**Report of ISHS VIII International Postharvest Symposium, Cartagena, Spain – 21 - 24 June 2016, by Richard Hurndall, Dr Ian Crouch, Daniel Viljoen and Angelique Marais**

# Content



## 1. Introduction

The symposium was held in the historical port city of Cartagena, Murcia region, Spain. The theme was 'Enhancing supply chain and consumer benefits: ethical and technological issues'.

The international postharvest symposium is held every 4 years, and the next one will be held in New Zealand. This symposium was one day shorter than its predecessors, and while it was noted that there were fewer high profile speakers, there were nevertheless some gems of presentations.

The purpose of the visit was to observe new innovations in postharvest research, as well as build relationships with researchers/institutions. The authors also visited the IRTA postharvest research facility in Lleida, Spain.

Apart from the authors, the South African contingent also comprised of:

| | | |
|---|---|---|
| Prof Linus Opara | Stellenbosch University | Keynote speaker |
| Prof Malcolm Dodd | Private | Presenter |
| Tarl Berry | Stellenbosch University | Presenter |

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|---|---|---|
| Renate Smit | Stellenbosch University | Electronic poster |
| Imke Kritzinger | Stellenbosch University | Electronic poster |

Back: Prof Malcolm Dodd, Prof Linus Opara, Daniël Viljoen, Dr Ian Crouch, Tarl Berry
Front: Angelique Marais, Imke Kritzinger, Richard Hurndall, Renate Smit

Some of the more interesting presentations / posters / exhibits are reviewed.

## 2. Objectives of the visit

1. Obtain post-harvest research information of relevance to the industry
2. Scout for new technologies in the post-harvest field
3. Build relationships with international researchers
4. Visit a research institute in Spain

## 3. Presentations

Preharvest application of oxalic acid improves antioxidant systems in plums – Alejandra Martinez-Espla, University Miguel Hernandez, Spain

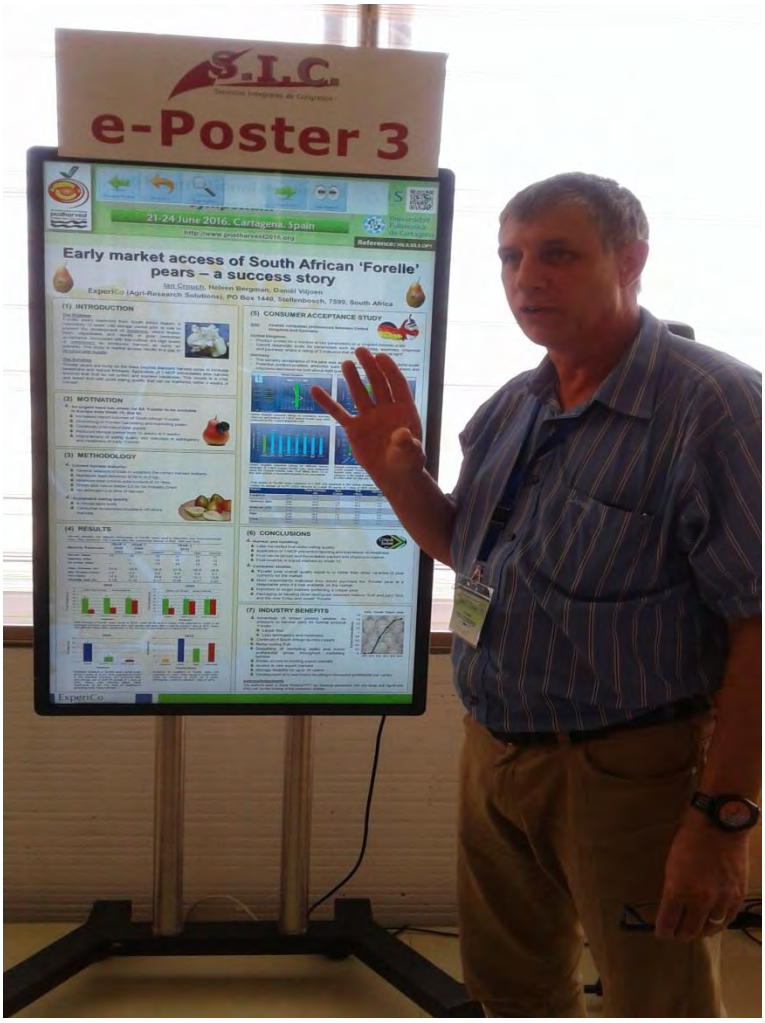
Previous studies have found that pre-harvest oxalic acid treatments improved storage quality of sweet cherries. Results in Black Splendor plums showed that oxalic acid did not affect ripening properties, but did increase anthocyanins, total phenolics and anti-oxidant activity. Pre-harvest antioxidant treatments thus increase bioactive

compounds with beneficial effects on human health, as well as a delay of the ripening process for better storage quality.

