

# The 2004 South African Avocado Export Season: Report on the quality of fruit exported to Europe, with special reference to new technologies

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## ABSTRACT

*The 2004 South African avocado export season was relatively trouble free, both in terms of marketing difficulties and in terms of quality defects.*

*Marketing difficulties were mainly caused by temporary over-supply situations, but quality defects also had an impact on sales prices.*

*As has been the case for several years now, the two most serious quality defects were black cold injury (unusually, this was more common on Hass than on Fuerte) and grey pulp (especially for later season Fuerte). These results are discussed in some detail.*

*Extensive use was made of 1-MCP technology during 2004, with some very positive results. Details are provided of these results, together with possible explanations of why there were some instances when the treatment appeared not have been effective.*

*The South African avocado industry has the knowledge and experience to continue to improve the quality of exported avocados. This is our greatest advantage for ensuring the continued profitability of the industry in an increasingly competitive market.*

## INTRODUCTION

2004 was a year during which the South African avocado industry supplied fairly good quality fruit to the traditional export markets of Europe and the United Kingdom. It would thus be expected that South Africa's reputation for supplying superior quality avocados have been enhanced.

Unfortunately, this is not the universal opinion of the overseas buyers, for a number of reasons. South Africa increasingly has to compete with other supplier countries, some of which (most notably Peru and Chile) have also acquired the reputation for supplying good quality avocados. This increased competition accounts for some of the negative perceptions regarding South African fruit – it has allowed the European trade to become increasingly stringent in its demand for superior quality avocados. In an over-supplied market, buyers have a wide range of produce to choose from and will naturally select better quality fruit; alternatively they will demand discounts for fruit, which they judge to be of inferior quality.

Despite the generally good quality of South African avocados during 2004, there were nevertheless a number of cases of severe quality defects, these are discussed in some detail in this article.

The industry is increasingly making use of alternatives to Controlled Atmosphere (CA) to ensure the delivery of firm fruit to the overseas markets and some information is also provided on these various technologies. For both of the foregoing, the main source of information is the quantitative quality data collected by the SAAGA Overseas Technical Officer (OTO) during the 2004 export season. Quality data are only discussed in detail for Fuerte and Hass avocados, since insufficient data was collected to allow for conclusions to be drawn as to the quality of other cultivars during 2004.

## MARKET SITUATION DURING 2004

The international co-operation initiated by SAAGA a few years ago has become increasingly successful, with the major supplier countries of avocados to the European market now sharing infor-

mation on the volumes of fruits which they are shipping to Europe each week. This has enabled the international avocado industry to co-ordinate the volumes that they deliver to Europe, thereby limiting the risk of over-supply situations – which can result in poor sales prices.

Despite this, periods of over-supply continue to impact upon prices. During the 2004 season there were two main periods when large volumes of avocados resulted in difficult marketing conditions in Europe.

The first of these was from late May until late June, where large volumes of South African, Kenyan, Spanish and Peruvian fruits were present on the market. The second over-supply situation had a relatively limited impact upon South African growers' returns, since it occurred in September and October, when the majority of South African avocados had already been exported to the European markets.

The latter over-supply situation was primarily caused by large volumes of Chilean Hass being delivered to Europe. The marketing difficulties caused by the large volumes in May and June were exacerbated by the fact that much of Western Europe experienced a very inclement and cool early summer, which negatively impacts on sales in countries (such as France) where the avocado is primarily regarded as a salad item.

## OTO SAMPLING PROCEDURES

The OTO was based in Rungis, France between March and October 2004, his primary role being to monitor the quality of South African avocados both upon delivery and when ripe. Quantitative "arrival" and "ripe" quality reports were provided to the industry on a weekly basis. Arrival quality was gauged by inspections of pallets on the day of delivery to the importers' warehouses; ripe quality data from ripened fruits originating from sample cartons collected during arrival inspections. The majority of arrival inspections were carried out at Rungis; more rarely warehouses in Benelux and England were venues for arrival inspections. Details on sampling procedures are provided in Nelson *et al.* (2001).

