Horticulture Innovation Australia

Final Report

Improving mango quality through accurate harvest maturity

Trevor Dunmall
Australian Mango Industry Association Ltd

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This report was previously confidential.

The confidentiality period has now expired. Please ignore all references to confidentiality within the report.

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Level 8, 1 Chifley Square
Sydney NSW 2000
Tel: (02) 8295 2300
Fax: (02) 8295 2399

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Media Summary

Consumer research into mangoes over many years has clearly indicated that one of the top two factors that influence purchase is quality. Mangoes are subject to a wide range of issues both in the field and through the supply chain system that can impact on quality. There has been much conjecture about the different aspects of quality and the impact on consumer's decision to purchase. Quality relates to a range of criteria, but importantly includes maturity and a range of defects and disorders.

This project was developed to provide an objective assessment of key quality parameters, both in the field and in the market place.

The project undertook two activities:

1. A small scale assessment, working with growers testing for maturity, as measured by dry matter, prior to harvest
2. In market assessment of mango consignments in the Brisbane, Sydney, Melbourne and Perth wholesale markets.

1. Orchard Dry Matter testing

This activity saw 215 Dry Matter (DM) tests and 38 Brix tests (on retained fruit samples) undertaken with growers in the Northern Territory. It was operated as a pilot study to assess the value and functionality of the activity. The outcomes of the testing will be delivered to industry in a series of industry meeting during the first half of 2014.

2. In market assessment

This assessment was undertaken by independent quality assessors in four of the key wholesale markets in Australia. Over 1000 consignments were inspected across the four markets, with more detailed quality assessments & brix testing done on random consignments. 400 of these consignments were tested for brix levels.

In addition, the consignments were assessed for a range of defects and disorders, such as resin canal, sap burn and field blemish.

Resin Canal, which has become a significant issue over the past two seasons, was evident in fruit from several regions, and often only becomes very evident as the fruit ripens. The symptoms often become evident in the wholesale markets and more evident in retail.

Other significant issues and defects were

- Skin browning
- Sap burn
- Field blemish
- Lenticel spots

A report on the outcomes of this project will be presented at regional growers workshops and reported in the industry publication, Mango Matters.

Technical Summary

Fruit quality can be described by a number of parameters. For mangoes, these include qualities that describe taste or flavour, often measured by sweetness, (brix) and physical aspects that cause degradation of both external and internal appearance and physical soundness.

A degree Brix, is a measure of the sugar concentration of liquids within the mango. It is used as a measure of sweetness. That is the higher the Brix, the sweeter the mango. Current industry standards are for mangoes, when ripe to have a minimum brix level of 12%. This project was developed to determine what brix levels are currently being reached through season.

Physical injuries, rots and other defects are considered to downgrade fruit quality. Consumer research indicates as quality deteriorates both the price and volume of sales drops.

For this project, defects and disorders were categorised into nine categories. These included:

1. Rots: including symptoms caused by anthracnose and stem end rot
2. Dendritic Spot: caused by the same causal organism as stem end rot
3. Disorder X: a skin and under skin disorder
4. Sap burn : caused by the mango skin being exposed to mango sap for extended periods
5. Skin browning: caused by a range of factors
6. Lenticel Spotting: caused by a range of factors, some unknown
7. Field Blemish: most likely caused by physical injury to the skin
8. Resin Canal: research is currently occurring on the causes of resin canal discolouration
9. Other: for any defects which cannot be categorised to the above list.

Introduction

Determining when mangoes are ready to pick can be challenging, especially for mango pickers with little experience. Choosing when to pick a mango is based on a number of factors, including dry matter, flesh colour, fruit shape.

In the 2012/13 mango season, the incidence of immature fruit reaching the market increased compared to previous years. Industry believes the incidence of immature fruit in the market could have an impact on sales and therefore grower profitability. This project aimed to assist growers in the Northern Territory, which usually is the production region with the first fruit on the market each season to determine when their mangoes are at the optimum stage to pick.