Use of bud sports to understand the complexity of Japanese plum ripening behaviours – Macarena Farcuh, University of California, Davis. USA

A systems biology approach was used to compare the metabolic pathways of Santa Rosa (SR) and its bud-sport mutant, Sweet Miriam (SM), whose ripening characteristics differed markedly. SR displayed high sucrose concentrations while SM had high sorbitol (more suitable for diabetics). SR firmness was significantly softer through storage and shelf-life. SM exhibited better firmness, TSS and colour, and lower acid during shelf-life. This approach determines whether a cultivar has ethylene-dependent or ethylene-independent ripening behaviour.

Recommendation: Japanese plums should be subjected to this systems approach to determine their ripening characteristics to assist with postharvest fruit management strategies.




**Ian Crouch explaining his e-poster**

Commercial benefits achieved from the removal of ethylene in a long plum supply chain with new ethylene scrubbing technology – Prof Malcolm Dodd

Commercial shipping trials with full container loads of Sapphire plums were conducted with a new generation ethylene scrubbing system, It'sFresh® (palladium chemisorption). Compared to untreated container loads, the treated fruit had higher firmness levels, less shrivel and less decay, as well as an increased shelf life.

Overview of novel disinfestation treatments of horticultural crops in New Zealand – Allan Woolf, Plant and Food Research, New Zealand

The use of pre-harvest mitigation methods, together with a range of postharvest disinfestation technologies allows a systems approach. High pressure washing of 80 – 100 psi removes mealy bug and woolly apple aphid.

Ethyl formate (0,8 – 1%) exhibited 100% mortality of thrips on apricots. Lepidopterans are more tolerant to ethyl formate. Codling moth on apples were successfully treated, though internal browning can occur at concentrations > 1% over 1 hour. No browning occurs if the apples are first stored for 6 weeks before treatment. There were no sensory differences between treated and untreated fruit.

Excellence in dynamic controlled atmosphere storage based on the respiratory quotient: leak correction – Niels Bessermans, Flanders Centre of Postharvest Technology, Belgium

In cases were leakage occurs in storage rooms using the respiratory quotient (RQ), it is advocated to use a leakage correction model to establish the true RQ value of stored fruit.

Time-resolved reflectance spectroscopy reveals different texture characteristics in 'Braeburn', 'Gala' and 'Kanzi®' apples – Maristella Vanoli, Piazza Leonardo da Vinci, Italy

This spectroscopy technique characterises apple cultivars according to their textural characteristics. Kanzi® had the firmest texture, followed by Gala and Braeburn. Kanzi® also had the least intercellular spaces.

A multi-parameter approach to vent hole design for cartons packed with internal packaging – Tarl Berry, Stellenbosch University

This study investigated vent hole design to ensure optimal carton performance. Edgevent and Multivent designs offered the best compression strength. The Multivent hole design significantly improved cooling performance by 37%. In cases where liner bags were used, the Edgevent and Multivent designs provided better air flow distribution around the bags, and thus cooled fruit more efficiently, reducing energy consumption by 49%.

