



# Blueberry Postharvest Research Updates

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# Impact of delayed harvests

## HARVESTING FACTORS

Blueberries set and ripen  
asynchronously within a  
cluster

Physiological age  
(ripe and overripe  
berries)

Decision of best harvest  
interval is key in  
estimating postharvest  
quality.

25% Blue



75% Blue



Optimal maturity stage:

Determinant of  
quality

Intended for long  
term storage

- The interval between consecutive harvests can significantly influence the storability and postharvest quality
- The proportion of ripe and overripe fruit impacts postharvest storage potential





## Fruit split and Oozing Issue

- Symptoms: Fruit crack, split, oozing and fungus growth





STUDY LAYOUT (2022)				
Locations	Cultivars	Harvest 1	Harvest 2	Harvest 3
Homerville, GA	Meadowlark (SHB)	17-May-22	24-May-22	N/A
Cogdell, GA	Brightwell (Rabbiteye)	2-Jun-22	9-Jun-22	N/A
Douglas, GA	Brightwell (Rabbiteye)	2-Jun-22	9-Jun-22	N/A
STUDY LAYOUT (2023)				
Homerville, GA	Meadowlark (SHB)	18-Apr-23	25-Apr-23	2-May-23
Cogdell, GA	Brightwell (Rabbiteye)	1-Jun-23	8-Jun-23	15-Jun-23
Douglas, GA	Brightwell (Rabbiteye)	1-Jun-23	8-Jun-23	15-Jun-23
Experimental Design: Randomized Complete Block Design				

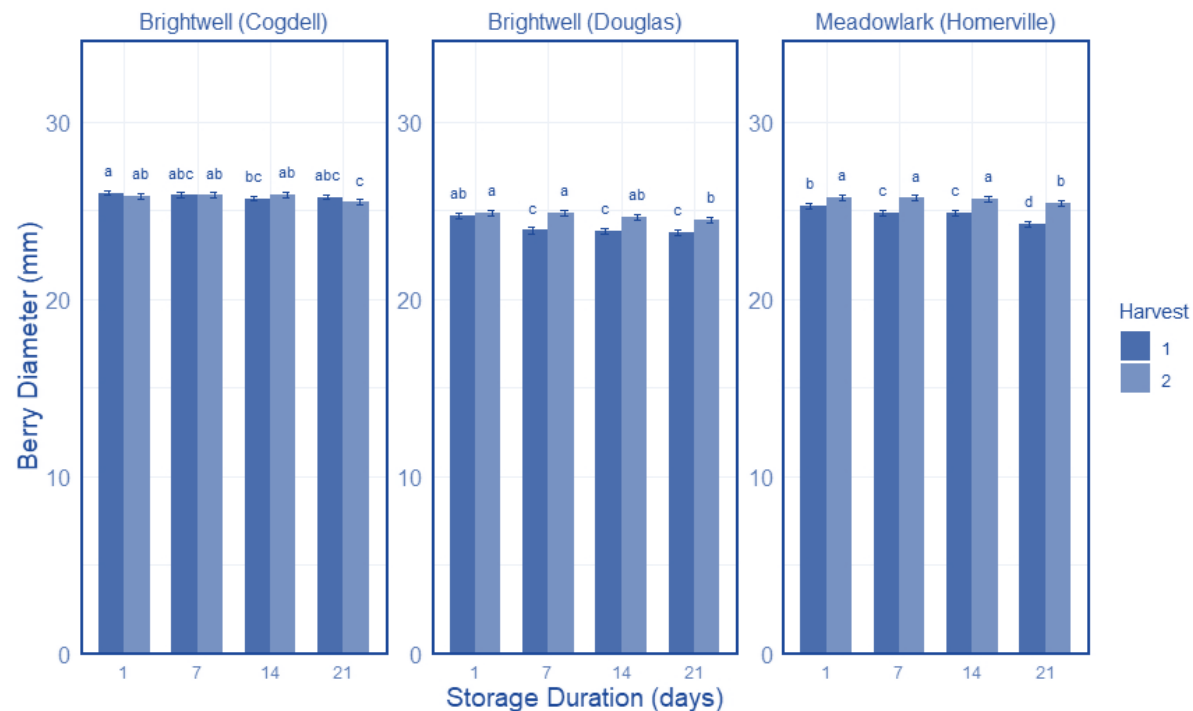
- Storage: 34°F and 85% RH
- Fruit quality assessment on both harvests (H1: early harvest and H2: delayed harvest):
  - Day 1
  - Day 7
  - Day 14
  - Day 21



