

POSTHARVEST MANAGEMENT OF SOUTH AFRICAN AVOCADO FRUIT

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Introduction

The South African avocado industry has specific logistical problems with regards to exports. Firstly, the major production areas are in the Northern Province, some 1800 km from the export harbour in Cape Town. Cape Town is in turn some 10000 km from the European ports to which South African fruit are exported. Volumes of subtropical produce do not currently justify the regular use of vessels with refrigerated holds, so the industry is dependent on the use of refrigerated container vessels which take 14 days to travel from Cape Town to Europe. Fruit must be held in Cape Town in a special refrigerated container-store, awaiting the departure of each vessel. When fruit reaches the distributors in Europe it is therefore 23-26 days old. During this long storage period at low temperatures, chilling injury, physiological disorders and diseases can develop. Temperature management according to fruit characteristics is therefore one of the most important factors determining ripening rate and fruit quality on the overseas market. Some factors affecting the quality of avocado fruit undergoing long distance transport are discussed in this paper.

Cultivar

The cultivar Fuerte, which still constitutes about 60% of the South African avocado exports, is vulnerable to cold injury and internal physiological disorders such as pulp spot and grey pulp. Early season Fuerte fruit are very sensitive to external cold injury. The incidence of pulp spot is also potentially high early in the season and drops later in the season, whereas grey pulp is likely to increase as the season progresses. Fuerte fruit quality varies between seasons, and any conditions promoting poor fruitset but vigorous

vegetative growth, are inclined to lead to poor storage quality of fruits (Eksteen & Bester, 1987).

Mass is less prone to physiological and pathological disorders than is Fuerte. However, lenticel damage and uneven skin colouration upon ripening may be problematic at times.

Postharvest wax treatment

For about 20 years, a polyethylene wax has been used by most South African avocado packhouses to prolong the storage life and improve the shine of avocado fruit. Since 1997, Stafresh, a natural wax emulsion containing shellac and carnauba, is used (Kremer-Köhne & Duvenhage, 1997).

Fruit maturity (oil/water content)

Avocados for export must contain not more than 80% moisture. It is recommended however, that the cultivars Hass and Ryan are not exported unless the moisture content is less than 77%, as experience has shown that at above 77% moisture, ripening can be uneven and shrivelling may occur. For plantings in the cooler, more southerly area of inland Natal, the respective moisture percentages should be about 5% lower, to ensure proper ripening of fruit destined for export (SAAGA, 1994). During the avocado season, shipping temperatures are adjusted downwards as the water content of the fruit decreases.

Storage Temperature

The maintenance of the cold chain is essential in the long term storage of avocados. After picking, fruit should be kept in the shade and transported to the packhouse within two hours of picking. At the packhouse, pre-cooling of the fruit to 16-18°C is advisable before packing. Immediately after packing, it is essential to cool the fruit down to a pulp temperature of 7-8°C before loading the fruit into refrigerated trucks which transport the consignments to the export harbour.

While the ideal is to export firm fruit with no external cold damage and no physiological or pathological disorders, a fine balance between firm fruit and external cold damage exists. A temperature regime was developed which adjusts temperatures downwards during storage, to prevent fruit from becoming soft in transit. During the season, the temperature regime for a specific cultivar needs to be adjusted according to the moisture content of the fruit (Table 1), as early season fruit is more sensitive to low temperatures than late season fruit (Vorster *et al.*, 1987).

The recommended temperature regime must be seen as a flexible tool in postharvest management. Fruit reaction to cold storage may differ from season to season. Therefore, reliable and detailed feedback from overseas markets on the firmness of the fruit, the occurrence of external cold damage and in-transit temperature recordings are of vital importance in temperature management. The variable step down temperature regime during transport has now been used successfully for the past 10 years.

Time

The time between picking and marketing is very critical. Therefore, fruit should be picked as close to shipping as possible and there should be a minimum delay in transportation to Cape Town and in transfer to containers and the ship. Similarly, long storage periods overseas will lead to rapid deterioration of fruit quality and should be avoided.

At temperatures below 6°C, external cold injury in Fuerte increases significantly if the time of storage is extended from 21 to 28 days. Similarly, grey pulp increases in all cultivars as the storage period is extended (Vorster *et al.*, 1988). For this reason, a date-coding system was introduced for all avocado exports and a prohibition was placed on the export of fruit harvested more than 12 days before the time of departure from Cape Town.

Controlled atmosphere

CA costs per kg from Cape Town to Europe are currently about double the costs using conventional containers. This cost increase must therefore be compared with the potential

price advantage of landing good quality fruit in Europe. During the 1998 season, CA containers were used for about 55% of the South African avocado exports, a record percentage due to a very warm harvesting season with fruit potentially ripening too fast.

Preripening

Most fruit exported to the UK are preripened by British prepackers working to a high set of standards with supermarkets. Fruit are ripened at 20DC using 100 ppm ethylene (humidity 85-90%, CO₂ levels should not exceed 1%) until soft. The fruit is then wrapped and stored at 2-4°C.

Conclusion

A management strategy in which temperature and time are both controlled, is necessary to ensure high quality South African avocados on the overseas market. For the past 10 years, a step down temperature program has been applied not only for the storage period, but also for the season, based on the cultivar and fruit maturity.

References

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Table 1. Recommended air delivery temperatures for the export of South African Fuerte avocados. Early season Hass and Ryan can be stored at 5.5°C for the total storage period. Lower temperatures can be considered for more mature fruit of these cultivars (Vorster *et al.*, 1990).

Fruit Moisture (%)	Coldroom Packhouse	Cold Truck	Holding Store	Vessel
78.5	7.5°C	7.5°C	7.5°C	7.5°C (Last week 5.5°C)
77.5 - 78.5	7.5°C	7.5°C	7.5°C	7.5°C (Last week 5.5°C)
76.5 - 77.5	7.0°C	7.0°C	7.0°C	6.0°C (Last week 5.5°C)
75.5 - 76.5	6.5°C	6.5°C	6.5°C	6.0°C (Last week 5.5°C)
74.5 - 75.5	6.5°C	6.5°C	6.5°C	5.5°C for entire trip
73.5 - 74.5	6.0°C	6.0°C	6.0°C	5.5°C for entire trip
72.5 - 73.5	6.0°C	6.0°C	6.0°C	5.5°C for entire trip
71.5 - 72.5	5.5°C	5.5°	5.5°C	5.5°C for entire trip
69.5 - 71.5	5.5°C	5.5°C	5.5°C	5.5°C (Last week 4.5°C)
69.5 and lower	5.5°C	5.5°C	5.5°C	5.5°C (Last week 3.5°C)