Report on ISHS International Post-Harvest Symposium held in Kuala Lumpur, Malaysia from 25–29 June 2012 – Richard Hurndall

Introduction to Malaysia

Malaysia is an impressive country in many ways with modern infrastructure and a strong focus on the development of its population. Malaysia has one of the strongest economies in Asia and showed one of the more rapid recoveries from the 1997 Asian Financial Crisis. Its debt-to-GDP ratio of 53%, while on the high side, is comparable to that of China (44%) and it has a GDP growth rate of 6,5%. Comparable to other countries e.g. South Africa 35%; USA 70%; Italy 120%; Greece 165%; Japan 219 %. The economy has traditionally been fuelled by its natural resources, notably petroleum and tin, and agriculture, mainly rubber and palm oil, but is expanding in the sectors of science, tourism, commerce and medical tourism.

Malaysia has diverse cultures and the population comprises mainly of Malays, but also Chinese and Indian and many indigenous groupings. However Malaysia is united under its 1Malaysia policy, which combines education, health care and social justice for all its citizens. Parents who do not send their children to six years of compulsory primary education are jailed. The youth are sternly warned not to resort to a zero-sum mentality when it comes to race issues. (Why do I think that we can learn something from them?) All teachers are provided with laptops, and one of the defining charateristics of the new generation is unlimited access to the Internet.

The seat of government, Putrajaya, is a purpose-built city constructed in 1999, 25 km from Kuala Lumpur, due to congestion in the latter.

Symposium - General

The symposium topics included:

Pre-harvest effects

Physiological and molecular mechanisms

Physical and chemical treatments

Postharvest pests and diseases

Antioxidants, bioactive compounds and health benefits

Low temperature storage

CA/MA

Omics and physiological disorders

Engineering and mechanisation

Quality, safety and security

Handling and packaging

Consumers and marketing

The conference tour included a visit to the Malaysian Agricultural Research and Development Institute (MARDI), the equivalent of our Agricultural Research Council, and also to the city of Putrajaya.

The symposium was large, with more than 500 delegates reported. Three concurrent sessions were held daily, and this presented a challenge to be at the right venue at the right time, especially when there were last-minute programme changes.

Symposium - Topics

The theme of the symposium was "Post-Harvest for Wealth and Health", and the introductory keynote speakers emphasised nutrition and health, backed by pharmacological studies. 'Let food be your medicine and medicine be your food – Hippocrates.'

In addition to providing vitamins, minerals and other nutrients, fruits are a source of many phytochemicals, which are responsible for health maintenance and disease prevention. The important role of horticulture in providing 'nutritionally dense foods' to feed the growing world population was emphasized. In future greater integration of efforts between breeders, horticulturists, food scientists, nutritionists and biomedical researchers will be necessary to facilitate advances for providing foods that promote health and wellness.

The impact of post-harvest processes on flavour is receiving attention. An important goal of post-harvest research is to reduce losses in the supply chain through to the consumer. Post-harvest losses are generally high, even in developed countries, and constitute a wasteful application of resources and carbon inputs to the detriment of the producer. It is apparent at post-harvest congresses these days that genomics, proteomics and metabolomics represent one of the advanced frontiers of research in post-harvest science to fully understand post-harvest metabolic processes. The challenges for post-harvest include the internationalisation of food trade, the growing militancy of consumers, regulatory issues, environment and horticultural capacity, and funding of research within universities.

SA Deciduous Presenters and Topics

South African presenters from a deciduous perspective included:

Prof Lise Korsten (University of Pretoria): Forensic market pathology; tracking the pathogen, its origin and inoculum sources in the supply chain (invited lead paper)

Prof Malcolm Dodd (Cold Chain Solutions, Cape Town): Managing airflow inside reefer containers to benefit produce quality

Prof Linus Opara (Stellenbosch University): The future of packaging

Symposium – Selected Interesting Information

Dr Adel Kader, formerly of University of California and tragically deceased after his recent South African visit, gave an overview of international collaboration in post-harvest education and extension activities. He provided the following useful links:

http://postharvest.ucdavis.edu/Most_Useful_Postharvest_Websites/ (Underscore _ in gaps)

Commercial Storage of Fruits, Vegetables and Florist and Nursery Stocks http://www.ba.ars.usda.gov/hb66/index.html

Small-scale Post-harvest Handling Practices Manual by Kitinoja and Kader http://postharvest.ucdavis.edu/libraries/

Produce Facts http://postharvest.ucdavis.edu/PF/

Post-harvest Education Foundation http://www.postharvest.org/

Post-harvest training group in "LinkedIn" http://www.linkedin.com/groups/Postharvest-Training-3770124

In his presentation on Dynamic Controlled Atmosphere (DCA), Dr Robert Prange (Canada) noted the following:

- There are more than 800 cold storage rooms world-wide using DCA
    - The tendency is to use fewer than the recommended number of sensors per room
    - Bon Chretien pears can be stored in DCA for 4 months
    - DCA reduces fruit respiration, thereby effecting energy savings
    - DCA was found to retain flavour of Cripps' Pink and Granny Smith

Dr Angelo Zanella (Laimburg, Italy) spoke on his toolbox to control superficial scald in the absence of diphenyl amine (DPA):

