

**Title:** Assessing Strawberry Cultivars with Moderate Resistance to Neopestalotiopsis

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**Objectives:**

- Identify strawberry cultivars showing moderate resistance to Neopestalotiopsis that are suitable for Georgia production.
- Disseminate the findings to strawberry growers in the southeastern U.S.

**Justification and Description:**

The strawberry industry in Georgia comprises small-scale farms, most of which are for pick-your-own operations. The United States Department of Agriculture does not account for strawberry acreage, the number of strawberry farms, or the value of the crop in Georgia. However, strawberries are a valuable crop for the state with revenues of approximately \$9.7 million (Krewer, 2018). Currently, the greatest threat to strawberry production in Georgia is the emergence of the new fungal pathogen, Neopestalotiopsis. In Georgia, this disease was first observed in the fall of 2020 and resulted in 100% losses on multiple farms during the spring of 2021 (Little, 2020). Between the time of its introduction and 2022, this disease had cost Georgia strawberry growers more than \$7.3 million and was once again a serious problem in the 2023 season (Dutta, 2024; Little, 2023a; Little, 2023b). Current registered fungicides do not offer adequate control of this pathogen, which is in large part the reason for the level of damage we have seen statewide. Until more effective fungicides are either created or registered for use on this pathogen in strawberry, adequate control will most likely rely on the use of the fungicides we currently have in combination with strawberry cultivars that have shown moderate resistance to this disease.

In the southeast, while there are more than ten strawberry cultivars commonly grown, the most common June-bearing cultivars planted include: ‘Camarosa,’ ‘Chandler,’ ‘Ruby June’ and ‘Fronteras,’ while the most common day-neutral cultivars are ‘Albion’ and ‘Monterey’ (Hoffmann et al., 2024). Although these strawberry cultivars have proven acceptable yield and quality, all of these cultivars have shown levels of susceptibility to Neopestalotiopsis infection (Guan et al., 2023). Both the University of Florida and the University of California – Davis have released cultivars that have shown higher resistance to Neopestalotiopsis, but have yet to be evaluated in Georgia.

Strawberry flowering is photoperiod sensitive. Facultative short-day or June-bearing cultivars are grown in Georgia to minimize crop losses from heat and rainfall events, which soften the fruit and dramatically reduce its storability and acceptability as a fresh-market product. There is a need to provide growers with information on the adaptability of these cultivars to Georgia that show moderate resistance to *Neopestalotiopsis* and perform well after storage. In particular, information on how the yield and quality of each cultivar are affected by a hot, humid environment is required. The data obtained from the proposed project will help growers make educated decisions when choosing a cultivar that is not only less susceptible to *Neopestalotiopsis* but also maintains good quality after storage.

**Procedure:**

A total of nine strawberry cultivars were planted in the week of October 16<sup>th</sup> (Table 1). The cultivars tested were from two breeding programs, the University of California Davis: ‘Monarch,’ ‘Valient,’ ‘Victor,’ ‘Goldengate,’ ‘Royal Royce,’ ‘Keystone,’ ‘Eclipse,’ and the University of Florida: ‘Ember,’ ‘Felicity.’ The cultivars chosen were based on preliminary data presented by Dr. Natalia Peres and recommendations by Dr. Vance Whitaker and Dr. Michell Feldmann. The cultivars were planted at Jaemor Farms, located in Alto, GA (34.4222, -83.6495) in the northern portion of the state. The commercial farm is the third-largest commercial strawberry operation in Georgia. The soil is Madison sandy clay loam (Web Soil Survey, 2024). The cultivars were planted using a randomized complete block design; each cultivar was replicated five times, and there were six plants per cultivar in each replication (Table 2). The cultivar ‘Ruby June’ was used as a commercial control. The cultivars were managed for pests and disease according to the Southern IPM guidelines.

Table 1. List of strawberry cultivars tested in north Georgia. The list includes University of California (UC) and University of Florida (UF) cultivars, plus the control Ruby June, from a private breeding company in California.

