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Factors influencing export fruit quality: 2001 season

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ABSTRACT

The SAAGA Overseas Technical Officer inspected and sampled South African avocados exported to the European markets during 2001 – this article reports on the quality of this fruit following post-season data analysis by the SAAGA Temperature Committee. South African avocados were prone to a number of quality defects during the 2001 export season; many of these defects can be ascribed to the fact that 2001 was a low-production season for most growers – as a result the fruits were more prone to quality defects.

Fuerte avocados were quite prone to Black Cold injury throughout the season. Soil nutrient imbalances have been found to influence the susceptibility of fruits to Black Cold injury.

The main quality defects for Hass fruits were soft arrivals and internal Grey Pulp. Fruit maturity is indicated as a contributing factor towards the incidence of soft arrivals and grey pulp; fruit maturity of later season fruits thus needs to be carefully monitored. Time from packing to arrival in Europe was often longer (approximately 28 days on average) than generally considered desirable. The industry needs to land fruit on the overseas markets sooner after packing if quality defects are to be avoided. Numerous logistical difficulties in the South African harbours, together with shipping delays, were the major cause of the extended period between packing and arrival in Europe.

Pinkerton fruit was often affected by Black Cold injury and Grey Pulp. Fruit from specific growers was often more prone to these defects. Soil nutrition and fruit maturity play an important role in determining Pinkerton fruit quality.

Insufficient fruit of other cultivars was inspected for meaningful comments to be made on the arrival and ripe quality of these cultivars.

INTRODUCTION

For the majority of South African avocado growers 2001 was a lower-yielding season, due to the avocado's alternate bearing cycle (generally referred to as "off-years" versus "on-years"). The incidence of quality defects in South African avocados exported to the European Market tends to be higher during an off-year than is the case during on-years. Throughout the 2001 export season, numerous reports were received of quality defects that were causing marketing difficulties. This article quantifies the type and severity of these quality defects using data collected by the SAAGA Overseas Technical Officer (OTO). Insight is provided into the factors contributing to quality defects. Hass and Fuerte exports are discussed in detail, but only brief comment is provided for some of the other export cultivars, since volumes of these cultivars inspected by the OTO were limited, making objective reporting difficult.

SAMPLING PROCEDURES

The OTO was based in Rungis, France between late March and early October 2001, his primary role being to monitor the quality of the South African avocados both upon arrival 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 was collected from samples that were allowed to ripen. The majority of arrival inspections were carried out at Rungis; more rarely warehouses in Rotterdam and England were venues for arrival inspections. Details on sampling procedures are provided in Nelson *et al.*, 2001.

Post-season data analyses concentrated on the following:

1) Percentage incidence at delivery of breaking to soft fruits.
2) Percentage incidence at delivery of ex-

ternal chilling injury ("Black Cold").

3) Percentage incidence of Anthracnose and / or Stem-end Rot (ripened sample fruits.
4) Percentage incidence of internal disorders (e.g. "Grey Pulp") for ripened sample fruits.
5) Regional differences in percentage incidence of quality defects.

FUERTE QUALITY

1) Numerous complaints were received of **Black Cold** injury during the 2001 season. This defect was cited as causing severe marketing difficulties and accordingly it was generally perceived that the incidence of Black Cold was higher during 2001 than has been the case during previous seasons. Whilst it is true that Black Cold incidence was indeed common across the industry, the actual percentage incidence of this defect was in fact lower than has been the case for a number of years. Data collected by the OTO showed that the average percentage incidence of Black Cold for the 2001 season was 0.899%. This compares favourably with previous "low production seasons" ("Off-years", when fruits tend to have a higher percentage of quality defects):

1999: 4.0% Black Cold (Nelson et al., 2002)

1997: 2.0% Black Cold (Eksteen et al., 1998).

