2023 Progress Report to the Southern Region Small Fruits Consortium

Project Title: **Investigating the Postharvest Quality Issues of Brightwell Blueberries**

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Public abstract

This study investigated the effects of harvest intervals on the postharvest quality and storability of 'Brightwell' rabbiteye blueberries, a variety widely grown in Georgia, and the Southeast. Blueberries are highly perishable and sensitive to harvest timing, with quality and shelf-life directly influenced by the frequency of harvests. The research specifically examined the impact of different harvest intervals—ranging from two to seven days—on key quality attributes such as weight loss, berry damage, firmness, and acidity during storage. Results indicate that longer harvest intervals, particularly those of seven days, lead to increased weight loss, greater susceptibility to physical damage, and significant loss of firmness. Conversely, more frequent harvesting every two to three days helped maintain better fruit integrity, preserving firmness and acidity levels while minimizing damage. The findings suggest that more frequent harvesting is essential for maintaining high postharvest quality, reducing spoilage, and extending the storability of blueberries. This research provides critical insights for blueberry growers, offering practical recommendations for harvest management that can enhance fruit quality and marketability, ultimately reducing postharvest losses and improving economic returns for producers.

Objectives

1. Evaluate the effects of an alternative harvest schedule on the fruit split disorder by comparing the denser picking schedule to standard harvest operations.
2. Investigate the possible effects of mechanical harvesting on blueberry fruit split disorder and the overall shelf-life.
3. Recommend an improved harvesting schedule with harvest suggestions based on the findings of the study.

Justification and Description

Blueberries, particularly the 'Brightwell' rabbiteye variety, are a major fruit crop in the southeastern United States, contributing significantly to the region's economy. However, the highly perishable nature of blueberries presents challenges for both growers and marketers, as the fruit is prone to rapid deterioration once harvested. Harvest timing plays

a critical role in determining the postharvest quality and shelf-life of blueberries, as the fruit is sensitive to environmental factors, handling, and storage conditions. Suboptimal harvest intervals can be attributed to labor shortage, planning inefficiencies or machine harvesting limitations. Such delays can lead to accelerated weight loss, increased susceptibility to physical damage, and a decrease in overall fruit quality, all of which result in significant economic losses for producers.

Despite the importance of harvest timing in maintaining fruit quality, there is limited research focused on how varying harvest intervals affect postharvest attributes in blueberries, particularly for the rabbiteye variety, which is popular in southern U.S. production systems. Understanding the impact of harvest frequency on blueberries' shelf life, fruit integrity, and marketability is essential to develop optimized harvest strategies that can improve storage performance and reduce postharvest waste. This study addresses these gaps by providing evidence-based recommendations on the best practices for harvest intervals to preserve the postharvest quality and extend the storability of 'Brightwell' rabbiteye blueberries.

Description

This research investigates the effect of different harvest intervals on the postharvest quality and storability of 'Brightwell' rabbiteye blueberries. The study evaluated harvest intervals ranging from two to seven days, with each interval representing a different harvesting frequency. After harvest, the fruit is assessed for key quality factors, including weight loss, berry damage, firmness, and acidity, which are known to influence consumer acceptability and marketability.

Blueberries harvested at shorter intervals (every two to three days) are expected to exhibit lower weight loss, reduced damage, and better retention of firmness compared to those harvested at longer intervals (every five to seven days). The fruit will be stored under controlled conditions to simulate typical postharvest handling, and quality changes will be monitored over time. This study aims to identify the optimal harvest frequency that minimizes fruit deterioration and extends shelf life, ultimately benefiting growers by providing practical recommendations for harvest management.

By determining the optimal harvest interval for 'Brightwell' blueberries, the research will help growers improve fruit quality at the time of sale, reduce postharvest losses, and enhance profitability. The results will also contribute to a broader understanding of harvest management practices for blueberry production in Georgia and other regions with similar growing conditions.

