

Dr. Graham Barry, Pr. Nat. Sci.
P.O. Box 5349
Helderberg 7135
SOMERSET WEST



Tel: +27-21 855 3548
Cell: +27-82 900 0616
Email: ghbarry@gmail.com
VAT Reg. No. 4580237586

Feedback on citrus packed and shipped using the Eco Pack System™ by XLnT Citrus during 2010

The XLnT Citrus company has lead the way with the introduction of the Eco Pack System™ for South African citrus exports, and packed lemons, mandarins and oranges during the 2010 citrus season.

Eco Pack™ is a patented, innovative packaging system providing a light-weight, customisable packaging solution using recyclable materials, and is the brainchild of Mr. Yosi Heyman and developed by Eco Pack, Israel (www.ecopack-greenbox.com). The Eco Pack System™ is composed of a plastic frame and two light-weight plastic sleeves which together create an economical, multipurpose, recyclable “box” for packing fresh and frozen produce. This alternative form of citrus packaging is engineered along standard carton dimensions and palletisation requirements.

The XLnT Citrus company first introduced the Eco Pack System™ of recyclable and re-usable plastic trays to South Africa in June 2010 with the collaboration of Colors Fruit (South Africa), as reported in FreshPlaza articles on 8 July 2010 (http://www.freshplaza.com/news_detail.asp?id=66005), 11 August 2010 (http://www.freshplaza.com/news_detail.asp?id=66841), and 22 September 2010 (http://www.freshplaza.com/news_detail.asp?id=69096). At the end of the 2010 citrus season, lemons, mandarins and oranges had been packed using the EcoPack System™ at six packhouses in the Western Cape, and exported by six exporters to five UK importers and one in Canada. Place-packed, to a specific packing pattern, and jumble-packed packing options were used.

Following the initial successes with the Eco Pack System™, the XLnT Citrus company has included two additional components to packing a pallet of citrus, namely plastic corner pieces and a plastic pallet cap. Lemons, mandarins and oranges have now been packed with the plastic packaging “from head to toe”. The materials used need to be fit for purpose, technically and environmentally acceptable, and economically viable. Light-weight materials, combined with sufficient strength and durability, allow for increased transport efficiencies leading to cost and energy savings during sea and road transport.

Capespan Exports actively participated with the packing of Nadorcott mandarin, traded as Clemengold®, using the Eco Pack System™ together with plastic corner pieces and a plastic pallet cap. Incidentally, Capespan was the first company to export Nadorcott mandarin from South Africa in 2001.

The XLnT Citrus company endeavours to add value to citrus production and marketing through innovative products and services.



Midnight Valentias place-packed using the Eco Pack System™.



Nadorcott mandarin, traded as Clemengold®, packed using the Eco Pack System™ together with plastic corner pieces and a plastic pallet cap.



Dr. Graham Barry of XLnT Citrus in the container with the pallet of Nadorcott mandarin packed using the Eco Pack System™ together with plastic corner pieces and a plastic pallet cap.

Summary of comments on citrus packed and shipped using the Eco Pack System™ by XLnT Citrus during 2010

Exporter, Packer & pack date	Receiver & Retailer	Cultivar, Packing details & ETA	Pallet and tray integrity after shipping	Product quality
Colors Fruit2U 21 June	Colors UK/ERMS Booths	Eureka lemon (x1 pallet) Place packed, count 108 ETA 21 July	Pallet appeared in excellent condition until corner pieces were removed when it was revealed that one leg had cracked on about row 5 resulting in that column of trays leaning outwards. However, the column did not fall over and collapse. However, it was necessary to re-pack the pallet before the pallet could be moved.	No difference between conventional packaging in corrugated cardboard open top cartons. Searched for compression damage, but only found one fruit with very faint cross-hatched lines from the net where the net was applied to the frame after the plastic sleeve. No damage to fruit despite one cracked leg in row 5.
Green Marketing La Colline 19 August	Poupart Waitrose	Midnight Val. orange (x2 pallets) Place packed, count 90 ETA 15 September	"Pallets arrived sturdy with no collapsed trays. Some breakage to the plastic film. Fruit slips out through the corners of the trays".	Good condition, no difference to conventional IFCO trays used.
Everseason Paardekop 20 August	MMG Sainsburys	Nadorcott mandarin (x2 pallets) Jumble packed, cal. 3 ETA 6 September	"Pallet appearance was good, all trays sitting fine on the pallet. One liner was slightly torn, it was also noted that there were some small gaps in the corners where the film/netting meet (moved, or creased when packed?). An occasional fruit was slipping through these gaps. Integrity of stacking was excellent no leaning".	"No compression damage noted, no visible dehydration or skin marking (abrasion or imprint)". Note: 4.9% weight loss recorded, but not measured for conventional packaging. Well within industry standards.
Colors Fruit2U 25 August	Chingford Sainsburys	Midnight Val. orange (x2 pallets) Place packed, count 90 ETA 20 September	No feedback received.	No feedback received.
Colors Fruit2U 25 August	Colors UK Morrisons	Midnight Val. orange (x2 pallets) Place packed, count 90 ETA 20 September	"Pallet appears neat, tidy and secure. The pallet looks nice. Pallets unstable during off loading from container. Fruit loss during handling/moving of pallets. Time consuming to offload Eco-pack, more than conventional carton box	"The product arrived in good condition. It is easier for the QC to form an initial impression because fruit is visible through the sides. The pallet facilitated the transportation from the packhouse in South Africa, to