**QUALITY DEFECTS AFFECTING SOUTH AFRICAN AVOCADOS DURING 2004 (RESULTS FROM POST-SEASON DATA ANALYSES)**

**1) Breaking to soft deliveries**

The majority of fruit was received in a firm to hard condition, allowing importing agents to store and sell their fruit according to market conditions. Soft fruit invariably causes marketing difficulties as agents are often required to sell such fruit rapidly, which can negatively impact on market prices. There were a number of cases of soft deliveries; these are discussed under “5) New Technologies”.

**2) Incidence of rots**

It is encouraging to be able to report that the incidence of rots was low during 2004.

**3) Black cold injury**

Black cold injury has often been considered as one of the most serious quality defects affecting South African avocados. It was therefore encouraging to note that the incidence of black cold injury was low for Fuerte in 2004 – 0.09% for the season as a whole (Fig. 1).

This compares very favourably with previous seasons – in 1999, for example, the seasonal industry average for black cold

injury in Fuerte was 4.0%. It was also encouraging to note that the previously well-known trend of a higher incidence of black cold injury during the early part of the season (related to less physiologically mature fruit being more susceptible to low temperature-induced black cold injury symptoms), was not observed in Fuerte during 2004. This is possibly because the industry is taking more informed decisions based on the maturity of their fruit when selecting shipping temperature regimes.

On the other hand, Hass had an uncharacteristically high incidence of black cold injury during 2004 – 0.58% for the season as a whole (Fig. 2). Whilst this figure may not seem high compared with previous season’s much higher percentages for Fuerte and Pinkerton, it is unusually high for South African Hass, which in previous seasons has rarely been prone to black cold injury. Most unusually, the incidence of Hass black cold injury increased dramatically during the final few weeks of the season. SAAGA has been collecting ripe quality data since the late 1980’s, and during no previous season has such a trend been seen. It is postulated that unusual climatic conditions contributed to the high incidence of black cold. It is also postulated that physiologically mature Hass fruits might be susceptible to black cold injury under certain conditions. It is speculated that certain exporters had been using unacceptably low temperature regimes for their late season Hass, but it should also be noted that during previous seasons, even lower temperature regimes had been used with positive

results. Further investigation is required. No regional differences in incidence of black cold injury were noted for either Hass or Fuerte.

**4) Grey pulp**

The incidence of grey pulp remains a problem. For Hass, the incidence of grey pulp was 1.69% (Fig. 3), which is the second lowest figure since 1999 (0.4% for 2003). This in itself is encouraging, as was the fact that no trend in increasing grey pulp was observed for Hass as the season progressed. Grey pulp is known to be more common in more mature / over-mature fruits and in previous seasons Hass grey pulp increased later in the year. This suggests that growers are taking into account the maturity levels of their Hass when harvesting and selecting temperature regimes.

Unfortunately, the same cannot be said for Fuerte (Fig. 4), where the seasonal average for grey pulp was 8.08% and with a sharp increase in incidence for later season fruits. An 8% seasonal incidence is unacceptably high and it should be noted that whilst the incidence of Fuerte grey pulp was lower (4.83%) for 2003, in both 2002 and 2001 the incidence of grey pulp was likewise around 8%. It is