In addition to the assistance with determining the optimum stage to pick, this project provided an objective assessment of fruit quality in the market through the season. This will allow industry to base judgements on fruit quality on an objective assessment, and not on anecdotal information.

Materials and Methods

This project had two specific activities:

1. On Farm Dry Matter testing
2. In market quality assessment:

1. On Farm Dry Matter testing

AMIA contracted an independent experienced crop consultant to undertake dry matter testing from samples of fruit leading up to harvest (Northern Territory). This service operated in the Northern Territory as it is this region which leads off mango production each season.

Early season fruit have been identified with a higher prevalence of immaturity which can impact on the entire industry. Sampling was conducted and dry matter testing and reporting back to the grower undertaken within 48 hours.

Where possible, samples of fruit will also be tested for dry matter content using NIR technology, pressure tested and samples retained for brix measurement when the fruit ripened.

2. In market quality assessment:

This component of the project monitored and assessed mango quality in each of four markets (Brisbane, Sydney, Melbourne and Perth). The reports include general assessments undertaken two to three times per week through the season and random samples of consignments of mangoes for full out turn reports

The market assessors undertaking this project are (Jon Brewer: Brisbane, Chris Cope: Sydney, Terry Rudge: Melbourne).

Undertake random sampling for outturn reports including brix measurements for five consignments per week in each market

Results

1. On Farm Dry Matter testing

The testing was undertaken from late September to late October on 12 growers orchards (20 individual production blocks), principally on the varieties Kensington Pride and R2E2.

12 growers participated in the on farm dry matter testing. Five randomly selected pieces of fruit were tested. 215 Dry Matter (DM) tests were undertaken and 38 Brix tests on retained fruit samples were performed.

DM range (in orchard): 12.7 to 16.4, with a majority of samples over 14.

2. In market quality assessment

Independent market assessors worked in four central markets (Brisbane, Sydney, Melbourne and Perth) assessing mango consignments in general and also undertaking specific out turn reports on randomly selected samples.

Over 1000 consignments were inspected across the four markets, with Quality Assessments & Brix testing done on random consignments. 400 of these were Brix tested. While the focus was on the variety Kensington Pride, all varieties were sampled.

Table 1 contains the incidence of each of the defects/disorders on a weekly basis through the peak part of the season from late September to late January.

Dendritic Spot, disorder X and other defects were left out of this table as the incidence throughout the season was minor.

Table 1 Defects and Disorders – 2013/14 Australian mango season

WEEK BEGINNING	Rots	Sapburn	Skin Browning	Lenticel Spot	Field blemish	Resin Canal
16-Sep	0.11	0.56	0.11	0.89	0.89	0.33
23-Sep	0.00	0.86	0.71	0.57	1.00	0.00
30-Sep	0.09	0.32	0.41	0.32	0.77	0.05
7-Oct	0.15	0.70	0.60	0.50	0.95	0.20
14-Oct	0.14	0.54	0.57	0.54	0.86	0.25
21-Oct	0.14	0.54	0.69	0.57	0.89	0.34
28-Oct	0.24	0.80	0.64	0.48	0.72	0.28
4-Nov	0.36	0.68	0.68	0.50	0.64	0.59
11-Nov	0.15	0.37	0.59	0.44	0.78	0.30
18-Nov	0.00	0.17	0.34	0.11	0.31	0.06
25-Nov	0.02	0.30	0.39	0.21	0.31	0.05
2-Dec	0.02	0.34	0.35	0.28	0.37	0.12
9-Dec	0.03	0.43	0.43	0.21	0.33	0.02
16-Dec	0.04	0.23	0.28	0.02	0.11	0.01
23-Dec	0.00	0.35	0.44	0.03	0.26	0.00
30-Dec	0.04	0.43	0.42	0.22	0.26	0.04
6-Jan	0.06	0.46	0.51	0.34	0.26	0.11
13-Jan	0.08	0.57	0.84	0.27	0.24	0.12
20-Jan	0.00	0.37	0.58	0.16	0.37	0.00

The rating scale is a factor of presence and severity of the defect/disorder. Table 1 illustrates a high presence of low level defects/disorders that varied during the season.