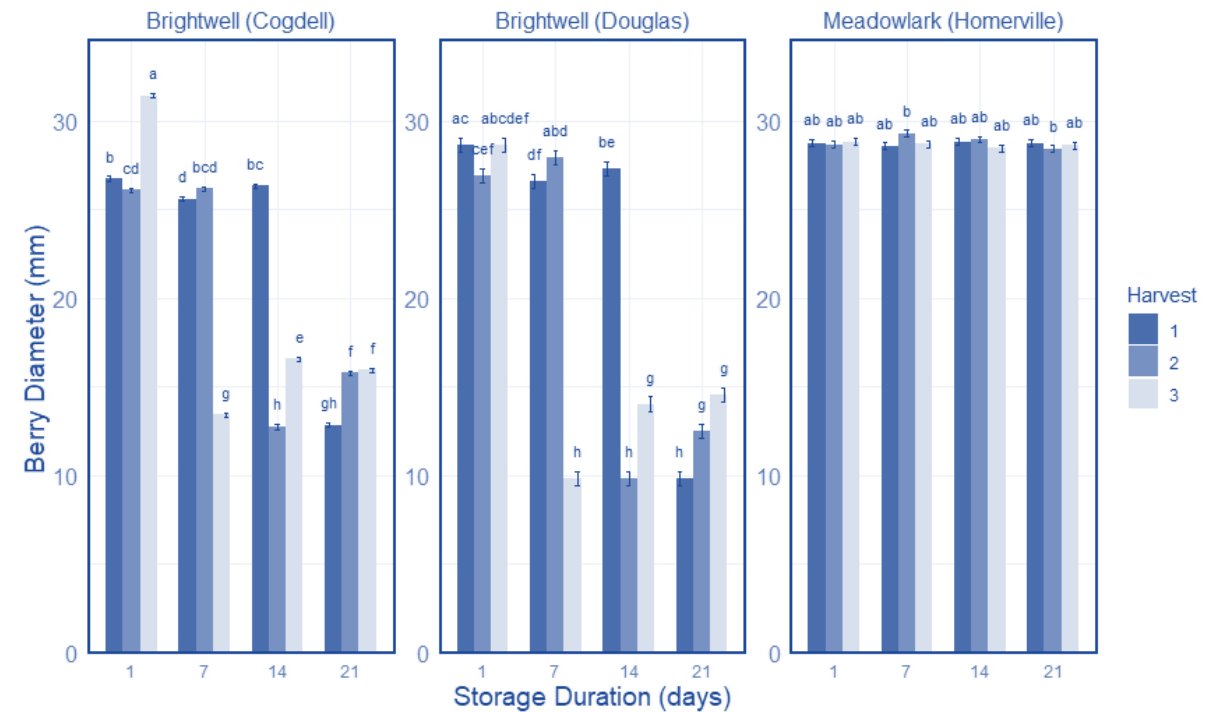


# Results – Fruit Size

**Berry Diameter - 2022**



**Berry Diameter - 2023**



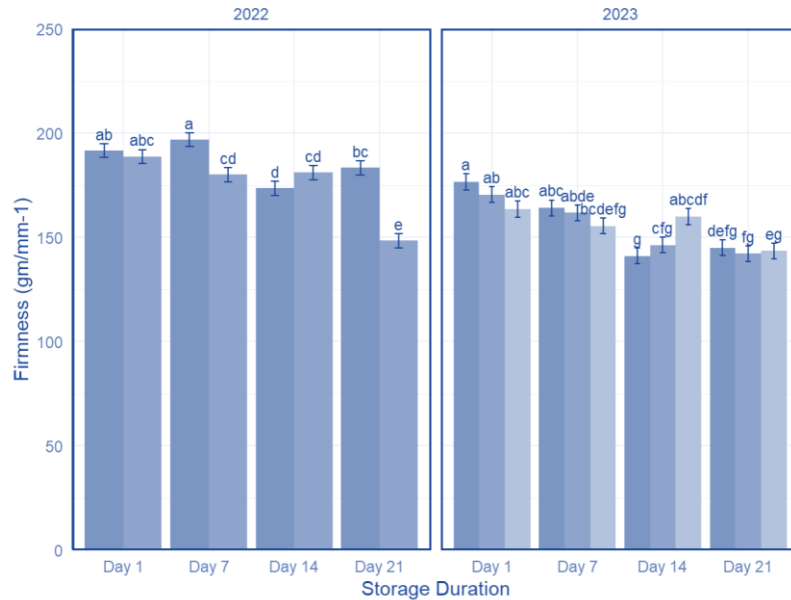
Increased w/ delayed harvest in first season  
Declined dramatically during prolonged storage for Brightwell (2023)



