



College of Agricultural &
Environmental Sciences
UNIVERSITY OF GEORGIA

UGA blueberry breeding program update

Juliet Chu

Horticulture Department

January 2025

Economic impact of blueberry in Georgia

Top 10 Georgia Commodities in order of value



Broilers
\$3.0 billion
24.1% of total



Cotton
\$727.8 million
6.0% of total



Peanuts
\$678.0 million
5.5% of total



Beef
\$663.4 million
5.4% of total



Timber
\$649.8 million
5.3% of total



Greenhouse
\$566.2 million
4.6% of total



Corn
\$358.1 million
2.9% of total



Blueberries
\$304.2 million
2.5% of total



Dairy
\$297.0 million
2.4% of total



Hay
\$291.2 million
2.4% of total

Eighty years anniversary of UGA blueberry breeding program

- Mr. Callaway and Dr. Woodard (UGA Horticulture Department head in Tifton) created the blueberry breeding position in Tifton in 1944
- Dr. Tom Brightwell (1944-1974)
 - Established the Alapaha Blueberry Research Farm 25 miles east of Tifton in 1945
- Close collaboration in breeding effort with USDA scientists
 - Drs. Darrow, Scott, Galletta, Moore, and Draper



UGA blueberry breeding history.....

- Dr. Max Austin (1974-1995)
- Dr. Mel Hall (1995-1997)
- Dr. Scott NeSmith (1997-2019)
- Dr. Ye Chu (Oct. 2022-)



Blueberry cultivar release from **UGA** blueberry breeding program

- 16 rabbiteye varieties such as Brightwell, Titan and Climax
- 33 southern highbush varieties such as Suziblue and Georgia Dawn



Long-term goals of UGA Blueberry breeding program

- Develop both rabbiteye and southern highbush blueberries adapted to the southeastern U.S. growing environment through wide hybridization, tissue culture and utilization of genomic and genetic tools.



Objective 1

- Continue the selection and advancement of current elite breeding lines.
- Field visual selection criteria
 - Plant architecture: conducive for machine harvest
 - High plant vigor and fruit loading
 - Fruit quality
 - no split
 - High waxy bloom
 - Medium to large fruit size
 - Good sugar/acid balance and good flavor
 - No grittiness
 - Excellent scar

Objective 1 cont.....

- 2023 selections
 - 5 RE lines
- 2024 selections
 - Six SHB lines
 - 6 addition RE lines
- Farm trial locations
 - Farmer John farms
 - Fort Mudge farms