		<p>Note: <i>These two pallets were “rush packed” with relatively little attention to detail and care. This situation would be considered a worst-case scenario for packing EcoPak trays and is not recommended.</i></p>	<p>pallets. ERMS did successfully handle the Eco-pack, but the pallets required special attention i.t.o. handling. Oranges fall through the corners of the trays, where the space between the netting and film is”.</p> <p>Note: While the pallet <i>appears</i> unstable during off loading, it is actually stable but more flexible than conventional packaging.</p>	<p>Colors UK, to Morrisons. The fruit arrived with quality well preserved, especially the lack of cubing noted”.</p> <p>When handling trays for QC: “Carton boxes can slide off the pallet and be taken to QC room. The Eco-pack requires a ladder that brings the QC onto a higher level than the pallet”.</p>
Unipack Unipack 1 September	MMG Sainsburys	<p>Eureka lemon (x1 pallet) Jumble packed, size 120 ETA 20 September</p>	<p>Pallet shifted during transit due to pallet not being strapped properly after inspection, yet product quality was not adversely affected.</p>	<p>“Quality was unaffected by transit – all defects seen would have been present at the time of packing”.</p> <p>1.85% weight loss during transit vs. 1.30% for conventional packaging.</p> <p>77 grams less fruit weight per carton than conventional, i.e. 1 fruit less. Need to ensure that correct weight is packed.</p>
Unipack Unipack 1 September	Fedfa AMC, Canada	<p>Nadorcott mandarin (x1 pallet) Jumble packed, cal. 3 ETA 4 October</p>	<p>“Pallet is very sturdy with no crushed or damaged cases due to the interlocking plastic eco pack cases. The supplier information is very legible and has not faded from the condensation or pallets rubbing together during transit. Cartons are intact, sturdy and interlocked. The eco pack system aids air flow thus the cartons show no signs of moisture or damage. All product and grower information is intact and easily readable. There are no signs of case damage”.</p>	<p>No difference between Eco Pack and conventional packaging.</p> <p>“Rind breakdown (1-2%) on some fruits was found which I believe is inherent on the fruit and not caused by the packaging”.</p> <p>“Aeration of the fruits is achieved better with this kind of packaging”.</p>

			"The pallet appears rigid, no trays were damaged, and the net/films which hold the fruit are intact. No damage to the skid".	
Capespan Stellenpak 7 September	Capespan UK Morrisons	Nadorcott mandarin (x2 pallets) Jumble packed, cal. 3, 4 ETA 27 September	"Good presentation and fruit has got a bright colour through the orange netting. One decay seen through the side and is easy visible. Fruit falling out when handled, with the correct design this should not be an issue".	"No real visible quality or firmness result between the trial and control pallets".
Mouton Citrus GHSK 9 September	MMG Sainsburys	Midnight Val. orange (x2 pallets) Place packed, count 65 ETA 29 September	"5 trays with ripped plastic . Some holes in the sides of the netting some fruit falling through" – plastic possibly ripped from abrasion with sides of container wall.	"Good quality fruit no compression seen". Some deformation in lower layers of conventional packaging.
Everseason Paardekop 9 September	MMG Sainsburys	Midnight Val. orange (x2 pallets) Place packed, count 60/65 ETA 27 September	"Some holes in the corner of the netting fruit falling though".	No difference compared with conventional packaging.
Stellenbosch Univ GHSK 2 September	FPT Cape Town	Midnight Val. orange (x1 pallet) Place packed, count 65 ETA 8 October	Did not undergo sea voyage, therefore no difference.	No difference in product quality. No surface moisture evident on fruit packed in EcoPack trays due to sweating/condensation after removal from the cold chain, whereas fruit in corrugated open top or telescopic cartons had condensation on them (telescopic having more condensation than open top).