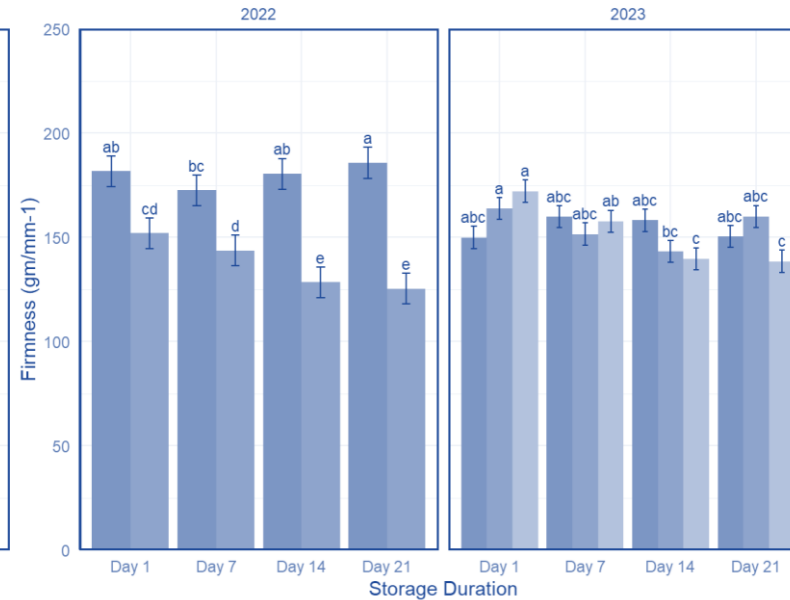


# Results – Firmness

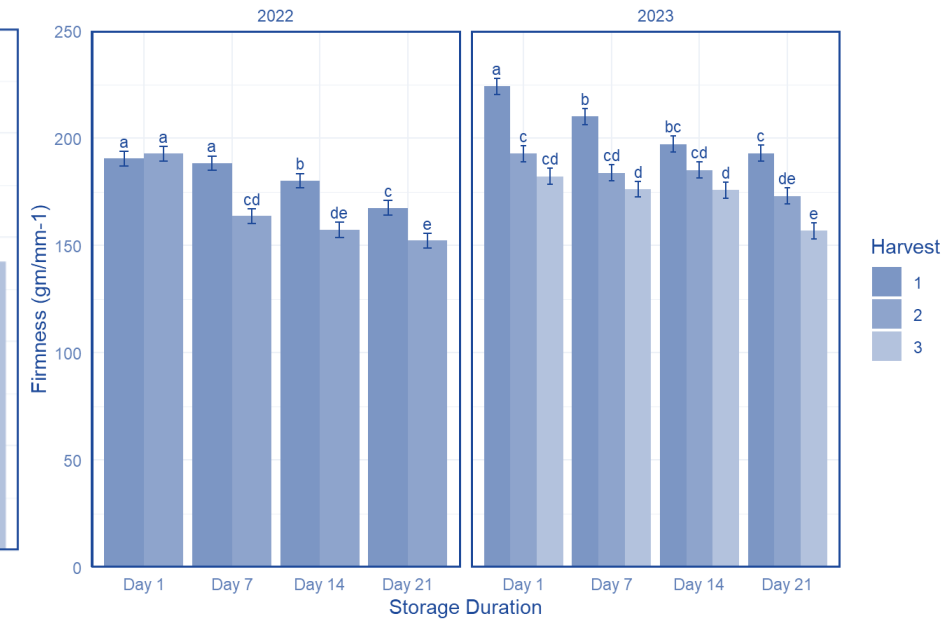
Brightwell (Cogdell)



Brightwell (Douglas)

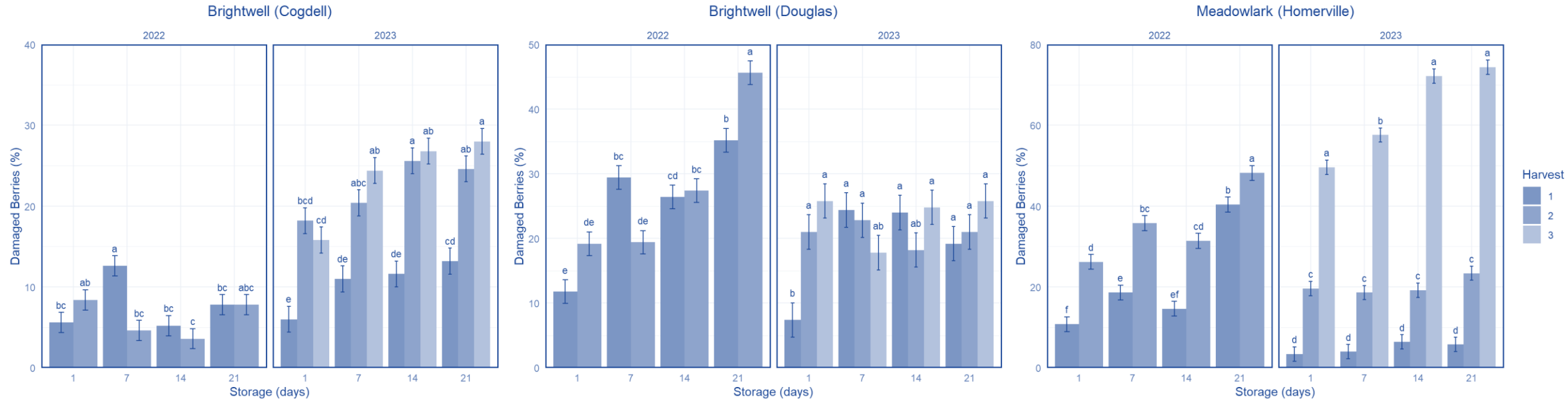


Meadowlark (Homerville)





