

POST-HARVEST PROBLEMS OF AVOCADOS — LET'S TALK THE SAME LANGUAGE

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SUMMARY

Confusion regarding the identification of the symptoms of different post-harvest disorders of avocados is causing the industry infinite problems. It is therefore imperative that standardization be sought, and a basis for this is described in this article. The different disorders are grouped firstly under "External" and "Internal" and then further classified under "Pathological", "Physiological" or "Mechanical", followed by a brief description of each. The specific disorders which are dealt with, are external fungal damage, stem-end rot, cold damage, frost damage, vascular blackening, pulpspot, vascular browning, internal browning and grey pulp.

OPSOMMING

Verwarring ten opsigte van die simptome-identifikasie van verskillende na-oesafwykings by avokado's skep baie probleme vir die avokadobedryf en dit is duidelik dat standaardisasie in hierdie verband onontbeerlik is. 'n Grondslag waarop voortgebou kan word, word in hierdie artikel uiteengesit. Die verskillende afwykings word eers in die kategorie "Uitwendig" en "Inwendig" saamgevat en daarna as "Patologies", "Fisiologies" of "Meganies" geklassifiseer, gevolg deur 'n bondige beskrywing van elkeen. Die bepaalde afwykings wat behandel word, is uitwendige swamskade, stingelend-bederf, koueskade, rypskade, vaatbundelverswaring, pulpvlak, vaatbundelverbruining, inwendige verbruining en grys pulp.

INTRODUCTION

There is a general lack of agreement as to which disorder is being referred to when terms such as "pulp spot", "frost damage", "cold damage" and "*Dothiorella*" are used in technical discussions. The importance of obtaining absolute clarity as to the specific meaning of these terms when used at discussions and in publications can not be overstressed. For example, one may read about "chilling damage", "internal browning", "and grey pulp", "pulpspot", "vascular browning", or even a pathological infection. Most of these seldom occur in un-refrigerated avocados and have therefore on occasion been classified as "refrigeration" or "chilling" disorders.

Similarly, the value of feed-back from overseas on the quality of our exported avocados is often vague and misleading.

For this reason, and as a broad base from which to proceed, the following exposition is advanced. Although it might be too general for a plant pathologist who wishes to distinguish between each specific pathogen, it was found to be more suitable for everyday use than an intricate system.

TERMINOLOGY

The terms used to denote the more general disorders of the fruit are conveniently grouped in both official languages under "External" and "Internal" symptoms,

ENGLISH

A. EXTERNAL

Cold damage

(Not to be confused with what is called chill injury overseas and which relates to internal problems)

Fungal damage*

(Includes anthracnose and *Dothiorella*)

Mechanical damage

(Includes scratches, bruising* and chafing)

B. INTERNAL

Grey pulp internal browning

Pulp spot vascular blackening

Vascular browning

(Not to be confused with the discolouration of the vascular bundles due to stem-end rot)

Stem-end rot*

(Pathological)

Frost damage*

(Caused by extremely low temperatures in the orchard)

*Internal and external symptoms are seen

AFRIKAANS

A. UITWENDING

Koueskade

(Moet nie verwar word met wat corsee "Chilling injury" genoem word en betrekking het op inwendige probleme me)

Swamskade*

(Sluit in *antraknose* en *Dothiorella*)

Meganiese skade

(Sluit in skrape, kneusing* en skawing)

B. INWENDIG

Grys pulp Inwendige verbruining

Pulpvlek Vaatbundelverswaring

Vaatbundelverbruining

(Moet nie verwar word met die verkleuring van die vaatbundels a.g.v. stingelend-bederf nie)

Stingelend-bederf* (Patologies)