The obvious conclusion to be drawn from this is that the European buyer is becoming increasingly discerning and thus only the best quality fruits are acceptable. It should be noted that during the previous "high production season" ("on-year") – 2000 – Black Cold incidence on Fuerte was very low, at 0.25% (Nelson *et al.*, 2001), and very few complaints were received during that year of Black Cold causing marketing difficulties. European traders are unlikely to remember that 1999's fruit had a far higher incidence of Black cold than was the case during 2001. In contrast, memories of the 2000 season would still be fresh enough for the traders to be able to make the observation that the incidence of Black Cold was considerably higher during 2001 than was the case during 2000. The OTO quality data for these two seasons confirms this, since 0.899% (2001 percentage incidence Fuerte Black Cold) is more than three times higher than 0.25% (2000 percentage incidence Fuerte Black Cold).

It is important to quantify what a percentage of 0.899% Black Cold equates to in terms of actual volumes of fruit affected by this defect: Based on a total export volume of 2 811 579 Fuerte cartons, this equals 101.1 tons of fruit with Black Cold.

Unlike the trend seen in previous seasons, **Black Cold** was **not more common during the earlier part of the season** – on the contrary, a high percentage incidence was recorded during the mid- to latter-parts of the season. The same trend was seen for packhouse and regional figures in addition to for the industry as a whole, and indicates that more physiologically mature fruits were more susceptible to Black Cold than was the case for earlier season fruits. This suggests that fruit maturity levels need to be carefully monitored when selecting avocados for the export market. Fig. 1 shows the

Figure 1

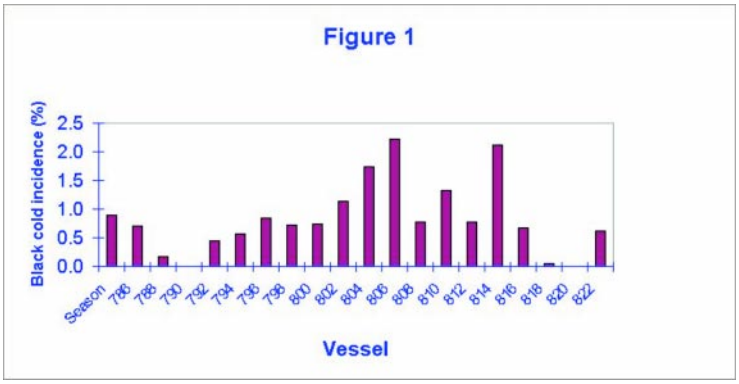
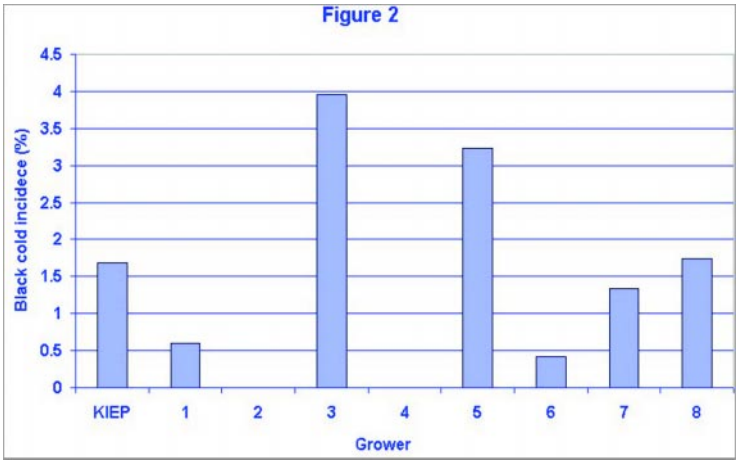


Figure 2



percentage incidence of Black Cold injury for Fuerte fruits upon arrival throughout the 2001 export season.

Larger-sized fruits were more prone to Black Cold. Differences in percentage incidence of Black Cold were observed for the various production areas:

Kiepersol	:	1.686%
Nelspruit	:	0.934%
Levubu	:	0.842%
Tzaneen	:	0.824%
Northern Natal	:	0.4%
Southern Natal	:	0.03%

(Industry average = 0.899%).