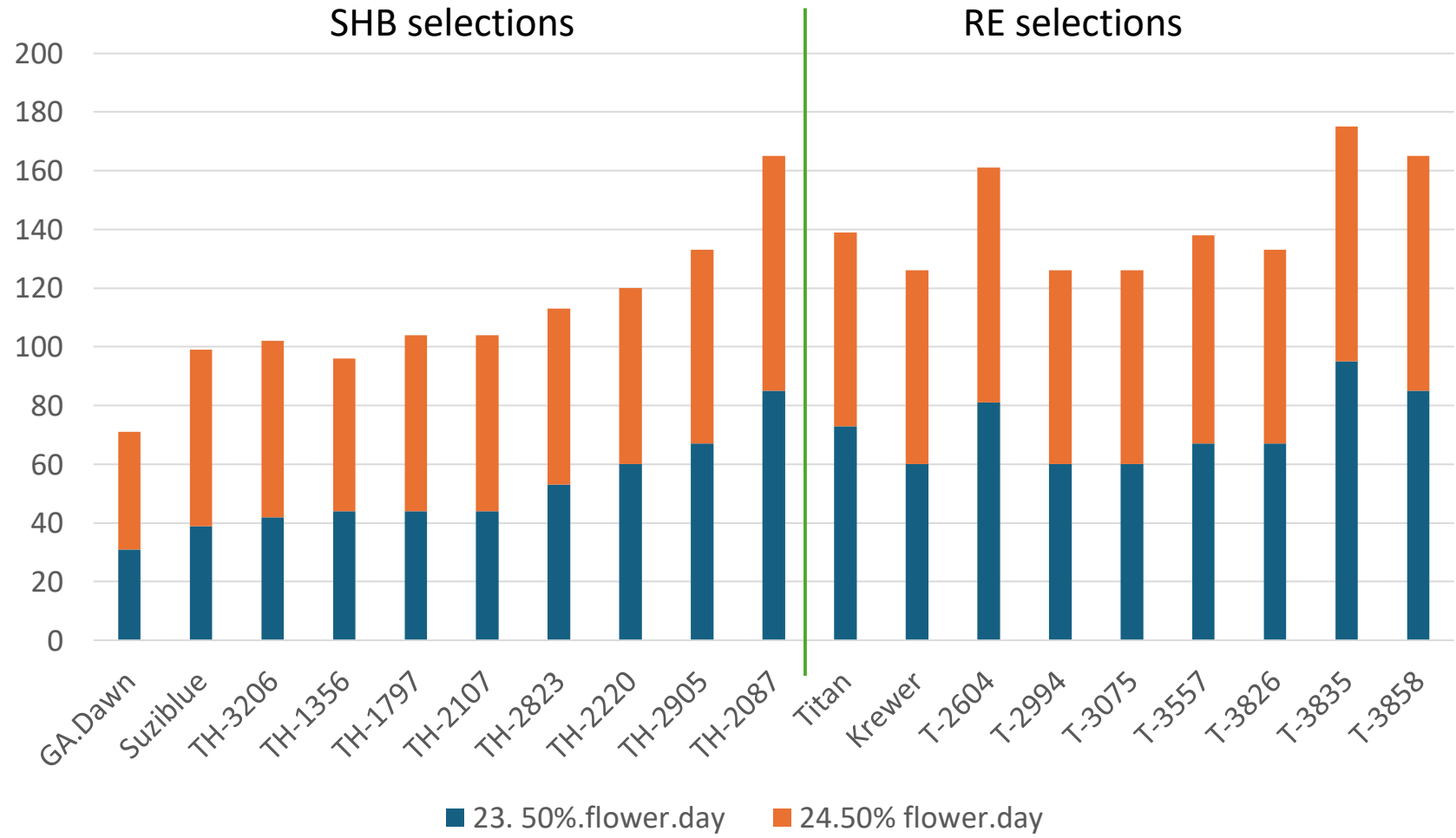
- TH-2220



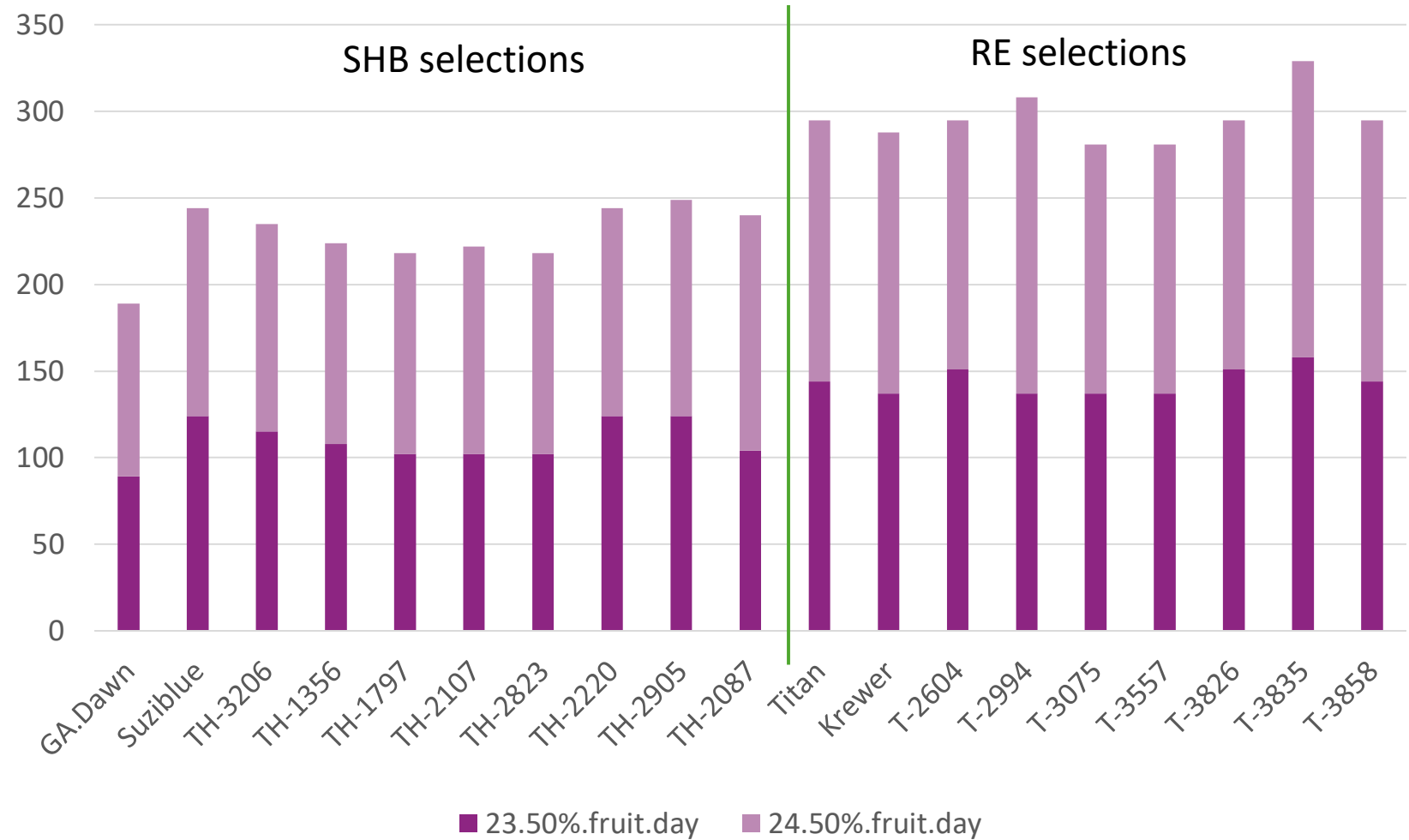
- T-2604