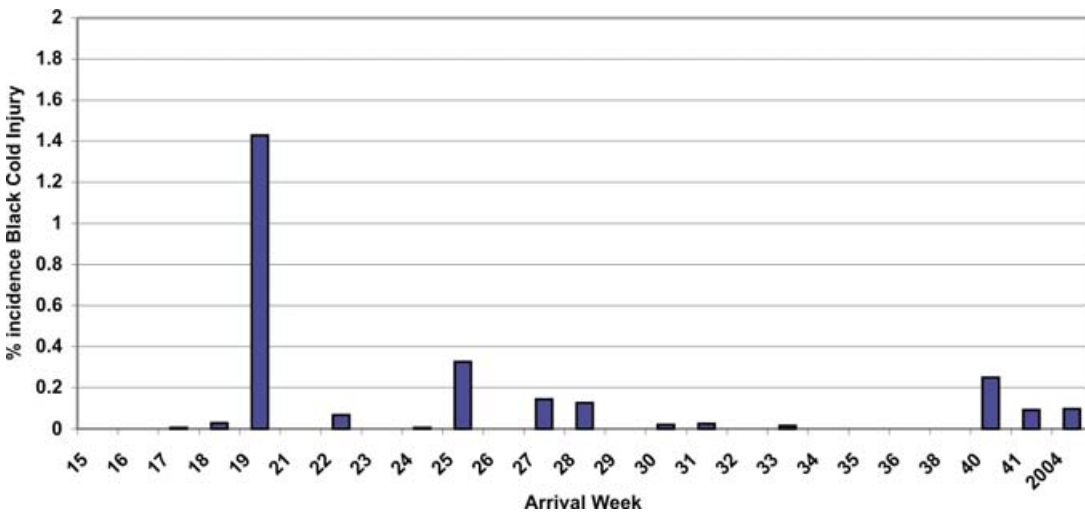


Figure 1. 2004 Fuerte arrival – % black cold per week.

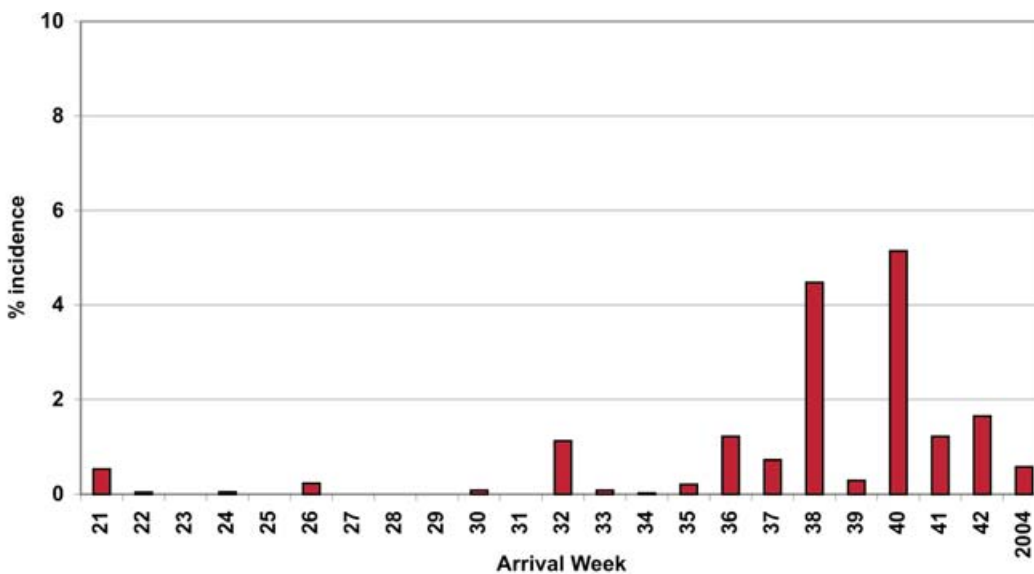


Figure 2. 2004 Hass arrival – % black cold per week.

interesting to note that fewer complaints are received from abroad regarding grey pulp in Fuerte than is the case for Hass. This is largely because very little Fuerte is trigger-ripened in the United Kingdom's pre-ripening programmes; thus less quality control feedback is received from this source. In contrast, large volumes of South African Hass are pre-ripened in the UK. In order to minimise the risk of increased grey pulp in later season fruits, all growers and packhouses are strongly encouraged to follow SAAGA's maximum maturity recommendations for all cultivars. No regional differences in incidence of grey pulp were noted for either Hass or Fuerte.

