

Project Title:

Quantifying the impact of insufficient winter chill on apple fruit quality.

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Objectives & Rationale

Insufficient winter chill is a reality in most of the apple producing areas of South Africa but little scientific data is available to quantify the effect that this has on the quality of the fruit. This study aims to quantify the variability in fruit quality in two climatically contrasting areas and to locate the origin of the possible variability. As a second objective it aims to determine if the variability on fruit quality can be mitigated by rootstock choice as well as investigating the rootstock effect on dormancy progression.

Methods

For the first objective 'Golden Delicious' orchards (Elgin and Koue Bokkeveld) were harvested by selecting 6 trees and removing the fruit from 2 branches into six categories: position on the tree (top and bottom), bearing position (spur and shoot) and degree of sun exposure (full sun and shaded). Destructive and non-destructive quality parameters were measured before and after storage (0.5°C, RA for 3 months) and statistical analysis was performed to determine the variability. Similar methods were applied in a randomised block design with seven rootstocks grafted with 'Reinder's Golden'. Dormancy progression of the rootstock/scion trial was also determined using one-year old shoots exposed to standard forcing conditions.

Key Results

The fruit maturity and quality results from the 'Golden Delicious' study showed that Orchard variation was the greatest contributor to the total variability followed by tree-to-tree variation. The variation in starch conversion within an orchard was found to be considerable irrespective of region with most orchards having high amounts of fruit outside of the optimum harvest standard. Canopy position (spatial positioning interacting with light exposure) had an effect on fruit firmness, with fruit from the upper canopy and sun exposed fruit being firmer. This effect was more pronounced after storage. Fruit colour (hue angle and lightness) correlated well before and after storage, but not with the other parameters such as starch conversion and/or flesh firmness. The analysis of the results from the trials on the influence of flowering date and rootstock on fruit quality is still underway and will be commented on in the final report.

The dormancy progression results from both years indicated that rootstock choice does influence the dormancy level and progression curves for Geneva rootstocks showed a deeper maximum dormancy level compared to the Malling rootstocks. Maximum dormancy was reached later in 2019 and was not completely released at the time that rest breaking agent was applied.

Conclusion/Discussion

No final conclusion can be made at this point, but preliminary data analysis confirm that sorting fruit appearance based on colour in a pack house is useful, but addressing variation in maturity (starch conversion and fruit firmness) and should be done at tree level and could differ across production areas. Horticultural practices that reduce canopy complexity are recommended to reduce fruit variability. Although dormancy progression is altered by the rootstock choice

Geneva rootstocks consistently showed a deeper maximum dormancy, but if rootstock choice mitigates fruit variability is still to be determined.