Julian days to 50% flowering



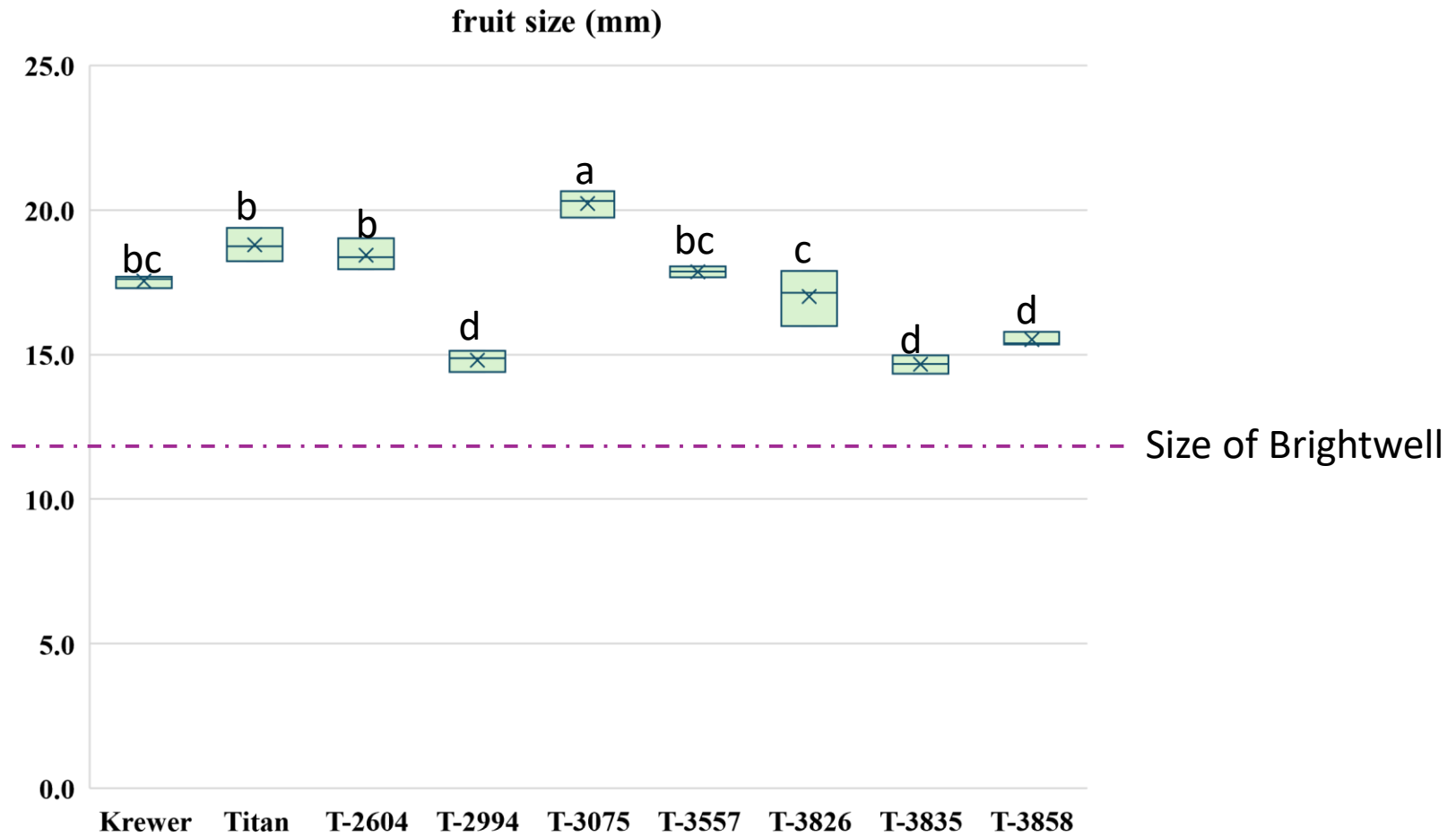
Julian days to 50% harvestable fruit



