New mandarins cope with the cold

South Africa’s newest export-quality citrus cultivars have shown that they can withstand sub-zero sterilisation without losing quality. The industry has every reason to be pleased.

**Consumers’ taste in fresh fruit – as in fashion – changes. Therefore, in order to remain competitive, exporting countries like South Africa have to continuously update their cultivar catalogue.**

The citrus industry, through Citrus Research International (CRI), the Agricultural Research Council (CitrusGold) and other partners, has responded to this challenge by developing a new selection of soft mandarin cultivars, all with promising internal and external qualities.

Spoiling the industry’s fun, however, is growing populations of Bactrocera invadens, a recently identified fruit fly species. Given its status as a phytosanitary pest, exporters already have to take strictly regulated precautions to prevent fruit fly infestation in consignments. As expected, the arrival of a new variety only made matters worse: sub-zero cold sterilisation has been passed as a mandatory treatment against B. invadens.

“New mandarins could be fully registered, without losing quality. The industry has every reason to cope with the cold,” explains Dr Nhlanhla Mathaba, project leader.

According to Dr Nhlanhla Mathaba, from University of Limpopo, to evaluate the effect of sub-zero cold sterilisation and ethylene degreening on the internal and external quality of the new mandarin cultivars, three objectives were formulated to achieve this aim; these were the following:

1. To establish the response of the newly bred mandarin selections to sub-zero sterilisation under export simulation conditions.
2. To establish if ethylene degreening has an effect on the development of rind disorders in the newly bred mandarin selections after withdrawal from cold sterilisation.
3. To establish the effect of sub-zero cold sterilisation on the internal quality of the newly bred mandarin selections after withdrawal from cold-storage.


**Research methodology**

De-greened and non-degreened ‘Sonnet ARC’, ‘Nova’ and ‘Nova ARC’, ‘I22’, ‘I24’ and ‘M37’ mandarins were sourced from an Addo farm in the Eastern Cape. The fruit was waxed with polyethylene citrus wax, packed and then transported to the ARC-ITSC laboratory in Nelspruit.

At the laboratory, the fruit was repacked into smaller cartons, each containing 50 mandarins. Cartons were stored at three different temperatures (0.5°C, 2.0°C and 0.4°C) for up to 28 days. After withdrawal from cold-storage, the fruit was kept at ambient temperature for seven days to allow for the development of rind disorders, mainly chilling injury.

Rind and juice were evaluated for the following physicochemical parameters: chilling injury, fruit weight loss, electrolyte leakage, membrane damage, juice total soluble solids, titratable acidity and rind colour.

**Results**

The study found that sub-zero cold sterilisation only affected cultivar ‘M37’; no effect on the physical and juice quality of the other cultivars was noted. ‘M37’ showed a significant decrease in fruit firmness and weight loss, and an increase in rind electrolyte leakage after cold-storage, irrespective of degreening treatment and cold storage temperature. The impacts on the quality of ‘M37’ were associated with severe chilling injury. Interestingly, the Brix index of ‘M37’ improved after cold sterilisation, which might be due to the significant water loss.

None of the chilling resistant cultivars showed any change in juice quality after withdrawal from cold sterilisation, irrespective of degreening treatment. The external colour of the non-degreened fruit seemed to improve during cold-storage, although not significantly.

“One of the most important findings of this study is that sub-zero cold sterilisation had a detrimental effect on only one of the new cultivars, South Africa now has the option to register five new cultivars for export to America and Japan.”

This export diversity increases the local industry’s competitiveness, while increased plantings of the new selections will lead to increased employment on farms, in packhouses and along the logistics value chain.

**Conclusions**

The new Mandarin varieties that were tested: ‘I22 ARC’ (2), ‘M37’ (3), ‘Sonnet ARC’ (4), ‘B24’ (5) and ‘Nova ARC’ (6). A recently identified fruit fly species, Bactrocera invadens, is yet another phytosanitary pest that producers have to control. (Courtesy: Peter Stephen from Citrus Research International)

© Prof. Tieho Paulus Mafeo, from the University of Limpopo, evaluated the effect of sub-zero cold sterilisation and ethylene degreening on the internal and external quality of the new mandarin cultivars.