Storage Performance of University of Arkansas Peach and Nectarine Genotypes Harvested at Different Maturities and Subjected to Pre-Storage Treatments

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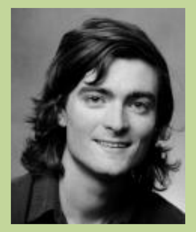

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Introduction

Standard-melting flesh peach and nectarine cultivars are highly susceptible to bruising and chilling injury. To limit harvest and storage damage, fruit are commonly picked prematurely. Although this practice produces fruit that will soften and develop adequate color, early picking limits soluble solids content (SSC), aroma, moisture, and taste, providing consumers with an unsatisfactory product (Scorza et al., 2004). Breeding work at the University of Arkansas has led to the development of firm-melting and non-melting genotypes that are firm when well-mature, intended to allow for fruit to be picked at a higher quality state than standard-melting flesh genotypes; however, no postharvest evaluations have previously been conducted.

Extensive peach and nectarine storage protocols have been developed for large producers and wholesalers, but there is no established protocol for testing the storage performance of breeding program germplasm (Crisosto, 2006). Having a protocol for testing storage performance is a necessary first step in evaluating new genotypes that can be picked at a more ripe state without sacrificing fruit quality, and in turn provide consumers with a superior product.

Objectives

Obj. 1- Differentiate Arkansas peach and nectarine flesh types and determine post-harvest performance differences among standard-melting, non-melting, and firm-melting flesh genotypes.

Obj. 2- Develop a storage protocol for the University of Arkansas peach and nectarine breeding program.

Obj. 3- Determine the effect of hydrocooling and hot water dip pre-storage treatments on storage performance.

Materials and Methods

- 29 genotypes with flesh types including 14 non-melting, six standard-melting, and nine firm-melting that varied for acid level, pit adherence, SSC, and flesh color were sampled.
- Fruit were harvested at minimum maturity (commercial ripe) and well-mature (tree ripe).
- After harvest, fruit were conditioned for 24 h at ~20˚C and then exposed to 2 min of ~1 ˚C hydrocooling with 100 parts per million chlorine, a 2 min hot water dip at ~50 ˚C, or rinsed with ~20 ˚C water.
- Fruit were then stored at ~1 ˚C for 4 weeks and sampled weekly. Prior to evaluation, fruit were warmed at ~20 ˚C for 24 h.
- SSC and pH were measured, skin quality and color, flesh color, and flavor were subjectively rated on a scale of 0-10 (with 10 being best), and flesh browning was rated on a scale of 0-10 (with 10 being worst) weekly (Figs. 1 and 2). Changes in flesh firmness were evaluated at ~20 ˚C for 6 d to establish flesh type (Figs. 3 and 4).

Acknowledgements

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References

Crisosto, C.H. 2006. Peach quality and postharvest technology. Acta Hort. 713:479-487.

Scorza, R., W. Anger, D. Peterson, K. Bett, E. Champagne, J. Beaulieu, D.A. Ingram. 2004. Non-destructive evaluation of post-harvest peach fruit softening. Acta Hort. 663:269-273.