- Fruit to be marketed soon: Initial Low Oxygen Stress (ILOS – 2 weeks @ 0,4 % O_2) or Ultra Low Oxygen (ULO)
- Fruit to be marketed early: ILOS+ (repeated ILOS) or DCA-light (ILOS + DCA) or 1MCP
- Fruit for medium-term marketing: ILOS+ or DCA-light or DCA or SmartFresh^{SM} (1MCP)
- Fruit for medium-term marketing: DCA or 1MCP or DCA + 1MCP
- He expects to see more decay and physiological problems in the absence of DPA
- Bolzano, Italy: 371 DCA rooms at 129 800 tons
- Delay of DCA conditions gives rise to scald
- An anomaly was found in that post-optimum harvested fruit stored under DCA conditions developed scald
- Benefits of DCA include fewer disorders, increased colour retention, firmness and acidity

Prof Errol Hewett (New Zealand) provided some thoughts on emerging postharvest technologies. He noted that a high dry matter content was important in fruits as this was linked to better taste and flavour. Taste and flavour is related to liking, acceptability and likely to repurchase. He added the New Zealand kiwi fruit payments are based on dry matter. It is important to investigate the supply chain from nursaries through to waste. More sophisticated monitoring systems through the supply chain are bringing greater transparency. Plant breeding coupled with genomics is expected to deliver a major impact in future. Many as yet unimagined changes can be expected with the introduction of nanotechnology systems in the supply chain. Although this technology still has to achieve

consumer acceptance, some imagined advances will be seen in new materials and packaging, sensing and monitoring, as well as pathogen control.

Additional snippets of information are included below.

- Nectarines exposed to deficit irrigation maintained their antioxidant capacity better than the control, and allowed a water saving without compromising quality in both RA and CA.
- Application of Aloe Vera gel (100 %) delays the postharvest ripening process of both peach and sweet cherry by retarding weight loss, colour changes, firmness loss, the increase of total soluble solids and the decrease in total acidity. A shelf-life of 20 days was achieved for peaches and fresh cherry stems were maintained. A pre-harvest application of Aloe Vera gel, which exhibits antimicrobial activity, reduces microbial counts on sweet cherries, peaches and nectarines.
- In a study of chilling injury in peaches it was found that a Smartfresh^{SM} treatment immediately after harvest was very effective in preventing chilling injury disorders such as woolliness, both during cold storage and after removal from storage. The study concluded that woolliness in peaches may be related to the capacity of the fruit to produce ethylene upon removal rather than endogenous changes in the antioxidant potential of the fruits. In another paper, a combination of Smartfresh^{SM} and ethylene treatment was found to reduce woolliness.
- Friction discolouration in pears, though influenced by various factors, can be associated with certain phenolic compounds. The New Zealand industry pear breeding programme is searching for molecular markers to reduce friction discolouration susceptibility.
- A combination of modified atmosphere packaging (MAP) and essential oils was found to increase the shelf-life of plums and nectarines and maintain the anti-oxidant properties of the fruit.
- Bag-it-Fresh MAP bags extended the storage life of Packham's Triumph pears by 1 month, while reducing weight loss and maintaining sensory quality.
- The concept of FEFO (first to expire, first out) was coined as a crop batch storage management plan.

Visits

A visit to the MARDI Research and Development campus was instructive. It is obviously a well-resourced institute. They have a strong commercial focus to generate new technology. In 2010 they exceeded their target for external income by more than 100%, to the tune of around R290 million. They also have a target for developing SME entrepreneurs in agricultural production and agro-based industries.

A new postharvest facility costing the equivalent of about R70 million Rand was recently established. A tasting session of their minimally processed fresh-cut exotic fruit was held there, and was concluded with a welcome thirst-quenching sugar cane drink (temperatures were around the mid-30s).

Also newly established was a centre for marker discovery and validation to promote amongst others, marker-assisted selection in their breeding programmes (the ARC is ahead of

MARDI in this respect, with the establishment of the biotechnology platform under Dr Jasper Rees several years ago).

A netted organic starfruit block was visited on the MARDI experimental farm. Of interest was the solar powered insect trap for one of their local moth pests (see picture). It was pollination time and a bee hive was placed in the block. The Asian bees appeared very docile compared to our African bees.

The trip home necessitated a stop-over in Singapore, and the opportunity was used to visit the amazing newly-opened 1 billion Singapore $ 'Gardens by the Bay' (see pictures).

South African delegates to the conference, from left to right: Richard Hurndall (Hortgro Science), Nhlanhla Mathaba (CRI), Handre Viljoen (Experico), Dr Johan Fourie (Experico), Prof Lise Korsten (University of Pretoria), Prof Malcolm Dodd (Cold Chain Solutions), Prof Linus Opara (Stellenbosch University)

The conference venue (exhibit using fruit and vegetables to symbolise 1Malaysia)

The entrance/exit to a netted starfruit experimental block at MARDI. Nlanhla, in conversation with Dr Johan Fourie, is enjoying a starfruit

Delegates inspecting a solar powered moth trap in the netted experimental block at MARDI

Gardens by the Bay, Singapore. To appreciate the scale, note the people on the elevated boardwalk.

A rain forest environment in a domed structure

Plants of the world in a domed structure