N	Variety	Name
1	UC	Monarch
2	UC	Valient
3	UC	Victor
4	UC	Goldengate
5	UC	Royal Royce
6	UC	Keystone
7	UC	eclipse
8	UF	Ember
9	UF	Felicity
10	California	Ruby June (Control)

Table 2. Experimental layout set up at the commercial farm ‘Jaemor Farms’ in 2025. Each cultivar was replicated five times (RCB), and the control was established in one block alongside the tested cultivars.

Block I	Block II	Block III	Block IV	Block V	Block VI
Royal Royce	Monarch	Felicity	Monarch	Valient	Ruby June
Ember	Keystone	Ember	Victor	Royal Royce	Ruby June
Felicity	Victor	Goldengate	Felicity	Felicity	Ruby June
Victor	eclipse	Keystone	Eclipse	Victor	Ruby June
Monarch	Royal Royce	Valient	Keystone	Ember	Ruby June
Eclipse	Ember	Victor	Goldengate	Goldengate	Ruby June
Goldengate	Felicity	Monarch	Royal Royce	Keystone	Ruby June
Keystone	Valient	Royal Royce	Ember	Eclipse	Ruby June
Valient	Goldengate	Eclipse	Valient	Monarch	Ruby June

Phenological stages for each cultivar were assessed from March to April using a scale adapted from Hernandez-Martinez et al. (2023) (Fig. 1). Strawberries were harvested by hand, placed in clamshells, and transported to the University of Georgia extension office, located in Hall County. The fruit was weighed using a scale, and berry size was measured using a caliper. Berry size and weight were measured at harvest, and berries were frozen for total soluble solids and titratable acidity. In addition, plants were visually assessed for the presence of *Neopestalotiopsis*.

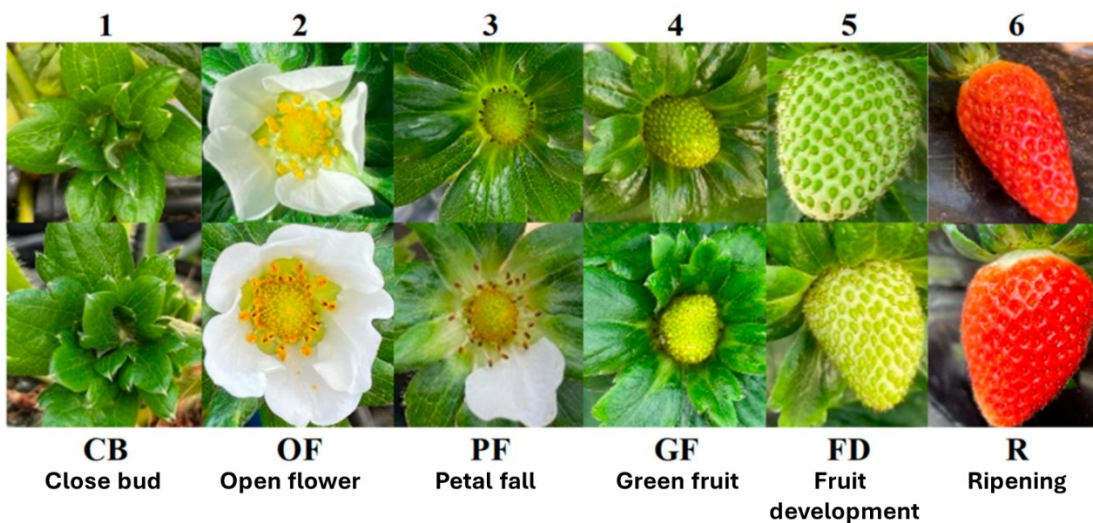


Figure 1. Strawberry phenological stages assessed from March to April 2025. The stages were adapted from Hernandez-Martinez et al., (2023).

