

Satisfying the out-of-season appetite for avos

South African consumers have developed such a taste for avocados that they want to enjoy them year round. A study funded by industry and the PHI Programme is looking at options to improve local production and storage methods to meet this demand without having to depend on out-of-season imports.

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Dr Frans Kruger

GLOBALLY, CONSUMPTION OF avocados is growing at around three percent per annum. Production is struggling to keep up, which is driving a healthy and lucrative export trade.

In South Africa, out-of-season demand has grown to the point where the local avocado industry has started to import fruit from Northern Hemisphere production regions during this period. It is an expensive exercise, and importers regularly claim to make a loss. Making matters worse is the fact that, in many cases, the quality of the imported fruit is poor while the retail price is out of range for most consumers.



In view of the above, it only makes sense for the domestic industry to invest time, effort and resources into extending the local season as much as possible. Various initiatives are already underway. One approach is to establish orchards in late-production areas. These are either at high altitudes or in the more southern regions of the country.

Two cultivars that have proven to consistently produce high yields during the late season are 'Reed' and 'Lamb Hass'. In August 2014, a study funded by the PHI Programme and the avocado industry aimed at measuring the ultra-late-season quality and storage potential of these cultivars, started.

Led by Dr Frans Kruger, a researcher at Lowveld Post-harvest Services, the study set out to achieve three objectives:

1. Determine for what period after the conventional harvest season can 'Lamb Hass' and 'Reed' avocado fruit from high altitude orchards still be harvested, stored and ripened.
2. Launch a trial aimed at establishing what effect the late hanging of the fruit has on tree health and alternate bearing.
3. Develop appropriate harvest and storage protocols.

According to Frans, the option to market highly productive late-season cultivars instead of imported fruit during the off-season is of extreme importance to the South African avocado industry. "It will have an enormous impact on the profitability of producers with late-season orchards, as well as the ripeners and pre-packers who service the industry."

Frans' two team leaders were Dr Bombiti Nzanza, a horticulturist who manages the R&D

department of one of the world's largest tomato and avocado farms, and Danie Lemmer, a post-harvest specialist with extensive knowledge of avocado storage technology.

Points of departure

Although late-season storage trials in 2006 and 2007 with the 'Hass' and 'Fuerte' cultivars yielded reasonably good results under carefully controlled laboratory conditions, commercial attempts at applying the technology gave mixed results due to challenges in managing the process as carefully as was done under experimental conditions. This emphasised the need to use true late-season cultivars, such as 'Lamb Hass' and 'Reed', for further investigation.

Two approaches can be followed when supplying the very late-season market with locally produced fruit.

The first is to let the fruit hang until the projected marketing date is reached. This is the best option for fruit quality. However, it can be detrimental to tree health. Certain cultivars, such as 'Hass', bear very poorly the next year. Both 'Reed' and 'Lamb Hass' are more robust when it comes to this aspect and, after fruit set, both cultivars mature at a slow rate, making them suitable candidates for the late-season market.

The second is to let the fruit hang as long as is practical and then to store it for an additional period. The present study aimed to determine whether it is feasible to use 'Reed' and 'Lamb Hass' to supply the late-season market and to develop appropriate harvest and storage protocols for these cultivars.

The study

Starting in August 2014 and covering two seasons, the study planned for the 'Lamb Hass' trials to be performed in the Nelspruit and Mooketsi areas in the Lowveld region of South Africa's Mpumalanga and Limpopo provinces. The 'Reed' trials were planned for the Schagen and Mooketsi areas.

Early on, however, reality forced a change in

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PROJECT TITLE

The development of harvesting and extended storage protocols for late season 'Lamb Hass' and 'Reed' avocado fruit

PRINCIPAL INVESTIGATOR

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CONTACT DETAILS

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DURATION

Two years

PHI PROGRAMME & INDUSTRY CONTRIBUTIONS

R207 000 & R197 000

LEAD INSTITUTION

Lowveld Post-harvest Services, Nelspruit

BENEFICIARY

Sub-tropical fruit

FOCUS AREA

Post-harvest physiology and pre-harvest aspects

PUBLICATIONS

Three

PRESENTATIONS

Three

plans. When project work started in September 2014, the Schagen fruit was already over-mature and therefore not suitable for the trials.