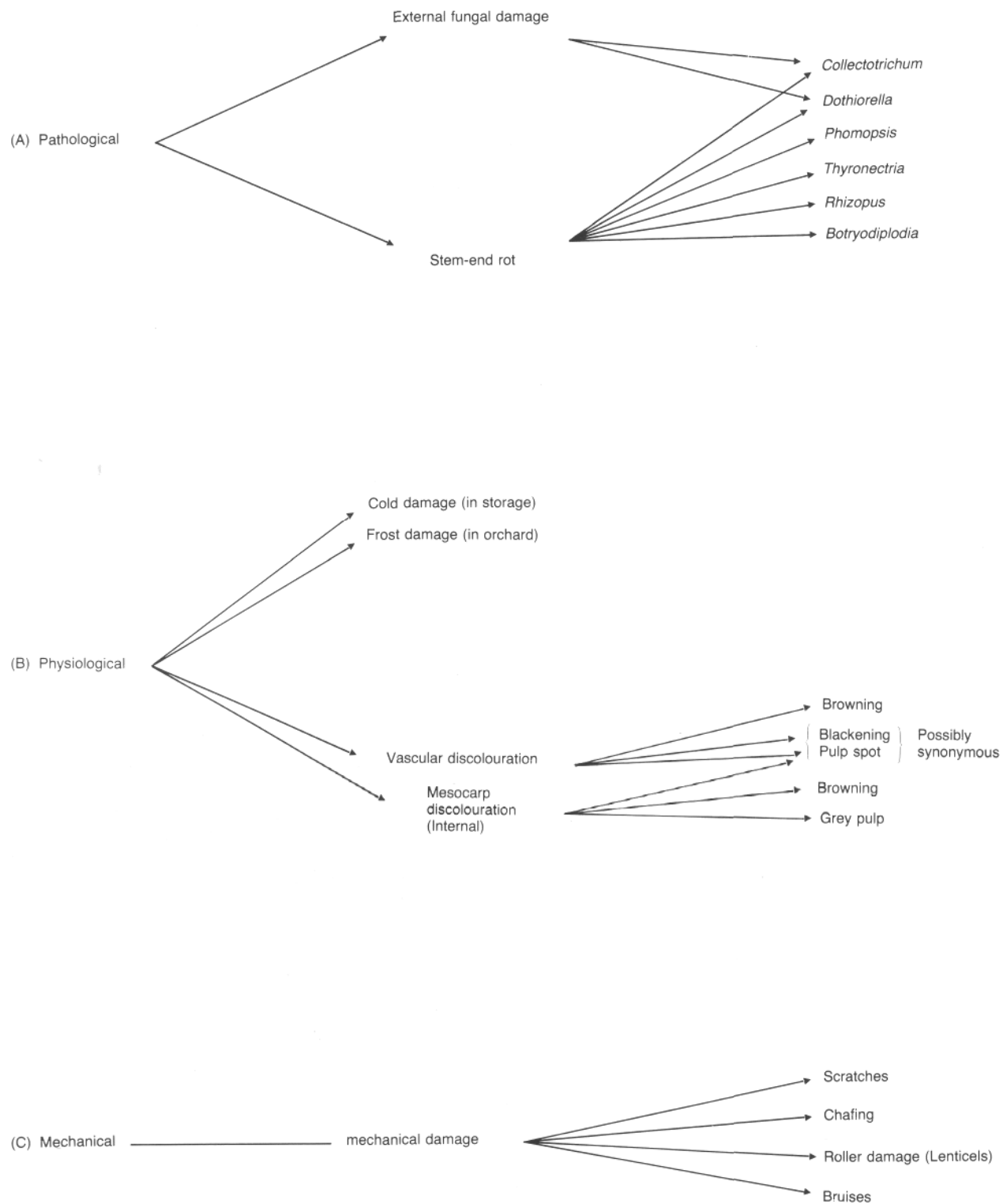
Rypskade*

(A.g.v. uiters lae temperature in die boord)

*Inen uitwendige simptome word waargeneem

SCHEMATIC CLASSIFICATION

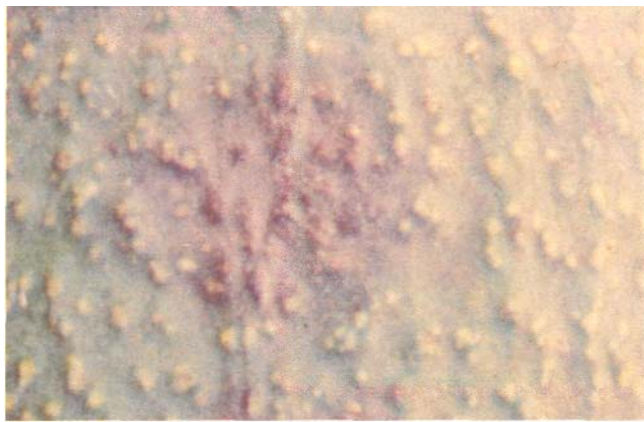
For a better understanding and easier identification, the aforementioned disorders are classified according to the common cause of each.



DESCRIPTION OF EACH DISORDER

A. Pathological External fungal damage

This usually begins with small, isolated brown spots on the skin. These increase in size and number until they coalesce and become large, round to irregular brown patches. They do not have a definite outline and their edges are not sunken below the level of the skin. However, there can be a gradual depression towards the middle in well-developed infections. At this stage, the infection penetrates and becomes visible as an internal symptom (which distinguishes it from "cold damage"). As the fruit ripens, these symptoms develop further, until the whole fruit is affected. As a rule, fungal damage is not visible on unripe avocados.