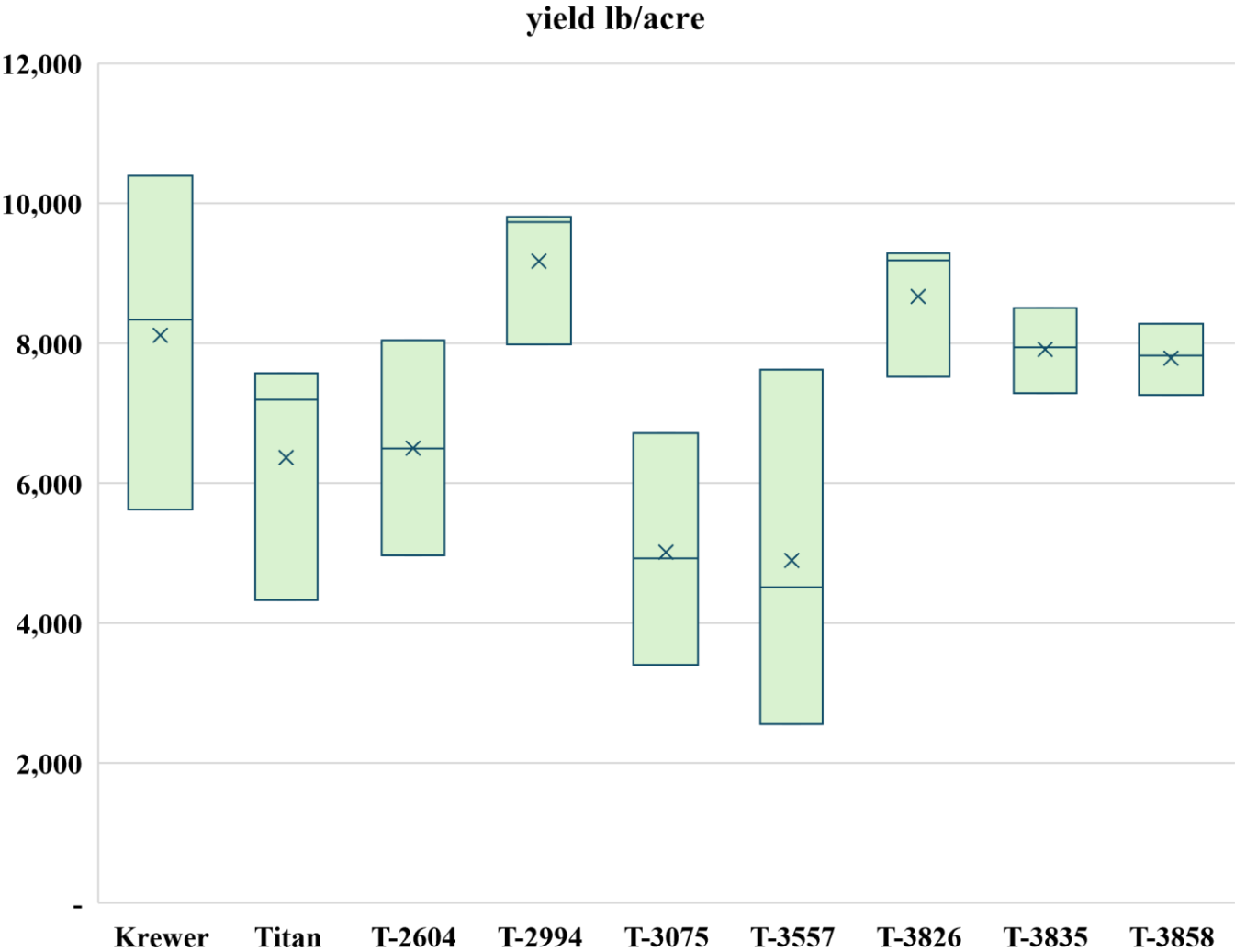
Fruit images of selected RE lines



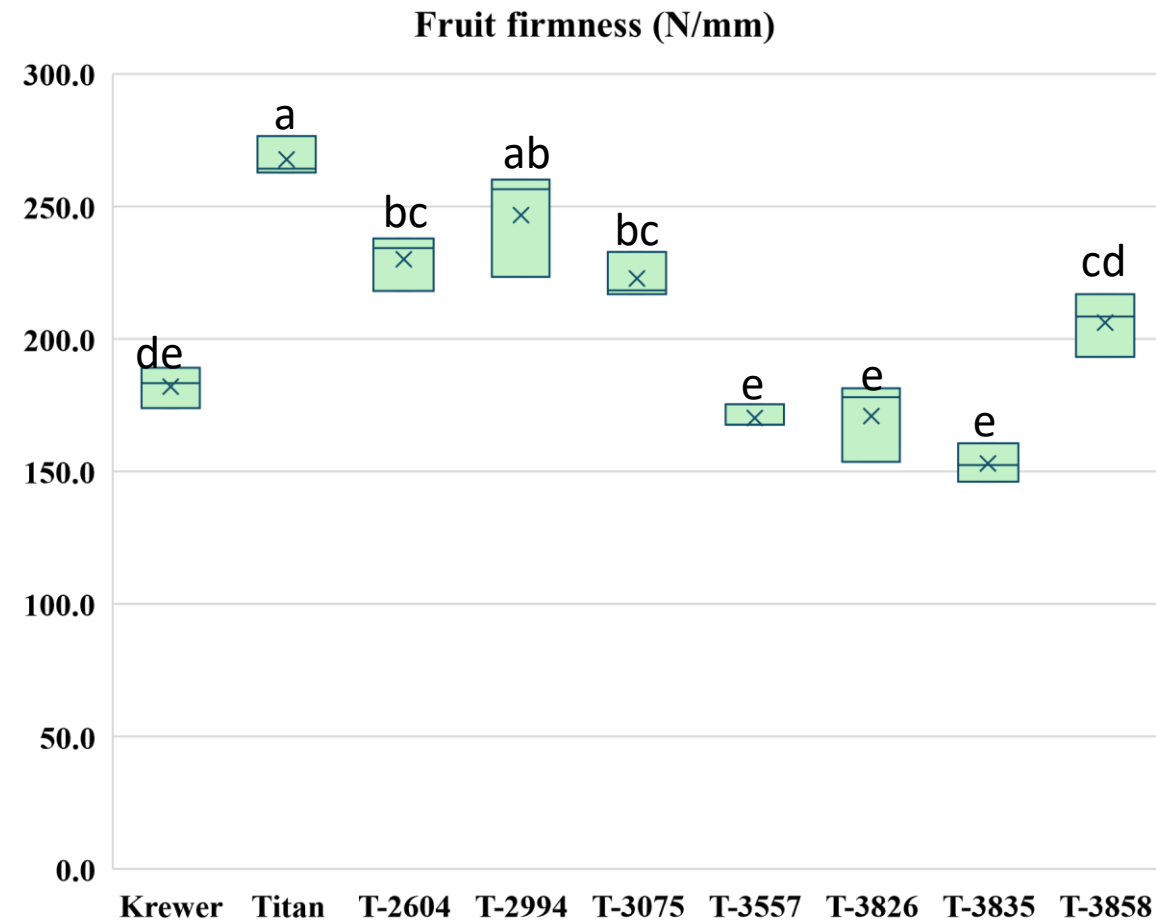