# Results – Percentage of Damaged Berries

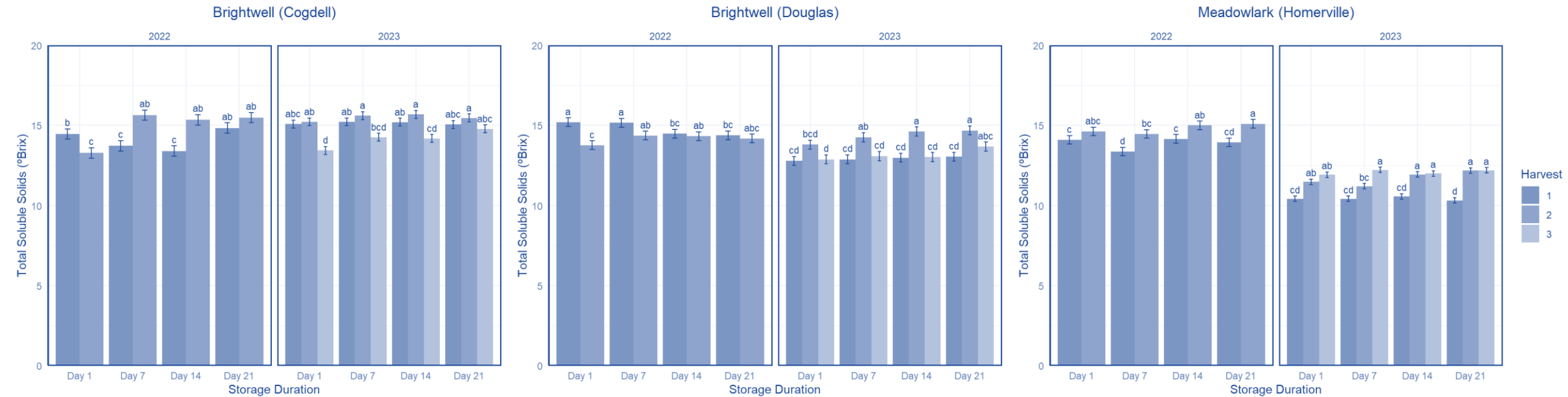


Increased % of damaged berries in majority of delayed harvests





# Results – Total Soluble Solids

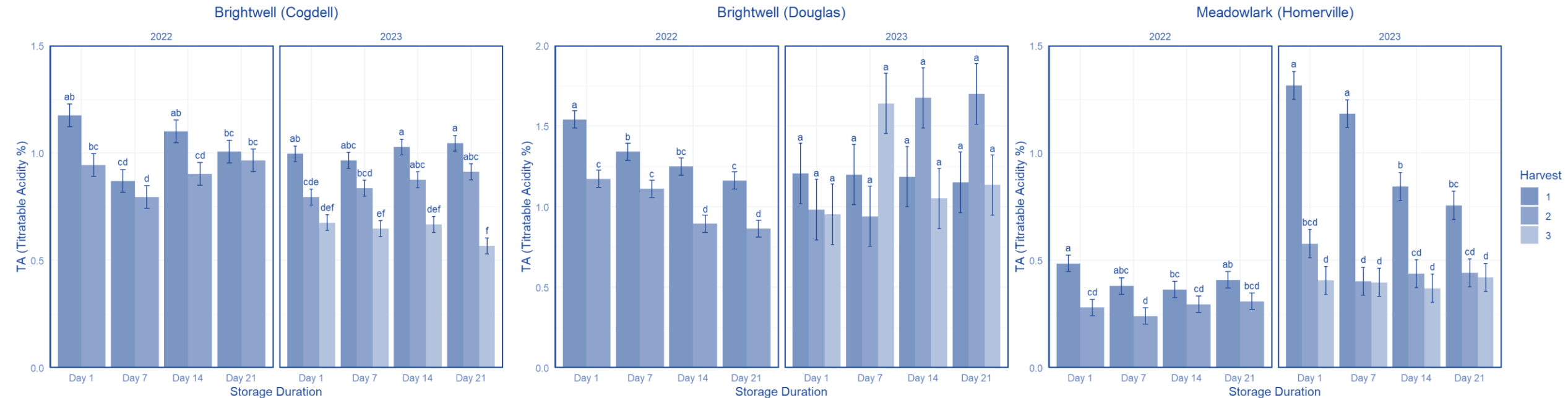


Total Soluble Solids showed no clear pattern  
Increased TSS in Meadowlark (2023)





# Results – Titratable Acidity



TA declined over time and during storage (except for Brightwell-Douglas 2023)





# Conclusions

- Fruit from H2 and H3 (delayed harvests) had lower firmness values after 7, 14 and 21 days of storage.
- Damaged berries: Significantly higher in harvest 2 in 2022 and harvest 2 and 3 in 2023.
- Delayed harvests reduced fruit storability by contributing negatively to fruit firmness and other quality characteristics.
- Timely harvests (<7d) are recommended to maintain fruit quality and increase storage potential.





# Assessing denser picking intervals on the storability and postharvest quality of Rabbiteye blueberries





## Study Layout: 2023-2024

- Location: Alma
- Cultivars: Brightwell (Rabbiteye)
- Number of harvests: 3
- Treatment:
  - T1: Harvest every 2 days
  - T2: Harvest every 3 days
  - T3: Harvest every 7 days
- Replications: 4
- Storage: 34°F and 85% RH
- Fruit quality assessment on:
  - Day 1
  - Day 7
  - Day 14
  - Day 21
- Experimental Design: Randomized complete block design