## Results

Most of the cultivars were in full bloom on March 24 (Fig. 2) and fruit development started on April 14<sup>th</sup>, with the cultivars ‘Ember,’ ‘Goldengate,’ ‘Valient,’ and ‘Royal Royce’ (Fig. 3), while ‘Valient,’ ‘Victor,’ and ‘Ruby June’ started to ripen (Fig. 4). The cultivars ‘Keystone’ and ‘Eclipse’ were still at green fruit stages on April 14 (Fig. 5). There was a total of six harvests. The first harvest took place on April 17, and the last harvest was on June 9 (Fig. 6). The cultivar ‘Keystone’ had the highest total yield across all the cultivars tested followed by ‘Goldengate,’ and ‘Felicity’ (Fig. 7). The cultivars with the smallest total yield were ‘Eclipse’ and ‘Valient,’ followed by the control, ‘Ruby June.’ The cultivars ‘Valient,’ ‘Victor,’ and ‘Eclipse’ had bigger berries, with an average berry size of 36 mm compared to the control (‘Ruby June’), with an average berry size of 33 mm (Fig. 8). The cultivars ‘Ember’ and ‘Royal Royce’ also had an average berry size of 33 mm. ‘Felicity,’ ‘Keystone,’ and ‘Monarch’ had an average berry size of 34 mm. Fruit size varied throughout the harvest season for all the cultivars (Fig. 9). The control cultivar ‘Ruby June’ maintained a smaller berry size through the season, compared to ‘Goldengate,’ which had a variable fruit size through the season. ‘Valient’ had a more constant berry size through the harvest season, but the cultivars ‘Ember’ and ‘Felicity’ had bigger berry size in the last two harvests, while ‘Keystone’ and ‘Royal Royce’ had smaller berry size in the first and last two harvests. There were no signs of Neopestalotiopsis on any of the cultivars tested; however, the control was affected by Neopestalotiopsis. Total soluble solids and titratable acidity measures are underway.

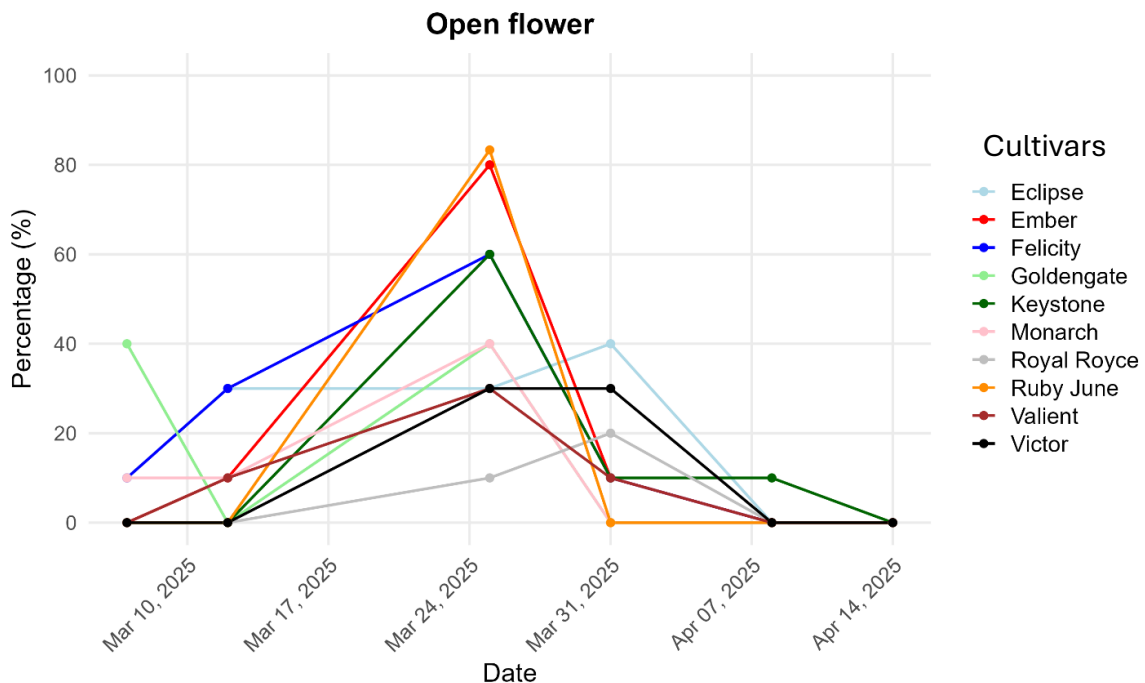


Figure 2. Percentage (%) of open flowers at different evaluation dates, growth stages were assessed from March 10 to April 14 for all the tested cultivars. Growth stages were evaluated in six plants per replicate.