Table 2 illustrates the incidence of severe defects/disorders across the entire season for each major production region.

Table 2 Severe defects/disorders per region for the season

Region	Rots	Dendritic Spot	Disorder X	Sap burn	Skin browning	Lenticel spots	Field blemish	Resin canal	Other
Darwin	0.5	0	0	3.5	3	2	9	2	0
North Qld	0	0	0	2.7	5.3	0	0	%	0
Far North Qld	0	0	0	2	4	1	0.7	0	0

Representation of the level of incidence of each defect/disorder through the season are illustrated in graphs below (Figures 1 to 6).

Figure 1

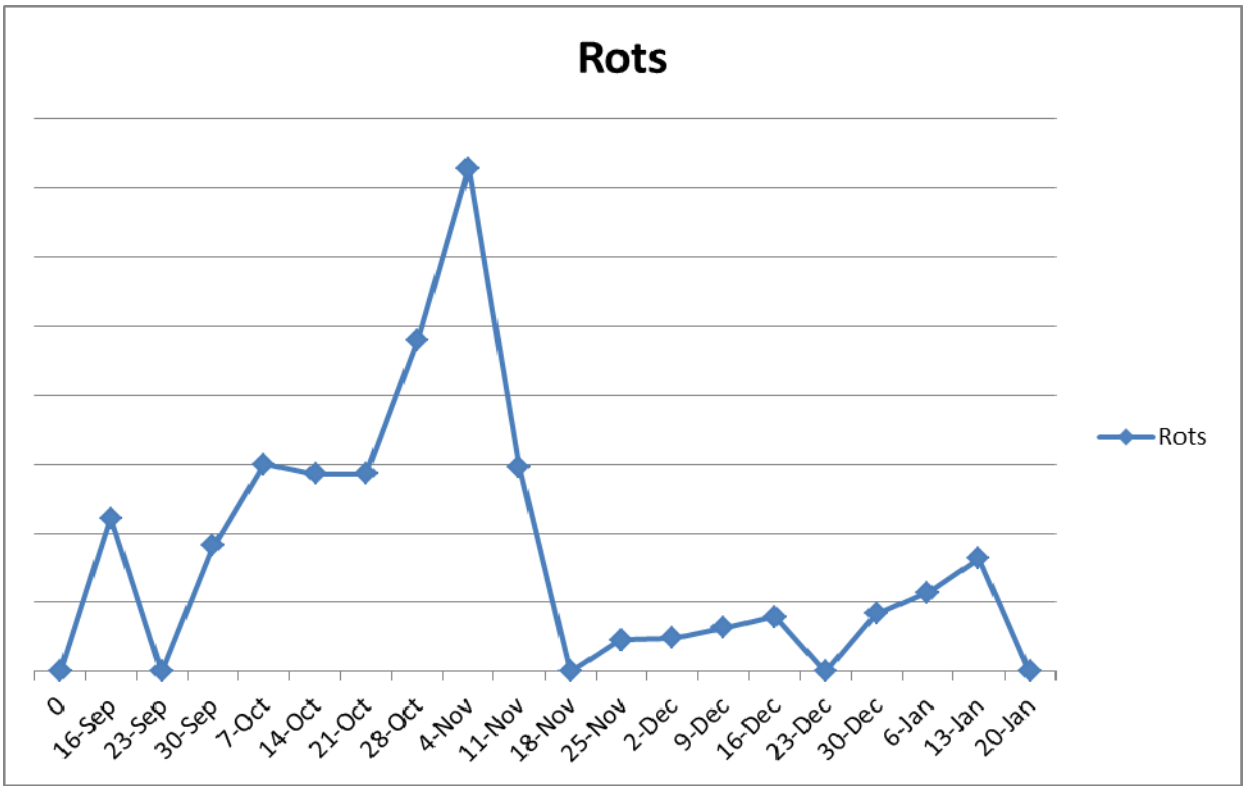


Figure 2

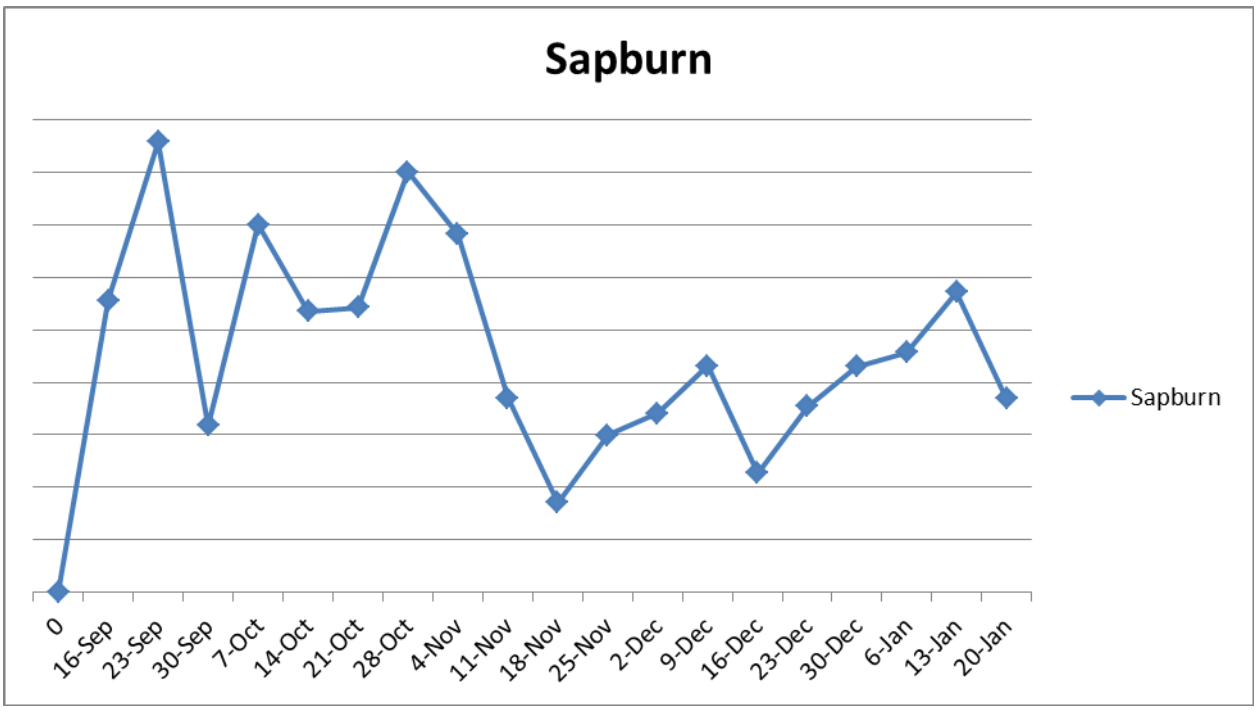


