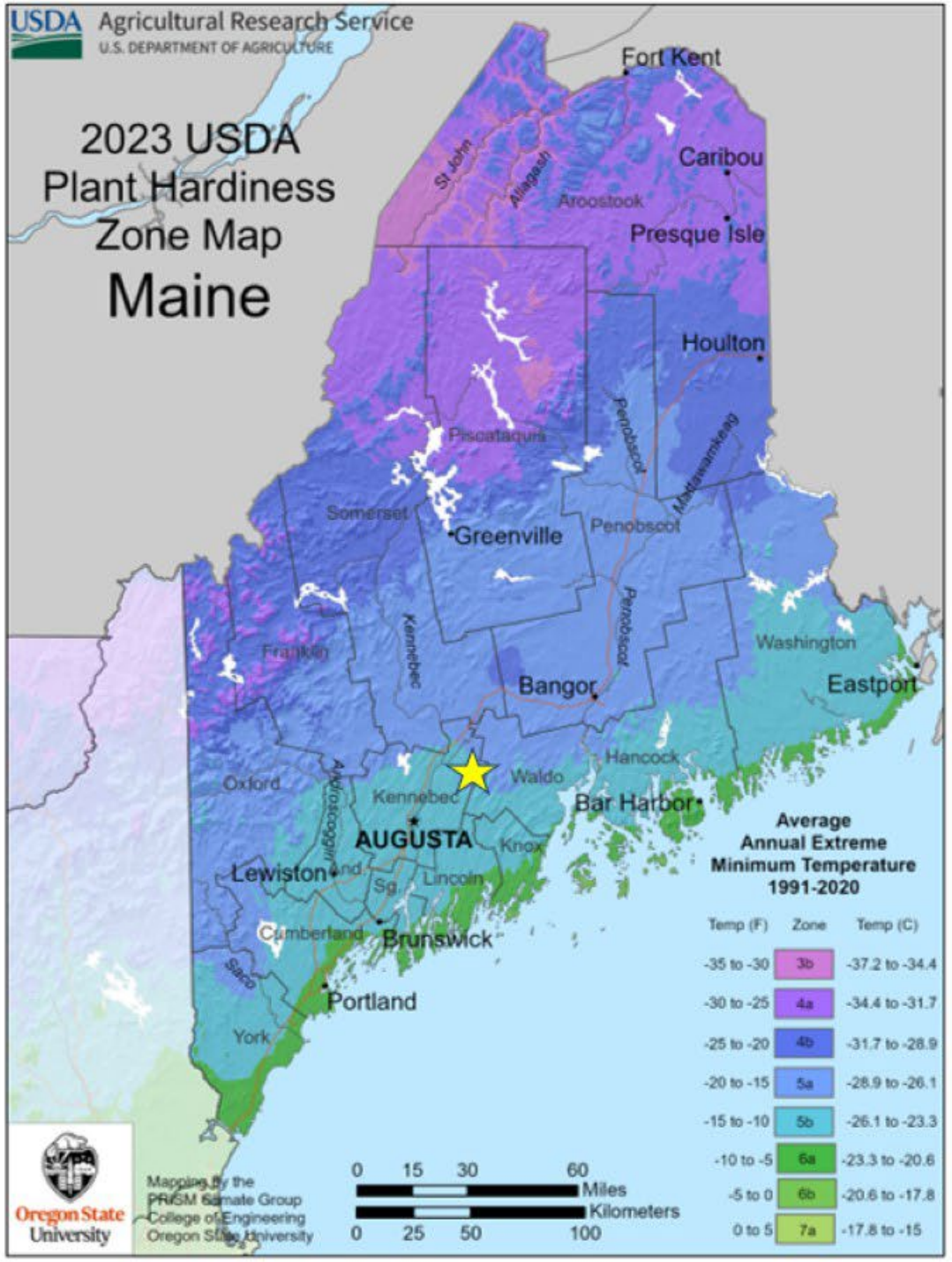
Original-source Home Farm

- 11 separate fields
- Diverse soils and land
- Short season, long days
- Hot & humid but cool nights