## 5) New Technologies

### 5.1 1-MCP

Due to a shortage of reefer containers mid-season, a number of exporters made use of port-hole containers, treating their fruits with 1-MCP immediately prior to containerisation in Cape Town. The suppliers of 1-MCP advised their clients at the time that the best results achieved with 1-MCP were when the avocados were treated with the gas within 72 hours of packing (for the port-hole consignments, the 1-MCP gassing took place a week or longer after packing). As a result, the 1-MCP suppliers did not guarantee that the port-hole containerised fruit would arrive at destination in a firm condition. Following shipment, it was learned that most port-hole consignments of 1-MCP treated fruit arrived in a

breaking to very soft condition. Despite sub-optimal conditions for their port-hole consignments, Westfalia had some firm 1-MCP port-hole deliveries – this was not the case for either H.L. Hall & Sons or Afrupro. Westfalia was able to confirm that their most successful shipments of porthole fruit had been with "deadline" (i.e. younger) fruit which had been delivered to the harbour shortly before the scheduled departure of the vessel – despite this they do not recommend the use of 1-MCP for porthole containers when the 1-MCP is applied in the harbour. In contrast, Westfalia made extensive use of 1-MCP in reefer (integral) containers during both the 2003 and the 2004 export seasons. Their fruit was loaded into containers at Tzaneen railway station and the MCP gas applied within the 72 hour recommended period. All consignments arrived in a firm condition (J. Bezuidenhout, pers. comm.). The OTO saw and sampled a considerable number of Westfalia's 1-MCP treated integral container consignments delivered to European warehouses during 2004. Post-cold-chain shelf life was comparable to that for fruits transported under controlled atmosphere. At the International Avocado Conference in Malaga, which the author attended in October 2003, a number of speakers indicated that 1-MCP treated fruits were prone to developing fungal rots. Based on their results from extensive studies and commercial trials, the ITSC (Lemmer and Kruger, pers. comm.) indicated that for the 2004-export season, this was not found for South African 1-MCP treated avocados. The OTO's own observations of 1-MCP treated fruits exported to Europe confirmed that

fungal rots were not higher compared with CA treated fruits during 2004. To the contrary, it appeared as if 1-MCP treated fruits had a lower incidence of rots than did CA treated avocados. It should be noted that whilst South Africa now has two years worth of experience in exporting 1-MCP treated fruits, both of these years have been relatively dry seasons. It is necessary to test 1-MCP during a higher rainfall season, when pathological defects are more common and harder to control.

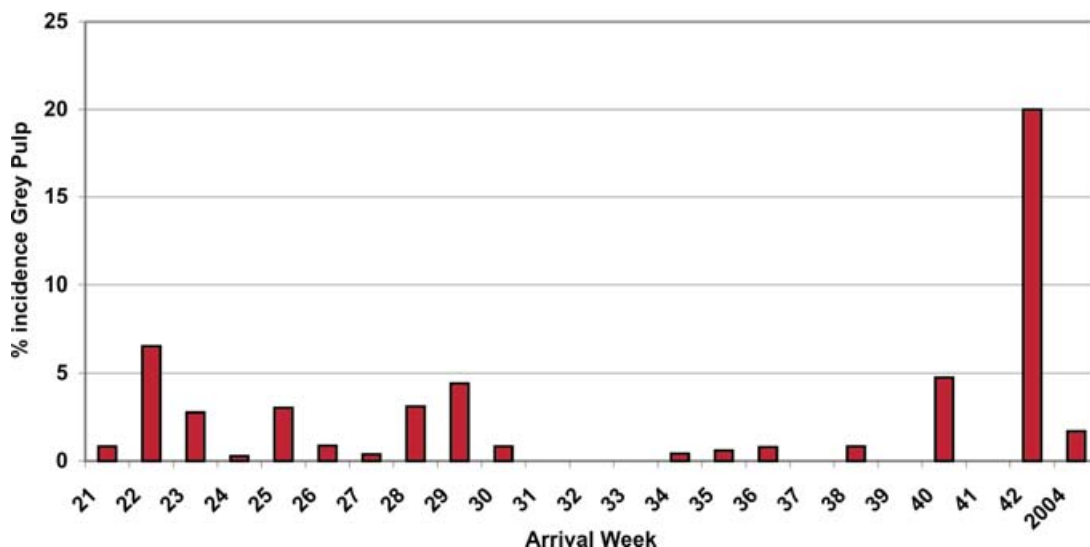


Figure 3. 2004 Hass grey pulp per week.