Materials and Methods

This study focused on the 'Brightwell' variety, a machine-harvested Rabbiteye blueberry cultivar. Harvests were conducted at different intervals: every 2 days (Trt A), every 3 days (Trt B), and every 7 days (Trt C). Fruit were harvested and transported under standard postharvest conditions for evaluation at three different times after harvest: 7, 14, and 21 days after harvest.

Berry quality parameters measured included weight loss, berry damage, firmness, total soluble solids (TSS), titratable acidity (TA), and anthocyanin concentration. Berry damage was assessed visually for split and cracked fruit, and firmness was measured using a digital fruit firmness machine. Juice from berries was analyzed for TSS, TA, and anthocyanins.

Brief Results

1. **Berry Weight Loss (%)**

   In both 2023 and 2024, berries harvested at the 7-day interval (Trt C) experienced the highest weight loss compared to those harvested at shorter intervals (Trt A and B). After 21 days of storage, Trt C berries exhibited 15.5% weight loss, significantly higher than Trt A and B, which showed lower weight loss (Fig. 1).

2. **Berry Damage (%)**

   Berries harvested at the 7-day interval showed significantly higher damage rates, particularly in harvests 2 and 3. In 2024, Trt C had 30.5% berry damage at harvest 3, compared to 20% in Trt A. During storage, berry damage was consistently higher in Trt C (Fig. 2A, 2C).

3. **Berry Diameter**

   No significant differences were observed in berry diameter at harvest 1, but at harvests 2 and 3, berries from Trt A had smaller diameters. At 7 days of storage, Trt B berries exhibited the largest diameter, while after 21 days, no significant differences were observed between treatments (Fig. 2B, 2D).

4. **Firmness**

   Firmness was significantly reduced in berries harvested at the 7-day interval (Trt C), especially after 7, 14, and 21 days of storage. Trt B consistently had the firmest berries, with significant differences compared to Trt C at all storage times (Fig. 3A).

5. **Total Soluble Solids (TSS)**

   While no significant differences in TSS were observed at harvest 1, berries harvested at the 7-day interval exhibited higher TSS levels in harvests 2 and 3, suggesting that extended harvest intervals may lead to over-ripening (Fig. 3B).

6. **Titratable Acidity (TA)**

   No significant differences were found in TA at harvests 1 and 2, but at harvest 3, berries harvested at the 7-day interval (Trt C) had lower TA. This suggests that longer harvest intervals may lead to a loss in acidity, which affects the fruit's flavor (Fig. 3C).

7. **Anthocyanin Concentration**

Berries harvested at the 7-day interval (Trt C) consistently had the highest anthocyanin concentrations, particularly at harvests 2 and 3. This indicates that extended harvest intervals may increase anthocyanin content at the cost of other quality parameters such as firmness and weight loss (Fig. 3D).