It was also observed that the most **severe cases of Black Cold** were invariably confined to fruits **from specific growers** and / or (less commonly) packhouses. Investigation of specific cases of Black Cold by the SAAGA field officers revealed that in most cases growers whose fruits were more susceptible to Black Cold had sourced the problematic fruits from orchards which had soil nutrient imbalances (e.g. high levels of nitrogen or phosphate). This is a clear indication that correct soil nutrition plays an important role in determining fruit quality. Examples of differences in incidence of Black Cold per grower / region are shown in Figs. 2 through 5.

It was very rare to find instances where Black Cold injury could be ascribed to incorrect temperature regimes subsequent to fruits leaving the packhouse (e.g. during the voyage).

2) **Grey Pulp** was NOT reported as a major **Fuerte** quality defect by the European trade. This is presumably because most of the information on internal defects causing marketing difficulties that is received by the industry, originates from the United Kingdom. There is a well-developed avocado-ripening programme in the UK, where strict quality assurance guidelines are followed in order to meet the requirements of supermarket buyers. The results of these quality assurance programmes are communicated to the South African suppliers. This information compliments the quality data collected by the OTO and gives the best indication of what the market perceives as being a good quality avocado (and hence one which is saleable for a good price). However, the supermarket-ripening is almost exclusively for Hass avocados – thus little quantifiable information is received about the ripe quality of Fuerte and other green-skinned avocados.

In total, 8.38% of the Fuerte fruits sampled by the OTO showed Grey Pulp upon ripening. Based on a Fuerte export volume of 2 811 579 cartons, this equates to 942.4 tons of Fuerte fruit with Grey Pulp. Thus (despite the lack of information about this problem from the supermarkets) it is clear that Grey Pulp is a sig-

Figure 3

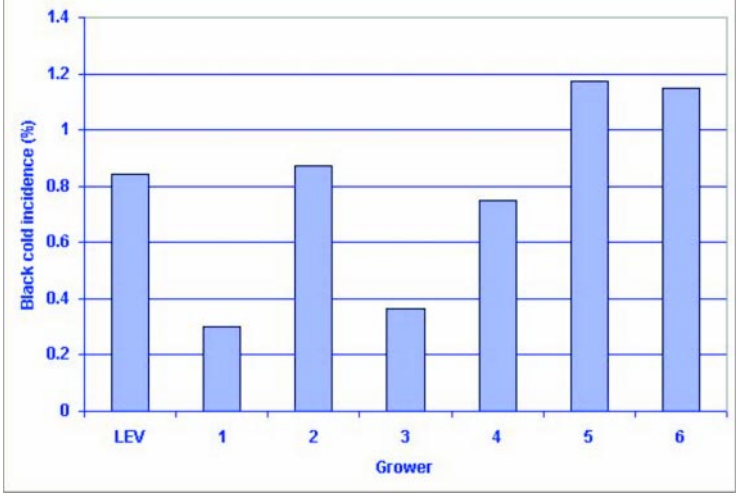
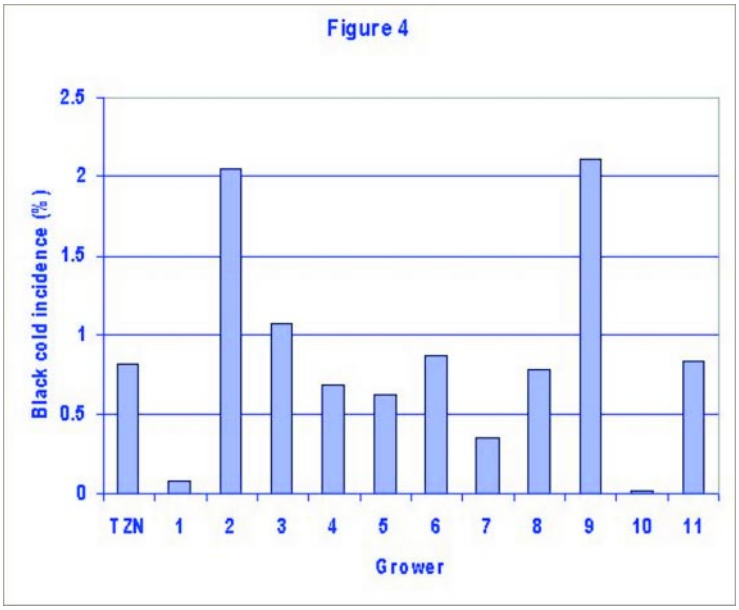