Fruit size



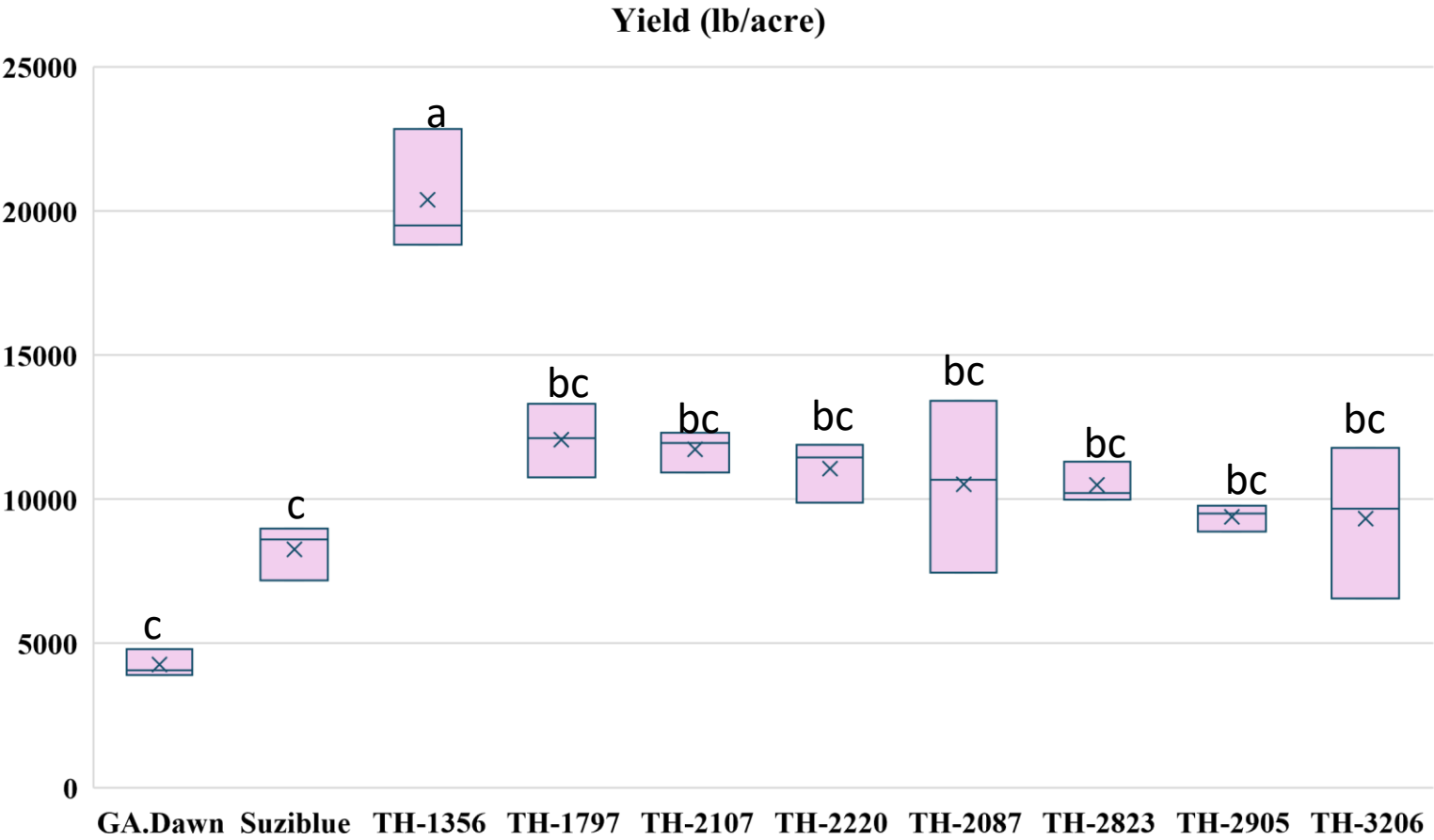
Total estimated per acre fruit yield for RE lines