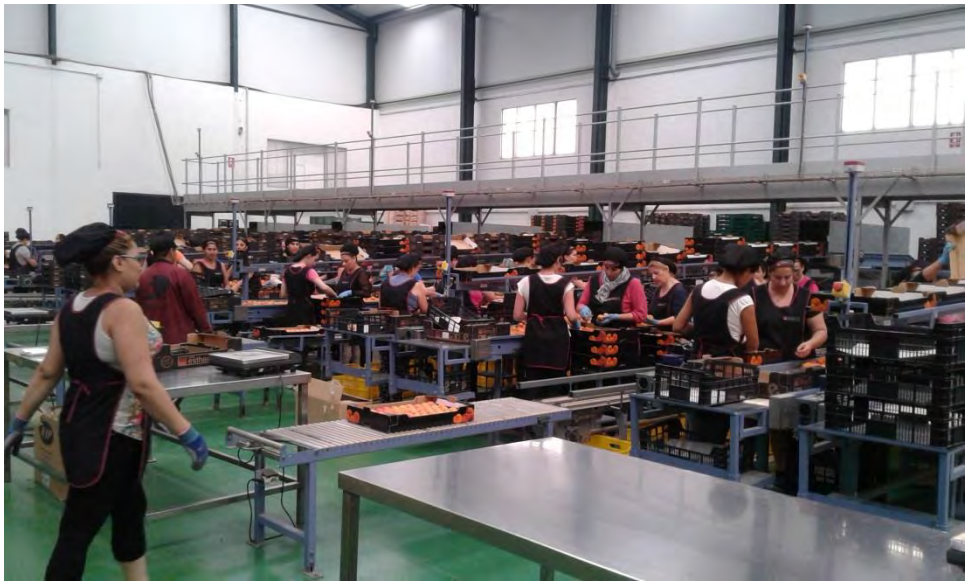
**Imke Kritizinger explaining her e-poster**

**Posters**

Responses of apple fruit to high shelf life temperatures – Jason Johnston, Plant and Food Research, New Zealand

It was recommended that shelf-life temperatures of fruit destined for Asian markets be increased to 30 °C to simulate their conditions where there is limited cold chain at point of sale. A new cultivar strongly disposed to browning under these conditions had a respiration rate 2 fold higher than non-susceptible cultivars, and internal ethylene concentrations 2 – 3 fold lower. The application of ethylene inhibitors exacerbated flesh browning, while ethylene treatments reduced browning (high $CO^2$ levels inhibit ethylene).

