

Simulated Shipping of the Avocado Cultivars Gwen and Pinkerton at Different Temperature Regimes

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ABSTRACT

The avocado cultivars Gwen and Pinkerton were compared to Hass and Fuerte under simulated shipping conditions for 28 days. For Gwen vs Hass the temperature regimes investigated were: 5.5 °C (28 days); 6.5 °C (7 days), 5.5 °C (14 days) and 4.5 °C (7 days); 5.5 °C (14 days), 4.5 °C (7 days) and 3.5 °C (7 days); and 6.5 °C (28 days). Pinkerton vs Fuerte were stored at: 5.5 °C (28 days); 5.5 °C (14 days), 4.5 °C (7 days) and 3.5 °C (7 days); and 6.5 °C (7 days) followed by 5.0 °C (21 days). Sea freight of both Gwen and Pinkerton were found to be feasible.

INTRODUCTION

There have recently been some fairly large plantings of Pinkerton which seems to be gaining in popularity as an alternative green skin cultivar to Fuerte. There has also been some interest from certain sectors of the South African avocado industry to grow the cultivar Gwen when it becomes commercially available. Although fruit exports of Pinkerton have already commenced, the cold storage temperatures of these cultivars have not been investigated intensively. In an attempt to solve this problem, simulated shipping tests of Gwen and Pinkerton was carried out at MTS during 1994.

MATERIALS AND METHODS

Avocado fruit of the cultivars Gwen (with Hass as comparison) and Pinkerton (with Fuerte as comparison) were cold-stored at different temperature regimes (Tables 1 & 2) for 28 days and were subsequently allowed to ripen at 18 °C. The fruit were rated for fruit physiological disorders (Swarts, 1984) and fungal disease on removal from storage and when soft-ripe. Results are presented as an index (%) according to Wheeler (1969). Those parameters which had an index of zero are not presented in Tables 1 and 2.

Table 1

A comparison of the avocado cultivars Gwen and Hass at different storage temperature regimes for 28 days. Fruit were allowed to ripen at 18 °C. Moisture contents were 75.1 % for Gwen and 76 % for Hass. Data are the means of 10 cartons of count 12 or 14.

| Cultivar | Storage temperatures | On removal from storage | | | When soft ripe: External | | | When soft ripe: Internal | | | |
|----------------|-----------------------|-------------------------|---------------------|-------------|--------------------------|------------|-----------------|--------------------------|-----------|-------------------|---------------|
| | | Black cold | Lenticel damage | Firmo-meter | Black cold | Brown cold | Lenticel damage | Pulp spot | Grey pulp | Vascular Browning | Days to Ripen |
| Gwen | 5.5 °C (28 days) | 0.24 | 25.7 a ^z | 18.7 c | 0.24 | 2.38 b | 29.4 a | 0.28 | 0.0 | 0.28 | 6.1 b |
| | 6.5; 5.5; 5.5; 4.5 °C | 0.00 | 27.0 a | 17.5 c | 0.00 | 6.91 a | 34.1 a | 0.00 | 0.0 | 0.56 | 7.3 a |
| | 5.5; 5.5; 4.5; 3.5 °C | 0.28 | 28.6 a | 16.8 c | 0.00 | 6.63 a | 32.6 a | 0.00 | 0.0 | 0.0 | 7.4 a |
| | 6.5 °C (28 days) | 0.00 | 9.0 b | 22.2 b | 0.00 | 1.11 b | 9.05 b | 0.00 | 0.0 | 0.0 | 5.9 b |
| Hass | 5.5 °C (28 days) | 0.00 | 28.6 a | 25.9 a | 0.00 | 0.00 b | 28.6 a | 0.00 | 0.74 | 0.0 | 4.7 c |
| | 6.5; 5.5; 5.5; 4.5 °C | 0.00 | 26.8 a | 22.3 b | 0.04 | 0.00 b | 30.5 a | 0.00 | 0.0 | 0.0 | 4.9 c |
| | 5.5; 5.5; 4.5; 3.5 °C | 0.00 | 30.0 a | 23.2 ab | 0.00 | 0.00 b | 30.7 a | 0.00 | 0.0 | 0.0 | 5.1 c |
| | 6.5 °C (28 days) | 0.00 | 8.6 b | 22.2 b | 0.00 | 0.00 b | 8.6 b | 0.00 | 0.0 | 0.0 | 5.9 b |
| LSD (P = 0.01) | | NS | 9.59 | 3.08 | NS | 2.896 | 8.63 | NS | NS | NS | 0.51 |

^z Means in each column followed by the same letter are not significantly different according to F-test.