"The first lesson we learnt was that, although both varieties are described as late cultivars in literature, they must be planted in a cooler area to ensure late-hanging potential," says Frans. As a result, the team then concentrated on high-altitude orchards.

The storage and ripening trails

'Lamb Hass' and 'Reed' fruit were harvested from Z22 orchards located on the Olyfberg farm (altitude 1400 mamsl) during, respectively, mid-October 2014, mid-November 2014, mid-December 2014 and mid-January 2015.

The samples collected on the first three dates were stored for one month; those collected during mid-January were stored for two weeks only. All the fruit were stored at 2°C, 4°C or 6°C after being treated with 0ppb, 200ppb, 300ppb or 500ppb 1-methylcyclopropene (1-MCP).

The results revealed stem-end rot

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1 Dr Frans Kruger with Precious Novela, a Z22 researcher, in the Boekenhoutsbult packhouse at Mooketsi.

2 The 'Lamb Hass' avocado fruit is characterised by a blunt ending neck and a rough skin that readily separates from the flesh when ripe.



“Lamb Hass’ avos grown at the appropriate altitude have excellent late-hanging and storage potential.”
Dr Frans Kruger

infection as the factor that determines when late-season avocados should be picked and for how long they can be stored. There was a direct correlation between the length of the ripening period and the incidence of stem-end rot infections. ‘Reed’ proved to be more susceptible than ‘Lamb Hass’.

‘Lamb Hass’ fruit stored at 6°C had no stem-end rot when harvested during October, November and December and stored for one month. The fruit harvested during January, however, had around 18% stem-end rot after two weeks of storage.

Stem-end rot aside, various other physiological disorders were present in the fruit harvested during mid-October and mid-November. Nevertheless, it was concluded that internal quality of the fruit should be acceptable after storage for one month at 6°C. The fruit harvested in mid-December and mid-January, stored for respectively one month and two weeks, had a less acceptable appearance. The most important cosmetic flaws were bruising, vascular browning, vascular hardening and grey pulp.

“Further trials should aim to reduce the appearance problems by pinpointing harvest dates and maximum storage periods, as well as handling recommendations to reduce bruising,” says Frans.

The results also showed that, because of their ripening retardation effects, neither 1-MCP nor the lowest storage temperature settings, namely 2°C and 4°C, were appropriate for achieving ultra-late-season marketing purposes.

Based on these results, the team provisionally recommended that ‘Lamb Hass’ fruit harvested in December should be stored

for two weeks at the most, and that fruit harvested in January be immediately marketed.

The first season’s results confirmed the potential of ultra-late season ‘Lamb Hass’. ‘Reed’, however, proved to be unsuited for the purpose. This outcome informed the decision to proceed with ‘Lamb Hass’ only in terms of measuring the effect that the late hanging has on tree phenology.

The tree health study

The pilot trial on the effect that late hanging has on ‘Lamb Hass’ tree health and alternate bearing involved four rows of ‘Lamb Hass’ trees (132 trees in total) in the Olyfberg orchard.

The number of 2014 fruit hanging on each tree was counted and the size of the 2015 set was scored. Fifty 2015 fruit on 20 of the trees were subsequently marked and the rate of fruit drop measured. The rate of fruit size increase was also measured on eight of the trees.

The study found a negative correlation between the numbers of 2014 fruit counted per tree and the 2015 fruit abundance score. However, the effect was not significant enough to justify the abandonment of late-hanging trials, neither did the late hanging cause an increase in fruit drop. The preliminary results indicated that trees on which the 2014 season’s fruit were retained for a longer period did not seem to shed more of the 2015 season’s fruit than those from which the 2014 fruit were stripped at an earlier stage. This observation was confirmed during the 2016 season.

