

A COMPARISON BETWEEN WAXING AND CELLOPHANE WRAPPING OF AVOCADOS FOR EXPORT

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OPSOMMING

Die effek van die toedraai van avokados (met QMS 345 sellofaan), waksbedekking (met TAG waks teen 0,9 — 1 ℓ waks/1 ton vrugte) en die kombinasie daarvan was ondersoek met betrekking tot die raktele en gehalte van die vrugte by aankoms oorsee. Die resultate dui statisties betekenisvolle verskille tussen behandelings aan asook die voordele van wakstoediening.

SUMMARY

The effects of cellophane wrapping (using QMS 345), waxing (using TAG wax at 0,9 — 1,0 ℓ wax/1 ton fruit) and a combination of both, on fruit arrival condition, shelf life and quality were investigated. The results indicated statistically significant differences between the control (unwaxed and unwrapped avocados) and the various treatments as well as the advantages of waxing the fruit.

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 ($\pm 26^{\circ}\text{C}$) 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 ($\pm 26^{\circ}\text{C}$) 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.

TABLE 1: Large scale commercial export trial of waxed and wrapped in cellophane and waxed and unwrapped avocado fruit during the 1980 season to U.K. & France

Boat	Week	Cult.	Wax	U.K.			France		
				Waxed no cellophane			Wax & cellophane		
				Exp	Hard Unripe	Soft Ripe	Exp	Hard Unripe	Soft Ripe
City of Durban	1	F	Full	1798	100%	—	1977	100%	—
Winterberg	2	F	Full	1800	100%	—	1977	100%	—
Sederberg	3	F	Full	1800	100%	—	1800	100%	—
Helderberg	4	F	Full	3660	100%	—	1800	100%	—
Ortelius	5	F	Full	5430	100%	—	2100	100%	—
Transvaal	6	F	Diluted	5430	+ 95%	Some	3629	+ 95%	Some
Waterberg	7	F	Diluted	3630	+ 95%	Some	3659	± 90%	5–10%
City of Durban	8	F	Diluted	3689	± 90%	5–10%	3629	± 90%	5–10%
Winterberg	9	F	Diluted	5759	40%	60%	3689	± 80%	10–20%
Sederberg	10	F	Diluted	3690	+ 95%	Some	5550	± 90%	5–10%
Helderberg	11	F	Diluted	5519	± 95%	2–5%	7349	+ 95%	Some
Ortelius	12	F	Diluted	5400	± 95%	2–5%	7377	+ 95%	Some
Transvaal	13	F/E	Full	5400	100%	Ripening Fast	7529	± 40%	60%
Waterberg	14	F/E	Full	5400	F 100% E 95%	F — no Problem	7408	± 90%	5–15%
City of Durban	15	F/E	Full	5400	100%	—	3810	100%	—
Winterberg	16	F/E	Full	3660	100%	—	3780	100%	—
Sederberg	17	F/E	Full	3600	100%	—	3810	± 90%	5–10%

F = Fuerte & E = Edranol

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.