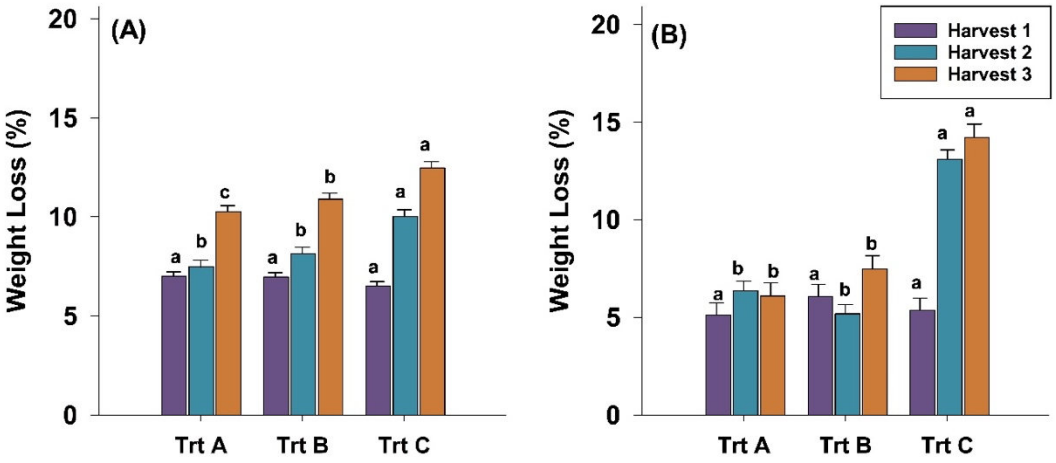

Figure 1. Effect of three different harvest intervals on Total weight loss (%) during 21 days of cold storage in 2023 (A), and 2024 (B). Three harvests were conducted on each treatment (Harvest 1: green, Harvest 2: purple. and Harvest 3: blue). The means followed by the different letters are significantly different at $p \leq 0.05$ based on the least significant difference (LSD) test.

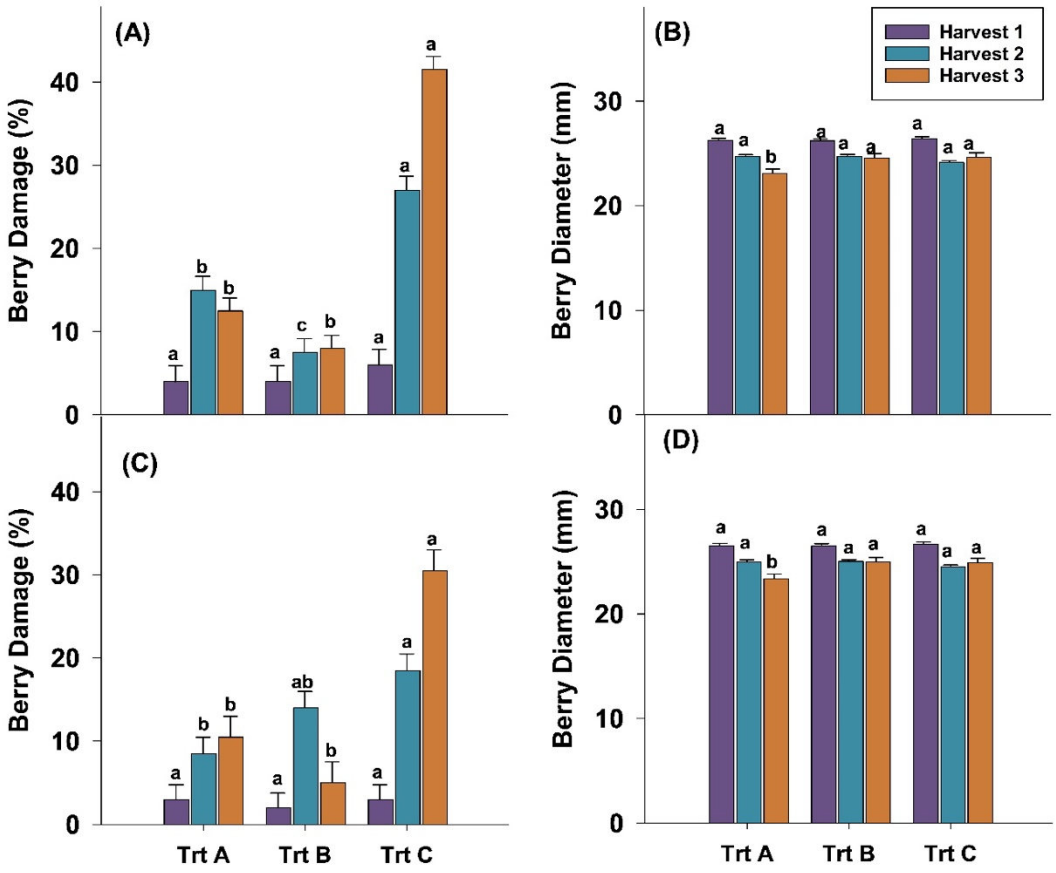

Figure 2. Effect of three different harvest intervals on Percentage of berry damage in 2023 (A) and in 2024 (C), and Berry diameter in 2023 (B) and in 2024 (D) on 'Brightwell' cultivar at harvest. Three harvests were conducted on each treatment (Harvest 1: green, Harvest 2: purple. and Harvest 3: blue). The means followed by the different letters are significantly different at $p \leq 0.05$ based on the least significant difference (LSD) test.