Initial fungal damage



Fungal damage



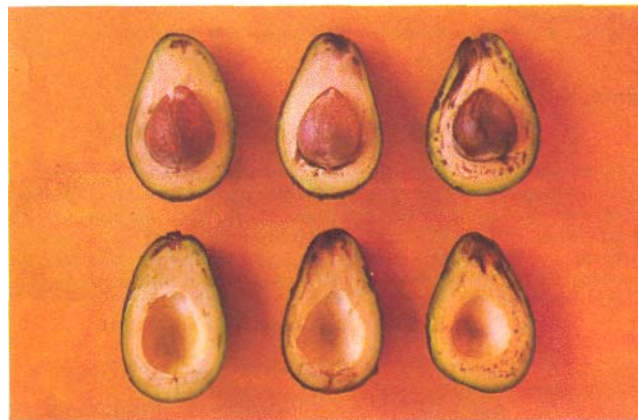
Extreme fungal damage

Stem-end rot

This disorder is caused by similar fungi, but in this case they enter the fruit at the stalk end. The first symptom is visible as a discolouration of the flesh at the stalk end, which progresses through the pulp, mainly through the vascular bundles, to the blossom end. As the infection develops, it can be seen externally at the stalk end. The external symptom also spreads towards the blossom end until the whole fruit is eventually affected



Stem-end rot



Different degrees of stem-end rot

B. Physiological

Cold injury

This disorder specifically implies damage caused by a storage temperature which was too low and bears no relation to problems resulting from suffocation or ageing. Temperatures which are too low cause irregular, clearly outlined, dark patches on the skin to appear after a few days. In the course of time these darken until they are brown or pitch black. The spot is clearly defined and there is a definite depression of the skin at the edges. The symptom is confined to the skin and does not penetrate to the flesh — a fact which is often used to distinguish this disorder from fungal damage. Its severity is directly proportional to how low the temperatures were, and the length of time the fruit was subjected to these low temperatures,



Cold damage



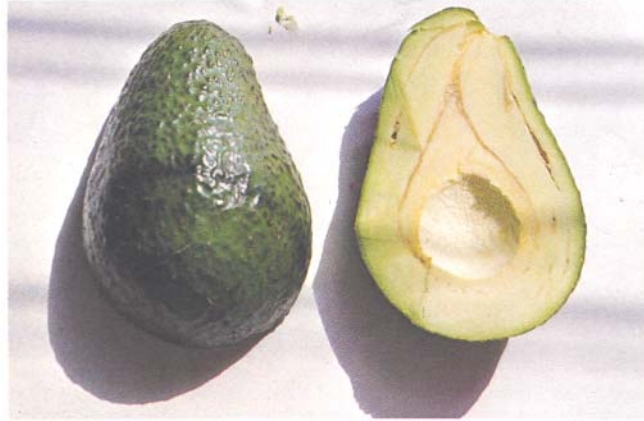
Cold damage showing no internal disorder



The difference between cold damage and fungal damage

Frost injury

This problem originates from very low, pre-harvest temperatures in the orchard. It sometimes only becomes evident after harvesting and packing. Externally, the fruit appears wrinkled and shows a "dulling" on one side. Internally, cracks appear in the flesh, predominantly in the neck region. These are usually outlined in brown, although in mild cases only a brown stripe is present. This symptom should not be confused with vascular bundle discolorations or advanced stem-end rot.



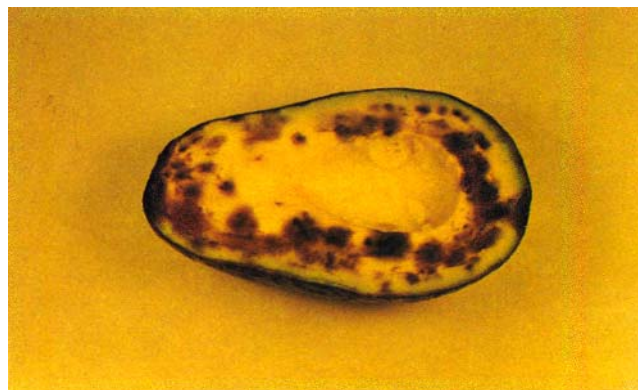
Frost damage

Vascular bundle backening

Only the vascular bundles are black when the fruit is cut open. The discolouration then develops outwards. Contrary to vascular browning, the symptoms are concentrated, to a larger degree, in the neck. This disorder is often confused with pulp spot for understandable reasons.