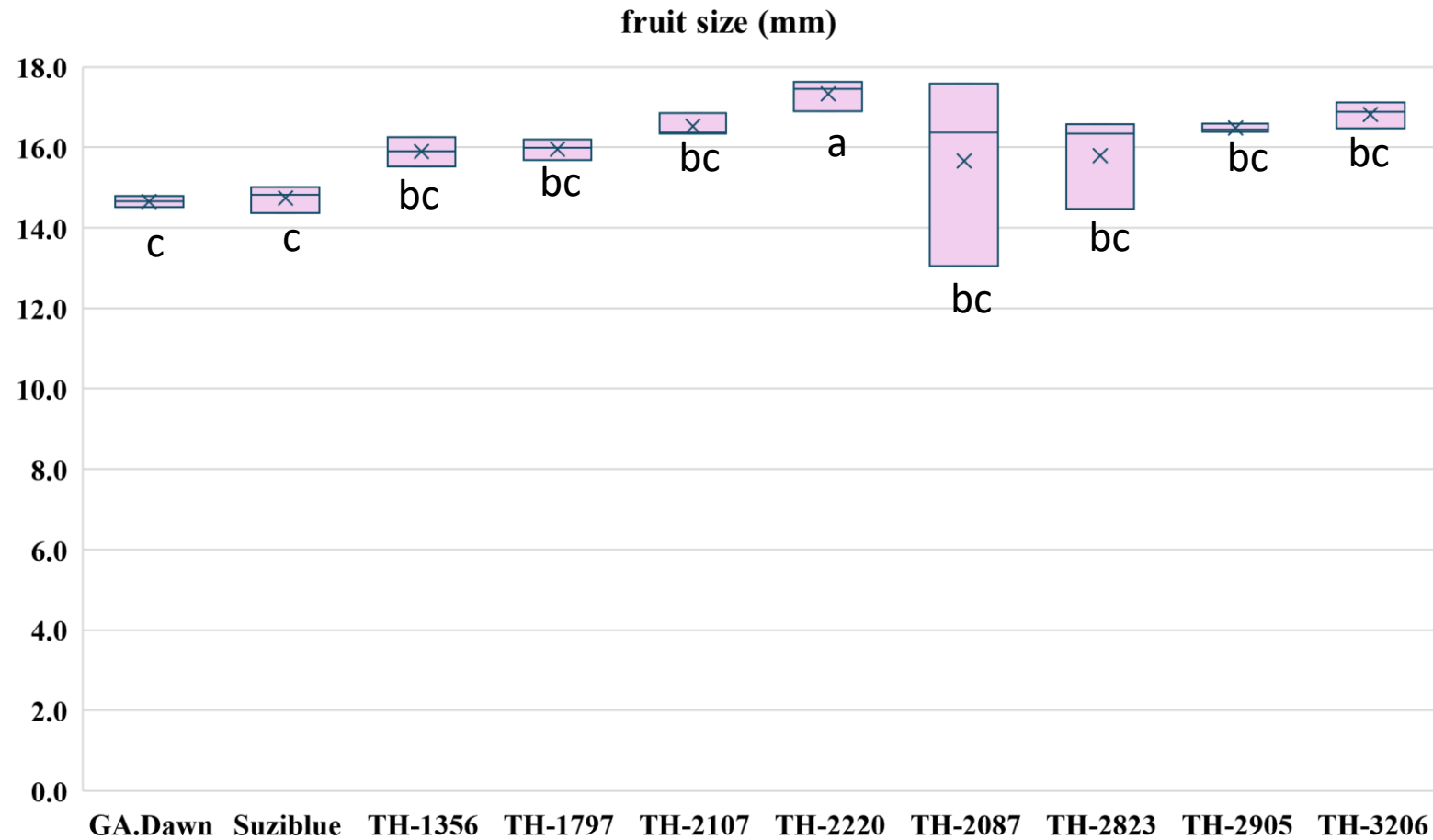
Fruit firmness



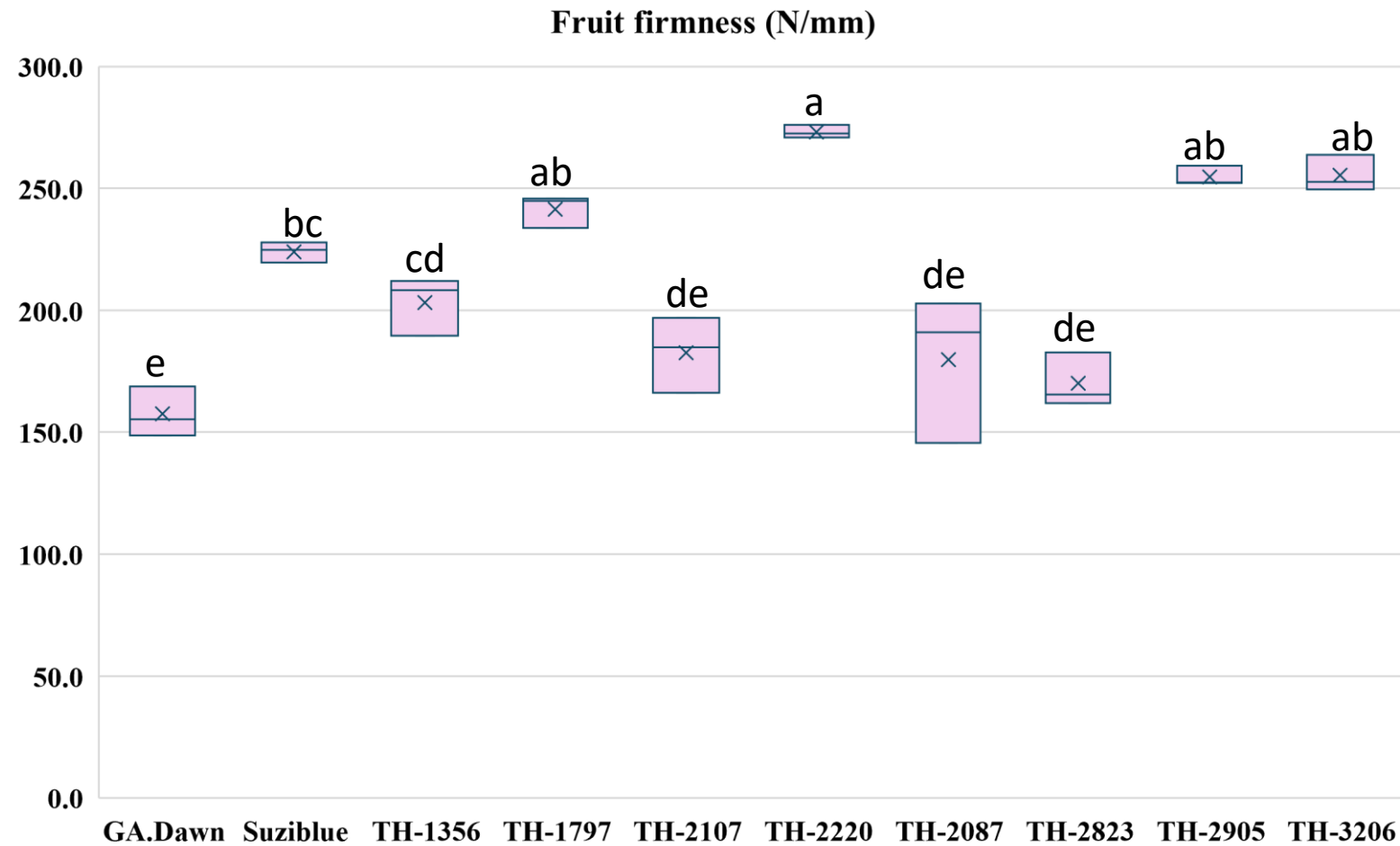
Total estimated per acre fruit yield for SHB