Note: Comments in quotation marks are copied directly from overseas QC report or email report.

Interpretation of cooling curve data

Log tag data loggers were included in EcoPack trays and conventional open top corrugated cartons wherein the Nadorcott mandarins were packed on 7 September 2010 at Stellenpak. Temperature and humidity data were logged at six-minute intervals. One representative data trace is presented below. Note: These loggers record the air temperature and relative humidity surrounding the fruit and not fruit pulp temperature.

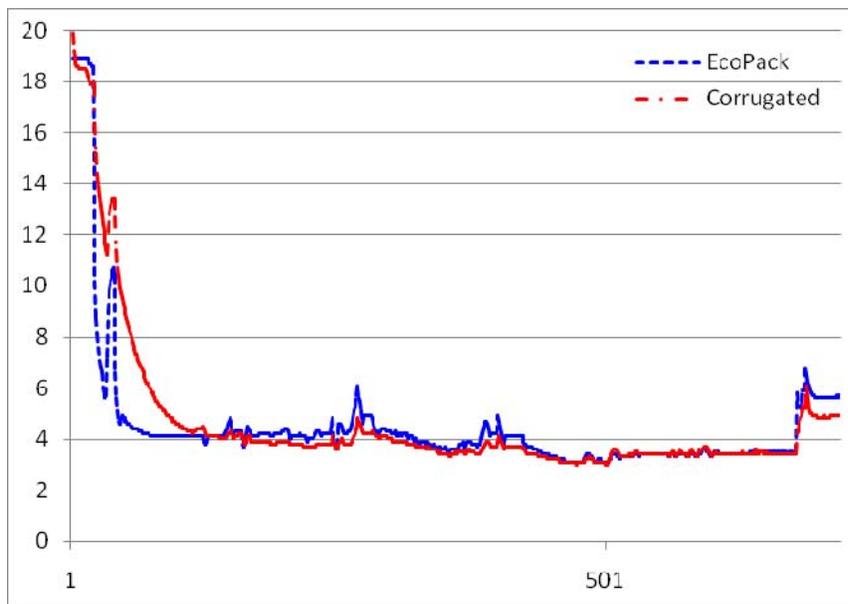
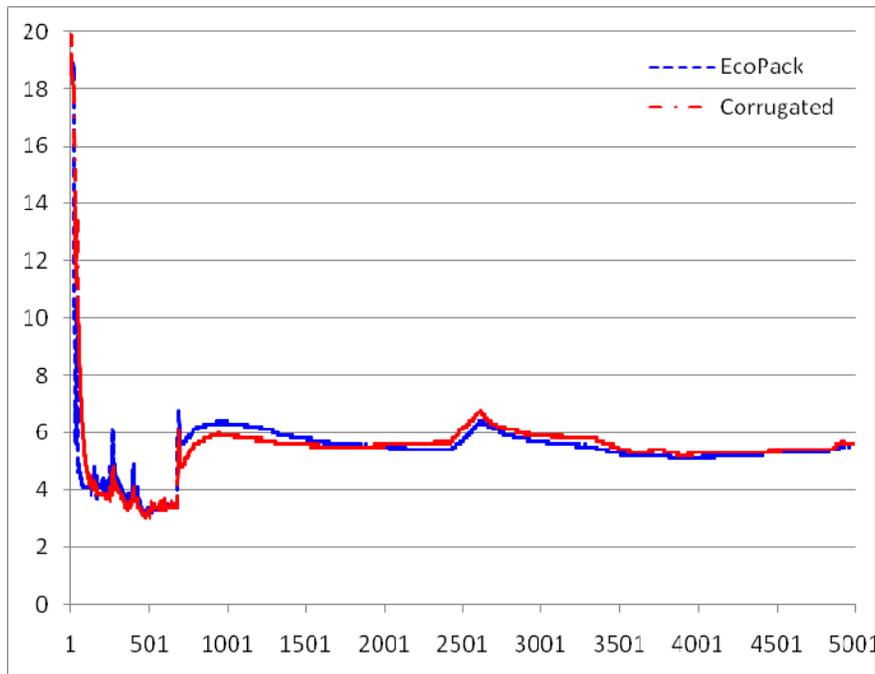
1. Forced-air cooling was started at approx. 4:50 pm on 7 September.
2. The pallets were removed from cooling for loading into the shipping container at approx. 10:35 a.m. on 10 September, i.e. where the temp graph spikes to 6.5-7 °C (at about data points 680-700) (see Graph 1).
3. The first temperature threshold of 5 °C was attained at 7:10 p.m. for the EcoPack trays vs. 11:30 p.m. for the corrugated cartons, i.e. a surrounding air temperature of 5 °C was achieved within 2h20m for EcoPack vs. 6h40m for corrugated.
4. The second temperature threshold of 4.5 °C was attained at 8:20 p.m. for the EcoPack trays vs. 12:50 a.m. for the corrugated cartons, i.e. a surrounding air temperature of 4.5 °C was achieved within 3h30m for EcoPack vs. 8h00m for corrugated.
5. Relative humidity (RH) stabilized at 90% at 9:46 pm for EcoPack vs. 6:07 a.m. for corrugated, i.e. 90% RH was achieved within 5h00m for EcoPack vs. 13h20m for corrugated (see Graph 2).
6. EcoPack maintained a higher RH better than what corrugated did.
7. Thereafter, the temperature and RH traces are comparable, within a narrow range of one another.
8. Overall, considerable savings in energy required for cooling are possible. Alternatively, fan cooling speeds can be set slower to reduce possible scalding and rind pitting due to forced-air cooling.
9. Combined quicker time to target air temperature and increasing RH to above 90% leads to less moisture loss and a quicker start of the cold chain.
10. After container loading, the re-cooling of EcoPack trays slightly lagged that of the corrugated cartons, but then maintained the required temperature better than the corrugated cartons. There being relatively little difference in temperature and RH during the voyage.
11. After unloading, EcoPack trays re-warmed quicker than corrugated (see Graph 3).
12. From a physiological viewpoint, there are a number of interesting responses, as well as pathological implications.