An unexpected spin-off for exporters

Until recently, exporters have struggled to land ‘Lamb Hass’ fruit in an acceptable condition in Europe. One of the mistakes made was the use of low storage temperature regimes employed for ‘Hass’ during the late season. During 2016, certain producers exported ‘Lamb Hass’ at 6°C (which is an unusually high temperature for the time of season) with excellent results. Not only did the fruit land in a good condition, but excellent prices were attained. This was due to the fruit’s high oil content and superior taste



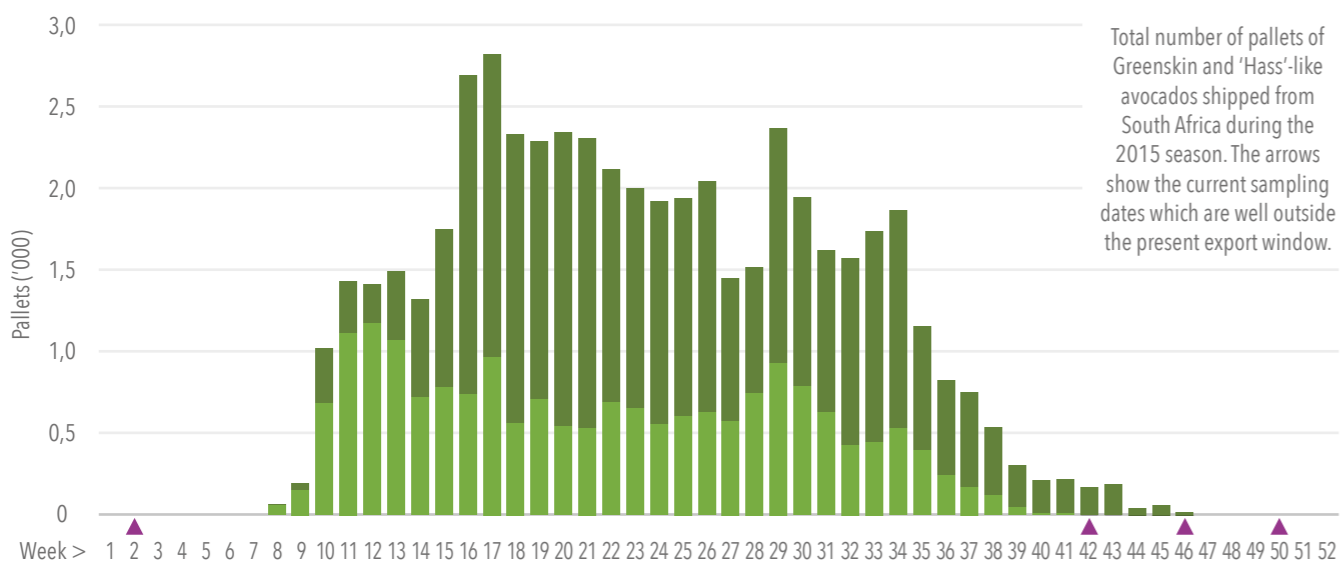
1 Harvest-mature ‘Lamb Hass’ (left) and ripe ‘Lamb Hass’ (right).

2 Emè Volschenk, a research assistant at Lowveld Post-harvest Services, taking fruit growth measurements in an avocado orchard in the Tzaneen area.

3 Letting ‘Lamb Hass’ fruit remain on the tree for an extended period after the fruit’s traditional harvest season resulted in mature fruit with a higher oil content (see oil globules in the cells of ‘Lamb Hass’) and subsequent superior eating quality for which consumers are willing to pay excellent prices.

2015 Avocado Exports

■ ‘Hass’ ■ Greenskin



Total number of pallets of Greenskin and ‘Hass’-like avocados shipped from South Africa during the 2015 season. The arrows show the current sampling dates which are well outside the present export window.