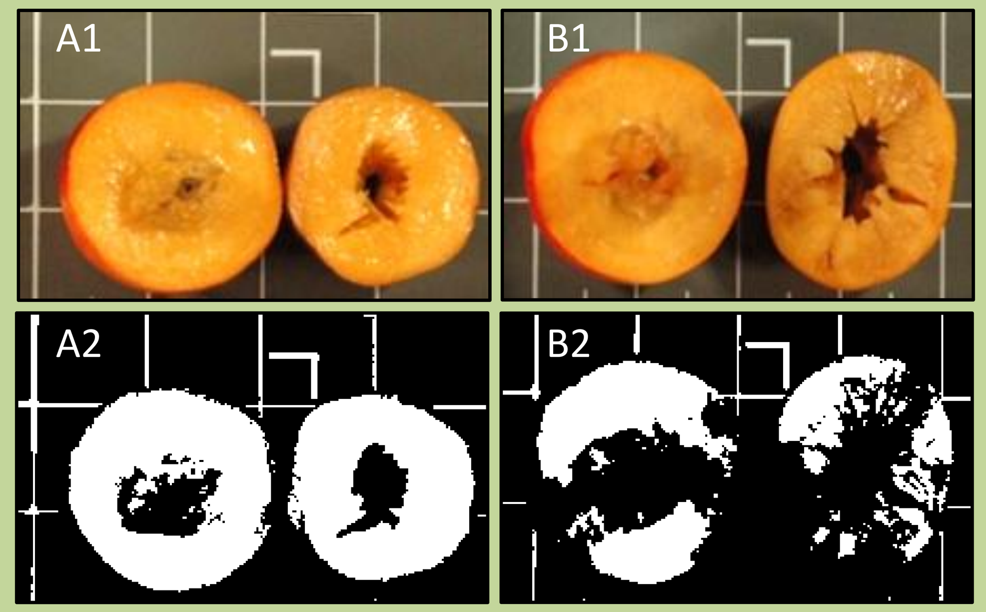

Fig. 1. Differences in browning between two yellow, non-melting, clingstone nectarines after 4 weeks of storage (A: no browning and B: browning). Images duplicated in black and white to show browning.

Fig. 2. Differences in mealiness severity between two yellow clingstone nectarines, melting (A) and non-melting (B) after 4 weeks of storage (A: mealy and B: not mealy).

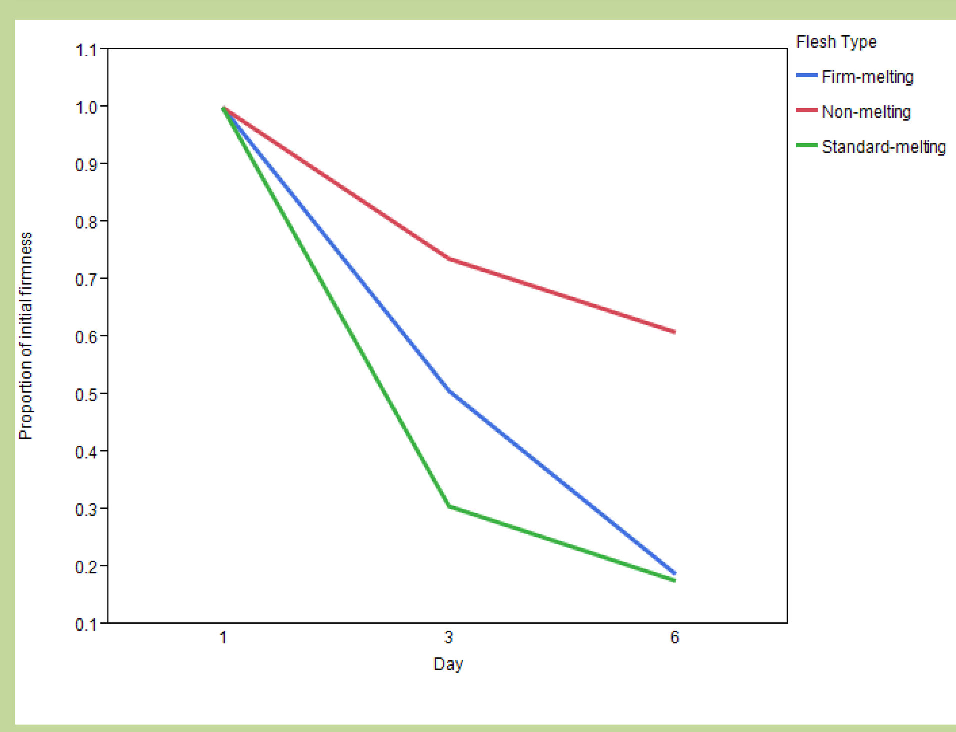

Fig. 3. Flesh type characterization based on average proportion of initial firmness at 3 and 6 d of room temperature storage (red: non-melting, blue: firm-melting, and green: standard-melting).