Original-source Regional Trials

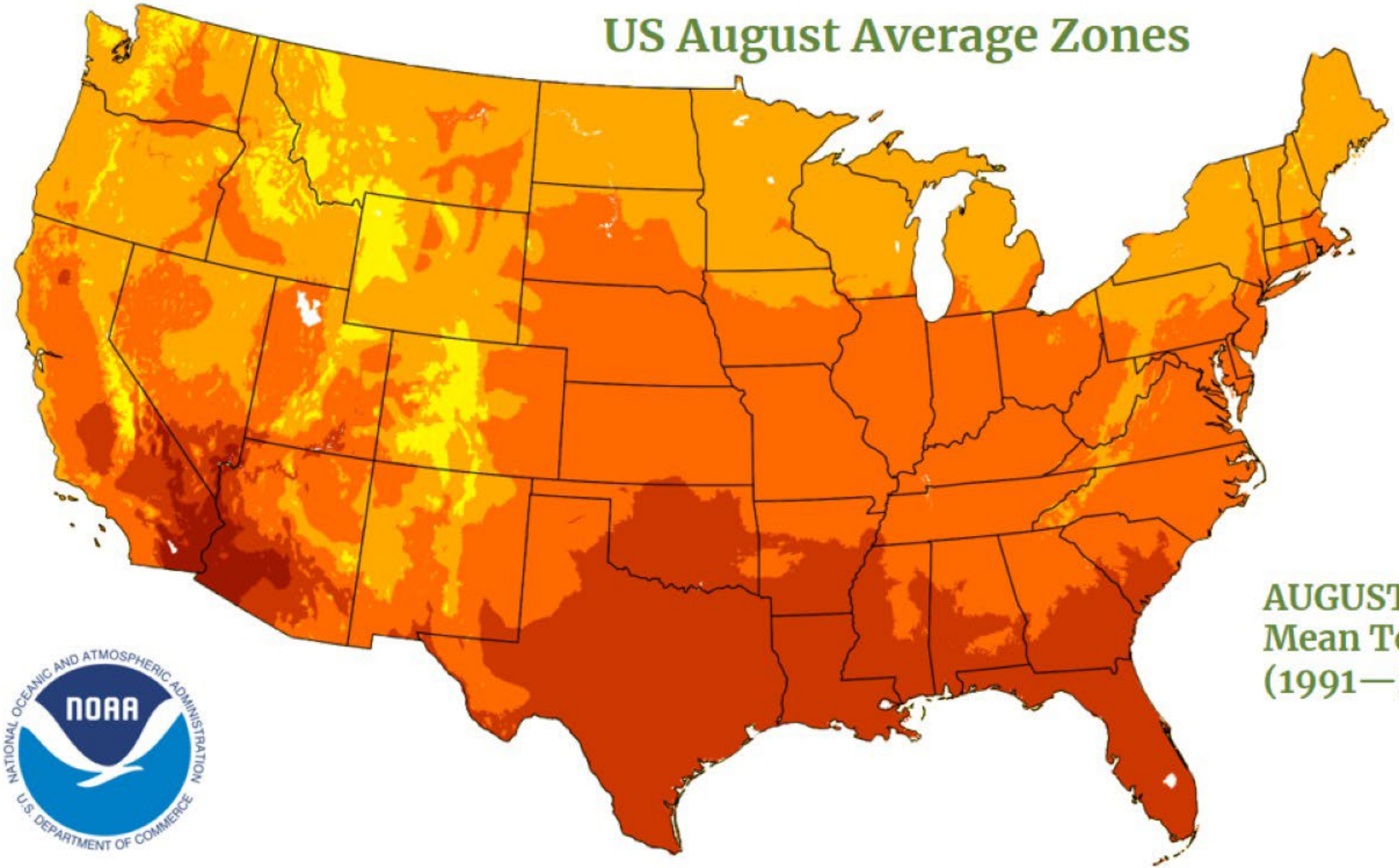
- Hardiness zone
- Planting dates (day length)
- Humidity/rainfall/sunlight
- Soil types
- Pest pressures
- Management practices
- Market needs

Image source: https://planthardiness.ars.usda.gov/



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US August Average Zones



AUGUST
Mean Temperature Normal
(1991—2020

10 20 30 40 50 60 70 80 90 100 (°F)