Alma Blueberry Research Farm





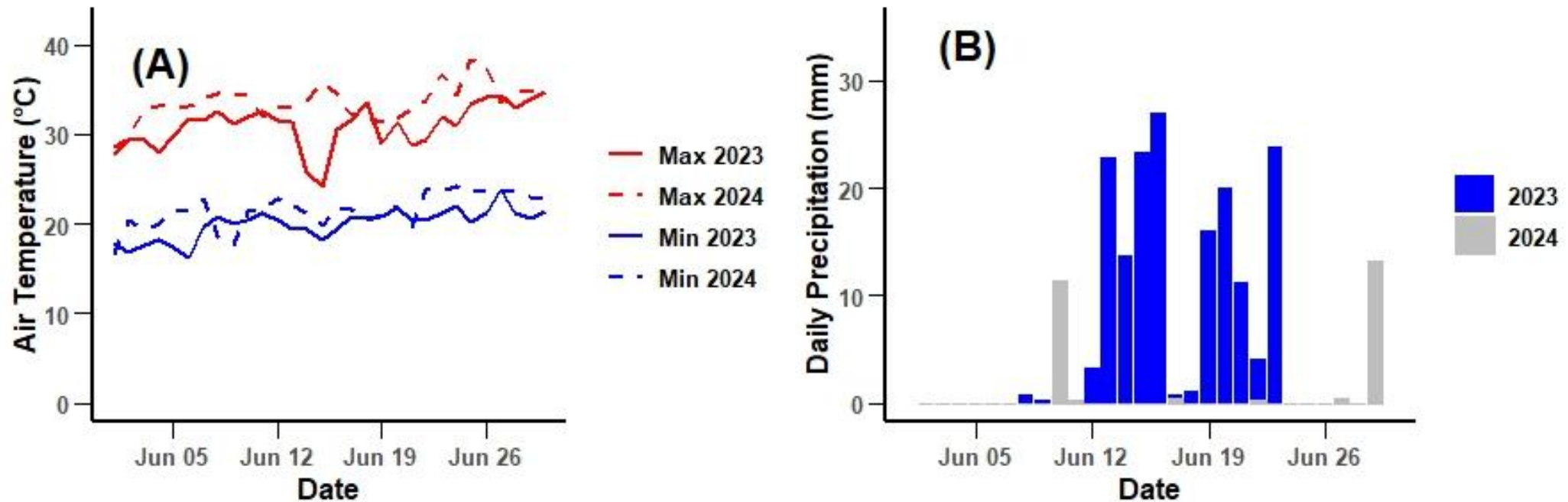
## Study Layout

- Storage: 34°F and 85% RH
- Fruit quality assessment on:
  - At harvest
  - After 7 days of storage
  - After 14 days of storage
  - After 21 days of storage





# Local Weather Conditions

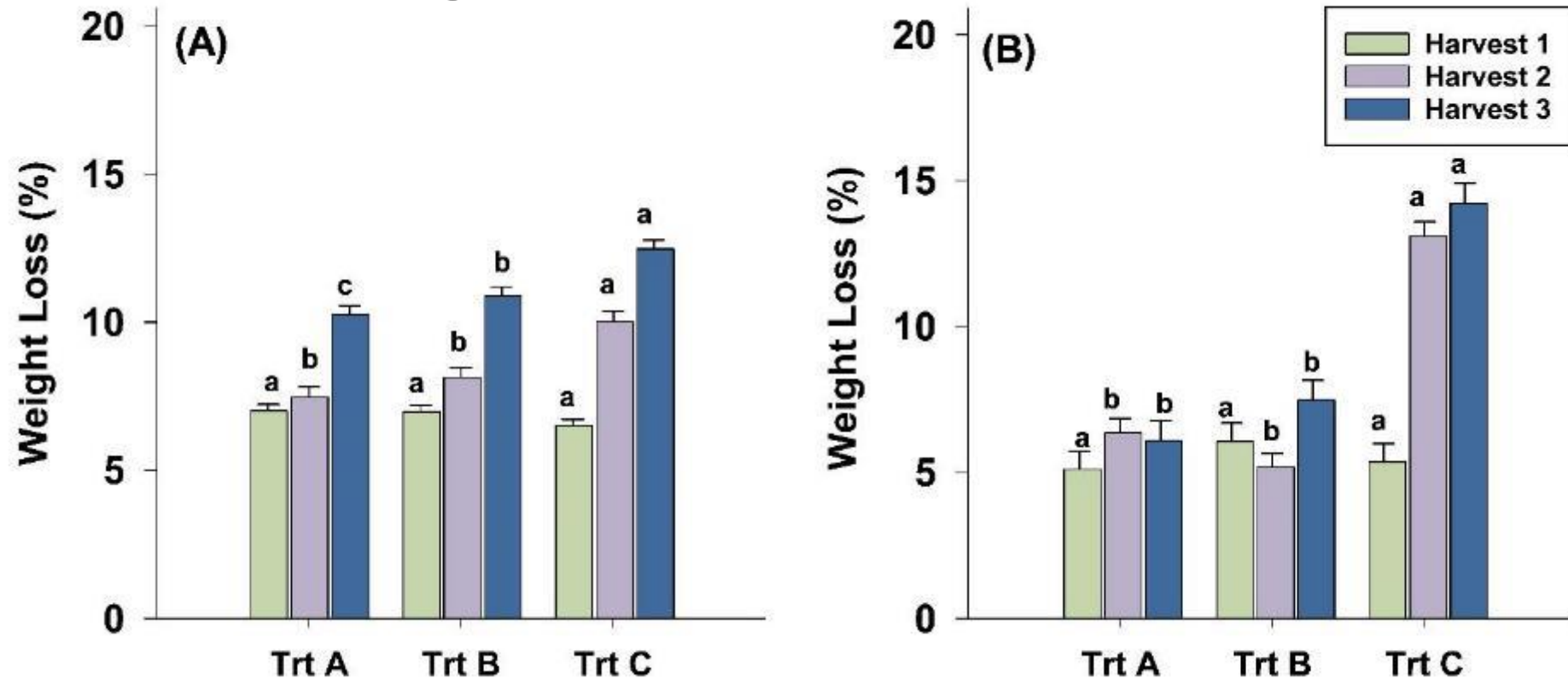


Maximum and minimum daily air temperature (A) and daily precipitation (B) in 2023 and 2024 from June 1 to June 31 at Blueberry Research Farm Alma, Bacon County GA.