Figure 3

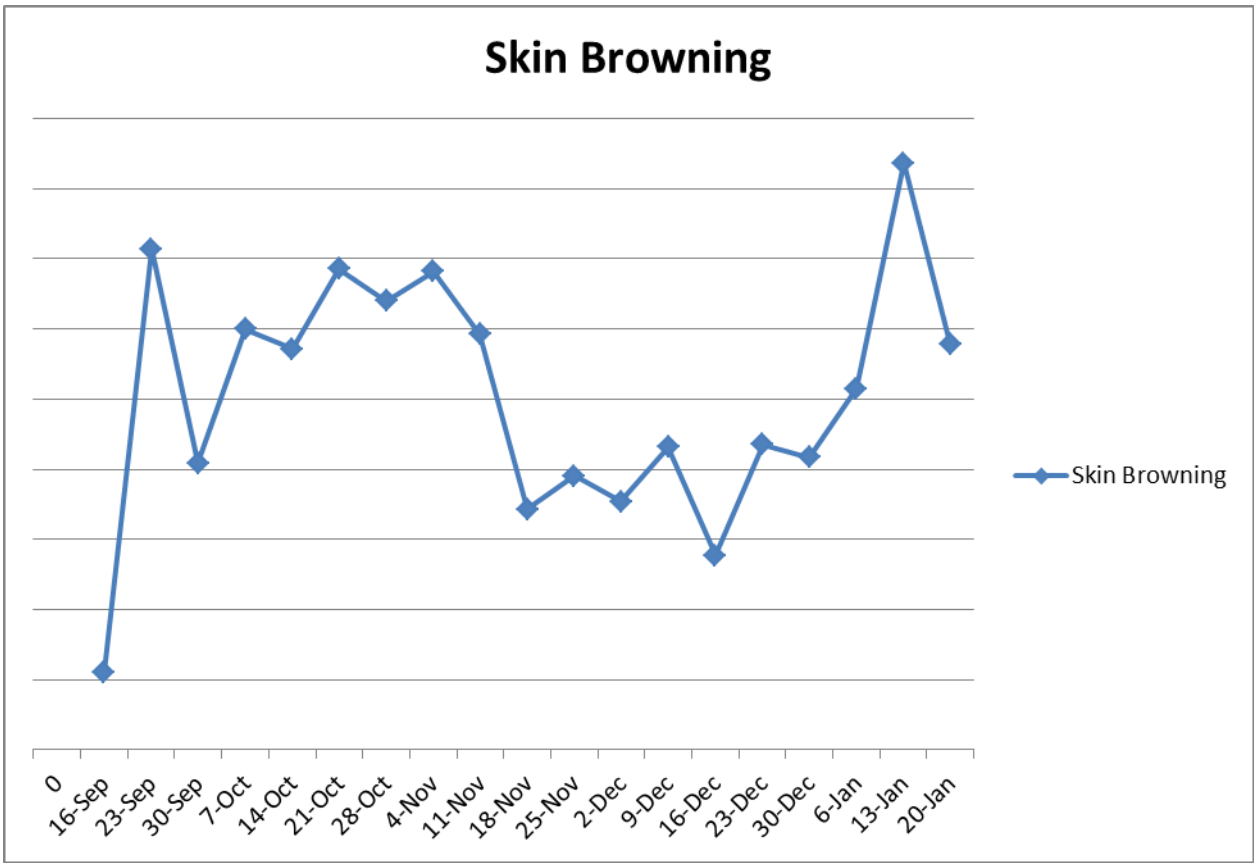


Figure 4

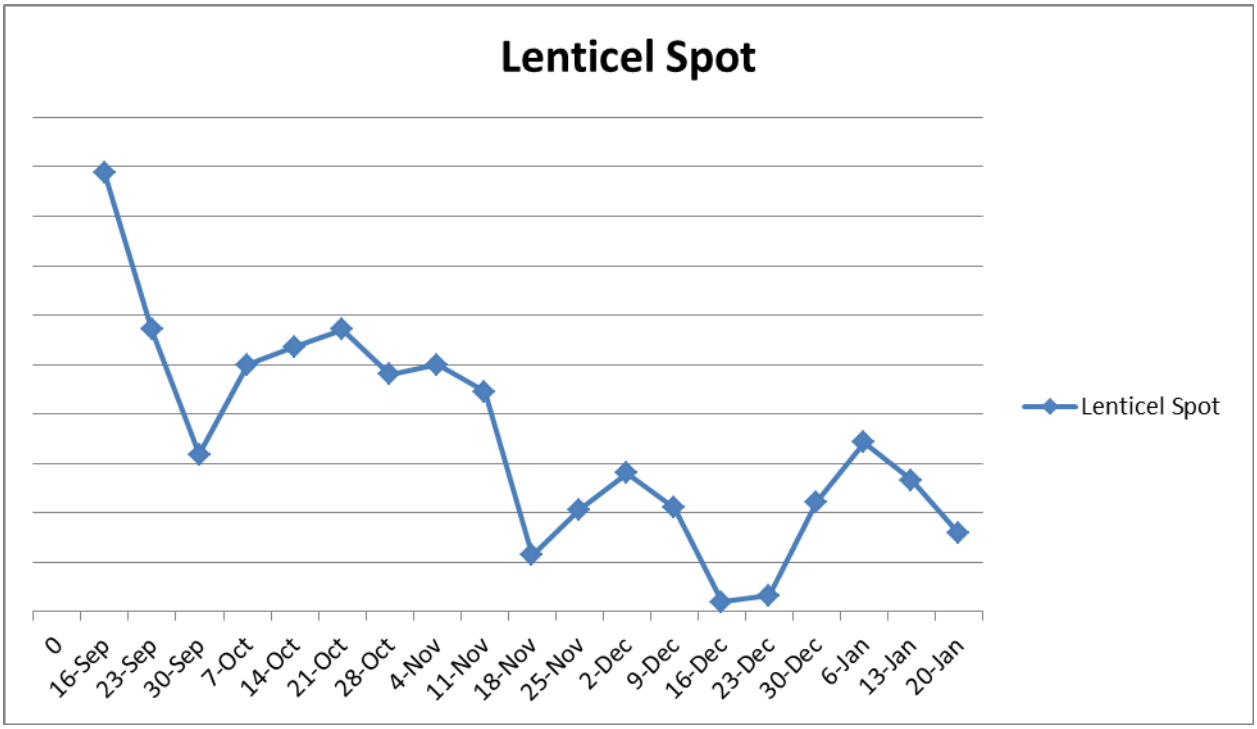


Figure 5

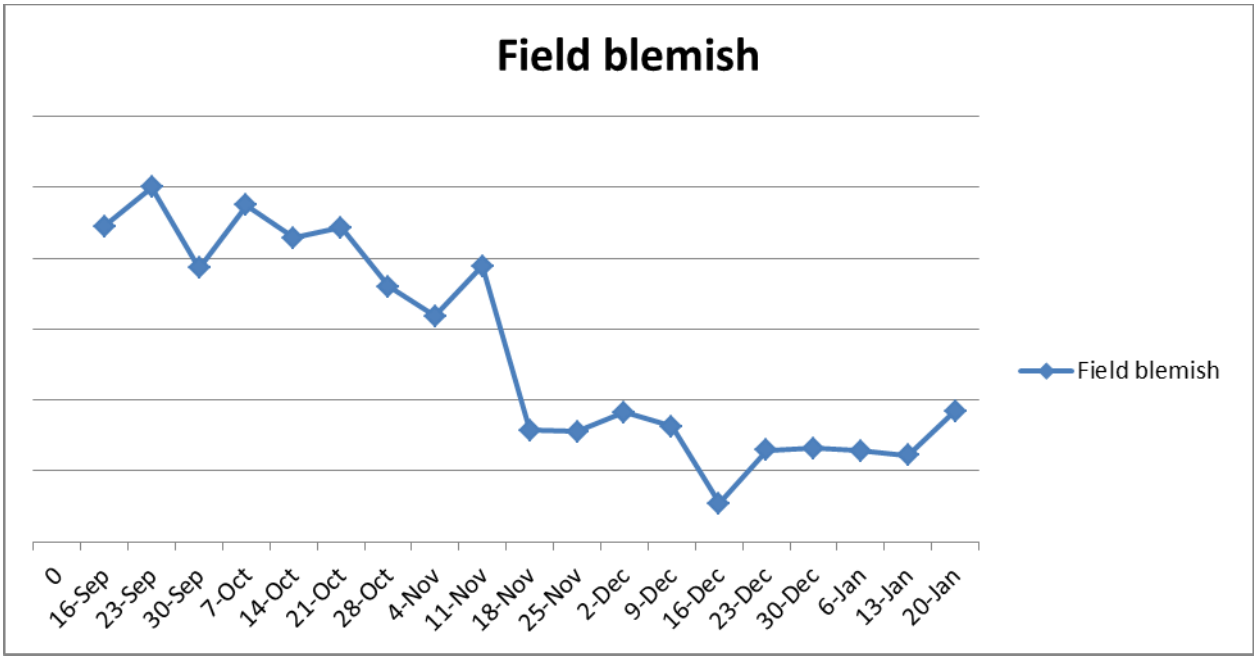
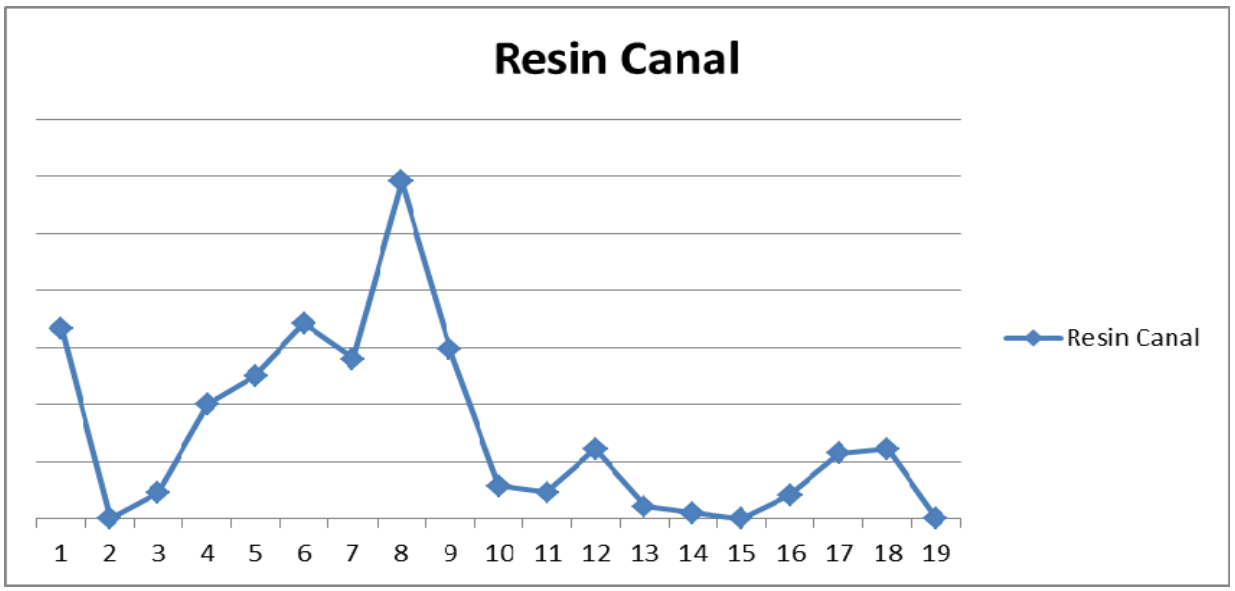