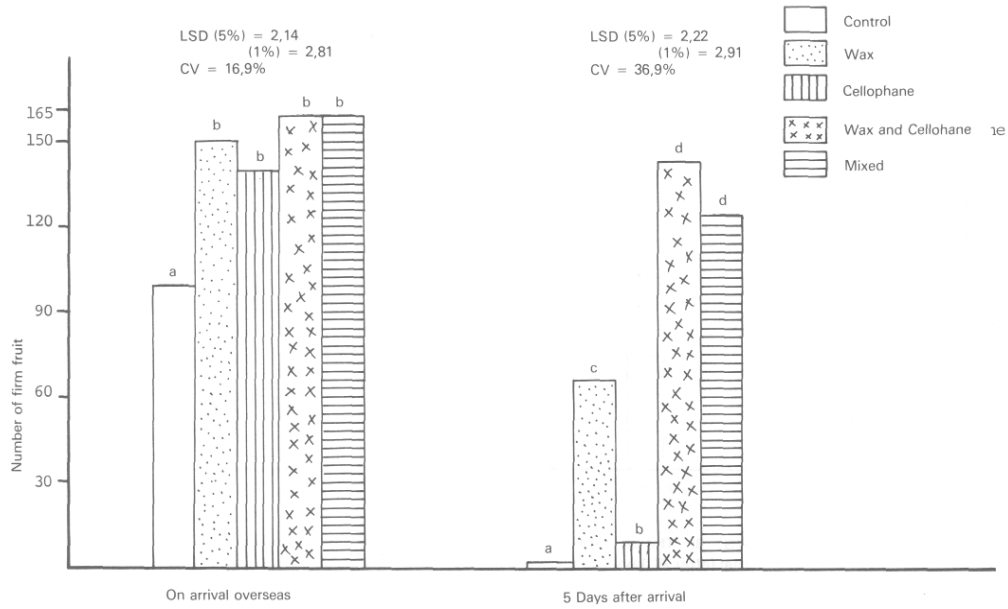


FIG. 1: Firmness of Fuerte avocados in a simulated trial (after 28 days storage) as on arrival and 5 days after arrival overseas

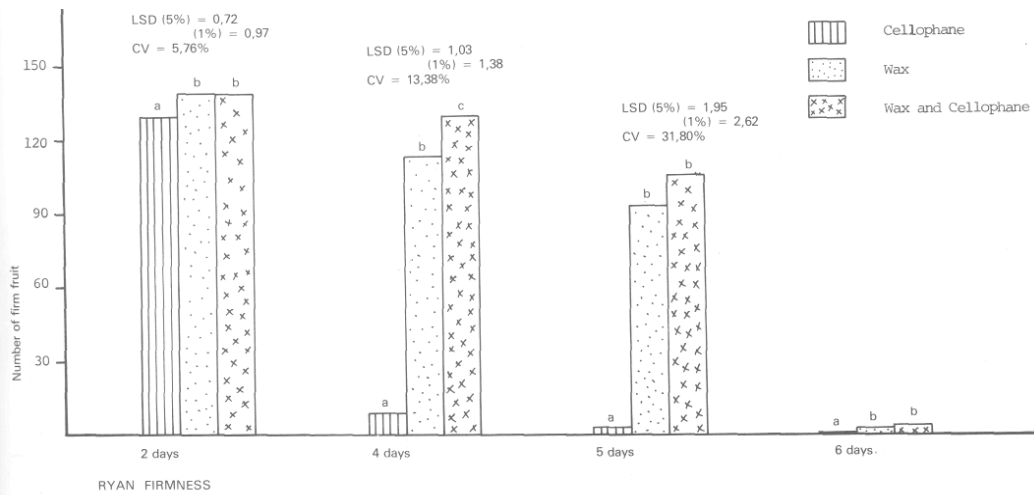


FIG. 2: Firmness of Ryan avocados in a simulated trial (after 28 days storage) from 2 to 6 days after arrival overseas