SHB fruit size



SHB fruit firmness

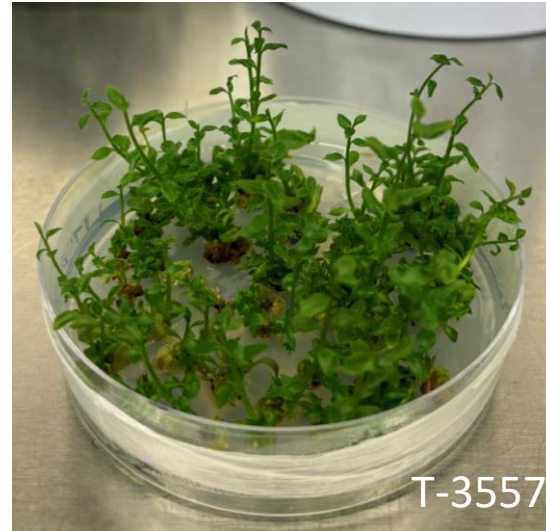
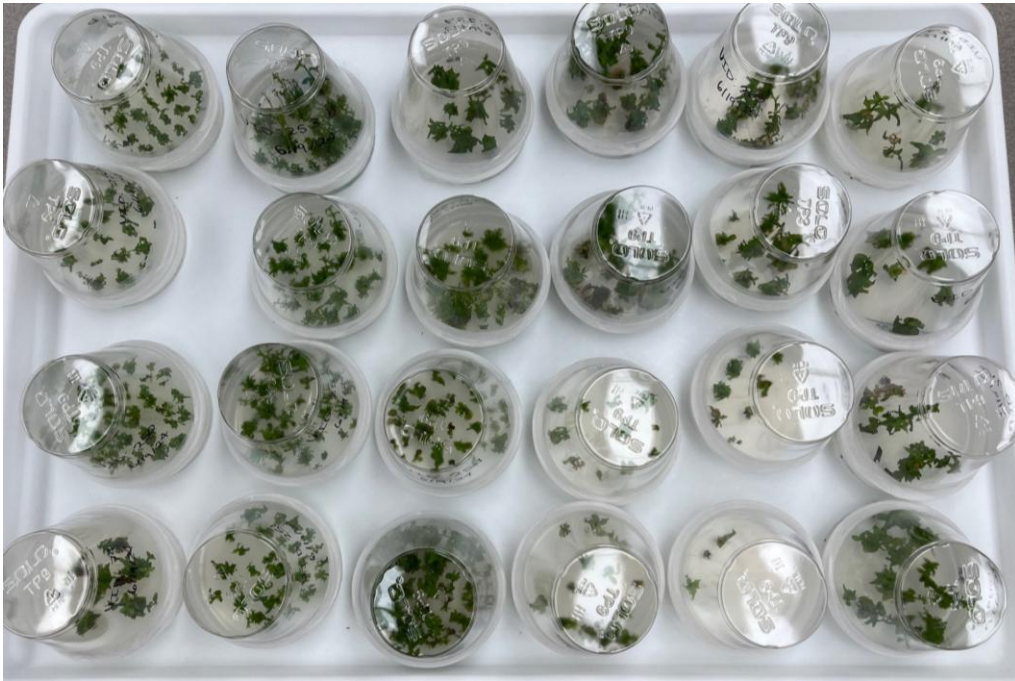


Softwood cuttings of RE selections established for farm trials



Objective 2

- Utilize tissue culture to accelerate accessibility of new cultivars to growers



Objective 3

- Broaden the genetic base for blueberry breeding by recruiting additional locally adapted diploid and hexaploid species.
 - Introgress vigor and local adaptability from RB to SHB via interspecific hybridization. Interspecific hybridization population of RE and SHB were established
 - Interspecific triploids were created with SHB x *V. Elliottii*

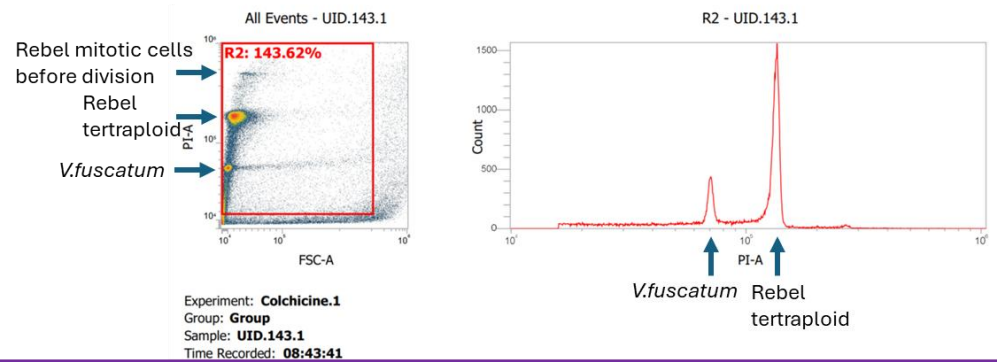


RE & SHB interspecific breeding populations

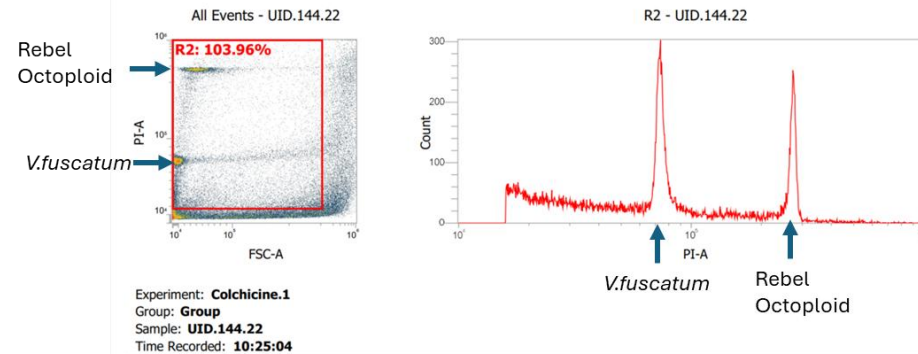
Objective 3 cont.