Overall conclusions

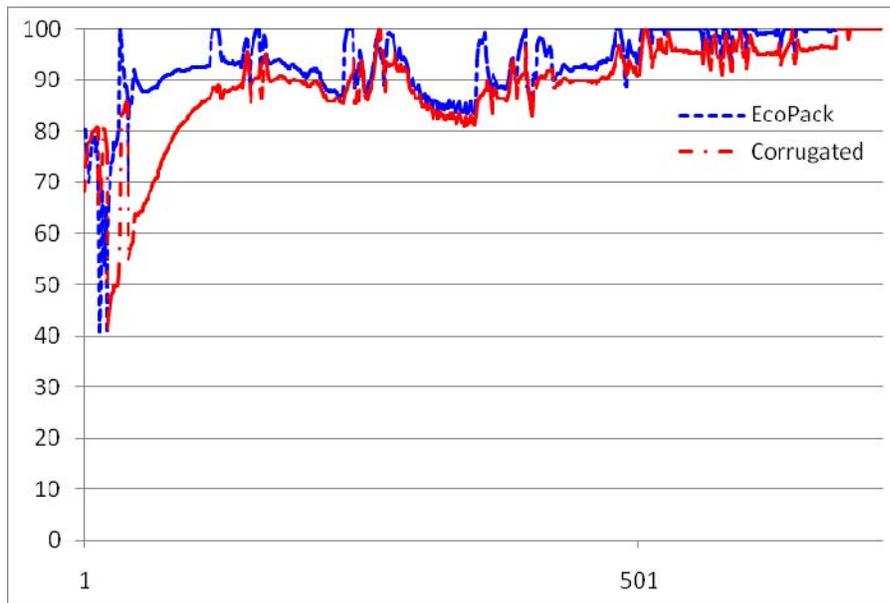
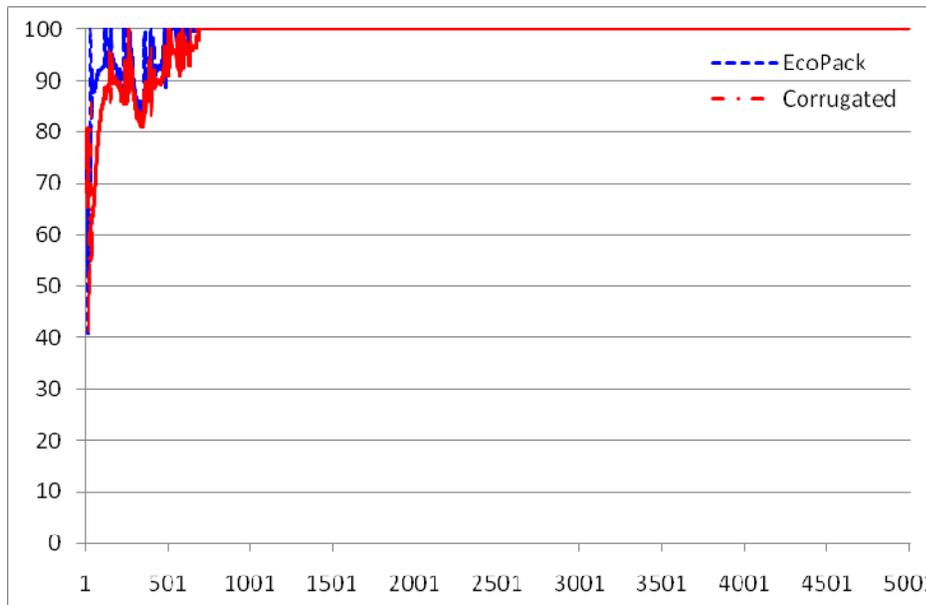
As one would expect, cooling was quicker with the well-ventilated EcoPack trays compared with conventional open top corrugated cartons. Note, however, that this initial interpretation is based on only one consignment with several loggers, although only one temperature trace was presented in this report.

