

# Investigation into the current rind lesion problems experienced with the 'Pinkerton' cultivar

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## ABSTRACT

Considerable problems were experienced with rind lesions on the 'Pinkerton' cultivar during the last number of seasons. An investigation was subsequently launched to characterise the symptoms and determine the possible causes. The survey revealed that two types of skin lesions occurred. Classical chilling injury lesions were quite prevalent at the beginning of the season, while fungal associated senescence lesions occurred towards the end. A set of recommendations were formulated to contain the two disorders.

## INTRODUCTION

Most exporters experienced problems with black lesions on the rind of 'Pinkerton' avocados during the last number of seasons. At the SAAGA Post-harvest Committee meeting held on 9 November 2011 (Nelson, 2011), the current authors were requested to gather information regarding the epidemiology and physical characteristics of the skin marks and to formulate appropriate recommendations. The present paper deals with a series of case studies from a single pack house that serve to illustrate the recorded trends. A set of recommendations are also put forward.

## MATERIALS AND METHODS

Upon completion of the 2011 season, arrival quality data sets were obtained from a number of exporters. The data was qualitatively and quantitatively evaluated and processed. Results from a single pack house that experienced severe problems were selected for this publication. It consists of a number of case studies involving five producers who have packed at the pack house and used the same exporter.

## RESULTS AND DISCUSSION

The results generated during the study are summarised in Table 1. The table shows the percentage of external lesions recorded during inspections performed on eight consignments that were packed at the pack house over a ten week period during 2012. As may be seen in the table, two producers (Producers 1 and 3) contributed towards each of the eight consignments while another two (Producers 2 and 4) provided fruit for seven of the consignments. The last producer (Producer 5) contributed towards the first

and the last three consignments. The table further indicates whether the containers were loaded in the pack house or at the harbour.

A number of trends are apparent from the table. It is firstly clear that the lesions were most prevalent during the beginning and end of the season. However, upon studying the external morphological characteristics of the lesions on the photos returned by importers, it became clear that the lesions that developed during the beginning of the season were dissimilar from the vast majority of lesions recorded towards the end of the season. The lesions recorded by importers in the beginning of the season (Table 1: Case studies 1 & 2) were consistent with those associated with classical chilling injury symptoms (Figure 1). In contrast, most of the skin marks observed towards the end of the season (Table 1: Case studies 6-8) were caused by fungal associated rind senescence (Figure 2).

The high incidence of chilling injury (black cold damage) symptoms recorded during the first two consignments implies that they were exported at a too low storage temperature. Analyses of the enclosed temperature recorders revealed that the air temperature in the container during the first case study decreased to 6.5°C which is lower than the recommended 8°C. Unfortunately the temperature recording for the second case study was not returned from overseas.

In terms of the end of season marks (Case studies 6-8), the reason why the fungal associated senescence lesions started to appear as from week 31 is that the end of season maturity cut off guideline was most probably exceeded. Unfortunately it was not possible to further investigate this aspect, as the



moisture content data obtained from many of the pack houses was unreliable. It is not unreasonable to assume that 10-15 years ago these consignments would have been very susceptible to grey pulp. However, due to more appropriate fertiliser practices, as well as the use of controlled atmosphere and Smart-Fresh, the grey pulp is effectively controlled while the associated rind lesions still remain.

It is interesting to note that the epidemiology of chilling injury and senescence lesions differed between producers 1 to 4 and 5. During week 24 (Case study 1) the incidence of chilling injury on the fruit from producers 1-3 was between 10 and 15%, while that of producer 5 was considerably higher between 21 and 25%. In contrast, during week 33 (case studies 7 and 8) the incidences of senescence related lesions were much higher in the fruit from producers 1-4 (16-20%) than in the fruit from producer 5 (1-5%). This is clearly an indication that the maturity of the fruit from producer 5 lagged behind that of producers 1-4. Less mature fruit are more susceptible to chilling injury during the beginning of the season, while they are more susceptible to grey pulp and rind senescence towards the end of the season. Again this was not possible to confirm due to the moisture content data generated by most pack houses being inadequate.

Two consignments each were exported during respectively week 28 (case studies 2 and 3) and week 33 (case studies 7 and 8). During both weeks one consignment each was loaded into a container at the pack house (door to door consignment), while the other was dispatched to Cape Town in a refrigerated truck followed by storage in a transitional facility and containerisation in the harbour. During week 28 the harbour loaded consignment had less chilling injury than the door to door consignment. This is probably due to more efficient cooling associated with the door to door consignment, while the harbour loaded fruit were subjected to more variable temperatures. This unintentionally aided the reduction of chilling injury. This was, however, not the case at the end of season. During week 33 the incidences of lesions were similar in both the harbour loaded and door to door consignments. This is because the lesions were senescence

related and not caused by chilling injury.

