It’s Fresh!— Ethylene filtration system for extended fruit freshness

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Discussion

• Cold supply chain
• Vulnerability of the cold supply chain
• Temperature and ethylene effects
• Commercial trials with the new ethylene filtration technology, It’s Fresh!
• Cost/benefit
• Conclusion
FRESH PRODUCE VALUE/LOGISTICS/COLD CHAIN

1. Orchard
2. Pack House
3. Inspection
4. Cold Store
5. Loading
6. Transfer
7. Transporter
8. Inspection
9. Ship/container
10. Import port
11. Discharge
12. Inspection
13. Consumer
14. Supermarket
15. Inspection
16. Depot
17. Cold store
Temperatures in the road and sea links of the supply chain
Respiration rate of early season Hass stored at four temperatures

![Graph showing respiration rate over 28 days at four temperatures (7°C, 6°C, 5°C, 4°C). The graph indicates that the respiration rate increases with time at all temperatures, with the highest increase seen at 7°C.]
The effect of a break in the cold chain on the respiration rate of avocados

Respiration rate (mg CO2/kg/h)

Storage period (days)

5°C cold room breakdown for 10 hours

5°C cold room back on temperature for one day

7°C

6°C

5°C

4°C
Controlled atmosphere usage

Orchard → Pack-house → Inspection → Cold store

Ship/container → Import port → Discharge → Inspection

Consumer → Supermarket → Inspection → Depot → Cold store
It’s Fresh! ethylene filter coverage of the supply chain

- Orchard
- Pack-house
- Inspection
- Cold store
- Loading
- Transfer
- Transporter
- Inspection
- Ship/container
- Import port
- Discharge
- Inspection
- Consumer
- Supermarket
- Inspection
- Depot
- Cold store
Hass packed with It’s Fresh! ethylene filter
Westfalia trial shipments with It’s Fresh! ethylene filtration technology.

- Two shipments of Hass from different picking periods (12/05/16 and 19/05/16) comparing It’s Fresh! to Controlled Atmosphere were set up.
- Westfalia used plastic crates with jumble packed fruit weighing about 9.8 Kg per crate. There were 120 crates per pallet with 20 pallets per container.
- This gave a total of 2,400 crates each packed with 2 small transit It’s Fresh! filters.
- Fruit shipped to the Netherlands and subject to a commercial evaluation.
Commercial evaluation results on the Hass avocados conducted by Westfalia Netherlands staff.

<table>
<thead>
<tr>
<th>Shipment</th>
<th>Treatment</th>
<th>Breaking/sensitive %</th>
<th>Turning brown %</th>
<th>Black cold %</th>
<th>Grey pulp %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CA</td>
<td>1 - 3</td>
<td>3 - 20</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>It’s Fresh!</td>
<td>1 - 3</td>
<td>5 – 20</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>CA</td>
<td>5</td>
<td>30</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>It’s Fresh!</td>
<td>2 - 5</td>
<td>10 - 30</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
Summary and Costs

• Commercial evaluation showed the fruit from the It’s Fresh! containers was of the same quality as the same fruit under CA.
• The additional freight cost for CA is published at US$ 1,350.00 per 12m container.
• In reality the amount paid is less than this because of volume rebates. This can amount to $100.00 per container. So the surcharge for CA will be approximately $1,250.00.
• This gives a total of 2,400 crates each packed with 2 small transit It’s Fresh! sheets at $0.20.
• This adds up to $ 960.00 per container. A saving of $290.00 per shipment (23.3%).
TFFG/Univeg trial shipments

- Hass from the same populations was picked in July and packed at Burpak and Koeltehof.
- Twenty pallets were packed with It's Fresh! ethylene filters and shipped under regular atmosphere plus an airflow kit.
- Forty pallets were packed as standard and were shipped under CA.
- Sent to Univeg in Spalding in the UK.
- Detailed arrival and shelf life analysis conducted.
Airflow in a container container.
Cordstrap Horizontal Air Flow (HAF) Kit.
Schematic of the Air Flow

- Return air duct
- Inflatable dunnage bags
- Delivery air flow
- PPS Material (97.5mm x 97.5mm) to block off pallet base & provide airspace for return air
- Area of T-bar not covered by floorliner (3m)
- Plastic sheet
Trial timeline

- Packed in South Africa 16.07.16
- Shipped from SA 19.07.16

- Arrival at UK supplier on 08.08.16
- Chilled storage from 08.08.16 to 12.08.16

- Ripening from 13.08.16 to 17.08.16
- Cold Storage post ripening from 18.08.16 to 23.08.16
- Shelf life from 18.08.16 to 30.08.16. (Days 33 to 45).
Arrival

• Fruit arrived in good condition in both the CA and the It’s Fresh! container:
  o Pressure on all fruit averaged 13 kg pressure.
  o All fruit unconditionally accepted in terms of internal and external quality.
  o All fruit full green skinned
Maturity assessment results on 15/08/2016 - day 6

- It’s Fresh! firmer than CA 1, for same grower and same harvest date
FTA - Average pressure (kg)

<table>
<thead>
<tr>
<th>Pressure (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>14.2</td>
</tr>
<tr>
<td>13.8</td>
</tr>
<tr>
<td>6.3</td>
</tr>
<tr>
<td>3.7</td>
</tr>
<tr>
<td>3.0</td>
</tr>
<tr>
<td>2.1</td>
</tr>
<tr>
<td>2.0</td>
</tr>
<tr>
<td>1.1</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>No. days from arrival in the UK</th>
<th>RIpening</th>
<th>Cold storage post ripening</th>
</tr>
</thead>
<tbody>
<tr>
<td>UK Arrival</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>10</td>
</tr>
</tbody>
</table>

No stand down requirements necessary for the RA + It’s Fresh! container.
## Grade Out

<table>
<thead>
<tr>
<th></th>
<th>CA</th>
<th>It’s Fresh!</th>
</tr>
</thead>
<tbody>
<tr>
<td>Packed to retail specification, %</td>
<td>62</td>
<td>87</td>
</tr>
<tr>
<td>Class 2, %</td>
<td>31</td>
<td>5</td>
</tr>
<tr>
<td>Hard / Back into ripening, %</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Waste after ripening, %</td>
<td>0</td>
<td>0</td>
</tr>
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</table>
Cost analysis

• Standard 4.5 kg cartons were used.
• 264 per pallet, therefore 5,280 per container.
• Using 1 It’s Fresh! small transit sheet per carton this amounts to $1,056.00 cost per container.
• Compared to the CA surcharge of +/- $1,250.00 per container.
• Airflow kit is +/- $60.00/container.
• This is a saving of +/- $134.00 (11%) per container.
• Additional savings due to:
  • Higher Grade 1 pack out
  • Less cold store time
  • Able to sort immediately upon arrival.
Summary

• The It’s Fresh! ethylene filters were able to manage the quality of Hass avocados to a higher level than controlled atmosphere.
• There were additional benefits in that the fruit could be worked straight out of the container, whereas CA fruit is kept for several days to equilibrate.
• Effect the same across the season as trials done in May (Tzaneen), July (Hazyview) and October (KZN).
Conclusion

- The It’s Fresh! ethylene filters show great promise as a cost effective technology to manage avocado quality in the export supply chain.
- Further trial shipments are planned this coming season.
Acknowledgements

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- Jaco Marais of TFFGSA
Thank you for your time