Fig. 4. Variation in melting and non-melting flesh types.

Results and Discussion

- There was no significant difference (P > 0.05) in storage performance among pre-storage treatments.
- A three-way interaction for maturity, genotype, and storage length was found for all variables.
- Standard-melting white genotypes picked at the well-mature level had poorer flesh and skin color, skin condition, and taste compared to standard yellow melting genotypes picked at the same well-mature stage (Fig. 5). This trend was not found in the firm-melting or non-melting types.
- After 4 weeks of cold storage, fruit harvested from all three flesh types at the well-mature level showed greater reductions in flesh and skin color quality, and skin condition, and had more flesh browning than fruit harvested at minimum maturity (Fig. 6).
- After 2 weeks of storage, the standard-melting genotypes showed higher levels of flesh browning and diminished flesh and skin color, quality, and taste than the firm-melting and non-melting types (Fig. 7).
- Throughout 4 weeks of cold storage the non-melting genotypes maintained superior skin quality and skin and flesh color over the standard-melting and firm-melting types (Fig. 7).
- SSC differences were not observed, but the pH of 67% of the genotypes increased during 4 weeks of storage.

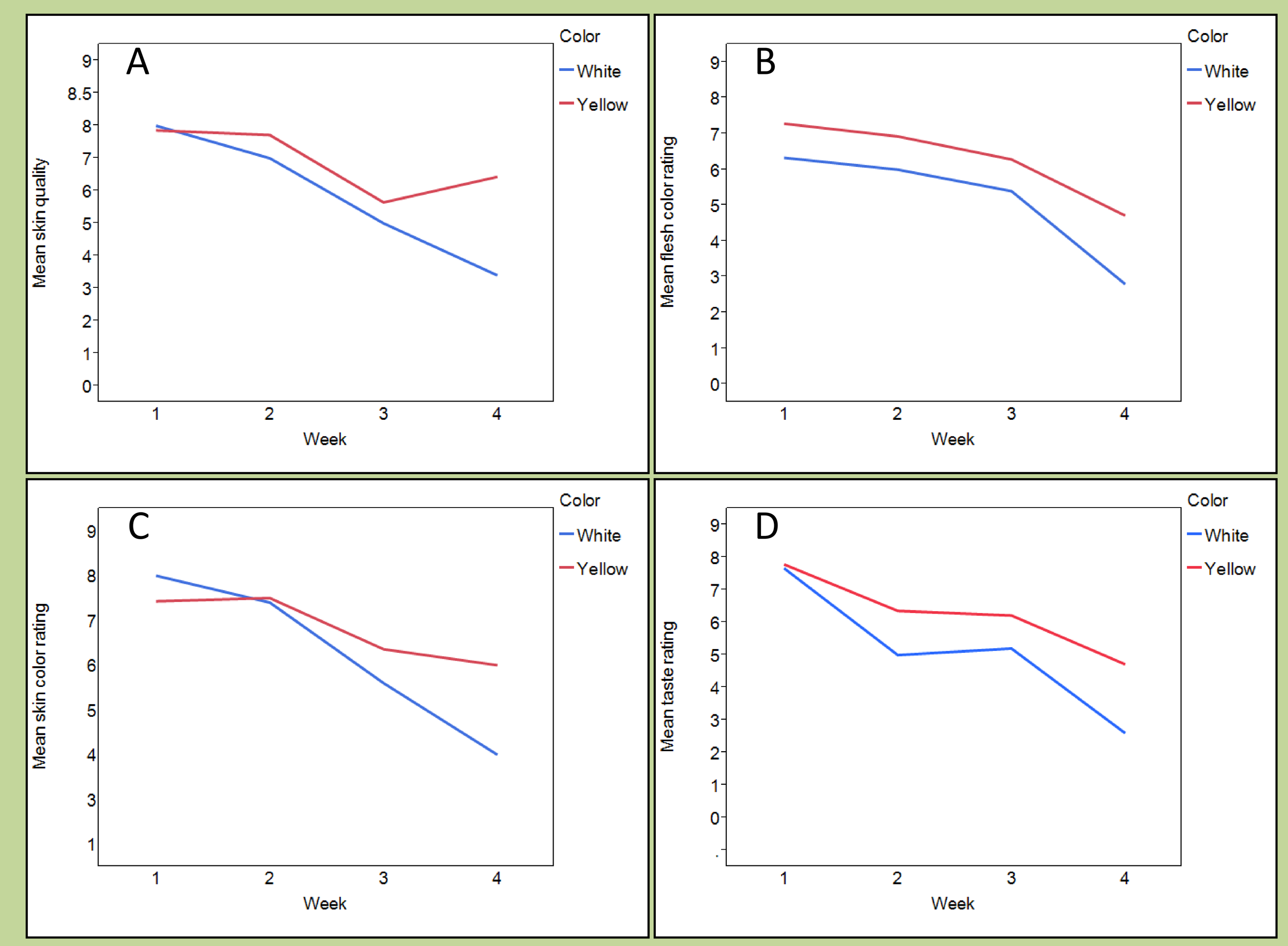

Fig. 5. Average variation in skin quality (A), flesh color (B), skin color (C), and taste (D) between 13 white (blue) and 16 yellow (red) melting flesh genotypes over 4 weeks of storage.