Image source: https://www.weather.gov/rah/ClimateNormals1991-2020#August

US Annual Rainfall

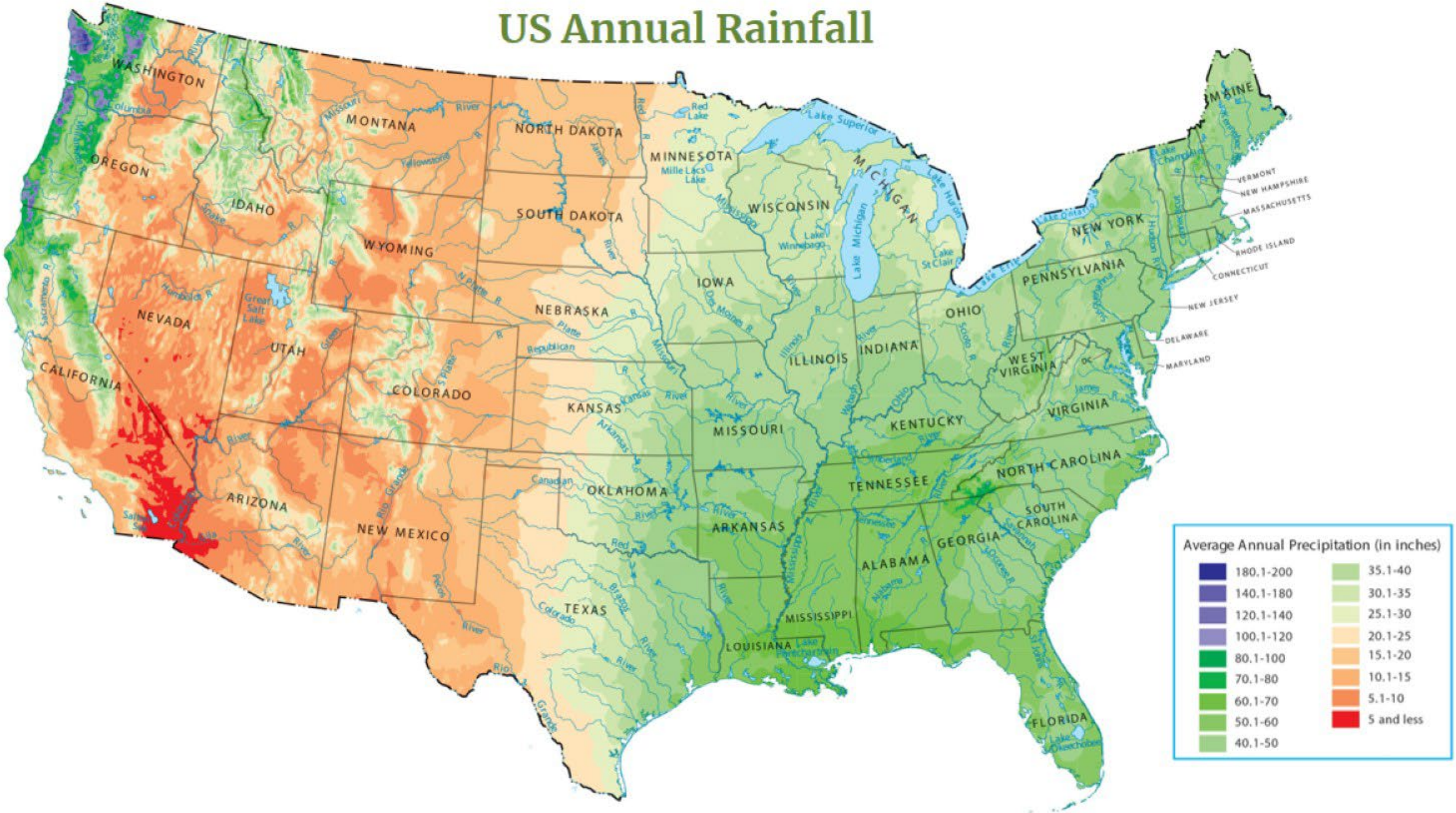


Image source: https://gisgeography.com/us-precipitation-map/

Original-source CLASSICAL

TOMATO BREEDING PROGRAM

A. Taxi (1986)

B. Red Pearl (2010)

C. Five Star Grape (2011)

D. Martha Washington (2012)

E. Defiant PhR (2012)

F. Verona (2013)

G. Jasper (2013)

H. Clementine (2015)

I. Cherry Bomb (2016)

J. Valentine (2018)

K. Citrine (2020)

L. Abigail (2021)

M. Harvest Moon (2024)

N. Strawberry Fields (2024)

O. Marmalade Skies (2024)



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TOMATO BREEDING GOALS

- Excellent flavor & eating quality
- Reliability
- Early maturity
- Wide adaptation
- Direct market appeal
- Labor saving
- Disease resistance
  - Late blight
  - Early blight
  - Septoria leaf spot
  - Leaf mold