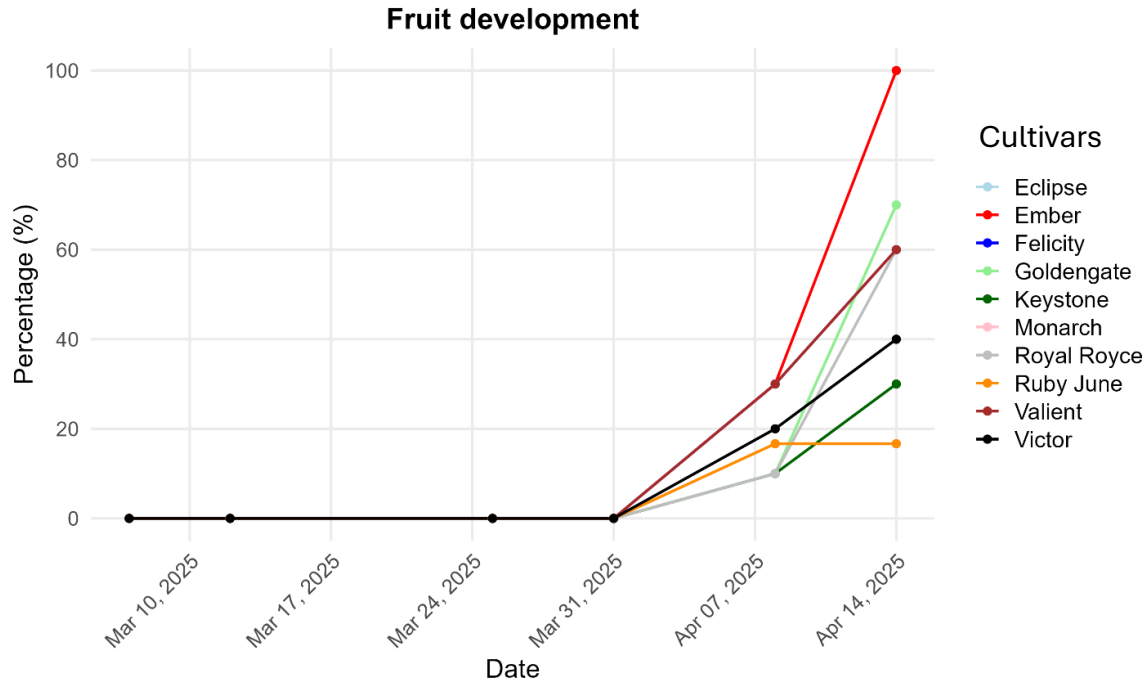


Figure 3. Percentage (%) of plants at fruit development stage at different evaluation dates, growth stages were assessed from March 10 to April 14 for all the tested cultivars. Growth stages were evaluated in six plants per replicate.

