Photo by Garloon (Envato Elements)

THE SHARPEST TOOL IN THE SHED

Measuring flesh firmness in late-season nectarines with the 8 mm penetrometer

By Anna Mouton

Photos on following pages by Elise-Marie Steenkamp

The introduction of late-season nectarine cultivars has transformed production in South Africa over the past three to four decades. Nectarines are now harvested as late as March, whereas in the past the season would end in early January. Many of the new cultivars have an increased sugar content and firmer flesh. But the harder fruit presents challenges when it comes to measuring firmness with the 11 mm penetrometer.

"Flesh firmness, measured with the penetrometer, and sugar are basically the two main parameters that determine whether nectarines are in the harvest maturity window," explains Arrie de Kock, senior researcher at ExperiCo. De Kock has investigated flesh firmness in nectarines using both the 8 mm and the 11 mm penetrometer.

"It's not a problem to use a penetrometer with an 11 mm tip on the softer early varieties, but when we get to the firmer late varieties, the 11 mm tip can crack the fruit and you get an inaccurate reading." Cracking can be avoided by using the 8 mm instead of the 11 mm tip. De Kock has also found that the variation in readings taken from opposite sides of the nectarine is reduced when using the 8 mm penetrometer on hard fruit.

In addition, the 11 mm tip has proved unreliable when used on electronic penetrometers. These instruments cannot differentiate the yield of the elastic flesh of firmer nectarines from actual penetration. As a result they take the reading at less than the required depth of 1 centimetre. This complication doesn't occur with the 8 mm tip.

"The other reason we wanted to change is simply that the international standard on stone fruit is the 8 mm tip," says De Kock. "When we get feedback from overseas, all the firmness readings that they quote are taken with the 8 mm tip. We're talking a different language to all the other stone fruit producing countries."

FIRMING UP ON MATURITY PARAMETERS

"What's happened over recent years is that a lot more late nectarine varieties have been planted," relates De Kock, "and many of those have a higher flesh firmness at optimum maturity than the older varieties. One of the reasons why we did this trial was that fruit was often rejected because it was deemed as immature or too hard, even though other parameters such as skin colour and sugar indicate that the fruit is ready to be picked."

Producers want to harvest fruit when it's physiologically ripe. Late-season nectarines will develop high sugar levels and achieve maturity without softening to the same extent as early cultivars. If late-season nectarines are allowed to soften beyond the optimum, there is an increased risk of bruising and storage disorders. De Kock believes that the 8 mm penetrometer is a better tool than the 11 mm penetrometer for identifying the optimum harvest window.

Above: Arrie de Kock demonstrates the correct use of the penetrometer during a new trial on plums.

De Kock's research also showed that the harvest maturity standards set by the Department of Agriculture, Forestry and Fisheries were not appropriate for certain cultivars. "One of the problems we have is that there are many, many new varieties — about 235 nectarine cultivars are exported from South Africa," states De Kock. "We don't know what the optimum maturity window is for some of those varieties."

Summer Fire was one of the cultivars for which a new maturity standard has been set. "I think it's a good variety but the producers were battling to get it packed

because it doesn't soften on the tree," says De Kock, "and by the time it starts softening it's too late.

"Summer Fire is a semi-clingstone type: it softens but not as much as many of the other varieties. Because of that the maturity standard that was set in the beginning was out." Based on his research, the maturity standard for Summer Fire has now been adjusted to allow a maximum firmness of 8.0 kilograms (measured with the 8 mm penetrometer), as has the standard for August Red. These changes came into effect on 1 January 2019.

"Of the small number of cultivars I tested, I came upon Summer Fire and August Red, for which the maturity standards were not correct. But there could be others," warns De Kock. "We don't know."

Above: Illustration of a pressure test with a penetrometer tip.

SETTING NEW STANDARDS FOR NECTARINES

An industry-wide dispensation to use the 8 mm penetrometer to determine flesh firmness on 37 late-season nectarine cultivars came into force on 1 January 2019. Firmness readings obtained with the 8 mm tip are lower than those measured with the 11 mm tip and the regulations have been adjusted using a conversion factor of 1.8. Dividing the generic flesh firmness range of 11.3 kg to 4.5 kg (measured with the 11 mm penetrometer) by 1.8 yields the new range of 6.5 kg to 2.5 kg (measured with the 8 mm penetrometer).

"Hortgro supplied a list of all the varieties that were inspected for export after 1 January for the last two years," says De Kock. "Those are the cultivars where the regulations have been changed to the 8 mm tip."

De Kock stresses that the list will be expanded in future. "We're in a transition period. There will be quite a number of cultivars that have to be added to that list. We've asked the producers to give us the names of the late cultivars so we can have a more complete list for next year."

The 8 mm penetrometer has made life easier for producers, according to De Kock, and the change represents welcome progress. "The 11 mm tip was a good way to do things in the past, but the industry has changed. It's time to move forward." **FQ**

Above: A side-by-side look at the 8 mm and 11 mm penetrometer tips.

RESEARCH OUTPUTS

NEW PROJECTS

2019 Evaluation of the 8 mm penetrometer plunger to determine harvest maturity on plums (Arrie de Kock)

COMPLETED PROJECTS

2018 Evaluation of the 8 mm penetrometer plunger to determine harvest maturity on nectarines (Arrie de Kock)

2009 Evaluation of plungers for accurate determination of harvest maturity of Imperial, Soldonnè, Bebeco and Charisma apricots (Arrie de Kock)