Figure 4



nificant problem, which can negatively influence the image of South African avocados in the eyes of the end-consumer. Fig. 6 shows the incidence of Grey Pulp in ripened Fuerte avocados throughout the 2001 export season. It is clear from the graph that incidence of Grey Pulp increased in later season fruit. This is a clear indication that the later season fruits were physiologically over-mature and hence more susceptible to internal quality defects.

HASS QUALITY

1) **Soft arrivals** accounted for 3,34% of the Hass fruit inspected by the OTO. Based on a total export volume of 3 675 174 cartons, this equates to 491.003 tons of soft fruit. It was found that there was a **very strong correlation between fruit age** (from date of packing) upon arrival in Europe and **fruit firmness** upon arrival – the older the average fruit age upon arrival, the greater the incidence of breaking to softer fruits. Fig. 7 shows that Vessel 810 carried the highest percentage of breaking to softer fruits – the average age of fruits upon arrival was over 30 days (from date of packing), making the fruits on this vessel significantly older than the seasonal average.

2) **Grey pulp** incidence was 6.41% in the same sample Hass fruits inspected by the OTO. Based on the total Hass volumes exported, this equates to 942.3 tons. There were no clear seasonal trends but regional differences in Grey Pulp incidence were observed:

Industry	:	6.41%
Kiepersol	:	13.54%
Levubu	:	7.06%
White River	:	2.99%
Tzaneen	:	1.67%
Southern Natal	:	0.90% .

There was also a strong **relationship between fruit age** from date of packing (upon arrival) and **incidence of Grey Pulp** when ripe (Fig. 8). This is certainly related to fruit firmness as mentioned above. Older fruits that ripen in transit are softer upon arrival and have a higher incidence of internal defects (Grey Pulp). More physiologically mature fruits will be more susceptible to quality deterioration as a result of extended transit times.

3) **Shipping delays** were the main cause of fruits being several days older (from date of packing) than is normally the case upon arrival in Europe. The industry average for Hass fruit age upon arrival, was 27.2 days, meaning that a considerable proportion of the fruits inspected over the 2001 season were older than this – 30 days or more. This compares very unfavourably with fruit age during more recent export seaons, e.g.:

1997 : 24.6 Days
(Eksteen *et al.*, 1998)
2000 : 25.5 Days
(Nelson *et al.*, 2001).

As far back as 1989, Leclercq noted: "An exponential increase in fruit disorders can be expected in fruits older than 28 days upon arrival at Rungis". The nature of the transport chain has changed considerably since the late 1980s. When Mr Leclercq was serving as the SAAGA Over-