Figure 6



Discussion

The 2013/14 mango season was characterised by a light crop from early production regions (Northern Territory and northern Western Australia). During the season, multiple flowerings meant that the harvest window extended much later than what would be considered a normal season. The Queensland mango season was characterised by a large crop, with some regions harvest windows earlier than their traditional harvest windows.

This project enabled industry to objectively assess both maturity and defect/disorders across the peak part of the season from multiple regions and across key varieties.

Rots (anthracnose and stem end rot)

Low levels of presence through the season, with higher incidence during late November an early December

Sapburn

Moderate to high incidence throughout the season

Skin Browning

Moderate to high incidence throughout the season

Lenticel spotting

Moderate incidence early in the season improving as the season progressed

Field blemish

High incidence early in the season improving markedly as the season progressed

Resin Canal

Moderate incidences during early season, with lower incidences later in the season

Technology Transfer

The information generated from this project has been developed into an article for the industry publication, Mango Matters. The information is also being presented at post season grower workshops which are being held in major production regions through the period March 2014 to May 2014.

Recommendations

The two major factors impacting on mango sales are fruit quality and price. Mangoes are always going to be subject to a range of factors that cause defects and disorders Minimising these factors should be a focus for the industry. The increase the major factor that influences sales, as demonstrated through industry consumer research.

The information from this project highlights the high incidence of defects that are downgrading fruit appearance, but are not making the fruit unsaleable. Further work needs to be undertaken to improve systems that impact on fruit quality from the tree though to the wholesale market.