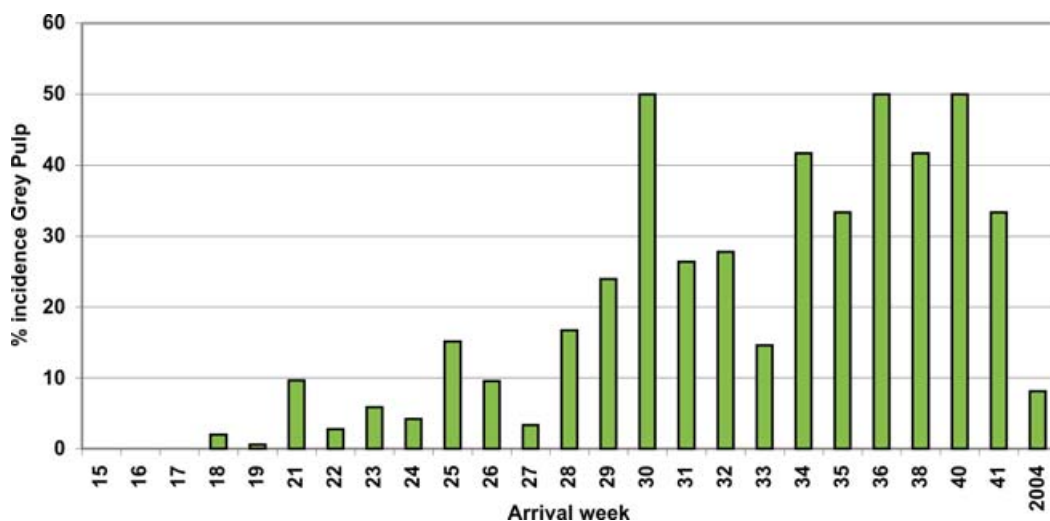


Figure 4. 2004 Fuerte grey pulp per week.

### 5.2 Breakbulk and citrus

In 2004 Westfalia conducted a number of trial shipments of 1-MCP treated avocados (Hass and Ryan varieties) in breakbulk holds together with Valencia oranges at 4.5°C. Fruits arrived in a firm condition and ripe quality and post-delivery shelf life were generally good (J Bezuidenhout, pers. comm.). Since citrus is often warm-loaded, it is important to stress that pre-cooled citrus must be used if the MCP treatment is to be effective for the avocados. Furthermore, since early season citrus fruits tend to be shipped at higher temperatures (e.g. 8 to 10°C), higher dosages of 1-MCP would need to be used in order to

avoid premature ripening.

It was noted that for the unloading process in the European harbours (in summer) in particular, logistical operations would need to be in order to avoid lengthy breaks in the cold-chain, which would break 1-MCP's inhibitory effect on ripening and result in shorter shelf life.

### 5.3 AFAM+ (Advanced Fresh Air Management)

Thermoking's AFAM+ technology is not currently available in South Africa and no trials on South African fruits were undertaken during the 2004 export season. The OTO was involved in some AFAM+ trials during 2003 and the results were positive – post delivery fruit shelf life was comparable to CA treated avocados and ripe quality of this fruit was generally good.

### 5.4 Extend Bags

Koelthof Packhouse used Extend Bags for a number of consignments during 2004 and reports were received that the results were satisfactory.