## 4. Visit to Esther packhouse near Murcia



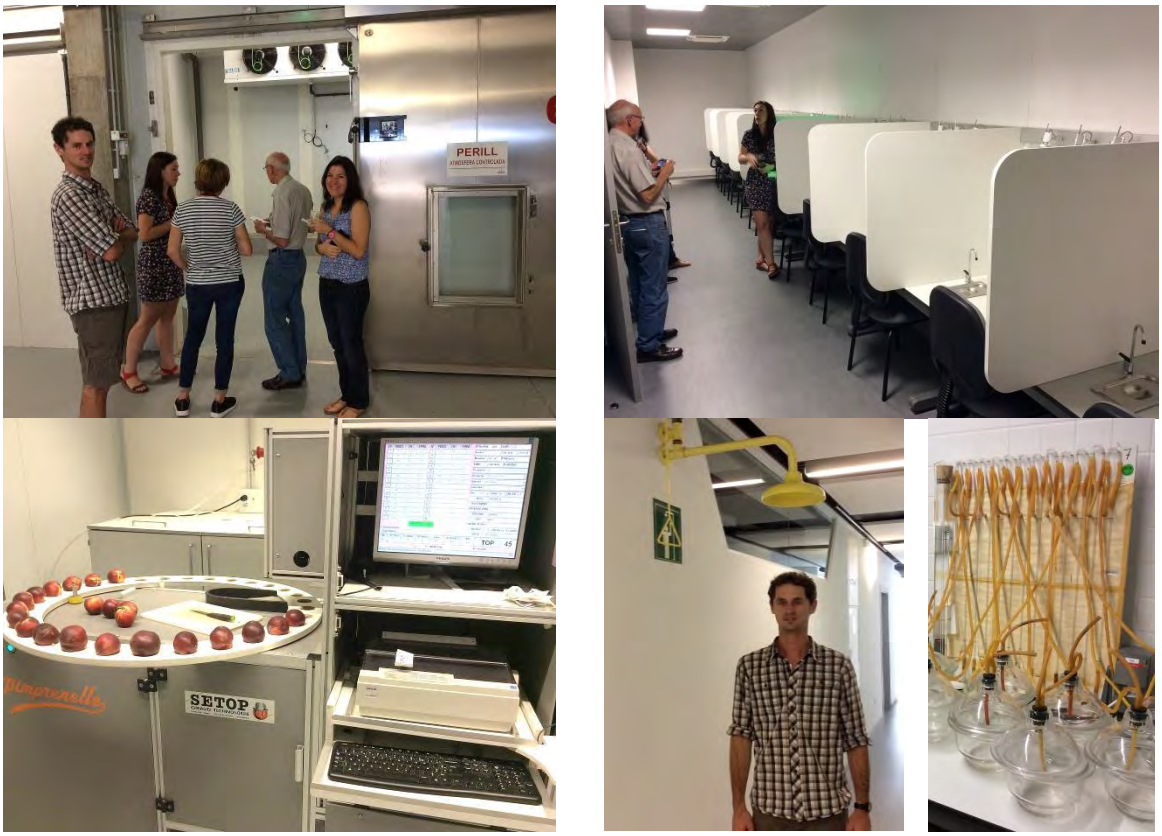
**Packing apricots**

While we were visiting this pack house they were packing nectarines and donut peaches for Shoprite/Checkers. The production manager mentioned that they have a good relationship with the retailer. They also supply the UK and German supermarkets and mentioned that "they first protect the fruit, while number of residues are a secondary concern." This was a very clean and well organised pack house and runs various lines of fruit packing simultaneously.

## 5. Institute Research & Technology, Food & Agriculture (IRTA) - Postharvest programme

| | |
|---|---|
| Institution | **IRTA Fruitcentre**, based in Lleida, a newly created research institute of the Catalan Government. The Fruitcentre opened in 2013 at a cost of 14,2 million Euro. |
| Purpose | The postharvest programme conducts both basic and applied research; provides technology transfer to producers, packhouses, processing industry as well as supplier industries. AgroFresh, for instance, has laboratories in the Fruitcentre. The programme comprises physiology, technology, engineering, pathology and minimally processed fruit and vegetables. A postharvest technical service is provided to packhouses for quality improvement and storage management throughout the postharvest chain. |
| Hosts | Dr Rosa Altisent Rossel, Innovation Manager, Postharvest (rosa.altisent@irta.cat)<br>Dr Jordi Ginè Bordonaba, Researcher Postharvest Fruit and Vegetables (jordi.gine@irta.cat)<br>Dr Neus Teixidò Espasa, Researcher Postharvest Pathology (neus.teixido@irta.cat)<br>Dr Elena Costa, Postharvest Extension, (elena.costa@irta.eu) |
| Structure & Capacity | • 15 researchers, 53 employees<br>• 103 research contracts<br>• 8 research projects<br>• 5 pilot plants (sorting , packaging, processing technologies) |

| | |
|---|---|
| | • 32 cold storage rooms (1500 $m^3$ and 100 micro CA chambers)<br>• 23 laboratories (including sensory analysis) |
| Funding | • 1,8 million Euro<br>• 69% contracts, 31% government<br>• Own funds generated through research funding calls, e.g. EU funding, IP, and contract research for companies<br>• Industry – voluntary contribution, no levy and no research budget |
| International collaboration | • 5th, 6th, 7th EU framework programmes<br>• Alliances with Plant & Food Research (joint research unit), NZ, Argentina and Uruguay.<br>• Relationships with Wageningen, University of Bologna, Cranfield, Volcani Centre, UC Davis, University College Dublin, RIVM Utrecht, University of Porto, GBF-INP Toulouse, USDA and INRA |
| Discussions | • They are doing research on 100+ antioxidants for scald control, some of which were promising.<br>• They employ PhD post-harvest extension agents to provide a comprehensive user-pay post-harvest service to packhouses. |




**Visit to IRTA**

## 6. Visit to Actel Group Packhouse

This is one of the biggest pack sheds in the region and they pack both stone and pome fruit during the year. During our visit they were packing Golden Delicious and Conference pears out of CA. The Golden Delicious fruit that we saw in the bins were for their local market and were quite large and yellow (after approximately, 9 months storage). Because they have very

little Granny Smith, they are all packed and sold immediately, making the use of 1-MCP unnecessary. They also use no 1-MCP on their Golden Delicious fruit and mainly store these under CA and DCA conditions. They were also busy packing new season cherries, peaches and nectarines. Many of their processes and machinery are very similar to what we use in South Africa. They also drench pome fruit with fungicides after harvest, prior to storage and stone fruit are treated with fungicides (Fludioxinil was being used during the visit) with an atomiser online. The fruit come in from the orchards in small wooden bins, while plastic bins are used to store the fruit once they have been pre-sorted.