Table 2

A comparison of the avocado cultivars Pinkerton and Fuerte at different storage temperature regimes for 28 days. Fruit were allowed to ripen at 18 °C. Moisture contents were 73.6 % for Pinkerton and 70.1 % for Fuerte. The data are the means of 8 cartons of count 12 or 14.

| Cultivar | Storage temperatures | On removal from cold storage | | When soft ripe: External | | When soft ripe: Internal | | | |
|-----------------------|-----------------------|------------------------------|-------------|--------------------------|-----------------|--------------------------|-----------|-------------------|---------------|
| | | Lenticel damage | Firmo-meter | Brown cold | Lenticel damage | Stem-end rot | Grey pulp | Vascular Browning | Days to Ripen |
| Pinkerton | 5.5 °C (28 days) | 32.7 a ^z | 26.3 b | 0.60 b | 33.3 a | 0.35 | 0.35 c | 3.77 a | 6.0 b |
| | 5.5; 5.5; 4.5; 3.5 °C | 32.1 a | 27.2 b | 0.30 b | 32.7 a | 0.00 | 0.00 c | 2.38 ab | 6.5 ab |
| | 6.5; 5; 5; 5 °C | 32.1 a | 24.9 b | 0.89 b | 32.7 a | 0.30 | 0.00 c | 2.38 ab | 7.1 a |
| Fuerte | 5.5 °C (28 days) | 21.7 b | 38.0 a | 3.87 a | 23.5 b | 0.60 | 1.19 bc | 0.00 b | 4.3 c |
| | 5.5; 5.5; 4.5; 3.5 °C | 14.9 c | 36.8 a | 3.87 a | 21.4 b | 0.60 | 3.57 a | 0.00 b | 4.4 c |
| | 6.5; 5; 5; 5 °C | 22.3 b | 28.5 b | 1.79 b | 23.2 b | 0.00 | 2.38 ab | 0.00 b | 4.4 c |
| Level of significance | | 0.01 | 0.01 | 0.05 | 0.05 | | 0.05 | 0.05 | 0.05 |
| LSD | | 4.37 | 3.08 | 1.53 | 2.61 | NS | 1.47 | 3.76 | 0.92 |

^z Means in each column followed by the same letter are not significantly different according to F-test.

Gwen fruit were picked on 19 July 1994 near Schagen, and waxed and packed at Westfalia Packhouse. Waxed Hass fruit were obtained from Westfalia Packhouse. Moisture contents were 75.1 % for Gwen and 76 % for Hass. Ten cartons of count 12 or 14 were used per cold storage treatment as shown in Table 1.

Pinkerton and Fuerte fruit were picked on 18 July 1994 at Brondal near White River, and were waxed and packed by Pienaar Packers. Moisture contents were 73.6 % for Pinkerton and 70.1 % for Fuerte. Eight cartons of count 12 or 14 were used per cold storage treatment (Table 2). Schutte (1994) found that temperature regimes 5.5 °C for 28 days, as well as a step-down temperature regime of 5.5 °C for 2 weeks followed by a week at 4.5 °C and week at 3.5 °C, were suitable for Pinkerton storage. These regimes were therefore included for confirmation.

RESULTS AND DISCUSSION

Gwen vs. Hass

Gwen was significantly firmer ($p \leq 0.01$) than Hass at the end of cold storage, and consequently took two days longer to ripen than Hass (Table 1). At the warmer temperature regime of 6.5 °C for 28 days, Gwen fruit were significantly softer than at the other temperature regimes used, although still acceptably firm. There was no significant difference between Gwen and Hass regarding lenticel damage, which was moderate (Table 1), but the fact that Gwen is green-skinned, made this damage visually unappealing, when compared to the black skin of Hass on which the symptoms were less conspicuous. Light incidence of brown cold on Gwen, especially with the step-down temperature regimes, which was not observed on Hass. If the lenticel damage on Gwen fruit can be controlled, then exports by sea should be possible.

Pinkerton vs. Fuerte

Pinkerton fruit displayed significantly ($p \leq 0.01$) more lenticel damage than Fuerte (Table 2), mainly because of its more knobbly skin, which is more easily damaged during packing. Firmometer readings of Pinkerton were significantly lower (more firm) than those of Fuerte which was coming to the end of its picking season. This was also reflected in the time taken for ripening (6.0 to 7.1 days for Pinkerton compared to 4.3 to 4.5 days for Fuerte) after removal from cold storage. The incidence of brown cold damage and grey pulp were significantly higher in Fuerte than in Pinkerton, while vascular browning was significantly higher in Pinkerton than in Fuerte fruit. However, the magnitude of these disorders was low, and not seen as a stumbling block to sea freighting the fruit. There were no great statistical differences between the different temperature regimes. In agreement with Schutte (1994), with Pinkerton fruit having moisture content of 75 % or lower, export by sea was found to be feasible.

CONCLUSIONS

The simulated export of Gwen fruit by sea freight at 5.5 °C constant temperature, as well as step-down temperature regimes starting with 6.5 or 5.5 °C and ending with 4.5 or 3.5 °C respectively, was successful. Similarly, Pinkerton fruit were able to be stored at all the temperature regimes investigated.

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REFERENCES

SCHUTTE, J.M. 1994. Die invloed van verskillende temperatuur regimes op die vrugkwaliteit van Pinkerton. *South African Avocado Growers' Association Yearbook*

17: 21.

SWARTS, D.H. 1984. Post harvest problems with avocados — lets talk the same language. *South African Avocado Growers' Association Yearbook* 7: 15 - 19.

WHEELER, B.E.J. 1969. *An Introduction to Plant Diseases*. John Wiley & Son, Ltd, New York. 301.