- Enhance interspecific through ploidy induction

'Rebel' at tetraploid level



Colchi-'Rebel' at octaploid level



Objective 4

- Produce a diverse set of elite blueberry cultivars adapted to local growing conditions and packaged with desirable genetic traits.
 - Method of screening for phytophthora root rot resistance in breeding populations is established



Comparison of alive and dead seedlings from *Phytophthora* inoculated population



C030



C027



C018

Objective 5

- Engage state-of-art genomic and genetic tools to develop molecular markers and accelerate breeding cycles.
 - Dr. Kendall Lee at Hudson Alpha was funded through USDA NIFA postdoc fellowship to develop genomic tools for our diversity population (2024 to 2025)
 - Area: Agriculture and Food Research Initiative
 - Program: Plant Health and Production and Plant Products: Post doctoral Fellowships Proposal Number: 2023-09715
 - Project Director: Kendall C. Lee
 - Proposal Title: Applying Pangenomics to Polyploid Breeding Programs Using Blueberry as a Model
- Brightwell tissue from USDA National Clonal Germplasm Repository was sequenced with other UGA germplasm through whole genome resequencing



Sequencing statistics

Species	DNA sample ID	Hifi Yield (Gb)	Raw reads avg. Length (kb)	Q30+ Bases*
SHB	B153	84.6	13.9	94%
SHB	B767	69	14.7	93%
RE	B080	83.2	12.3	94%
SHB	B100	34.6	9.5	93%
SHB	B591	80.9	15	93%
SHB	B791	87.3	15	93%
RE	B467	86.9	13.8	93%
RE	B487	72.8	13.2	95%
SHB	B278	85.6	14	95%
RE	Brightwell	83.5	13.2	95%
SHB	Suziblue	40.8	13	95%

Tifton Misty house



Dr. Toews helped to remodel the previous greenhouse structure at the Aquaculture farm to a blueberry misty house

New seedling plots at Alapaha Research farm



W3 block: 3,481 seedlings from 33 crossing family



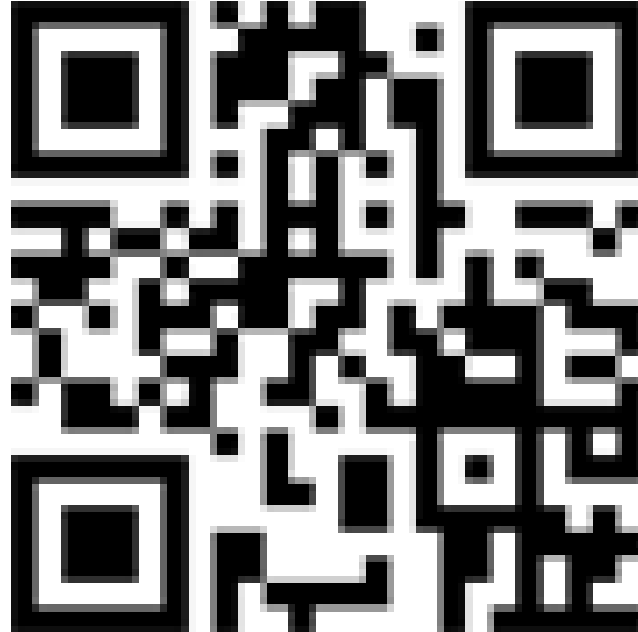
E2 block: 1,947 seedlings from 31 crossing family

Total: 5,428 seedlings from 64 crossing families transplanted in April-May 2024

NeSmith Professorship in Blueberry Breeding



- UGA blueberry breeder, Dr. NeSmith retired in 2019 after 30 years of distinguished career
- This endowed professorship will provide funding in perpetuity for blueberry breeding and cultivar development and student training



Give online <https://t.uga.edu/9b1>

Mail check (payable to UGA Foundation to:
UGA CAES

117 Four Towers
Athens, GA 30602

include "NeSmith Professorship" in memo

Acknowledgement

- UGA blueberry breeding team
 - Tracey Cook
 - Sindooru Nalajala
 - Emily Walter
 - Jacob Sandifer
 - Ashley Golden
 - Scott NeSmith
- UGA Alapaha research farm
 - Shane Tawzer
- UGA plant pathologists
 - Jonathan Oliver
 - Miaoying Tian
- Hudson Alpha Institute for Biotechnology
 - Kendall Lee
 - Josh Clevenger
 - Walid Korani
- UGA extension faculty
 - Zack Williams
 - James Jacobs
- Georgia growers and consultants
 - Sydney Lee
 - Steve Mullis
 - Keven Eason
 - Jerome Crosby
 - Danny Stanaland



Innovation Gateway
Office of Research
UNIVERSITY OF GEORGIA



GEORGIA SEED
DEVELOPMENT