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HIGH TUNNEL ADAPTATION



Breeding High Tunnel at the original research farm

DISEASE RESISTANCE



Image source: American Phytopathological Society





TOMATO TRAITS OVERVIEW

PLANT

Vigor (height & canopy)
Tidiness (compact vs. wild)
Habit (vegetative vs. generative)
Health (ID diseases)

YIELD

Maturity & Duration
Pollination/Fruit set
Yield Potential
Marketability (defects)

FRUIT

Flavor & Texture
Truss & Calyx Traits
Size, Shape
Shelf-life, Firmness

OTHER

Genetic Resistances
Seed Quality
Seed Form
Price



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OPEN FIELD TRIAL DESIGN

Prepare for Field Planting

- 200-300 varieties
- Treat Seed
- Tricky Germination
- Bump up transplants into 72's

Field Layout

- Living mulches before and during crop
- Plasticulture, drip tape
- Basket weave w/ walking breaks
- 12' centers, 2' in-row
- Multiple check plots



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SEEDLING PHASE







ESTABLISHMENT







FIRST HARVEST





September 3 – Determinate Paste Tomato

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Indeterminant Plants
Determinant Plants

Early Sept Frost – 2020

Photo: 9/21/20



SUMMARY
Selecting an Open Field Tomato

- Canopy coverage (south)
- Tolerance to the elements & disease
- High output over shorter duration
- Eating quality



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HIGH TUNNEL TRIAL DESIGN

- Bump up into 4" pots (sometimes)
- Indeterminates on vertical string, single-leader
- Determinates on basket weave, prune to 1st branch
- Drip irrigate 2x daily, fertigation
- Foliar spray as needed, bio-controls





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ESTABLISHMENT







First Flowering Stage



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POLLINATION

- Wind and Insect pollinated
- Self-fertile
- Temperature – optimal range
- Blossom Drop – stress response
  - Below 55° or 50°F
  - Over 90° F days, high nights >75° F
  - Drought stress
- Healthy flowers and plants
- Genetic differences in the flower