## 7. Visit to Vegetable Packhouse outside Cartagena

An interesting visit to one of the largest vegetable packhouses in the region gave a new insight on packaging of a fresh produce not normally experienced by post-harvest researchers working on deciduous fruit. The variety of produce being packed at any one time was remarkable and included cantaloupes, Honeydew melons, watermelons, red, green and yellow peppers – and in many different packaging types. Strict attention was paid to food safety as was evidenced by dress code of the visitors. The tour ended with a visit to the large greenhouses to see how the green peppers were being cultivated.


**Visit to vegetable packhouse near Cartagena**

## 8. Promotion of new technologies at the conference

Like at all conferences, booths were available for companies and sponsors to promote their technology. Below are highlighted some of the more relevant and interesting instruments:

1. Amilon Starch Meter from ISOCELL

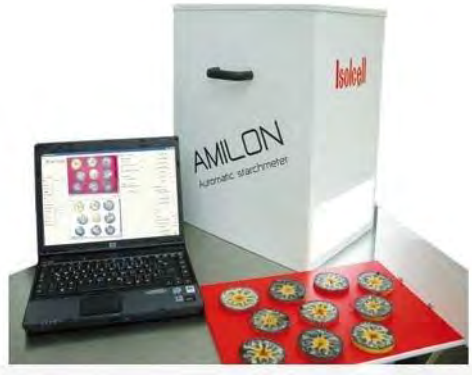
   **Computer image analysis is suitable for the assessment of starch pattern index (SPI) to evaluate apple maturity stage**

   **Zanella et al., VIII International Postharvest Symposium, June 2016, Cartagena**
   A technique that overcomes the subjectivity of visual assessment of starch conversion, and has an additional bonus of avoiding the use of iodine solution is **NIRS hyperspectral imaging**. At this stage, due to the cost of the instruments, coupled with the specific knowledge required to operate them, this technique is currently in the domain of scientific research and out of reach for most practical applications. However, a method, based on computer image-analysis of the iodine treated apple disks for estimation of SPI might be a viable and economical alternative for practical application.

   Zanella introduced a new, commercially available instrument (Amilon, Automatic starch meter, Isolcell, I) for estimation of SPI based on computer image analysis of iodine-treated disks which was tested on samples of various apple cultivars, exhibiting a wide range of SPI stages. Samples were analysed with both 5 point and 10 point starch scale and referenced to the visual estimations made by experts. Several different set of parameters for automatic detection of SPI were used. Moreover, the variability i.e. the subjectivity, in the visual assessment within expert panels was estimated.

   The readings obtained by the digital starch reader and visual assessments by experts were comparable to a moderate-high degree of accuracy (R2=0.7-0.9) depending on the cultivar. However, a need for separate types of calibrations to assess the SPI of cultivars with circular and of those with radial type of starch degradation was recognized.

   http://www.postharvest.biz/en/company/isolcell-spa/_id:23380,seccion:news,noticia:77721/




Isolcell
CONTROLLED ATMOSPHERE SINCE 1958

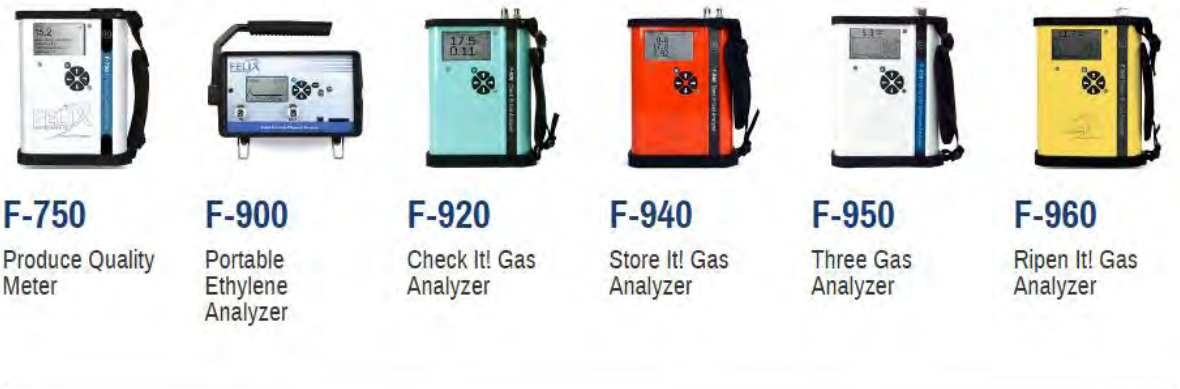
2. Isolcell New Aeroclean Ionizer

This equipment controls fungal pathogens, removes odours and ethylene from cold storage rooms. The device works according to the principle of deactivating microorganisms and pollutants in the air through oxidation. A unit for 300 – 500 $m^3$ costs €2800. Isolcell is prepared to place a unit on loan for a period to test its efficacy.

