Smart solution to plum conundrum

What to do when you know your export plums arrive at their best when stored at different temperatures during shipping, but your overseas market dictates a strict one-size-fits-all cold-steri approach? You turn to science for answers.

STORING AND SHIPPING

1. **Handré Viljoen**, project leader.
2. Dual temperature plum cultivars, such as ‘Sapphire’, require cold-storage at -0.5°C for 3-10 days. This temperature is then raised to 7.5°C for 5-7 days and then cooled down again to -0.5°C until marketing. This prevents storage disorders, such as internal browning, that would develop at prolonged temperature of -0.5°C. The period at 7.5°C allows the fruit to recover from permanent cell damage. Cold steri markets, however, require these plums to be stored at -0.55°C for 22 days. Inevitably, this protocol is too harsh for most dual temperature cultivars, resulting in internal browning and decreased fruit quality.

1. **Handré Viljoen**.
2. Preliminary results showed promise but highlighted that not all dual-temperature cultivars were going to react similarly to SmartFresh™. The research was therefore extended in 2014 through a Post-Harvest Innovation Fund project conducted by ExperiCo.

“Smart Fresh solution to plum conundrum”

1. **Handré Viljoen**.
2. The specific risk indicators for each plum cultivar have to be known before they can be exported to phytosanitary markets using SmartFresh™.

**Objectives and methodology**

The research project, jointly funded by the PHI Programme and industry, allowed the ExperiCo team to test the five top dual-temperature plum cultivars exported from South Africa: ‘Fortune’, ‘African Rose’, ‘Sapphire’, ‘African Pride’, ‘Sunkiss’ and ‘Ruby Red’. The mission was clear:

- Establish if SmartFresh™ application and warming treatments applied during cold-storage can counter quality losses which may develop during cold-steri treatment of traditional dual-temperature stored plums.
- Provide essential information on how to handle and store dual-temperature plums for cold steri markets.
- Develop specific cold-storage protocols for each cultivar.

Trials were conducted over three seasons using fruit sourced from Montagu and Franschoek. Once harvested, the fruits’ quality was assessed by looking at flesh firmness and skin colour, the total percentage of soluble solids present in the juice and malic acid levels. After going through various cold sterilisation and temperature management regimes with and without the addition of SmartFresh™, the plum wrappers were opened and the fruit stored at 10°C for five days to simulate shelf conditions. Notes were then made of signs of skin shrivel, decay or over-ripeness. Flesh firmness, internal quality (visual signs of gel breakdown or internal browning), taste and skin colour were also considered.

**Results and implications**

The data confirmed unequivocally that good quality fruit depended on cold-steri treatments being done in combination with SmartFresh™. Clear differences in how the cultivars reacted to different treatment regimes also came to the fore, along with the realisation that there was more than one treatment option.

“‘It’s critical for the industry to take note of new mitigation treatments. New phytosanitary pests emerge and bring with them the danger of closing down important markets,” says Handré.”

Handré Viljoen
The SmartFresh™ Quality System is globally recognised as an important tool for fruit quality management.

Launched commercially in 2002, SmartFresh™ is registered and has been approved for use in 46 countries to manage the ripening of climacteric fruit and vegetables by controlling naturally occurring ethylene during storage and transport.

Ethylene triggers ripening and decay in most fruits and vegetables, and can be responsible for storage disorders that spoil products and result in loss and waste. SmartFresh™ reduces fruit waste and maintains the texture, firmness, taste and appearance of fruits by warding off negative ethylene effects.

SmartFresh™ technology’s active ingredient is 1-methylcyclopropene (1-MCP), a simple hydrocarbon molecule similar to naturally occurring ethylene. This similarity allows SmartFresh™ to interact with the ethylene receptors in fruit.

SmartFresh™ formulation releases the 1-MCP in the storage room, which reduces the need for, and cost of, refrigeration and scrubbing.

Benefits for supply chain partners:

SmartFresh™ technology increases marketing flexibility, reduces the pressure to sell fruit as soon as possible, and provides more consistent product quality during the entire sales season.

It makes it easier to maintain the quality of ethylenesensitive fruits like plums, persimmons, apples, pears, avocados and kiwifruit.

In export and long-distance transportation scenarios, SmartFresh™ enables fruit to better withstand breaks in the cool chain or unforeseen delays in the supply chain. Additional benefits include compatibility with residue-free programmes and the potential for higher profitability.

Once the fruit has arrived at its destination, SmartFresh™ helps improve shelf life at ambient temperatures.

French retail studies have shown that more than 80% of plums treated with SmartFresh™ technology maintained top quality after seven days, compared to just 48% of control fruits.

Several studies have proven that SmartFresh™ contributes to a slowing down of the decrease of vitamin C throughout the entire apple supply chain and in a number of other crops.