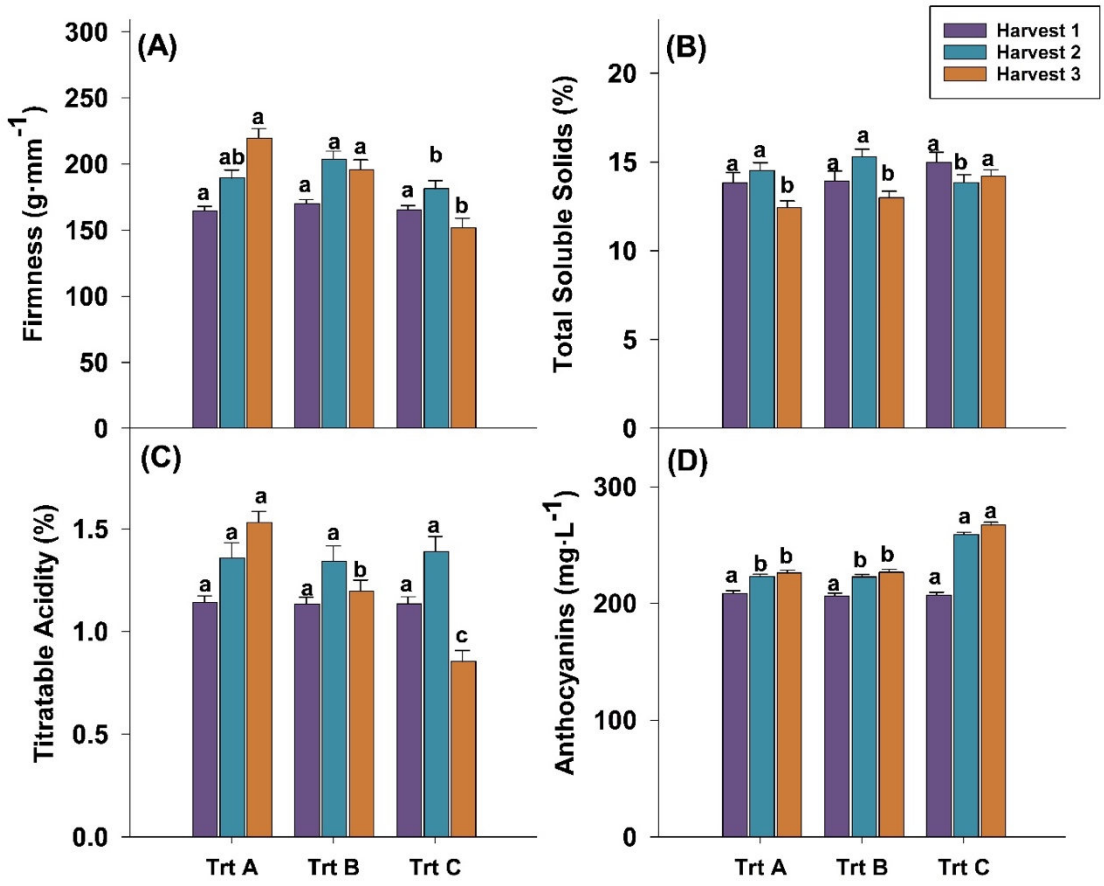

Figure 3. Effect of three different harvest intervals on Berry firmness (A), Total soluble solids (B), Titratable acidity (C, and Anthocyanin concentration (D) on the 'Brightwell' cultivar at harvest in 2023. Three harvests were conducted on each treatment (Harvest 1: green, Harvest 2: purple, and Harvest 3: blue). The means followed by the different letters are significantly different at $p \leq 0.05$ based on the least significant difference (LSD) test.