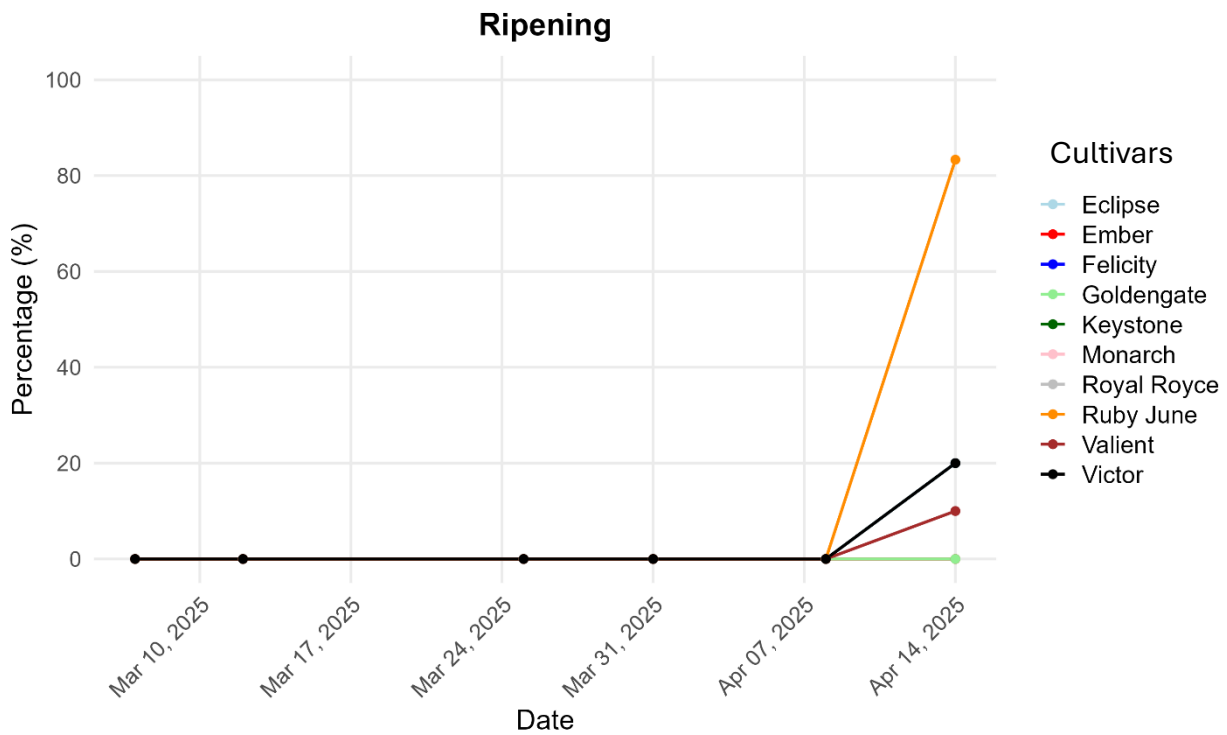


Figure 4. Percentage (%) of plants at ripening stage at different evaluation dates, growth stages were assessed from March 10 to April 14 for all the tested cultivars. Growth stages were evaluated in six plants per replicate.