3. <u>A range of portable gas analysers from FELIX Instruments:</u>

Instruments included the:

- Produce Quality Meter (F-750)
- Portable Ethylene Analyser (F-900)
- Check It! Gas Analyser (F-920)
- Store It Gas Analyser (F-940)
- Three Gas Analyser (F-950)
- Pipen It! Gas Analyser (F-960)

4. Postharvest Solutions to prolong shelf-life of Perishable Produce from BION BIOCONSERVACION:

Bi-ON®: Protection against Ethylene, VOC's and Fungal Spores.

Post-harvest solutions from Bioconservacion are based on a unique product, Bi-On, which consists of a mixture of natural, porous clay and potassium permanganate. Without entering into contact with fresh produce Bi-On® retards maturation senescence and spoilage caused by bad air quality. The efficacy of this technology allows:

- Ethylene elimination
- Elimination of volatile organic compounds (VOCs)
- Retaining fungal spores

BIOCONSERVACION


## 9. Take-Home Message and Recommendations

It was reported from previous post-harvest conferences that genomics is taking hold in post-harvest research, to the extent that leading researchers are now calling for closer cooperation between post-harvest researchers, molecular biologists and geneticists. In addition, the importance of nutritional value and food safety of produce for the consumer has been gaining traction, and the involvement of food technologists and nutritionists is thus becoming important. Consumers are becoming increasingly aware of the provenance, environmental sustainability, and energy and water resource management of food production.

1. Establish a systems biology approach to identify stone fruit cultivars with a high sorbitol content (as opposed to sucrose), which promotes healthy eating and is suitable for diabetics. This can be used for the screening of

new cultivars. This approach of determining the ripening characteristics of new cultivars will assist with their post-harvest management strategies.

2. Circulate the report to CA Group to highlight new technologies.

3. Recommend higher shelf-life evaluation temperatures (30 °C) for trials of fruit destined for Middle East and Asian markets, to simulate their conditions where there is a limited cold chain at the point of sale.

## 10. Appendices

### Appendix 1

**Contacts:**

**IRTA** http://www.irta.cat

Dr Rosa Altisent Rossel, Innovation Manager, Postharvest

Dr Jordi Ginè Bordonaba, Researcher Postharvest Fruit and Vegetables

Dr Neus Teixidò Espasa, Researcher Postharvest Pathology

Dr Elena Costa, Postharvest Extension

**Tecnidex Crop Protection** http://www.tecnidex.com

Carlos Domènech

**ActelGrup** http://www.actelgrup.com

Josep Lluis Trilla, Commercial and Marketing Director

**Appendix 2**

# Itinerary ISHS Postharvest Congress, Cartagena, Spain

| | | | | | |
|---|---|---|---|---|---|
| Sun 19 Jun | KLM | KL 598 | 22:55 | Amsterdam, Netherlands | |
| Mon 20 Jun | Arrive Amsterdam | | 10:30 | | |
| | KLM | KL 1715 | 13:45 | Valencia, Spain | Arrive 16:15 |
| | Drive to Cartagena | | | | |
| Tues 21 – Fri 24 | ISHS Symposium, Cartagena | | | | |
| Sat 25 Jun | Drive to Alicante airport | | | | |
| | 15:45 Dept Flight IB458 from Alicante – Barcelona | | | | |
| | 16:55 Arrive Barcelona | | | | |
| Sun 26 Jun | Train 18:00 | Station Barcelona Sants – Renfe Barcelona – Lleida | | | |
| Mon 27 Jun | Visit IRTA Postharvest Research & Technology, Lleida | | | | |
| | Train 16:00 | Renfe Train Lleida to Barcelona Sants | | | |
| | 17:30 | Arrive Barcelona by train | | | |
| Tues 28 Jun | KLM | KL 1662 | 06:20 | Barcelona – Amsterdam | Arrive 08:45 |
| | KLM | KL 597 | 10:00 | Amsterdam – Cape Town | Arrive 21:15 |