NON-DESTRUCTIVE MEASUREMENTS OF INTERNAL MATURITY OF FEIJOA (*Acca sellowiana*)

A 90 credits thesis presented in partial fulfilment of the requirements for the Master degree of AgriScience in Horticulture at Massey University, Palmerston North, New Zealand.

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2015

ABSTRACT

Feijoa (*Acca sellowiana*) is a delicious fruit with a narrow window for harvest and a limited postharvest life. In New Zealand, feijoa fruit is required to have at least 6 weeks postharvest life in cool storage plus 6 days shelf life under room temperature in order to be exported to global markets. Slightly immature feijoa fruit (maturity stage 2) can be stored for more than 6 weeks plus few days' shelf life. However, the variation of maturity is large even among individual fruits harvested from the same tree at the same time, and currently, there is no way to segregate fruit non-destructively based on the internal maturity of feijoa at harvest time. The problem with current industry segregation practice is that the external features of feijoa, such as shape, size, and weight cannot segregate fruit with different maturity. It is inevitably that some more mature fruit will rot quickly and affect overall batch quality during storage. It is vital to have a non-destructive assessment of fruit internal maturity at harvest time. Then fruit with different maturity can be divided into different batches with more mature fruit put on sale on local market and less mature fruit put into storage. As a result, the fruit loss rate and overall fruit quality can be improved. Therefore, in this study, efforts were made to explore a non-destructive method to estimate the internal maturity of feijoa fruit and correlate that maturity with performance during storage.

The non-destructive measurements in this experiment included fruit weight, compression firmness, and skin colour. Four feijoa varieties: 'Kakariki', 'Barton', 'Anatoki', and 'Wiki-Tu' were selected for this experiment. For each variety, 945 fruit samples were harvested at approximately one week before becoming fully mature (standard commercial harvesting) and sent to the lab in Massey. All the fruit were divided into three groups based on their skin colour (from darkest green to lightest green). 45 fruit (three replicated batches of 15) from each colour group were measured immediately for weight, firmness, maturity, skin colour, Brix, and titratable acidity (TA). Then all the other fruit samples from the same colour group were randomly divided into three groups that were kept in cool storage for 4 weeks, 6 weeks and 8 weeks respectively. Once cool storage was completed, those samples

were taken out and firmness and skin colour were measured (non-destructive measurements). Then all the samples were retained at 20°C. Half of these fruits were assessed for quality attributes 3 days later, and the other half were measured 6 days after cool storage. All fruit were cut open for final visual assessment of maturity according to the maturity index developed by Plant & Food Research Institute. The data of internal maturity and initial fruit quality (weight, firmness, and skin colour) for each fruit was used to draw scatterplots in order to find out the correlation between estimated maturity at harvest, final fruit internal maturity and fruit quality after storage.

The correlation (R^2) between internal maturity and compression firmness found on 'Kakariki' was 0.6 to 0.5. The correlation for 'Barton' and 'Wiki-Tu' was weaker than that of 'Kakariki' (R^2 from 0.6 to 0.2). The correlation between firmness and internal maturity for samples of 'Anatoki' were weak. The simulated segregation based on firmness for 'Kakariki' and 'Barton' indicated that the firmness segregation at harvest time could be very useful on eliminating potentially bad fruit during cool storage. A non-destructive method for 'Kakariki' and 'Barton' fruit based on initial firmness is therefore now available that would allow successful segregation of fruit with potential for long term storage. However, this segregation would not work well on 'Anatoki'. No significant correlation was found between skin colour, fruit weight and the internal maturity of feijoa fruit either at harvest time or after storage.

There was a very large variation in fruit quality at harvest time and during the storage periods. Samples of 'Wiki-Tu' indicated that this variety could have the best storage performance among the 4 varieties testes. 'Anatoki' may also have a reasonable storage potential with less flavour.

The feijoa fruit may not be stored well when covered with polyethylene film, as it may harm the storability of the fruit. Too immature fruit should not be harvested as well, as it would never be able to ripen properly during the postharvest period.

ACKNOWLEDGEMENTS

I would like to express my great gratitude to the all the people who helped me to bring this research project into fruition. Firstly, my profound appreciation goes to my master supervisors, Professor Julian Heyes, Professor of Postharvest Technology, Institute of Food, Nutrition & Human Health, Massey University, and Dr. Andrew East, Postharvest Physiologist, Massey University. I really appreciate their consistent guidance, encouragement, professionalism and critical feedback throughout my whole master studies. There is no possibility for me to finish this thesis without their help.

All the feijoa samples for my experiment were supplied by the Southern Belle Orchard and the Kaiaponi farm. Great gratitude is also given to the general manager of Kaiaponi Scott Wilson, the grower liaison manager David Hansen, and the owner of Southern Belle Orchard Frans for their hospitality and great assistance. I also would like to thank the New Zealand Feijoa Grower Association (NZFGA) for their generous sponsorship on the fruit samples.

I would also like to thank the lab manager Sue Nicholson at Massey lab, who taught me how to use the lab facilities and instruments that I needed, and many thanks also goes to Peter Jeffery, for his professional help with computer matters during my study.

During my master degree, I received financial support from Professor Julian Heyes, Professor Ren Jizhou Scholarship and Turners & Growers Research Grant. I am very grateful for their generosity and trust. This study was based on the previous researches from Abdul-Aziz Salim Al-Harthy and Srikanth Rupavatharam. I would like to thank them for the inspiration and guidance.

Finally, I must express my very profound gratitude to my parents and to my partner for providing me with unfailing support and continuous encouragement throughout my years of study and through the process of researching and writing this thesis. They are my fundamental motivation to finish this thesis.

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