# Results – Weight Loss

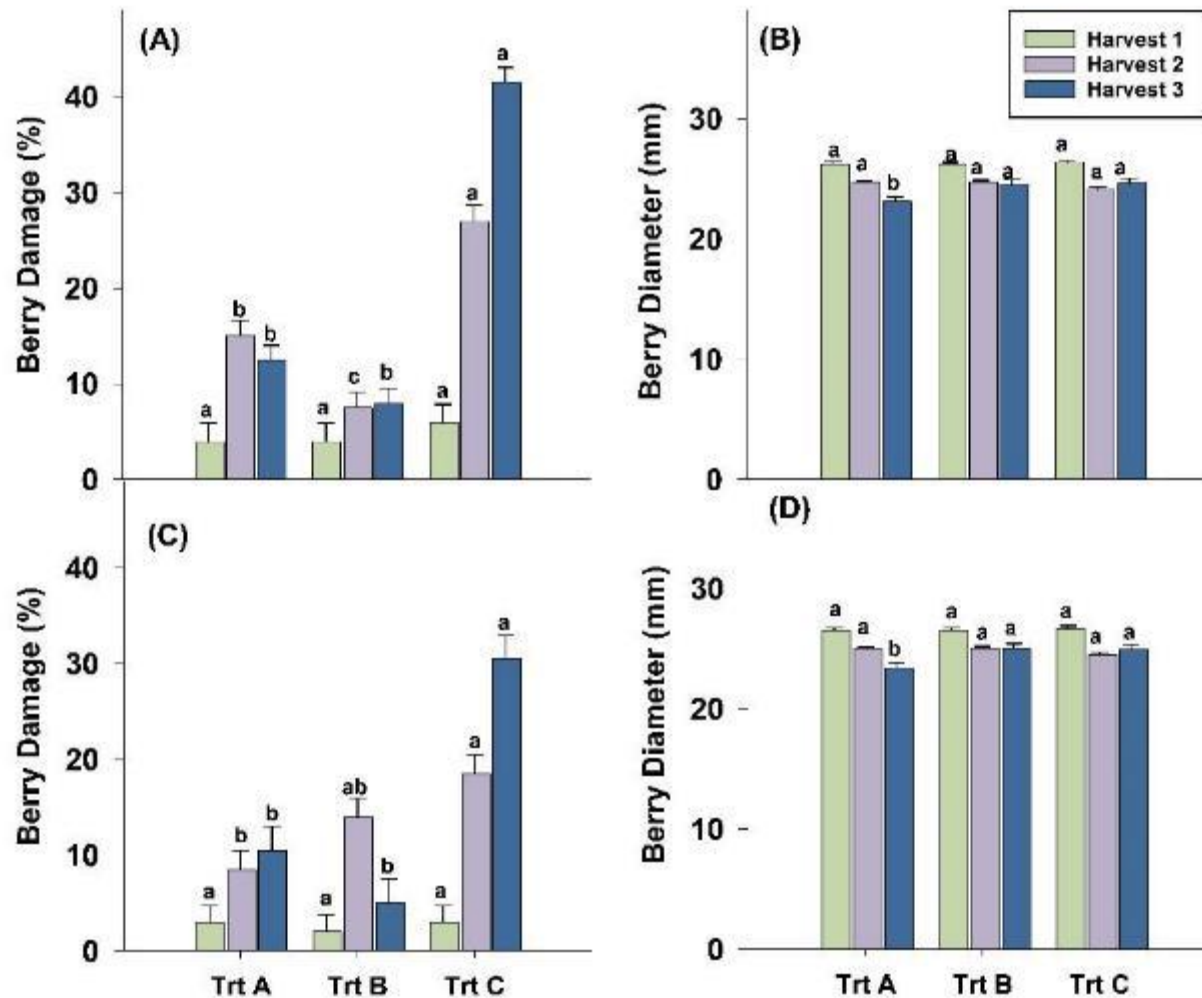


Effect of three different harvest intervals on Total weight loss (%) during 21 days of cold storage in 2023 (A), and 2024 (B).





