**The III International Conference on Fresh-cut Produce: Maintaining Quality & Safety**

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The III International Conference on Fresh-cut Produce was held at the University of California, Davis, between the 13th and 16th of September 2015. Over 80 delegates were in attendance with representation from both academia and industry. Under the aegis of the International Society for Horticultural Science (ISHS), the conference aimed to draw upon expertise from a wide variety of subject areas to determine the current state of the research field, and how best to move forward in new collaborative efforts. Topics included: quality & product development, temperature handling & logistics, preparation & processing, packaging & modified atmospheres, food safety & sanitation, and marketing & consumer acceptance. In keeping with the aims and objectives of the GCRI Trust, many of the applications and technologies discussed were of relevance to UK growers and horticulture in general, as much of the research presented included important aspects of the supply chain. These ranged from harvest conditions, all the way through to washing, sanitizing and packaging of vegetables.

The first talk of the conference was given by Jeffrey Brecht of the University of Florida, and encompassed several aspects that would be discussed by other presenters. The talk emphasized the importance of keeping product chilled (between 2-5°C, ideally as close to 0°C as possible) constantly after harvest; Wyatt Brown of Cal Poly San Luis Obispo echoed this in a later talk. In his study of trans-USA produce shipments, not a single journey of fresh-cut produce, from processing plant to shop floor, was able to preserve the cool chain. Temperatures of up to 10°C were recorded for up to 75% of the entire journey time (typically over 10 hours), and temperatures varied greatly in general. Plant material generates metabolic heat after harvesting, and can potentially make keeping produce cold difficult. In transit, cool and efficient airflow is important for minimizing the effect of this heat. Current retail displays in supermarkets and grocery stores are also not satisfactory in keeping vegetable products cold. Stacking produce on shelves introduces temperature variability, and display cabinets can reach as high as 16°C, even if the temperature control is set to only 1°C. Back-room storage areas in supermarkets and grocery stores were particularly bad areas where the cool chain was breached for extensive periods of time, as product is often left waiting to be put into fridges or onto shelves.

Jeffrey Brecht’s (University of Florida) talk also highlighted that although visual changes in vegetables may be limited during shelf-life, substantial changes can occur, affecting chemicals within tissues, which can lead to increased respiration rates and reduction in overall shelf-life. This was also covered in more physiological and biochemical detail by Mikal Saltveit (UC Davis). Different vegetables respond differently to wounding and stress stimuli, though these can be broadly classified into three groups: physical, biochemical and metabolic responses. Physical responses relate to appearance, such as the wrinkling of leaves when dehydrated, for example. Biochemical responses are diverse and can often result in appearance changes too, such as phenolic compounds oxidizing to turn leaves brown. Metabolic responses are changes within genetic and cellular mechanisms, causing up-regulation and accumulation of phenolic compounds. Each of these responses can co-occur, and make preserving shelf-life quality very challenging for growers and processors. This does have a flip side however, as pointed out by Luis Cisneros-Zevallos (Texas A & M University). Chopped vegetables are potentially healthier for consumers, due to this metabolic accumulation of secondary metabolites with health benefits, such as phenolics.

Understanding the chemical changes within crop tissues is important, because even small changes can result in big perceptual differences. Charles Forney (Agri-Food Canada) made this point in his talk about aromas and off odours in fresh-cut produce. Stress to tissues causes fermentation of sugars, and the ensuing senescence in turn causes off-odours to be produced, which is not pleasant for the end consumer. It was also pointed out that to have a high quality end product, a high quality field product must be grown. This means selecting the best cultivars that are resistant to stress and post-harvest treatments. Giancarlo Colelli (University of Foggia) and other researchers engaged in a Europe-wide project (Quafety; Quality & Safety) and developed methods for detecting molecules associated with ‘off’ odours in products, and distinguishing between cultivars according to where they were grown and at what point in shelf-life they were. He and his group hope that this technology could one day be introduced into supply chains as a method of monitoring the quality of crops, such as rocket.

Pathogens and product safety were large issues discussed at the conference. Elliot Ryser (Michigan State University) highlighted the possible pre-harvest sources of contamination that growers might unwittingly expose their crops to. These included: contaminated irrigation water, wild animals, and even pathogens from field worker’s hands. Crates and bins where produce is kept in processing plants were highlighted as one of the leading sources of food contamination, as they are often taken from outside in to low-care environments. Within the supply chain, up to 90% of bacteria is removed from lettuce leaves, for example. However, all bacteria can never be fully removed due to their small size, resistance to chemicals, and ability to ‘hide’ within internal leaf spaces. Cross contamination between different products can occur within a processing line too. It has been documented that contaminated radicchio spread onto lettuce leaves through wash water, in a separate processing run. Chlorine sanitizers are largely ineffective if the organic load of wash water is >10%, making prevention of contamination the most important priority for researchers and industry to deal with at the present time.