Considerations in Melon Grafting Performance, Yield and Fruit Quality in High-Desert Climates

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Introduction

Although melons perform well in arid climates, northern Nevada farmers deal with a short growing season and would benefit from a fast crop establishment, canopy development and fruit set. In northern Nevada, the average monthly minimum temperature before June is ≤8 °C, with risks of frost at the end of May and early June closer to the Sierra Nevada (e.g., Reno; Bristow et al. 2021). The risk of early frosts by the end of Summer, leaves ~4 months for a growing season of Summer crops. Since plant establishment is dependent on a root system able to meet plant nutrient and water demands, grafting melons could enhance root characteristics that favor earlier establishment, fast canopy development and support better yields. Most commercial rootstocks for cucurbits are squash hybrids from a cross between *Cucurbita maxima* and *Cucurbita moschata*. Although several of these rootstocks provide resistance to biotic stresses, not much is known about their performance and impact to local melon production in high desert environments.

Aim of the study

To evaluate field performance and impacts on yield of commercial, squash-hybrid rootstocks (i.e., *Cucurbita maxima* x *C. moschata*) grafted with a common melon scion (cv. Sarah's choice).

Materials and methods

Plant material: Several squash-hybrid rootstocks were sourced from different seed companies for trials in 2021 and 2022. In 2021, nine rootstocks were used: Carnivor, BS1, Tz148, Just, RS841, AQ, Ercole, Cobalt and Shintosa. In 2022, four rootstocks were selected for trials based on performance from the previous year: BS1, Carnivor, Cobalt, Ercole. All rootstocks were grafted with cantaloupe cv. Sarah's choice, and the ungrafted cultivar was used as a control. Grafted plants, using the one cotyledon method, were obtained from Plug Connections (Vista, California).

Locations: In both years trials were conducted at:

- Lattin Farms, Fallon, NV.
- Valley Road Field Lab at UNR in Reno, NV.

Variables evaluated: Soil canopy cover, NDVI, production over time, total yield, fruits per plant and fruit weight (not all shown in this poster).

Experimental design: All trials were conducted as a Randomized Complete Block Design (RCBD) with at least six replicates (i.e., blocks) and six plants per plot. In-row plant spacing was 90 cm.

Note: In the figures only the four rootstocks used in both years are shown. The values are mean ± standard error. Different letters indicate that means are statistically different at $P < 0.05$.

Acknowledgements

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Results

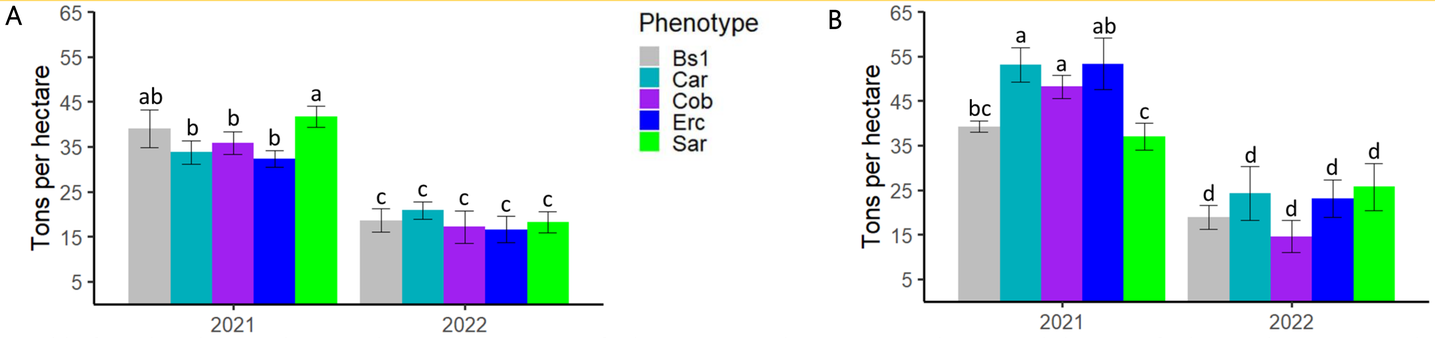

Figure 1. Yield of Sarah's Choice cultivar as the common scion grafted onto rootstocks (Bs1, Car, Cob, Erc) and the ungrafted control (Sar) in two distinct locations in northern Nevada, Fallon (A) and Reno (B), over two growing seasons (year; x axis).

