Selective Blueberry Harvesting

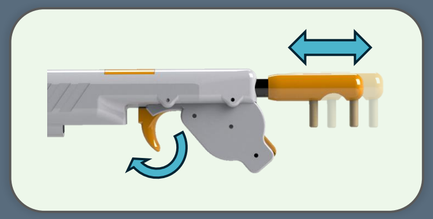
Introduction

Automated harvesters are unsuitable for the New Zealand fresh blueberry market as they damage fruit and are expensive.

Localised shaking of berry clusters is a step to improved automation, being relatively inexpensive and having low damage rates. One issue with shaking is it can remove unripe blueberries which don't ripen after harvesting.

Aim

The aim of this project is to modify a handheld shaker to have discrete shaking profiles and find the optimal shaking revolutions per minute (**RPM**) and application time (T_a) to remove only ripe blueberries.



Pulling the trigger, the shaker head oscillates the blueberry cluster, shaking the berries off

Method

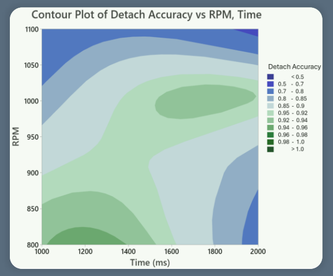
12 combinations of RPM and T_a were each tested on 4 blueberry clusters.

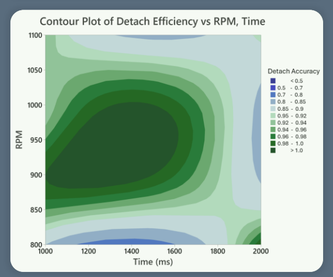
- Test RPMs: 800, 900, 1000, 1100
- Test T_a: 1s, 1.5s, 2s

Ripe and unripe berries in the cluster were counted before and after shaking. The data was then analysed using a multi-variable regression with RPM and T_a as explanatory variables.

Results

The results were plotted into two graphs: Detachment accuracy (a value indicating the ability to harvest **only** ripe blueberries) and Detachment Efficiency (a value indicating the ability to harvest **all** ripe blueberries), against RPM and T_a. Common optimal settings could then be obtained.





Discussion

Shaking RPM and time affect detach accuracy and efficiency. From the regression analysis, the optimum combination is:

980 RPM for **1.55 seconds**
Detach Accuracy: **93%**
Detach Efficiency: **100%**

There is high variability associated with the multi-variable regression due to a small sample size.

Conclusion

This study has shown that precise control over shaking profiles can improve harvesting performance. Further investigation should be done into how other variables like shaker position and time of year affect detach accuracy and efficiency.

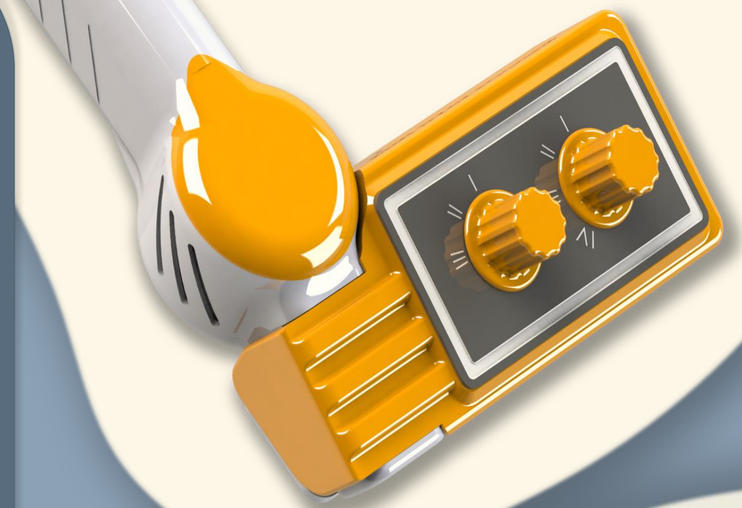
Eventually, these shakers can be used in autonomous systems to retain fruit quality while still increasing harvesting rates.

Rotary encoder
Actively counts rotations so shaking RPM can be calculated

PID controller
Varies PWM signal to BLDC motor to maintain shaking RPM

Profile Switches
Choose shaking RPM and applied time

See More



Design: Jonathan Pearse, Samuel Hodder

Supervisors: Ben McGuinness, Alicia Sim

Acknowledgments: BerryCo, Nanric Blue, Plant Wise, University of Waikato Summer Research Program

MaaraTech

THE UNIVERSITY OF WAIKATO
Te Whare Wānanga o Waikato