International Horticultural Society Congress (IHC) – Brisbane, Australia – 17 – 22 August 2014 – Richard Hurndall

The IHC congress is a series of horticultural symposia (52 product and theme symposia, as well as several workshops) comprising of around 3400 delegates. One of the challenges of such a large event is the dashing from venue to venue in the large and impressive Brisbane convention centre to accommodate topics of interest. On the other hand, one can fill in the gaps by attending lectures of peripheral interest that one would not otherwise have an opportunity to do.

The scene was set with an excellent opening presentation by Julian Cribb, an author, journalist, editor and science communicator. He explored the question whether horticulture could feed the world in the years ahead. The conundrum is to feed the worlds' population which is expected to increase by 1 billion people in the next 12 years, given that climate change can have a negative impact on production levels (demand versus scarcity). Of this population growth, 7,7 people will be concentrated in mega cities and cities. He noted that the potential of a food shortfall is not well understood by governments and consumers. They have not grasped the impact of climate change.

There is currently competition for available resources. Cities are devouring farmers' water. Vehicles are consuming fossil fuels. At the same time there was unacceptable food waste and diet related disorders. The R & D on food research was low in relation to, say, defence spending.

Possible solutions to resource limitations and feeding the world population include:

Recycling (water, packaging and food waste)

Innovative intensive high rise and rooftop vegetable greening of cities

Floating greenhouses

Desert farms

Boom in fish farming

Algae production and harvesting for feed, fuel, textiles, chemicals etc.

Novel edible plants

Cultured meat

Biocultured products

Adoption of weird foods (insects, reptiles etc)

In summary, the age of food has arrived. This, in a world where 800 million people are hungry every day while more than 1 billion are obese. It was noted that the nutrient density of fruit and vegetables had declined over time, whilst there has been a dramatic increase in energy-dense snack foods.

A strong theme that emerged in the conference was the focus on nutrient content of fruit and vegetables, and specifically phytonutrients. In Australia and New Zealand there is a particularly strong focus on consumer studies.

A brief summary of selected presentations follow.

Consumers' changing perceptions of quality: revisiting the science of fruit and vegetable cultivation for improved health benefits − Patil

Global health imperatives to reduce chronic diseases, and shifting consumer preferences, require us to address the health benefits of fruit and vegetable crops. Current market trends have shifted based on consumers' perceptions of health-promoting qualities of fruits, vegetables and nuts. Consumers base these perceptions on the phytonutrients present in these foods. Emerging knowledge on the effect of phytonutrients in the prevention of chronic disease requires that we re-visit the crop management strategies that affect phytonutrient quality. Cultivation practices such as fertilisation, season, soil fertility and irrigation have a profound effect on phytonutrient levels and profiles. Similarly, post-harvest factors such as packaging and processing techniques can affect phytonutrients and also impact the consumer's willingness to pay more. We must critically evaluate the importance consumers place on these quality parameters and attributes to derive constructive policies for addressing future nutritional sustainability. In the USA, healthy dining finder http://www.healthydiningfinder.com/ is all the rage to find nutritional information for healthy dining.

Visit http://postharvest.ucdavis.edu/ and
http://postharvest.ucdavis.edu/Most_Useful_Postharvest_Websites/

Perfect pears for the next generation of consumers − Turpin

Blushed pears are being bred in Australia in order to address low consumption in pears. ANP-0131 branded Deliza is reported to be better than Packham's Triumph, and consumer evaluations showed that it could be priced at AUD 3.50 versus AUD 2.90 for Packham's Triumph. This variety can be stored for 10 months in controlled atmosphere.

ANP-0118 branded Lanya is a pear that ripens to a crisp texture on the tree. It was reported that 45 % of Australians like crisp pears. Based on this preference, these consumers would marginally prefer the variety over Bon Chretien.

Increasing consumer demand for fresh stone fruit through market research in Australia – Hale

Consumers in the Melbourne area exhibited a preference for high acid peaches and low acid nectarines. Firmness was the driver for acceptance and purchase, and there was a strong preference for softer fruit.

Stone fruit value chain: a system approach for improved consumer satisfaction – Stefanelli

The supply chain for the Australian stone fruit industry is characterised by a series of operational problems that affect the entire sector.The large number of stone fruit varieties makes it difficult to develop general protocols to manage fruit quality, which results in

variable eating quality and consumer dissatisfaction. Also there is insufficient information flow in the value chain from grower to consumer.

