A COMPARISON BETWEEN WAXING AND CELLOPHANE WRAPPING OF AVOCADOS FOR EXPORT

RE LUNT, H SMITH, MM DARVAS
LETABA CO-OPERATIVE LIMITED, TZANEEN

INTRODUCTION
There have been considerable controversial opinions about the efficiency of cellophane against waxing of avocado fruit for export purposes and it was decided to re-investigate these aspects and to include commercial considerations.

Method and materials
Commercial trial
Fuerte and some Edranol were used in this trial.

The fruit were packed in a commercial packhouse using a commercial "brush spray" wax applicator with an average wax application rate of 0,9 — 1 ℓ wax/ton of fruit. The wax used was TAG wax and the cellophane was QMS 345.

Freshly harvested avocados were run through the commercial packhouse except for controls and non waxed fruit which bypassed the waxing plant.

The commercial trials duration was over a period of 17 weeks from 1980.04.12 to 1980.07.02 with consecutive weekly consignments to the U.K. and France. A total of 31 000 cartons waxed unwrapped fruit was despatched to the U.K. and a total of 70 000
cartons of waxed and cellophane wrapped fruit was despatched simultaneously to France.

For part of this trial the reduction of wax layer (film thickness) was achieved by diluting the TAG wax 75% with water. Results were reported back in a prescribed manner by the overseas agents.

The simulated trials

Trial 1

The trial was laid out in a randomised block design with 5 treatments and 10 replicate. Freshly harvested Fuerte fruit (average moisture content 66%) was treated, packed and stored at 5,5°C for 28 days to simulate transport time to Europe. The fruit was then removed from cold storage, kept at ambient temperature (± 26°C) and inspected regularly for external and internal quality.

All the data was statistically analyzed, except for appearance which was rated on a 0 — 10 scale, (0 — perfect fruit, 10 — unmarketable fruit).

Trial 2

The trial was also laid out in a randomised block design with 3 treatments and 10 replicates. Freshly harvested Ryan fruit (average moisture content 69%) was treated, packed and stored at 5,5°C for 28 days. The fruit was then removed from cold storage, kept at ambient temperature (± 26°C) and inspected regularly.

No internal examinations were made in this trial.

RESULTS

Commercial trial

Over the first 5 week period a total of 14 488 cartons of waxed (0,9 — 1,0 ℓ/ton fruit) unwrapped Fuerte fruit and 9 298 cartons of waxed and cellophane wrapped Fuerte fruit arrived at their respective destinations in an unripe condition.

During the following 7 weeks (with the wax film reduced to ± 250 ml wax/ton fruit) some fruit were ripe on arrival at their destination. (Table 1)

On using full wax strength 0,9 — 1 ℓ per ton fruit from the 13th week the fruit condition returned to the same as the first 5 weeks, except that fruit packed during the 13th week arrived firm but it tended to ripen very fast for no apparent reason.
Deviation on Table 1

On weeks 9 and 12 abnormal shift in arrival condition was noted towards soft fruit, this was due to temperature control problems in transit.

Simulated trials

Trial 1

The treatments in this trial consisted of Fuerte avocados with 5 treatments and ten replicates. The treatments were:

1) Control — no wax no cellophane.
2) Wax only @ ± 1 ℓ wax/1 ton fruit.
3) Cellophane wrapped unwaxed fruit (cellophane QMS 345).
4) Wax and cellophane wrapped fruit.
5) Waxed and every alternate fruit cellophane wrapped, (mixed)
Trial 2
Ryan avocados with 3 treatments and ten replicates as follows:
1) Cellophane wrapped only.
2) Wax only.
3) Waxed fruit cellophane wrapped.
All results are shown in histograms 1 — 6.
FIG. 3: The appearance of Fuerte avocados in a simulated trial (after 26 days storage) on arrival and up to 10 days after arrival overseas.

FIG. 4: The appearance of Ryan avocados in a simulated trial (after 26 days storage) 2 to 6 days after arrival overseas.
FIG. 5: The percentage incidence of sunburn of the total deliveries for 1979 and 1980 seasons

FIG. 6: Seasonal distribution of avocado cultivars represented by percentage of total exports for 1979
DISCUSSION

In the commercial large scale trial there were deviations but there was no significant deviation from the general pattern other than what one could expect with all the variable factors involved in the export chain: from maturity of fruit on harvesting to temperature fluctuations in transit.

Taking this into account we conclude that on a commercial scale there is no significant difference between the two packing methods as regards fruit condition on arrival overseas.

The thinner wax film caused a slight shift to softer fruit on arrival in both the U.K. and France and therefore played an important role despite the presence of cellophane wrapping on the fruit despatched to France. (Table 1)

In the simulated trial, cellophane only, wax only and cellophane wrapped, waxed fruit will be discussed.

With regard to firmness on arrival there was no significant difference between the three main treatments, but 5 days afterwards there was a significant difference between all three with respect to Fuerte. Cellophane only being significantly softer than wax only and wax only being significantly softer than cellophane wrapped waxed samples. (Fig. 1) In the case of the Ryan trial there was no significant difference between wax only and wax cellophane wrapped fruit but both were significantly better than cellophane only. (Fig. 2)

In appearance of Fuerte avocados on arrival the unwaxed fruit was noted to lack the deep green glossiness of the various waxed samples. Up to 5 days after arrival a large difference remained between cellophane only being significantly poorer than the waxed and wax wrapped samples. This difference, however, started to disappear at the eat ripe stage which was after 7 days.

In the Ryan trial the waxed fruit appeared significantly better than the unwaxed
cellophane wrapped samples but this difference remained unchanged, and on the 6th day after arrival the unwaxed fruit appeared un-saleable whereas wax only and waxed cellophane wrapped fruit were still of good appearance. (Fig. 4)

On the Fuerte, significant difference was found between external symptoms on both the 7th and 10th day after arrival between the three main treatments. (Fig. 5)

Internally there was no difference on the 7th day after arrival between the main treatment with respect to stem-end rot but after ten days the cellophane wrapped fruit exhibited significantly less stem end rot than the other 2 treatments. On lead discolouration it was found that both cellophane wrapped treatments were significantly better than the wax only treatment. (Fig. 6) Vascular bundle browning was also examined on 7 days after arrival but the incidence was so low for all treatments that it could not be statistically analyzed.

CONCLUSIONS

This study should be evaluated with strong bias on the commercial aspects of the avocado export industry. Bearing in mind that commercially at a point 7 days after arrival of a consignment most of the fruit would already be consumed, one could take this stage as a cut off point for evaluation. Studies beyond this stage however are interesting but academic.

At this 7 day cut off point the following conclusions are drawn:

- Internal quality — there is no significant difference between the three methods.
- External appearance — the wax only and wax cellophane wrapped treatments were significantly better specifically for the initial sales period, up to 5 days, than the cellophane only treatment.
- Firmness which is a vital aspect commercially specifically for the initial sales period. Again wax cellophane wrapped and wax only treatments were significantly better than the cellophane only.
- The application of a wax film has a distinct advantage on the quality of the avocado overseas. Further if the cost of packaging be brought into consideration, then waxing only would be the better all round treatment for export avocados.