Pulp spot/vascular blackening



Vascular blackening

Pulp spot

Grayish/black round spots are sometimes visible as the fruit is cut, but usually only develop after the cut fruit has been exposed to the atmosphere. The spots are associated with the cut ends of the vascular tissue, although the vascular tissue is not necessarily discolored before cutting. Pulp spot is to a large extent dependant on season, and as a rule is only evident at the

beginning of the season. As already mentioned, pulp spot is often confused with vascular blackening.

Pulp spot and vascular blackening are related biochemically in that the discolouration is caused by the same reaction. The only difference is that in pulp spot, the reaction occurs in the flesh whilst in vascular blackening it begins in the vascular tissue (bundles) and moves outwards from there. When the problem (in both cases) is serious, the symptoms look almost identical and it is very difficult to differentiate between them. Therefore, some researchers suggest that vascular blackening and pulp spot should be combined and the description of pulp spot extended to include both disorders. Others feel that the symptoms should be kept separate to accommodate whatever causes them to spread differently.



Pulp spot

Vascular browning

This disorder, which is associated with poor temperature control (too high or too low) must not be confused with stem-end rot, frost injury or vascular blackening. The disorder specifically describes a brown vascular bundle discolouration which usually starts at the blossom end of the seed. The symptom is already visible when the avocado is cut, but becomes more pronounced thereafter.



Vascular browning



Vascular browning (X-section)



Vascular browning caused by stem-end rot

Internal browning

This problem is caused by death of the tissue as a result of factors such as suffocation or ageing, and the symptom is a specific browning reaction. In this case, the tissue death may be a quick process which only affects the flesh. The disorder also usually spreads from the blossom end of the fruit.

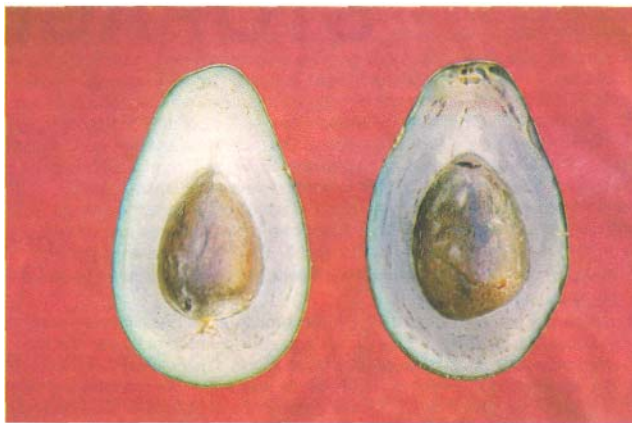
The dead tissue loses its ability to ripen, has a bad smell if the problem is serious, and becomes rubbery instead of softening normally. As is generally the case with internal discoloration, this disorder is usually only found in fruit which has been stored for a considerable period. This symptom must not be confused with grey pulp.



Grey pulp

An evenly-distributed grey discoloration which usually spreads from the blossom end. This symptom is generally associated with senescence or ageing and is probably a slow process. It differs from internal browning in that the actual browning reaction does not necessarily take place here.

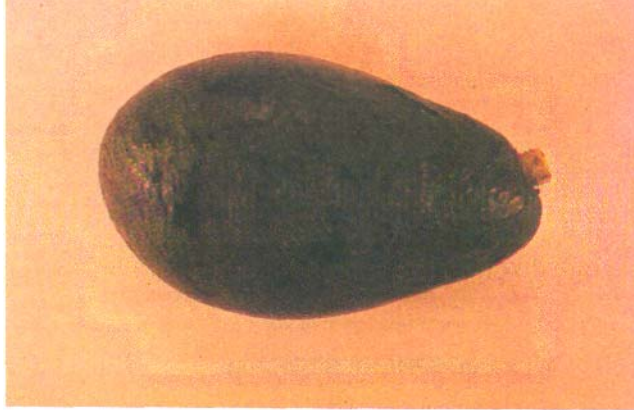
The grey colour is visible as soon as the fruit is cut, but can subsequently darken further.



Grey pulp

C. Mechanical

Mechanical damage caused by scratching, chafing, roller damage or bruising, enhances fungal infection. In addition, ripening is accelerated and therefore shelf-life is shortened. The poor appearance caused by mechanical damage is worsened by low temperature storage.



Mechanical damage



Mechanical damage