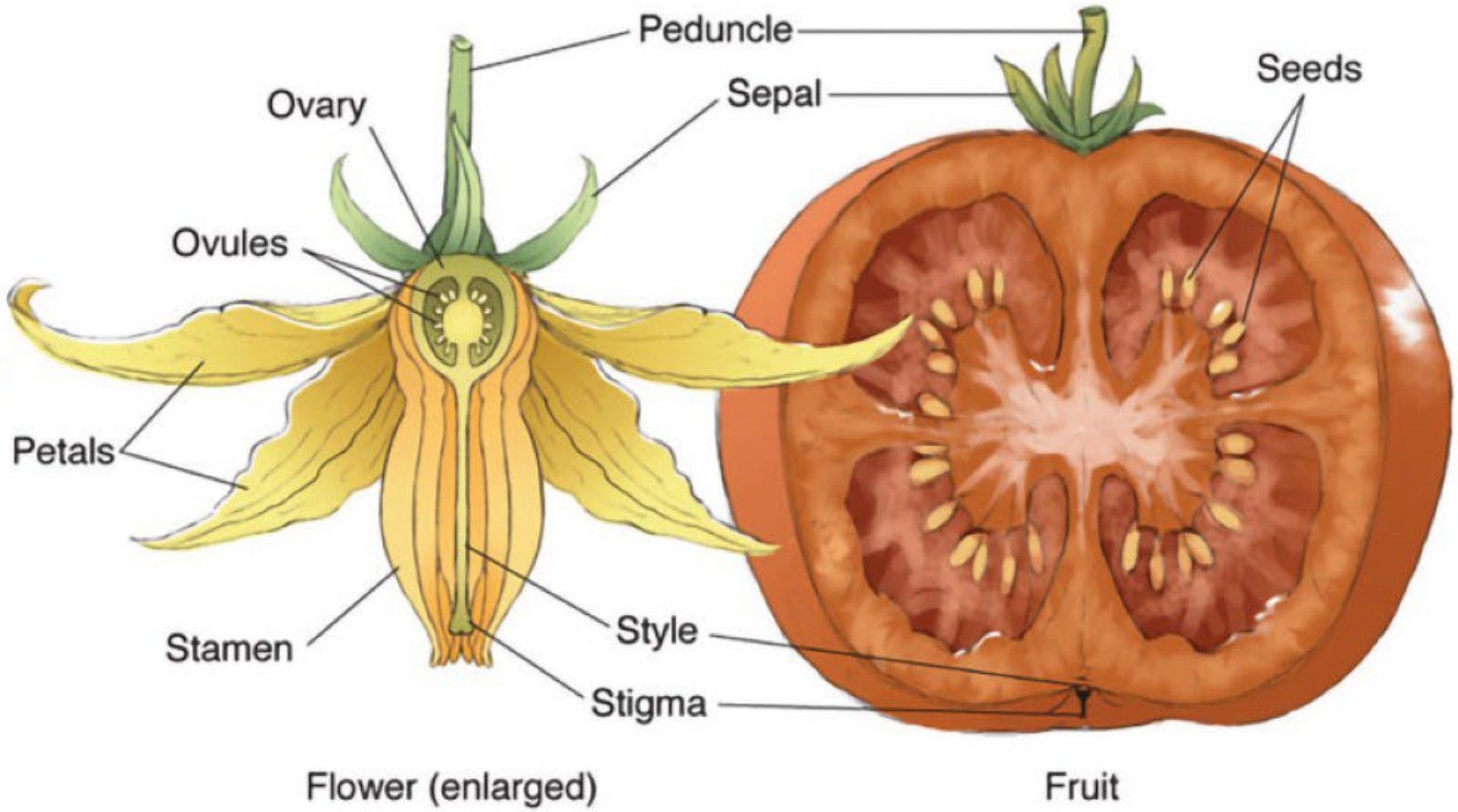


Image source:
https://www.buncombemastergardener.org/flicking-tomato-flower-tomato-fertilization/