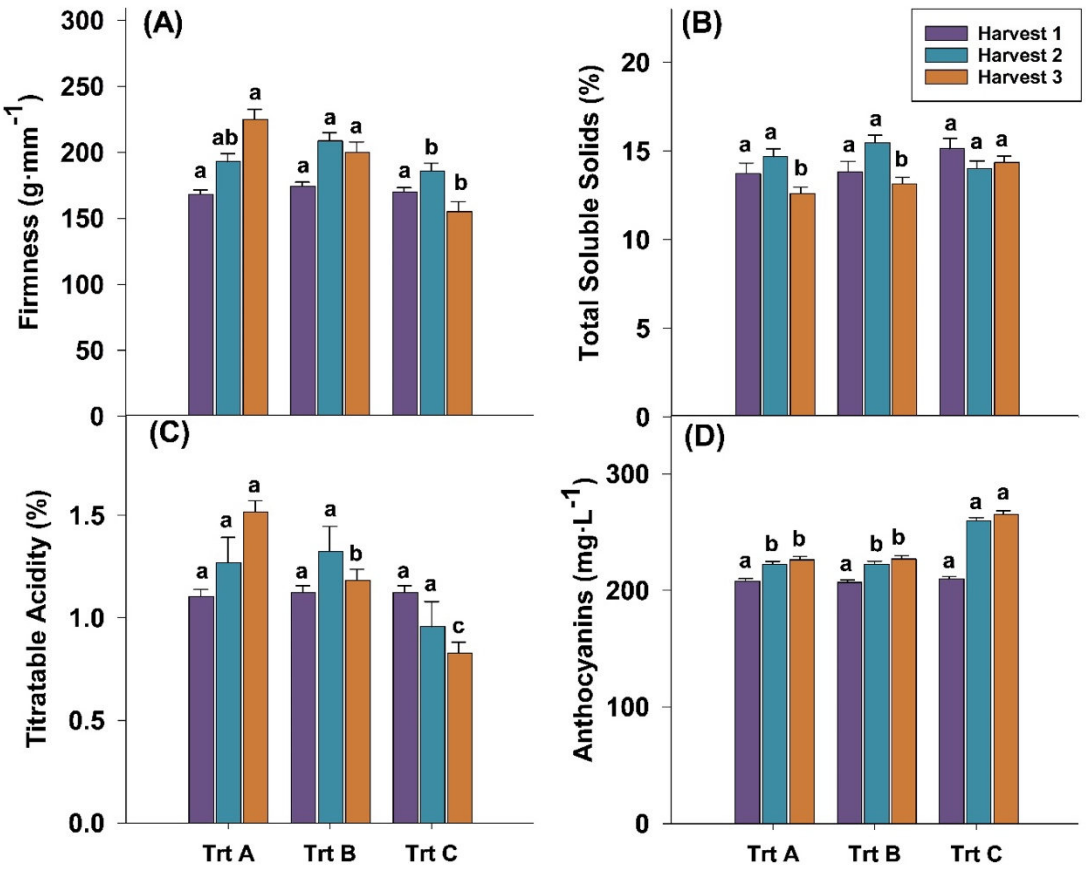

Figure 4. Effect of three different harvest intervals on Berry firmness (A), Total soluble solids (B), Titratable acidity (C), and Anthocyanin concentration (D) on the 'Brightwell' cultivar at harvest in 2024. Three harvests were conducted on each treatment (Harvest 1: green, Harvest 2: purple, and Harvest 3: blue). The means followed by the different letters are significantly different at $p \leq 0.05$ based on the least significant difference (LSD) test.