The Australian industry is developing a more integrated approach that allows better flow of information in the handling chain by use non-destructive sensor technologies such as the Index of Adsorbance Difference (I_{AD}). This relatively new technology determines the physiological maturity of fruit enabling the effect of each step in the supply chain on fruit maturity to be measured.

Identifying elements of an ideal peach experience: a consumer-centred approach − Olmstead

Consumer surveys conducted in Florida, USA showed the top four elements that consumers desired were 1) fruit that were sweet with good acid balance, 2) full of juice, 3) plump and round, and 4) freestone. Young consumers preferred firm peaches.

Production of the high anthocyanin plum variety, Queen Garnet, as a new ingredient for the functional food market – Berecry

This dark-skinned red plum has been developed by the Queensland Department of Agriculture. Apart from good flavour and high Brix, the plum has a high anthocyanin content of 150 – 280 mg/100 g, which puts it in the same category as berries as far as anthocyanin content is concerned. The anthocyanin content in other plums is usually less than 30 mg/100 g. The plums are processed into anthocyanin and flavonol- rich juices, natural colourants, pulp, concentrates and powder for the functional food market. Production processes are geared to produce nutrient density and the highest anthocyanin content. Health properties of the plum are being investigated in animal and human trials.

Orchard factors and postharvest handling of fruit and nuts influence on consumer quality − Crisostos

Store prunes at -1.1 °C. Ten percent decay was found after 6 weeks with prunes stored at + 0,5 °C.

The orchard productivity and consumer appeal of the new 'Kalei' scab resistant apple – Middleton

Delegates were provided samples of the apples at registration. After 4,5 months of regular atmosphere storage, these full-coloured red apples were crisp and sweet, with a low acid. Apart from being scab resistant, the apples produced 80 - 100 tons/hectare with a class 1 packout of 80 – 90%. The apples retain their firmness during shelf-life and do not develop much oxidation browning when cut.

Sensory-instrumental relationships that have transformed the concept of fruit quality in the fruit sector – Harker

The key to improving quality standards in the fruit sector has been the development of sensory-instrumental relationships e.g., those which define crispness and firmness, and sweet and acid taste. This has led to the successful implementation of consumer-centric quality standards by the New Zealand apple and kiwifruit industry. The determination of dry matter content of apple is a good predictor of apple quality.

Sensory and non-sensory factors of product experience. A consumer-centric perspective – Jaeger

Traditional new product development focusses primarily on the sensory attributes of the product. Non-sensory aspects involving the consumer should also be taken into account. These include branding, packaging, health and well-being, price (value for money), convenience, production technology and political/ethical factors. To take one example, price can vary according to the occasion. It is therefore necessary to understand the consumer to fully capture the product / consumer relationship.

Recent innovations on postharvest diseases control: an overview − Droby

Postharvest pathogens either attack produce through surface wounds or intact / cracked surfaces of produce. Synthetic chemicals are still widely used for control despite consumer resistance to residues. While there are new products such as pyrimethanil (Philabuster) and fludioxonil (Scholar), older products such as iprodione are being phased out in several countries. Extensive research has been conducted on biological products such as yeast and bacteria, but their application remains limited. The reason for this is their inconsistency and low control. A combination of multisystem approach incorporating two or more treatments, such as using a biological product together with heat treatment, which have a direct or indirect effect on the pathogen, yields better results. A recent trend is that the multinationals are acquiring companies developing biological products. The focus in the future will increasingly be on molecular tools and mechanisms, with the development of resistant lines for breeding.

Understanding infection pathways and tree factors for integrated disease management of brown rot and grey mould in sweet cherry − B*arry*

In this instance in Tasmania, no chemicals are applied after petal fall. Studies showed that 95% of the decay was due to *botrytis*, and no incidence of *monilinia* was found. Although infection increases toward harvest, substantial *botrytis* infection was found prior to 53 days before harvest.

Using data from in-situ fruit assessment to inform pre- and post-harvest management decisions − Zude-sasse

It was noted that ‘farming is easier with sensors’ Examples were shown of self-driven platforms and aerial drones. Data is collected by wireless sensor networks and analysed in geographical information systems, which in turn provides management information.

Decision support tools that include models of fruit quality variability: from biological age, measurement uncertainty and other factors – Jordan

The difficulty with prediction models is that they do not always address sample variability. By using factors such biological ageing rate and hue angle (colour), the harvest of KiwiGold can be predicted 50 days in advance. Near infrared (NIR) instruments can have significant uncertainties that add to the overall variability within a set of sample measurements. This allows a decision support system to determine fractions of the population meeting specifications (e.g. percentage of fruit above or below target).