Figure 5

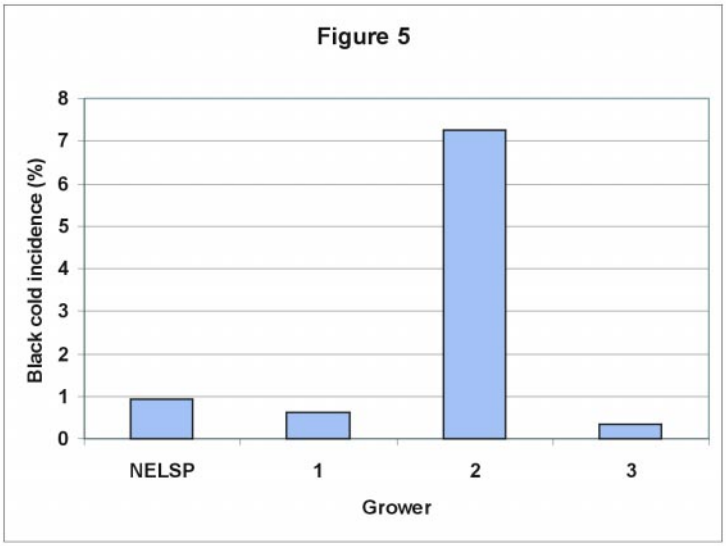
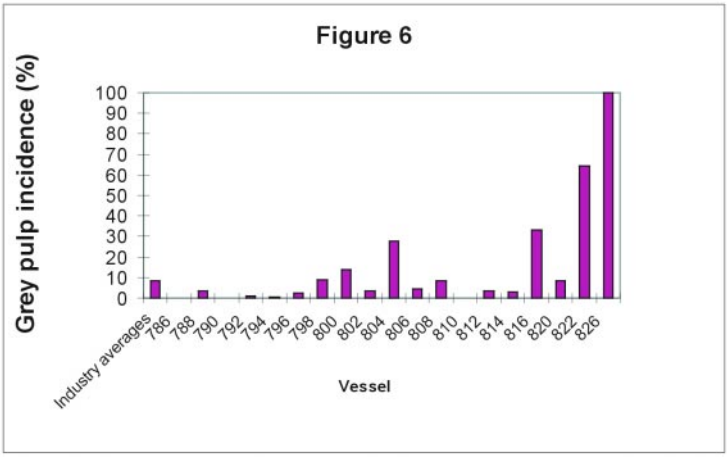


Figure 6



seas Technical Officer, most sea-freighted avocados were transported in Regular Atmosphere "porthole" containers and correct temperature regimes, unbroken cold-chains and quick transport were crucial in ensuring that firm fruit was delivered to the European market. The advent of Controlled Atmosphere ("CA") technology for avocados in the latter 1990s was soon shown to have beneficial effects on fruit firmness and shelf life (e.g. Eksteen *et al*., 1998). In consequence, by 2000 the overwhelming majority of sea-freighted avocados were being transported under CA and instances of soft arrivals were rare. The high incidence of soft arrivals of CA transported Hass fruits during the 2001 season was therefore alarming, and indicates that despite the benefits of CA, transit times (i.e. age from date of packing upon arrival at the overseas markets) are critical in ensuring that fruit arrives in a firm condition.

4) There was also some concern that **handling procedures** for containers of avocados received at **European ports over weekends**, might have been inadequate and had contributed to rapid fruit ripening. It was observed that fruits were often softer upon delivery to European warehouses when containers had been held at the ports of Le Havre and Rotterdam for longer than a few hours, due to containers having been discharged from the vessels over weekends. In such cases, pallet air temperature recorders (e.g. "Ryan", "Temptale") indicated steady rises in temperature in the period corresponding to the time during which the containers would have been in the ports. This strongly suggests that the containers were not under refrigeration at the ports, which would trigger rapid ripening and result in soft or ripening fruits being received at the importers' warehouses.

PINKERTON QUALITY: Insufficient data is available for meaningful comparisons of Pinkerton fruit quality for the different production regions. **Black Cold** injury and severe **Grey Pulp** remain the most important quality defects for this cultivar. **Quality differs according to grower origin.** Some improvements in quality may have been noted compared with past seasons, but for those growers whose fruit has in the past had severe quality defects, the incidence of such defects in general remains unacceptably high.

RYAN QUALITY: The arrival quality of Ryan fruit was generally good, with most fruit arriving in a hard condition, with no Chilling Injury being observed. It was noted that Ryan fruits were especially prone to Cercospora. Ripe quality of Ryan was good, rots being rare. Incidence of Grey Pulp in ripened Ryan samples was in general rare, however some later season samples showed an increase in incidence of Grey Pulp – this indicates that some of this fruit was overmature when harvested.