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POLLINATION = FRUIT SET



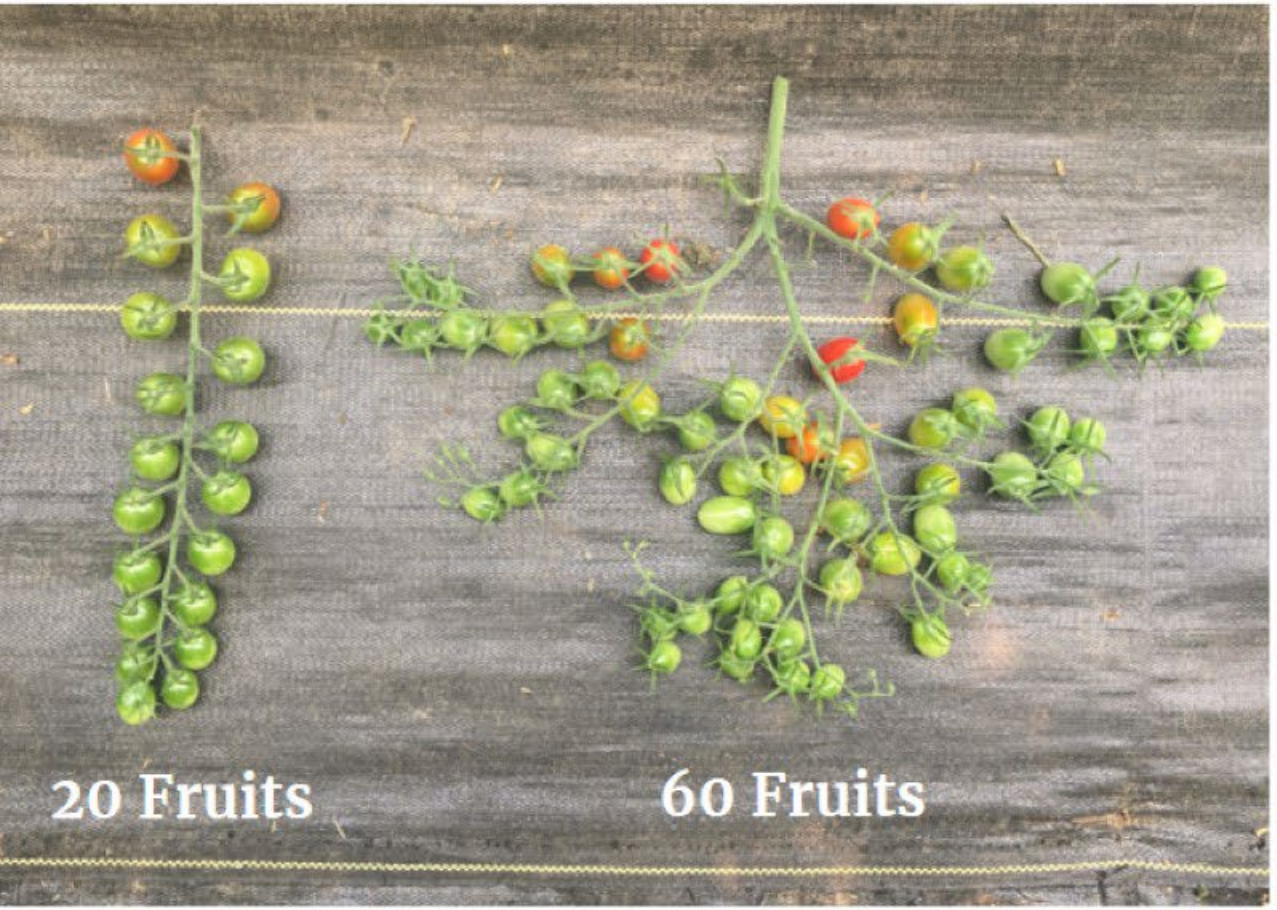




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TRUSS STRUCTURE

Single Stem vs. Branching





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Yield Harvest Process

- Weekly Harvest
- Size, Color, Uniformity
- Weight, Marketability
- Eating Qualities
- Changes throughout season

Unmarketable = Plant's Fault

- Cracking/Splitting/Concentric Rings
- Catfacing/Zippering/Scarring
- Oversized Blossom or Stem Scars
- Undersized (racquet ball) or Mishappen
- Uneven Ripening/Yellow Shoulder/Greywall
- Hollowness
- Sun Scald

Shelf Life

- Critical for high value production
- Profits and flexibility
- Sugars, water, density, skins, etc
- 7-10 days at room temperature



SUMMARY
Selecting a High Tunnel Tomato

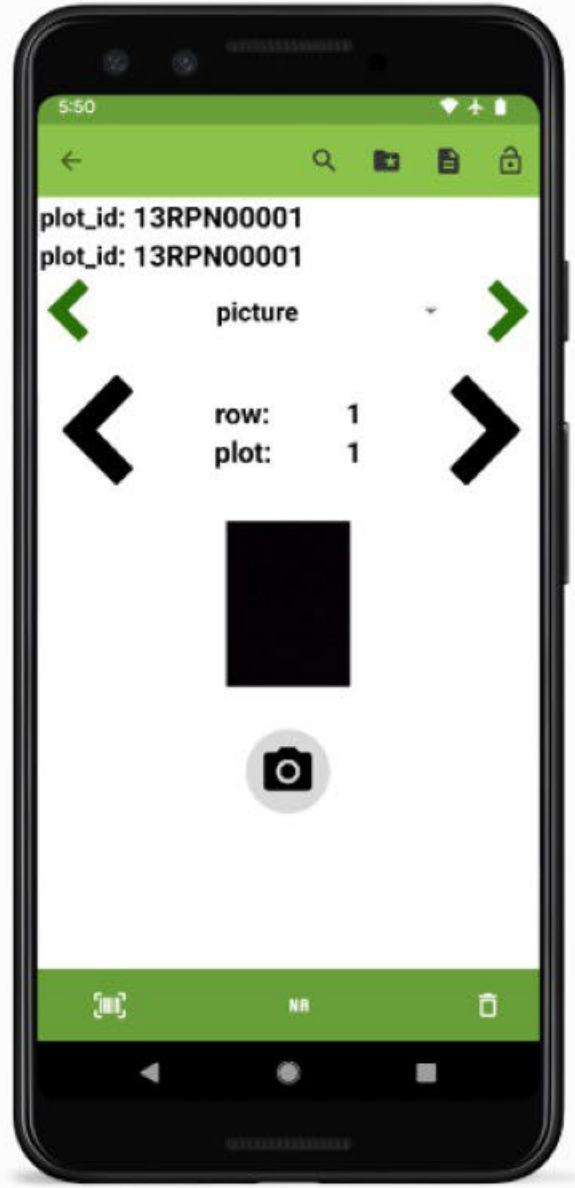
- Compact internodes and tidy truss of ideal size
- Production over longer cycle
- Balanced vigor with earliness
- Consistency in plant and fruit
- Fruit Set in high temperatures & low pollination
- Tolerance to indoor disease pests