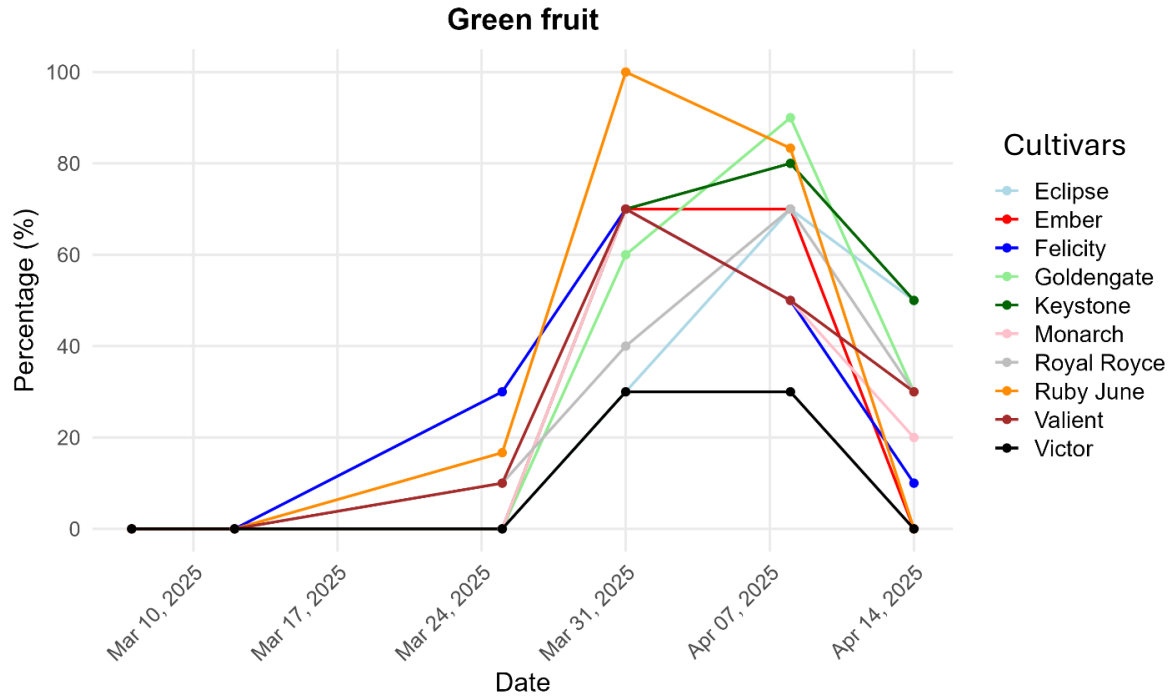


Figure 5. Percentage (%) of plants at green fruit stage at different evaluation dates, growth stages were assessed from March 10 to April 14 for all the tested cultivars. Growth stages were evaluated in six plants per replicate.

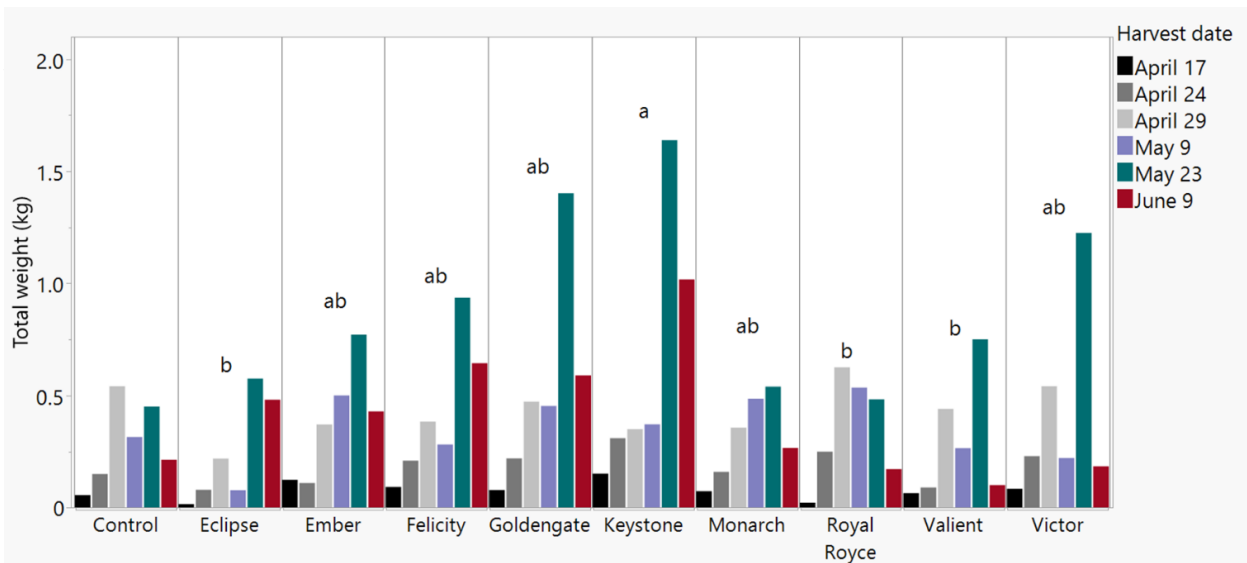


Figure 6. Total weight (kg) obtained in each harvest date, the bars represent the yield obtained in each harvest date from each cultivar (five replicates, six plants per replicate). Different letters indicate significant difference among cultivars. The control was not part of the statistical analysis.