Pre and post-harvest inhibition of ethylene production and action by 1-mcp on the quality of apples and other horticultural products − Watkins

Currently 70% of USA CA stored fruit is treated with 1-Methylcyclopropene (1-MCP). Harvista (pre-harvest 1-MCP) is almost as good in controlling ethylene as the post-harvest 1-MCP treatment. Harvista reduced soft scald on Honeycrisp apples, but can increase CO_2 damage. Both Harvista and Retain reduce internal ethylene concentrations. It is best to apply Harvista close to harvest to minimise its impact on colour inhibition.

1 MCP:

- reduces senescent breakdown in apples
- reduces senescent in pears
- increases woolliness and internal breakdown in peaches and nectarines
- reduces core flush of apples and pears
- increases CA disorders such as:
  - CO_2 injuries of apples
  - flesh browning of apples and pears

SPA 365, a McIntosh-like apple with improved post-harvest qualities − Toivonen

The Canadian breeding focusses on improving existing cultivars due to the high cost of establishing new varieties. SPA 365 has replaced McIntosh as it has the same flavour and less bruising. Aurora Golden Gala (Splendour/Gala cross) was rated the best tasting apple. It has good firmness retention with only slight bruising.

Sex pheromones offer an elegant future for pest control − Suckling

When light brown apple moth was discovered in Aukland, authorities conducted 40 aerial *bt* sprays. This could only be achieved by spending one third of the budget on communication with the public. Pheromones are good for surveillance, but an attractant is required for eradication, and chemicals need to be applied before sterile insect release. When conducting eradication, sixteen pheromone traps per hectare provide good results.

Advances in the development of ethyl formate + carbon dioxide to control pests of horticultural commodities − Jamieson

Ethyl formate (16,7% in 83,3% CO_2) is regarded as a GRAS product which can be applied as a fumigant to disinfest fresh produce. 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.

Advances in application of high pressure washing for market access − Woolf

High pressure washing can be used to remove surface pests. The most widely used high pressure washing system was developed in South Africa by L.J.K. Theron in 1979. This system uses multiple rows of manifolds (7-10), with multiple nozzles on each manifold pointing downwards onto rotating brushes. Systems developed in New Zealand involve a three-nozzle treatment system (side and top nozzles), while another employs a high speed spinning rotor (1000 rpm) with four inward pointing nozzles. Low level water blasting at 80 − 100 PSI removes woolly apple aphid. For good control for other insects 800+ PSI is required. While insect removal is the primary aim, they have found other significant benefits

such as improved visual appearance, reduced disease development, and reduced chemical residues. Equipment requires a high capital cost.

Nitric oxide as a fumigant for postharvest pest control and its safety to postharvest quality of fresh products – Liu

Nitric oxide (NO), is a potent fumigant against insects under ultralow oxygen conditions. Nitric oxide inhibits bacterial growth and enhances post-harvest life of fruit and vegetables. It is effective against insects such as thrips, codling moth and mealy bug on apples. Nitric oxide reacts with oxygen to produce nitrogen dioxide (NO_2) and cause damage to fumigated products. When fumigation chamber was flushed with nitrogen to dilute nitric oxide at the end of fumigation before opening fumigation chamber to ambient air, the fumigation did not cause any injury to fresh fruit and vegetables. Nitric oxide treatments are currently unregistered, and require a high capital cost.

Recommendations

The following IHC congress will be held in Turkey in 2018. Apart from picking up new trends and ideas in horticulture, as well as valuable information, the IHC congress offers a wonderful networking opportunity. Programme managers and researchers are encouraged to attend the following congress. Turkey has a strong production and technical capability in our smaller industries such as cherries, apricots, figs and pomegranates, and for members of these industries, it will be insightful to arrange a tour to their production regions in conjunction with the symposium.

We should place a higher priority on consumer studies in our industry.

Make anthocyanin content a focus in our breeding programme.

Investigate the relevance of Index of Adsorbance Difference (I_{AD}) for stone fruit.

Should researchers require more information on specific presentations, they can contact me for the contact details of the presenter. Seeing as we are commencing with a project for disinfestation of grain chinch bug using ethyl formate, we can learn from the New Zealand researchers' experience with this fumigant.