# Results – Berry Damage/Diameter



Wet stem scar and leaking symptoms

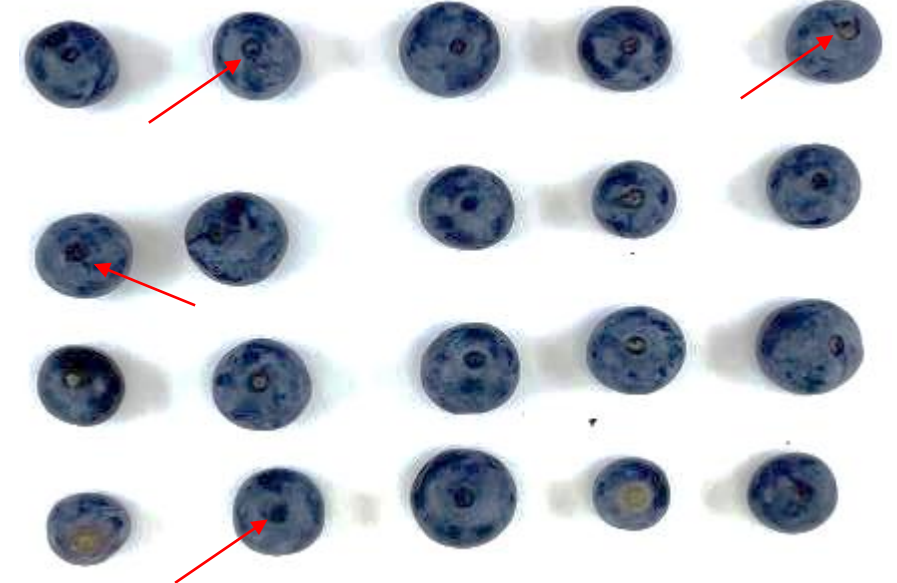


Photo by Amit Godara  
Cultivar: Brightwell (RE)

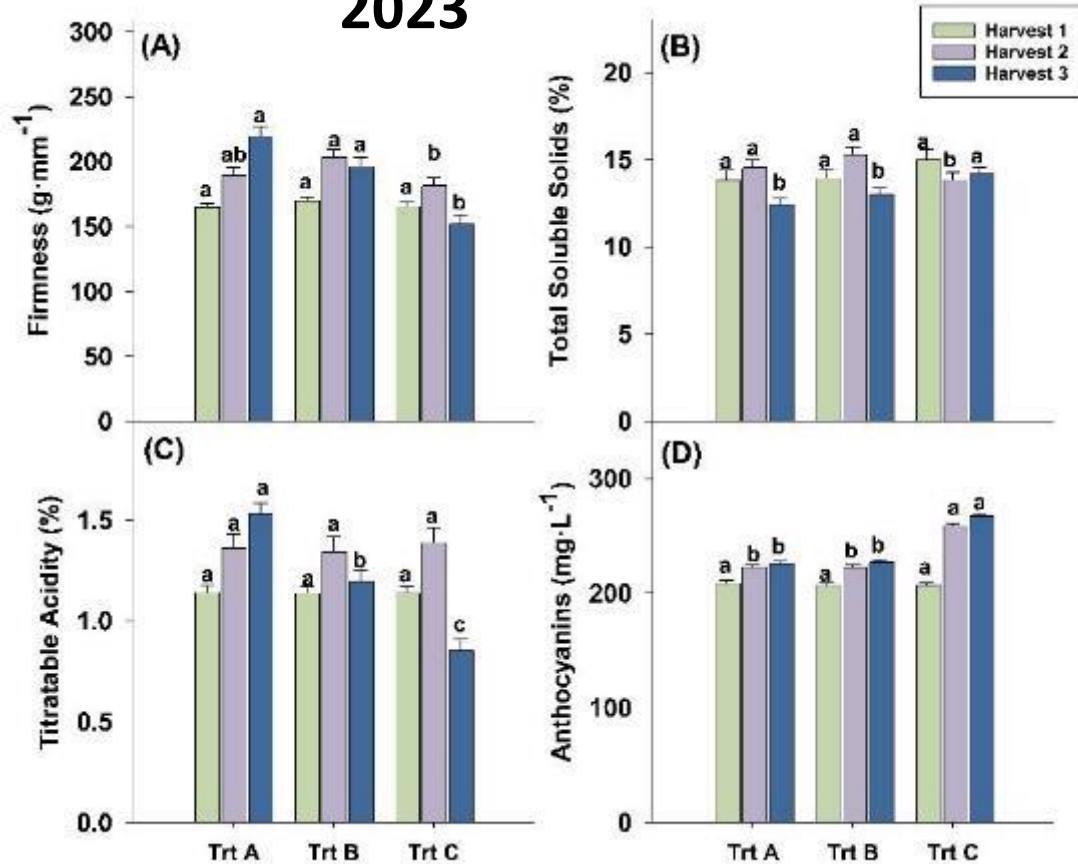
Effect of three different harvest intervals on Percentage of berry damage in 2023 (A) and in 2024 (C), and Berry diameter in 2023 (B) and in 2024 (D) evaluated at harvest.