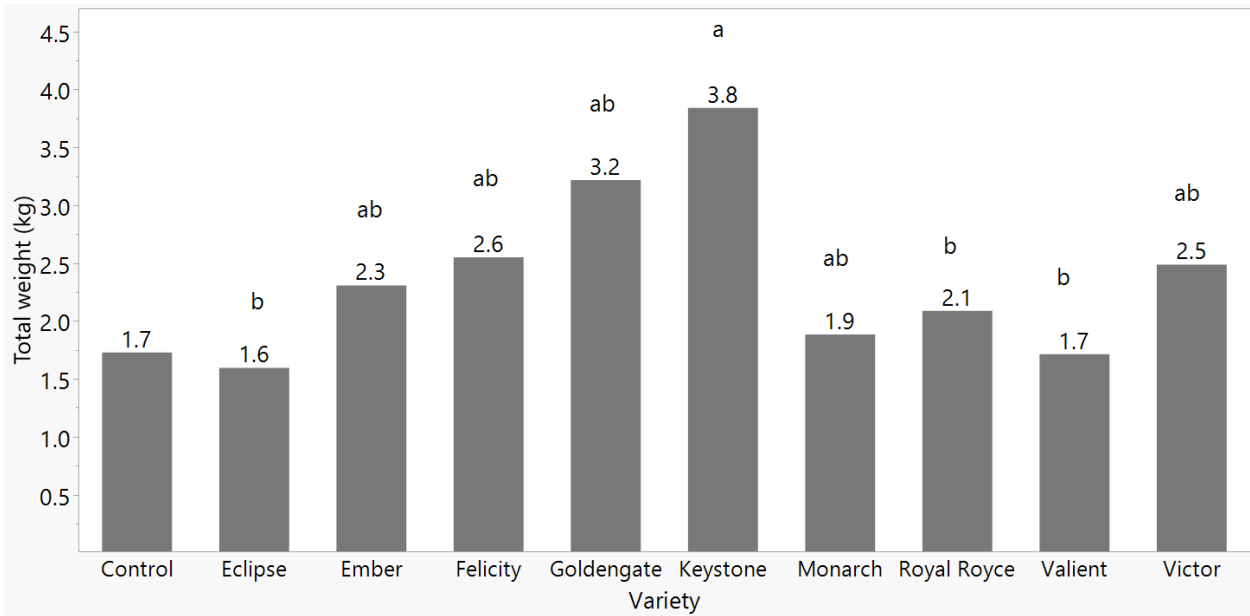


Figure 7. Total yield (kg) for each cultivar tested, the bars represent the cumulative yield obtained in the six harvests from each replicate (five replicates, six plants per replicate). Different letters indicate significant difference among cultivars. The control was not part of the statistical analysis.