## SUMMARY AND RECOMMENDATIONS

For long term survival in an increasingly competitive market, the South African avocado industry needs to ensure that top quality fruit is delivered to clients. The industry has made considerable progress in this regard – especially when one recalls the situation of not too many years ago, when soft deliveries to the European markets were a common occurrence. Likewise, the incidence of severe quality defects is now far lower than was the case a few years ago.

Despite this progress, South Africa continues to experience quality defects with export consignments. The most serious quality defects remain black cold injury and grey pulp.

Several years of research have provided the industry with a good understanding of the relationship between fruit physiological maturity, shipping temperatures and the susceptibility of avocados to black cold injury. Specifically, it is well known that less mature avocados are more prone to developing chilling injury and hence higher temperature regimes tend to be used for early season fruits. Observations during more recent years have provided increasing evidence that orchard conditions (e.g. soil nutrient status, local weather conditions) also affect the susceptibility of fruits to chilling injury. The strongest evidence for this is where it is reported that specific growers' fruits have a higher incidence of black cold injury than do fruits from other growers from the same region (and even, in some cases, from the same packhouses). Whilst it is generally believed that black cold injury is an early season quality defect, there have been a few cases in recent years which suggest that black cold may also manifest itself in later season fruit.

This would strongly suggest that over-mature fruits can also be prone to chilling injury. Whilst the reasons for this are unclear, it is recommended that growers consult closely with SAAGA technical staff when planning on harvesting later season fruits. Local weather conditions and orchard soil nutrient levels also need to

be carefully monitored.

As has been the case for a number of years, in 2004 the incidence of grey pulp increased to an unacceptable level in later season Fuerte. Physiologically very mature fruits are very prone to grey pulp and fruit maturity levels should be carefully monitored prior to harvest.

The use of 1-MCP as an alternative to Controlled Atmosphere has proved effective when the technology is used for fruit to be transported in integral containers and when the fruit has been 1-MCP treated within a few days of harvest. The use of 1-MCP has not been effective when the treatment has been applied several days after harvest.

The experience and technological knowledge which the South African avocado industry possesses – and thus the ability to ensure that good quality fruits are delivered to our clients – is our greatest advantage in an increasingly competitive market. Adapting and improving whilst still making use of our wealth of knowledge, will insure the long-term future of the industry.

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## LITERATURE CITED

- EKSTEEN, G.J., BEZUIDENHOUT, J., KEEVY, C., NELSON R., REAY, N. and ROBERTSON, R. 1998. The Effect of Intransit and Storage Conditions on the Quality of Avocados – 1997 Season. *South African Avocado Growers' Association Yearbook* 21: 100-108.
- LECLERCQ, H.J.H. 1989. Observations on the Quality of Avocados on the Overseas Market. *South African Avocado Growers' Association Yearbook* 12: 14-16.
- NELSON, R.M., BEZUIDENHOUT, J.J. and DONKIN, D.J. 2001. An Overview of the Export Market Situation and Fruit Quality during the 2000 Export Season. *South African Avocado Growers' Association Yearbook* 24: 5-12.
- NELSON, R.M., BEZUIDENHOUT, J.J. and DONKIN, D.J. 2002: Factors Influencing Export Fruit Quality – 2001 Export Season. *South African Avocado Growers' Association Yearbook* 25: 54-62.
- NELSON, R.M., DONKIN, D.J., BEZUIDENHOUT, J.J., EKSTEEN, G.J., HUYSAMER, M. and OOSTHUIZEN, M. 2000. Evaluation of Avocados Exported to Europe and the UK during the 1999 Season. *South African Avocado Growers' Association Yearbook* 23: 21-29.
- NELSON, R.M., BEZUIDENHOUT, J.J. and DONKIN, D.J. 2003. Trends in the Quality of Exported Avocados: Report on the Quality of Fruits exported to Europe during the 2002 Export Season and Comparisons with Previous Seasons. *South African Avocado Growers' Association Yearbook* 26: 113-122.