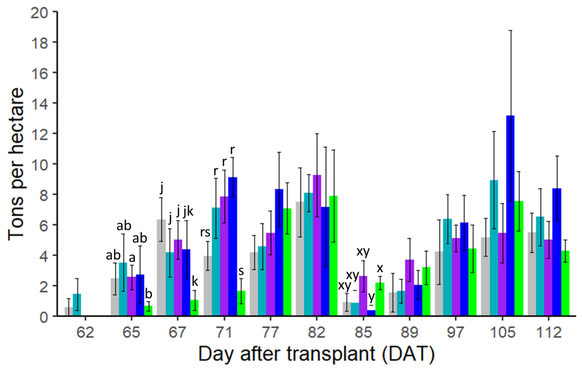

Figure 2. Production over time of plant material described in Fig. 1. Data is from the Reno location and 2021 growing season.

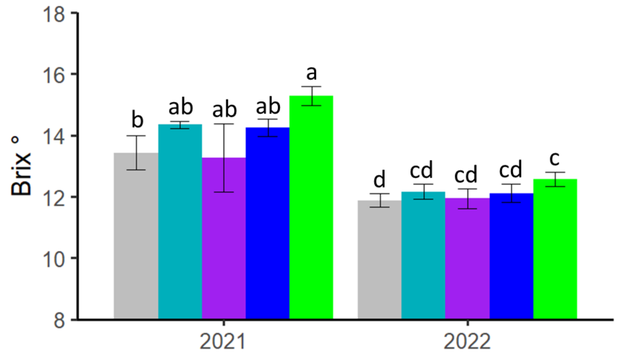

Figure 3. Fruit soluble solids (Brix°) of plant material described in Fig. 1. Data for the Reno location and the two growing seasons (year; x axis).

Figure 1:

- Grafting did not provide a consistent advantage on total yield across locations and years. In 2021, the ungrafted control did better than most phenotypes in Fallon, while in Reno the ungrafted control had lower yields.
- Yields were 50% lower in 2022 than 2021 in both locations.

Figure 2 and data of the two locations and years:

- Patterns of harvest differed by location and year.
- 2021 had consistently greater number of harvests than 2022, regardless of location.
- In Fallon 2021, grafted phenotypes had their highest yields during the first two weeks of harvest, while the ungrafted control had peaks of harvest at the beginning and end of the harvest period.
- In Reno 2021 (Fig. 2), grafted phenotypes produced earlier, and Ercole rootstock provided an early and late peak of production.

Figure 3 and data of the two locations and years:

- The ungrafted control produced consistently sweeter melons (higher Brix) than several grafted phenotypes, regardless of location and year.
- In Reno, Brix° were higher in 2021 than in 2022.
- In Fallon 2022, the ungrafted control had higher Brix° than the grafted phenotypes, except for Carnivore rootstock. No Brix° measurements were taken in Fallon 2021.

Conclusion

- Environmental conditions in the high desert influenced performance of phenotypes, and grafting melons did not provide a consistent improvement in plant performance (e.g., canopy development, number of fruits per plant and fruit weight).
- The ungrafted control had consistently sweeter fruit than several grafted phenotypes, which warrants further studies on fruit quality.
- Grafted melons may provide a different pattern of production overtime, which can benefit local producers on having a consistent supply of melons to meet demands from farmer markets and CSAs.

References

Bristow et al. 2021. Frontiers in Plant Science, 11, 618488.