Acknowledgements

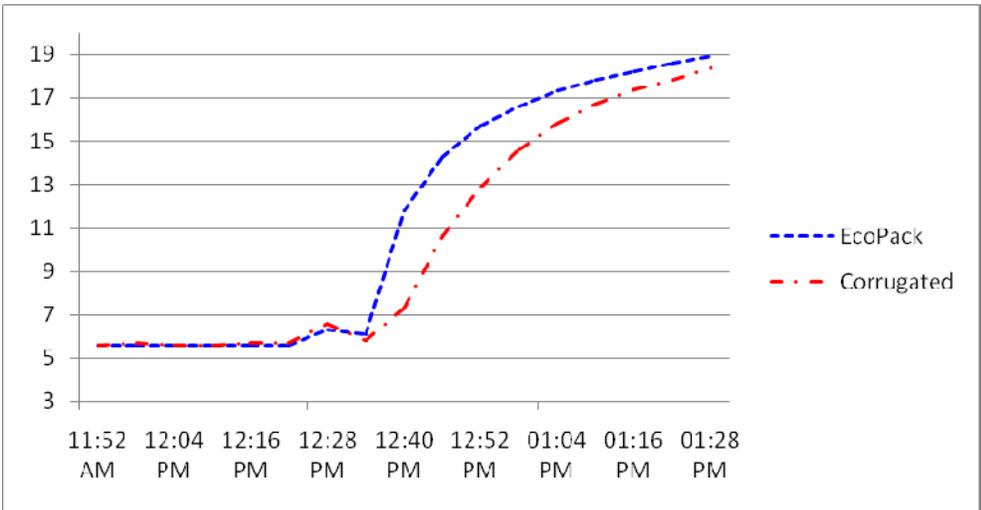
I thank the citrus packhouses (Fruit2U, La Colline, Paardekop, Unipack, Stellenpak, Goede Hoop), citrus exporters (Colors Fruit, Green Marketing, Everseason, Unipack, Capespan, Mouton Citrus), and overseas citrus receivers (Colors UK, Poupart, MMG Citrus, Chingford, Fedfa, AMC Canada, Capespan UK) for their willingness to participate in these commercial trial shipments using the EcoPack System. Without such collaboration, progress in technology development would be hampered and it would move at a slower rate.



Graph 1. Temperature traces (six-minute intervals) for EcoPack trays vs. open top corrugated cartons during the commercial cold chain for Nadorcott mandarin fruit packed for shipment to the UK. Left: Complete temperature trace for the duration of the cold chain, from before forced-air cooling through container unloading in the UK. Right: Temperature trace for the first 720 data points, i.e. 72 hours, to more clearly show differences in cooling curves between the two packaging formats.



Graph 2. Relative humidity traces (six-minute intervals) for EcoPack trays vs. open top corrugated cartons during the commercial cold chain for Nadorcott mandarin fruit packed for shipment to the UK. Left: Complete RH trace for the duration of the cold chain, from before forced-air cooling through container unloading in the UK. Right: RH trace for the first 720 data points, i.e. 72 hours, to more clearly show differences in cooling curves between the two packaging formats.



Graph 3. Temperature traces for EcoPack trays vs. open top corrugated cartons during re-warming after removal from the shipping container in the UK.