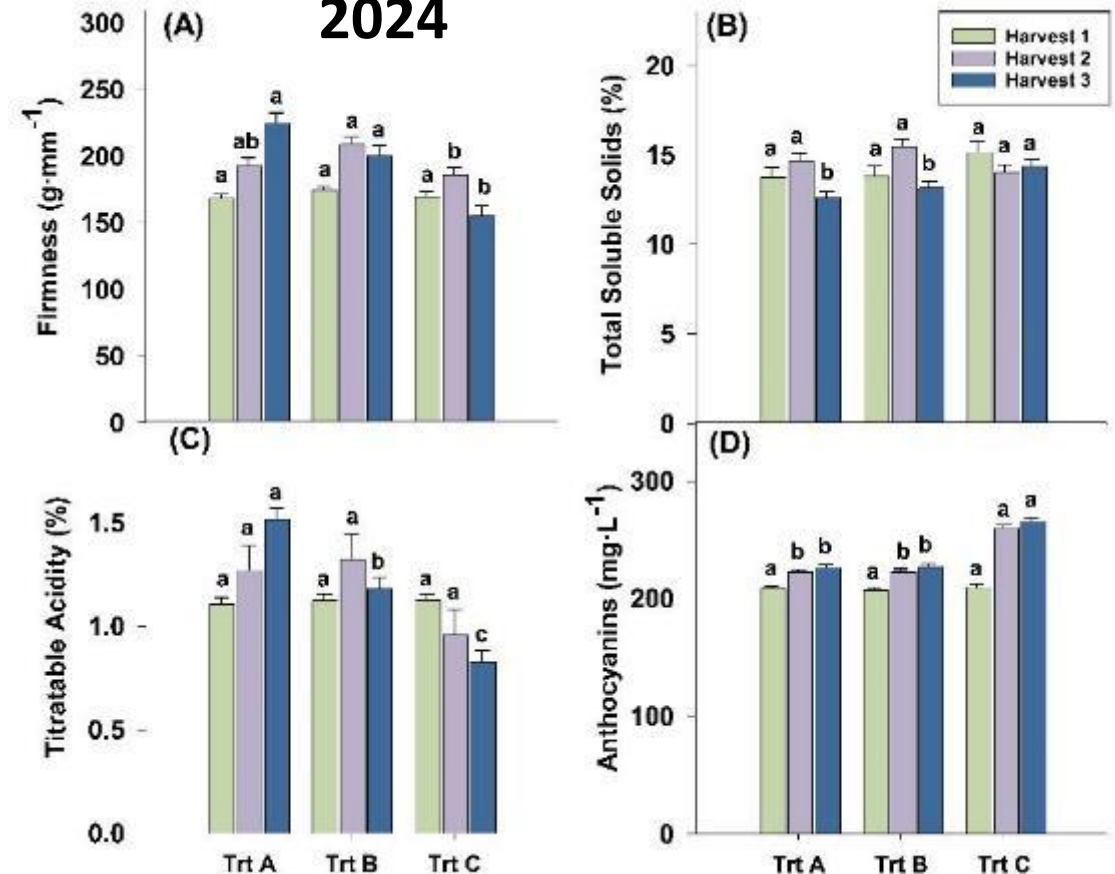


# Results

2023



2024



Effect of three different harvest intervals on Berry firmness (A), Total soluble solids (B), Titratable acidity (C), and Anthocyanin concentration (D) evaluated at harvest in 2023 and 2024





# Conclusions

- Trt A and B help maintain the berry quality.
- Trt C (harvest 2 & 3 ):
  - Lowest fruit firmness
  - Highest water loss over 21 days cold storage and symptomatic berries damage were observed from harvests 2 and 3.
  - Higher TSS and lower TA in berries from Harvest 3.
  - Higher anthocyanins
- Overall, Trt C had more wet sunken and poor-quality berries.





# Conclusions

- Shorter picking intervals (2 or 3 days) help preserve fruit quality by reducing moisture loss, maintaining firmness, and minimizing berry damage.
- The 3-day interval (Trt B) was particularly effective in balancing fruit quality and storage potential, offering a practical harvesting schedule for growers.
- Further research could investigate mechanical harvesting adaptations and explore the impact of variable weather conditions on blueberry ripening and postharvest behavior.





# Blueberry recommended storage conditions

## **Optimum Temperature**

$32 \pm 1^{\circ}\text{F}$

## **Optimum Relative Humidity**

85-95%

## **Rates of Ethylene Production**

0.1-1.0  $\mu\text{L/kg}\cdot\text{hr}$  at  $41^{\circ}\text{F}$

## **Responses to Ethylene**

- Blueberries: climacteric fruit and respond to ethylene; but flavor does not improve after harvest
- Removal of ethylene from storage air may reduce disease development

## **Responses to Controlled Atmospheres (CA)**

- Modified atmosphere packaging for shipment with 15-20%  $\text{CO}_2$  and 5-10%  $\text{O}_2$  reduces the growth of decay
- Reduces the respiration and softening rates of blueberries
- Whole pallet covers and consumer packages for containment of the MA commonly used
- Prompt cooling should be done before atmosphere modification



# Blueberry recommended storage conditions

- Forced-air cooling is best!
- Cool fruit to 32-34°F as quickly as possible, 85-95% RH
  - Reduce water loss
  - Reduce decay
  - Reduce respiration rate and extend postharvest life
- Maximum postharvest life:
  - Blueberry – 4 weeks



# Retaining Blueberry Quality After Harvest

- **Storage temperature** - the most important factor affecting fruit quality.
- Reducing fruit temperature from typical field temperatures to 32°F (0°C) increases shelf-life 8 to 10-fold.
- Temperature effects on decay organism also very important.
- Rate of temperature reduction influence on shelf-life measured by decay incidence.
  - Fruit fully cooled in 2 hours have significantly less decay than fruit cooled over a period of 2 days.
- Using a cooling system designed to rapidly remove heat (forced-air cooling) can expand potential storage life.
- **Cooling rapidly** and **harvesting during the cooler morning hours** of the day are important in maintaining fruit quality.





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**EXTENSION**

## Blueberry Harvesting and Postharvest Handling



## Blueberry Fruit Set, Development and Ripening





Thank you!

Amit Godara, M.Sc. Student  
Rubio Lab  
Georgia Blueberry Commission