The low but persistent incidence of chilling injury symptoms (1-5%) during the middle of the season (case studies 28-30) is a nuisance that needs to be addressed with improved temperature regimes. During this period, the incidence of chilling was considerably increased when the new MMAU REEFER containers were used (data not shown).



**Figure 1. Chilling injury symptom recorded by importers during, especially, the early season.**



**Figure 2. Rind senescence symptoms recorded by importers during, especially, the late season.**

**Table 1. Incidence of rind lesions on 'Pinkerton' avocado fruit packed by five producers at a single pack house during the 2011 season.**

Case no	Week no	Container loaded	Rind lesions (%)				
			Producer 1	Producer 2	Producer 3	Producer 4	Producer 5
1	24	Pack house	10-15	10-15	10-15		21-25
2	28	Pack house	1-15	1-15	1-15	1-15	
3	28	Harbour	1-5	1-5	1-5	1-5	
4	29	Pack house	1-5	1-5	1-5	1-5	
5	30	Pack house	1-5	1-5	1-5	1-5	
6	31	Pack house	1-10		1-5	1-10	1-5
7	33	Harbour	16-20	16-20	16-20	16-20	1-5
8	33	Pack house	16-20	16-20	16-20	16-20	1-5



## RECOMMENDATIONS

There are obviously two symptoms to be addressed, namely the classical chilling injury lesions and the senescence related lesions. The chilling injury lesions were most abundant at the beginning of the season, while the senescence lesions were most problematic towards the end. The following recommendations are made:

- It is essential that maturity measurement practises must improve. This refers to both the procedures involved as well as the frequency at which it is done.
  - It is important that the moisture content analyses starts approximately one month before the estimated first harvest date. It must then be continued in all orchards fortnightly throughout the season.
  - The current practice of pooling 10 fruit and determining the moisture content of the combined sample with a microwave is inadequate. It is recommended that the moisture content of the ten fruit be individually determined using an oven set at 35°C.
  - It is recommended that the information be analysed and interpreted by a skilled person with the necessary background regarding the 'Pinkerton' cultivar, taking into account factors such as tree age, yield and climatic conditions.
- It is important to conduct mineral analyses of the fruit pulp.
  - The first analysis must be done in November/December on a pooled sample of 10 fruit.
  - The second analysis must be done in February/March, also using a 10 fruit sample.
  - It is recommended that the information again be interpreted by a skilled person.
- During the SAAGA Post-harvest Committee meeting held on 9 November 2011, a decision was tak-

en to register two additional temperature regimes (Table 2).

- It is recommended that the AVK regime (9.5, 9, 8.5°C) be used during the early season while the AV9 (9, 8.5, 8°C) regime must be used during the early mid season.
- During the mid late season it is proposed that the AVD (8°C) procedure be used.
- During the late season it is proposed that the exporter start with the AVD regime and that the temperature be lowered to 6°C per instruction on the ship.
- It is recommended that the MMAU type REEFER containers not be used for the 'Pinkerton' cultivar.
- It is good practise to keep holdback samples of each consignment.
  - In the beginning of the season it is ideal to store the fruit at the export temperature as well as one degree centigrade lower and higher so as to establish the fruit's sensitivity to chilling injury. (Unfortunately few pack houses currently have this facility.)
  - At the end of the season it is crucial that holdback samples are kept. They can be stored in the pack house cold store at the approximate mean export temperature of the consignment. As soon as the first signs of rind senescence appear, all exports of fruit from the specific orchard should be stopped.
- It is essential that all consignments are waxed and receive a prochloraz treatment.
- It is critical that exporters continue to apply CA and/or SmartFresh on all 'Pinkerton' consignments.

## ACKNOWLEDGEMENTS

The author would like to sincerely thank the export companies who have participated in the project.

**Table 2. Proposed storage temperature regimes.**

Regime no	Time of season	Storage temperature (°C)		
		Pack house, truck, harbour & 2 days on ship	Next 6 days on ship	Rest of period on ship
AVK	Early	9.5	9	8.5
AV9	Mid	9	8.5	8
AV9 with further instructions	Late	9	8.5 to 7 to 6	6