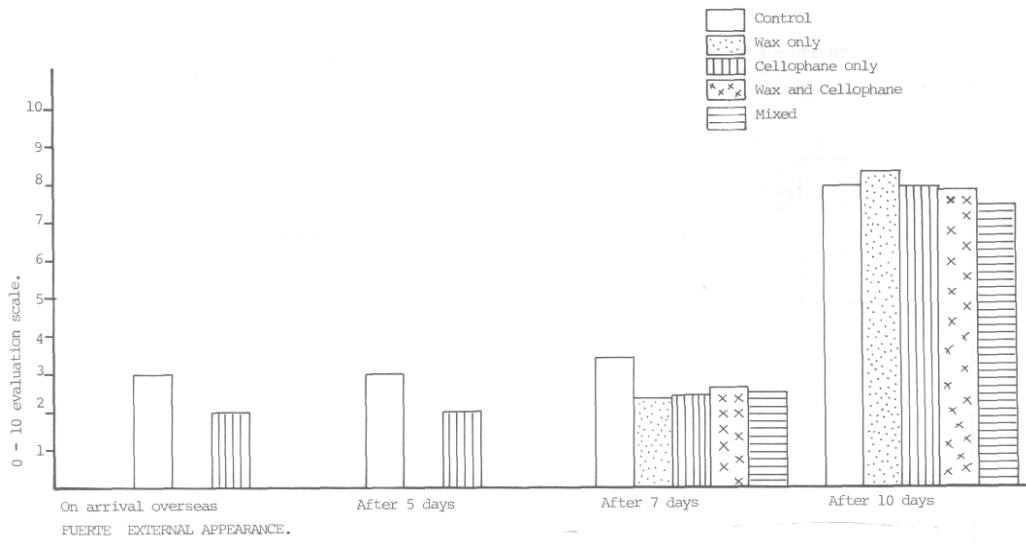


FIG. 3: The appearance of Fuerte avocados in a simulated trial (after 28 days storage) on arrival and up to 10 days after arrival overseas

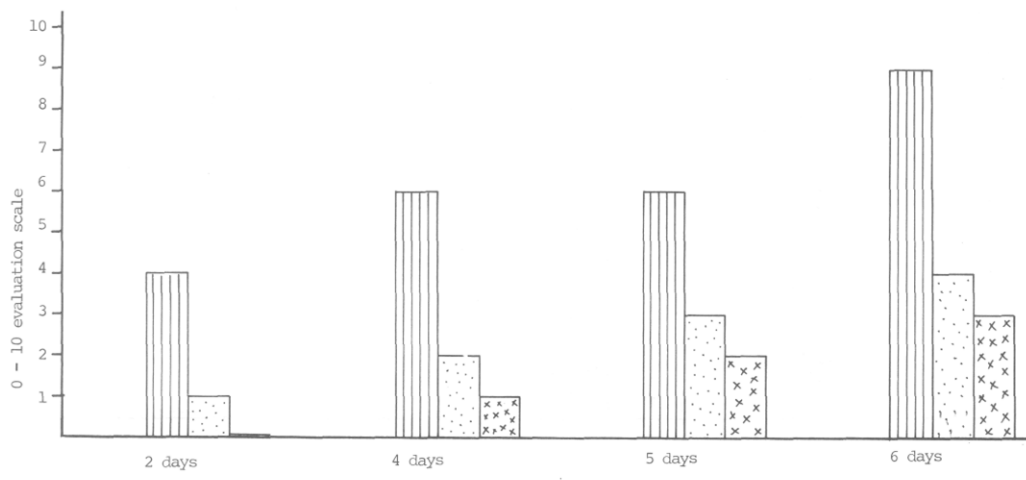


FIG. 4: The appearance of Ryan avocados in a simulated trial (after 28 days storage) 2 to 6 days after arrival overseas

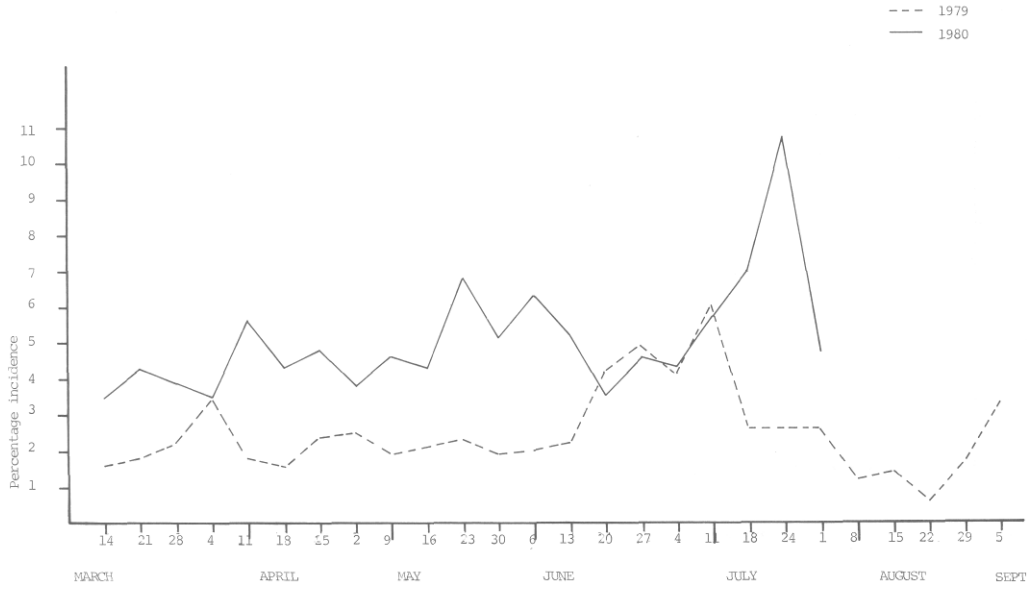


FIG. 5: The percentage incidence of sunburn of the total deliveries for 1979 and 1980 seasons