EDRANOL QUALITY: Very little Edranol was inspected by the OTO during the 2001 season – making generalisations on quality difficult. A number of pallets of Edranol were noted to carry a high percentage of breaking to softer fruits upon arrival – there did not appear to be a correlation between fruit age (from date of packing) and fruit firm-

Figure 7

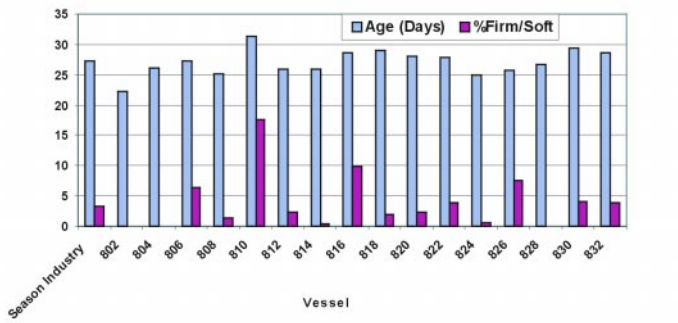
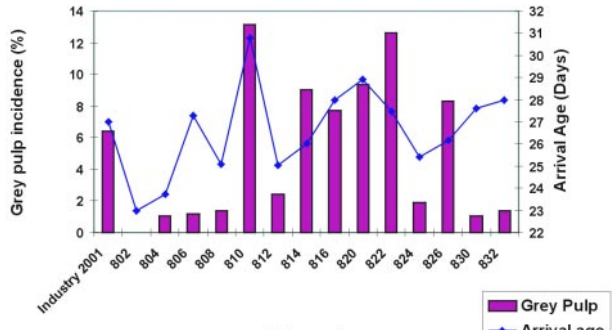


Figure 8



ness upon arrival. Several Edranol fruits displayed Black Cold symptoms upon arrival, when ripe there were also occasional cases of Brown Cold and Dusky Cold. Incidence of Grey Pulp appeared to be confined to fruits from specific growers.

SUMMARY AND RECOMMENDATIONS

Quality defects were sometimes quite severe during the 2001 South African Export Season. 2001 was a low production season for the South African industry and many of these quality defects can be ascribed to the fact that during low production seasons avocados tend to be more susceptible to quality defects.

The incidence of Black Cold injury on Fuerte was indeed higher than was the case during 2000 (the previous "high-production" season), but the incidence thereof was nevertheless lower than previous low production seasons. Incidence of Black Cold was common throughout the season. Fruit from some growers was found to be more susceptible to Black Cold injury; soil nutrient levels seem to strongly influence the susceptibility of fruits to Black Cold injury. Growers whose fruit has been found to be prone to Black Cold are encouraged to interact with the SAAGA technical staff. Later season Fuerte was found to be more prone to Grey Pulp. There is therefore a need to determine maximum maturity levels for export.

The main quality defects for Hass fruits were soft arrivals and Grey Pulp – especially for later season fruit. To a large degree, many of these quality problems can be correlated with fruit having being older than 30 days from date of packing upon delivery to Europe. Shipping delays and logistical difficulties in the South African harbours were largely to blame for advanced fruit age. Regardless, the industry should do everything in its power to ensure that young fruit (preferably less than 25 days) is delivered to Europe. It is also certain that some later season Hass was already fairly physiologically mature when exported; physiologically mature fruit is more prone to Grey Pulp and also ripens more rapidly than less physiologically mature fruit. Maturity of later season Hass needs to be carefully monitored to minimise the risk of such quality defects.

The well-known quality defects (Black Cold and Grey Pulp) to which Pinkerton fruits are prone were again quite common during the 2001 season. It was however noted that the incidence and severity of such defects varied considerably according to grower origin. Fruit maturity and soil nutrient levels play an important role in determining Pinkerton fruit quality (Snijder, *et al*., 2002) and growers should interact with the SAAGA technical staff.

Insufficient Edranol or Ryan fruits were inspected to be able to make generalisations on fruit quality.

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