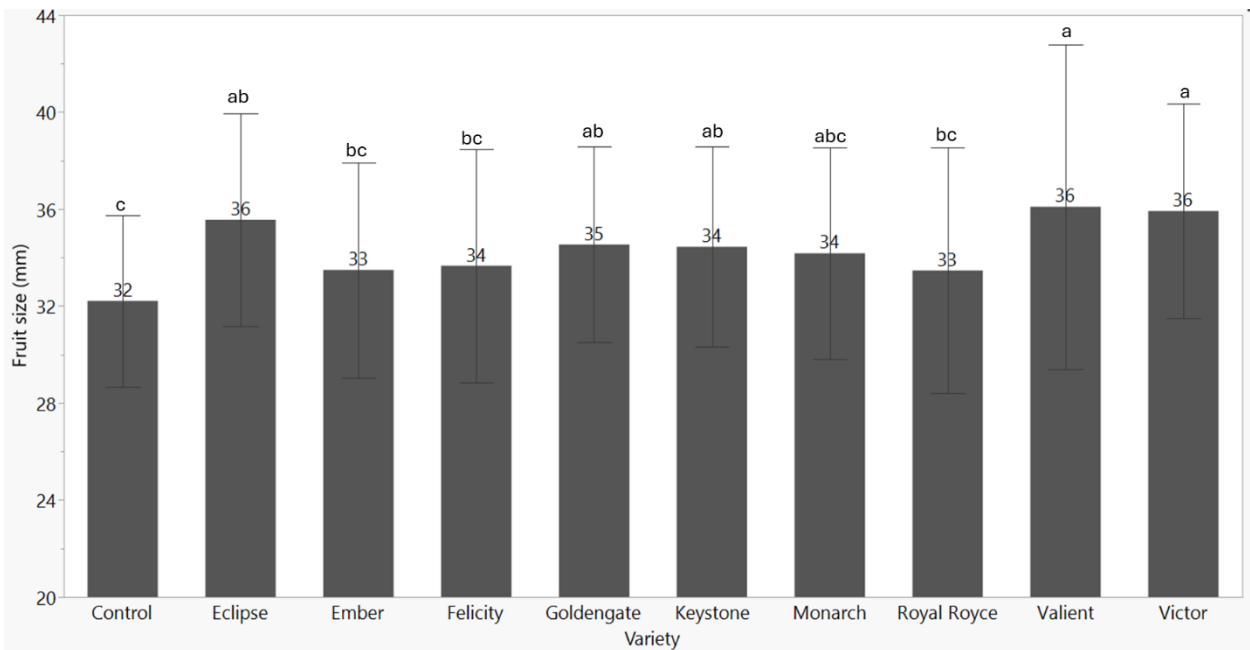


Figure 8. Fruit size (mm) measured using a caliper, a total of nine berries per cultivar were measured each harvest season. The bars are the mean berry size across all the six harvests. Different letters indicate significant difference among cultivars.

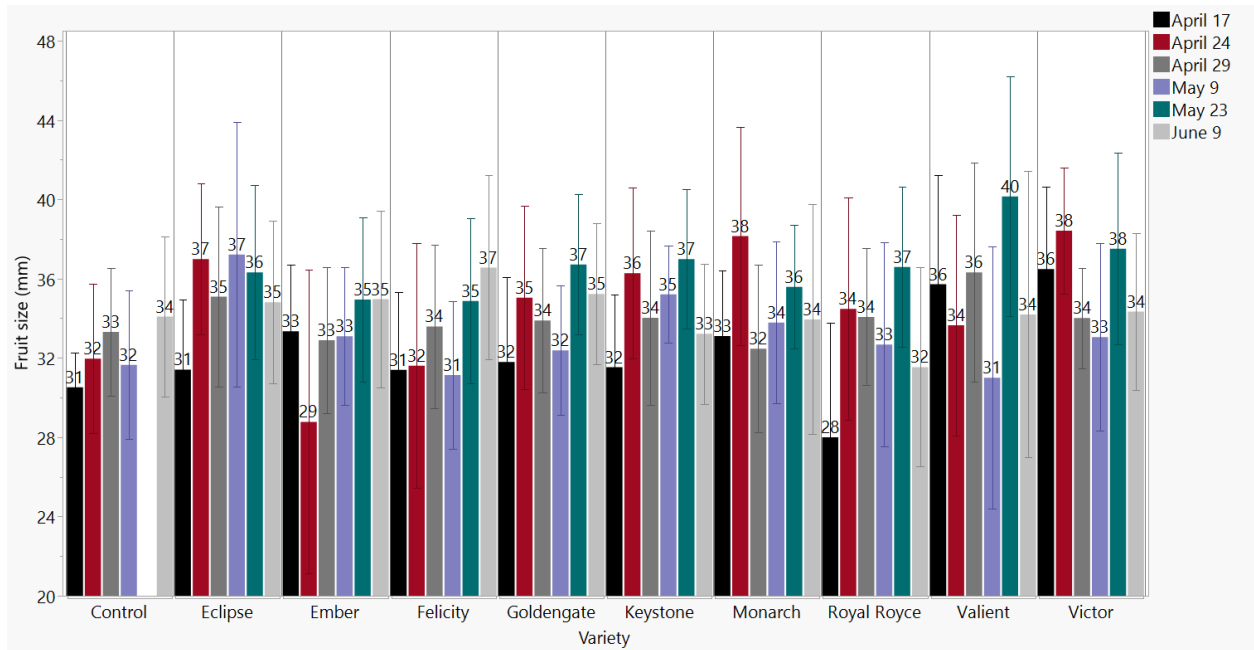


Figure 9. Fruit size (mm) measured using a caliper, a total of nine berries per cultivar were measured each harvest season. The bars are the mean berry size at each harvest.