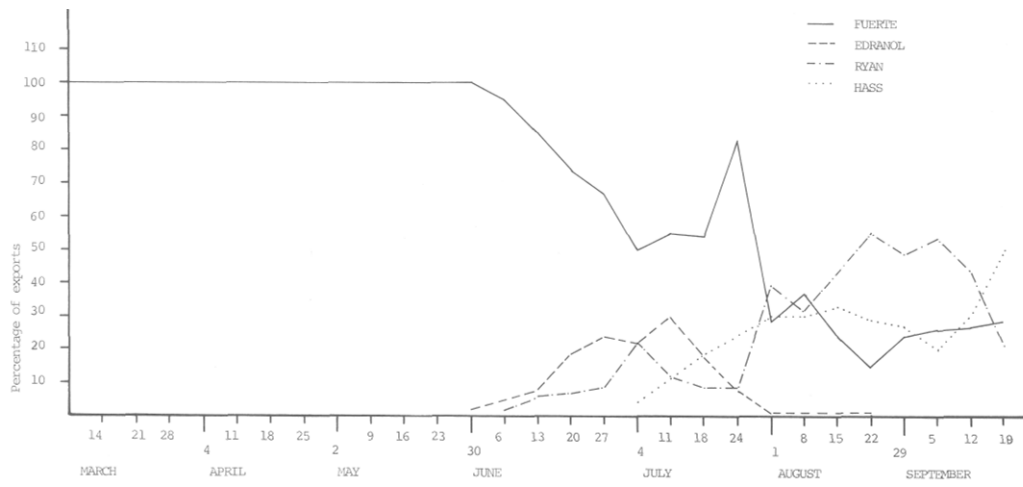


FIG. 6: Seasonal distribution of avocado cultivars represented by percentage of total exports for 1979

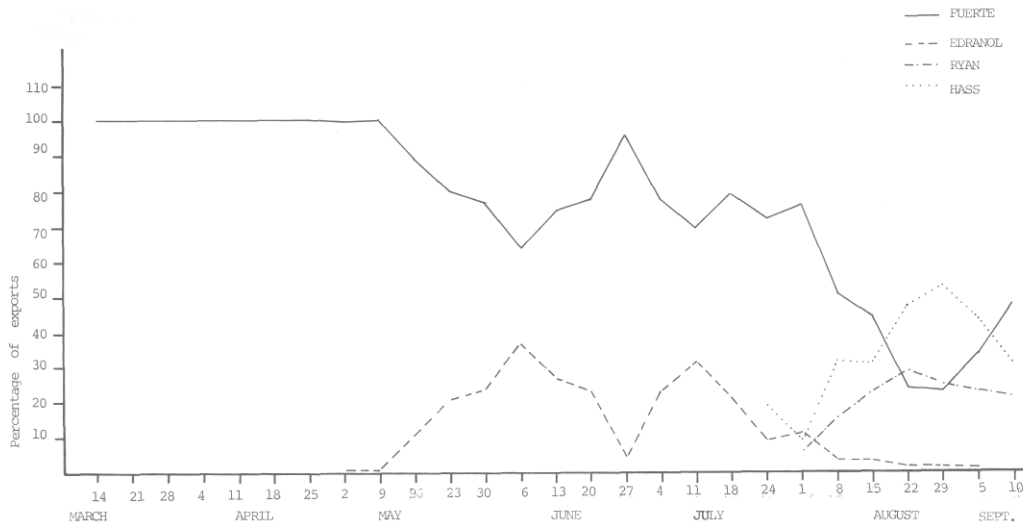


FIG. 7: Seasonal distribution of avocado cultivars represented by percentage of total exports for 1980

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.