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COLLECTING DATA

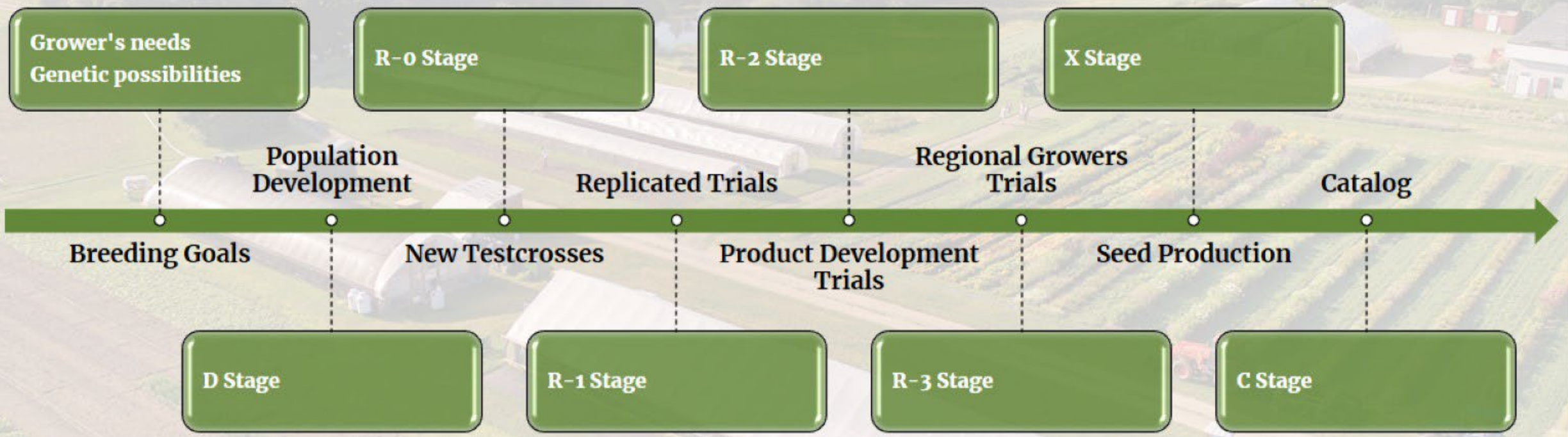




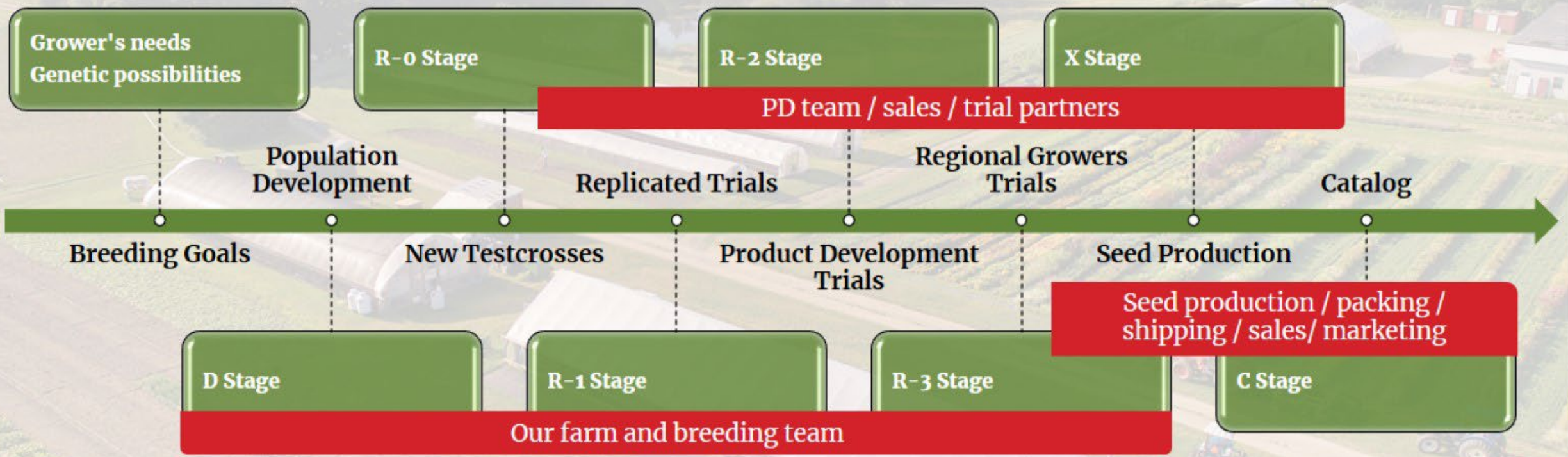
Fieldbook by PHENOAPPS

https://docs.fieldbook.phenoapps.org/en/latest/field-book.html

CURRENT BREEDING PROGRAM

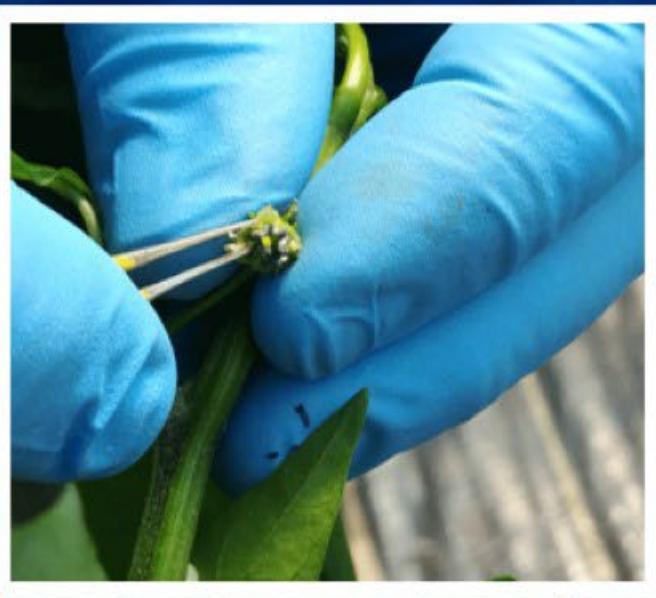


CURRENT BREEDING PROGRAM



CROSS POLLINATION







SEED PRODUCTION



NEW Marmalade Skies

Marmalade Skies

Habit
Vegetative, Tall

Maturity
Medium Early

Fruit
Tall Beef, 8–10 oz

Color
Solid Orange

Main Use
Open Field

Resistance
LB

Valencia

Habit
Mildly Vegetative, Slightly Compact

Maturity
Medium Early

Fruit
Lightly Ribbed Slicer, 8–10 oz

Color
Solid Orange

Main Use
Open Field

Resistance
None Known



NEW

Marmalade Skies







NEW Strawberry Fields

Strawberry Fields

Habit
Balanced

Maturity
Medium Early

Fruit
Lightly Ribbed Slicer, 7–10 oz

Eating
Acidic & Sweet, Slightly Firmer

Main Use
Open Field/Tunnel

Resistance
LB, RKN

Abigail

Habit
Mildly Generative

Maturity
Early

Fruit
Flattened Beef, 10–16 oz

Eating
Mildly Sweet and Delicate

Main Use
Open Field

Resistance
LB



NEW

Strawberry Fields







NEW

Strawberry Fields



NEW Harvest Moon

Harvest Moon

Habit
Mildly Generative, Compact

Maturity
Early

Fruit
Slightly Flattened, 7–10 oz

Color
Golden Bicolor

Main Use
Open Field

Resistance
LB

Margold

Habit
Mildly Generative

Maturity
Medium

Fruit
Slightly Tall, 7–10 oz

Color
Yellow Bicolor

Main Use
Tunnel/Greenhouse

Resistance
LM/ToMV/V



NEW

Harvest Moon





NEW

Harvest Moon








THANK YOU
We hope you enjoyed this presentation!
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