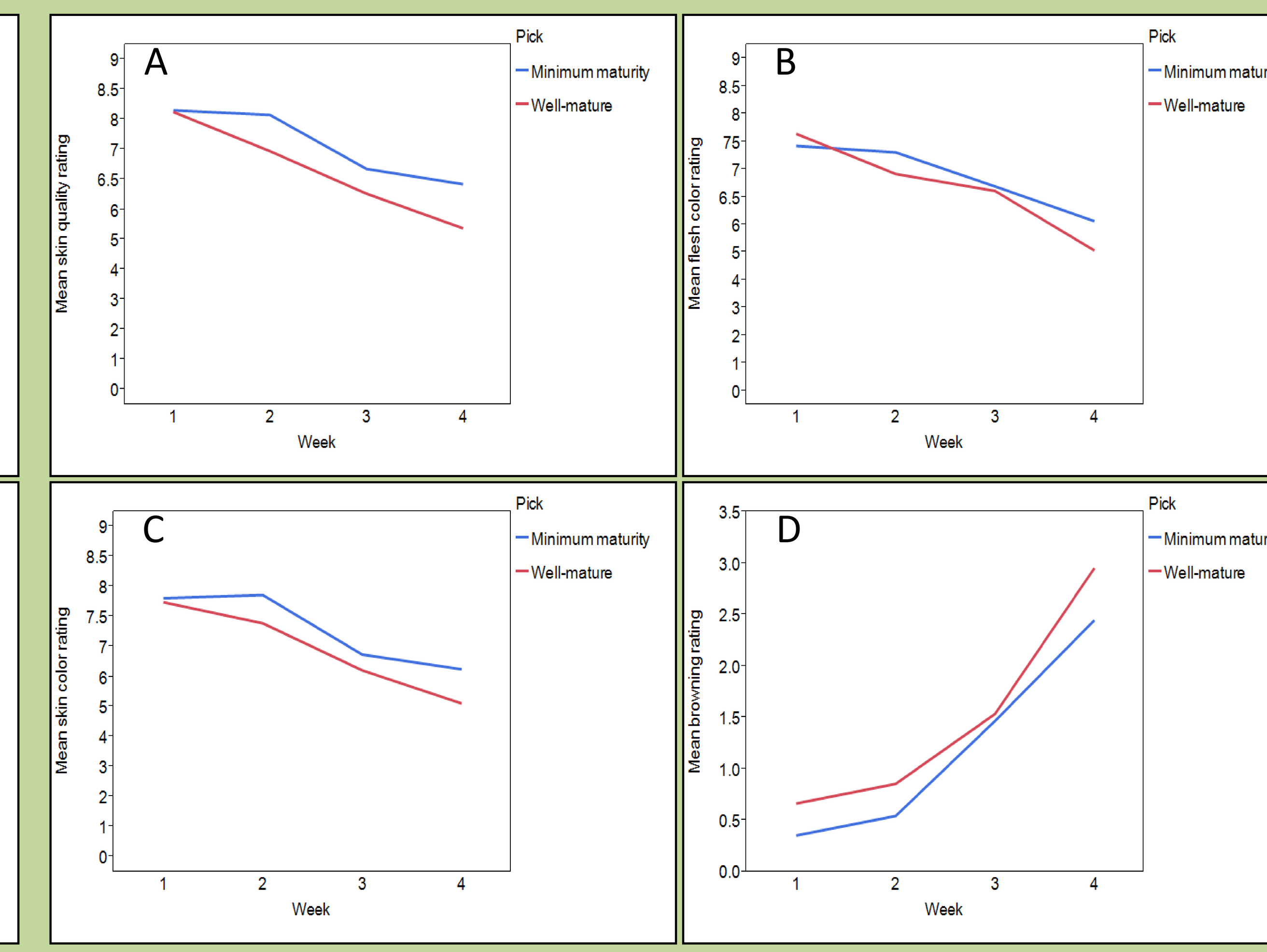

Fig. 6. Average variation in skin quality (A), flesh color (B), skin color (C), and browning (D) between well-mature (red) and minimum maturity (blue) picked genotypes over 4 weeks of storage.

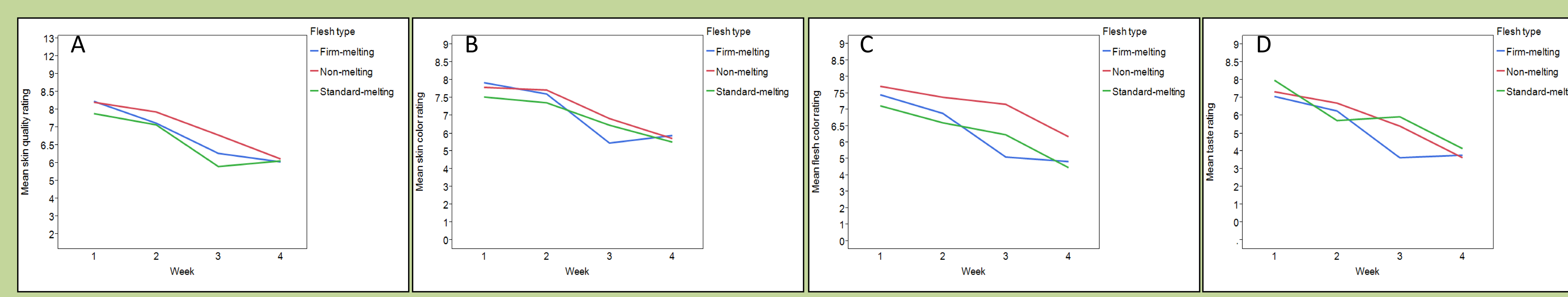

Fig. 7. Average variation in skin quality (A), skin color (B), flesh color (C), and taste (D) between non-melting (red), standard-melting (green), and firm-melting (blue) flesh genotypes over 4 weeks of storage.

Conclusions and Future Work

- Differences in flesh softening rate clearly differentiated selections into three flesh type groups: standard-melting, firm-melting, and non-melting. The identification of the firm fleshed genotypes facilitates their use as future parent material.
- Although the firm-melting genotypes did not exhibit superior storage performance over the standard-melting genotypes, the firm-melting genotypes demonstrated superior handling characteristics compared to the standard melting genotypes (data not statistically analyzed). A future study focusing on the differences in ease of harvest and transport of mature standard-melting and firm-melting fruit is needed to confirm the superiority of the firm-melting handling characteristics.
- Based on the lack of treatment differences, pre-storage treatments are not necessary to test the storage performance of breeding program selections, thus leading to a simple fruit storage protocol.
- Program selections with superior storage performance were identified and can now be used as parent material for improving the storage performance of the Arkansas peach and nectarine breeding program germplasm.