FOR THE DECIDUOUS FRUIT GROWER

FRESH QUARTERLY

CHEMICAL THINNING OF POME FRUIT

What’s available
Best practices
How does it work?

+ Interview with Karen Theron

CANKERS AND DIEBACK IN APPLE TREES
MEASURING FRUIT FIRMNESS IN NECTARINES

HORTGRO
Growing Fruit IQ
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A CENTURY OF FRUIT THINNING

In 1919, Spencer Pickering published a book called Science and Fruit Growing. Chapter XIII deals with the problem of fruiting in consecutive seasons. Pickering was interested in why apple trees would crop heavily one year but poorly the next.

"The recommendation is often made, to severely thin the fruit from a tree which is bearing heavily, with the object of destroying this tendency, and of obtaining moderate and more uniform bearing in future years," wrote Pickering.

Pickering found that removing blossoms seemed to control the biennial cropping habit, so that's what growers did — using small hand scissors. They soon noticed the added benefits of better fruit size and quality. Within the next few decades, scientists began discovering chemicals that caused flower scorch and fruit drop. 1-Naphthylacetic acid and naphthaleneacetamide came along about the same time as World War II, banishing scissors for good.

So where are we with chemical thinning a century after Pickering? This issue of Fresh Quarterly focuses on the present with articles describing the options available locally, best practices for use and how the various agents work. We were also fortunate to interview professor Karen Theron, an internationally recognised expert in the field of fruit thinning. She shares her insights on chemical thinning in the South African context.

Not interested in chemical thinners? You can read how cankers are threatening the establishment of new apple orchards. Or, how research comparing different penetrometer tips has led to a change in fruit maturity standards for late-season nectarines.

Enjoy!

Anna Mouton
Editor
Most fruit trees set far more fruit than they can support. Trees respond naturally by shedding fruitlets. In apples and some pear cultivars, this response is usually too weak to produce fruit of the size growers want. We therefore apply chemical thinners to stimulate fruit drop.

There are several thinning chemicals registered for use on apples and pears in South Africa: 6-benzyladenine (6-BA); 6-benzyladenine plus gibberellic acid (6-BA plus GA); 1-naphthaleneacetamide (NAD); 1-naphthylacetic acid (NAA); metamitron; and carbaryl. These are available in different formulations under various trade names. Different formulations are registered for different cultivars and each has its own instructions for use. The summary below is a broad overview: always study product labels carefully for the details!
CURRENT THINNING AGENTS AT A GLANCE

6-BENZYLADENENEDINE (6-BA)

Trade names: Bapso, Etilia, MaxCel

6-BA can be used as a single application on Bon Chretien, Golden Delicious, Granny Smith, Cripps Pink and Royal Gala — apply when king fruitlets are 8 to 12 millimeter in diameter. It can also be used in combination with NAA on Fuji, Golden Delicious, Cripps Pink and Royal Gala. Apply as a tank mix at petal drop, or when king fruitlets are 10 to 12 mm in diameter if using after NAA. Temperatures should remain above 18 degrees Celsius for two to three days following application, but temperatures above 28 C can lead to excessive thinning.

6-BENZYLADENENEDINE PLUS GIBBERELIC ACID (6-BA PLUS GA)

Trade names: Elppa, Gibbalin, Perlan, Promalin

6-BA plus GA is registered for thinning of Golden Delicious, Granny Smith and Royal Gala. 6-BA plus GA is usually combined with NAD, separately or as a tank mix, with the specific programme depending on cultivar and formulation. It can also be used alone in two applications: the first at 85 percent full bloom and another 14 days later.

1-NAPHTHYLACETIC ACID (NAA)

Trade name: Pochama

NAA is registered as a single application for easy-to-thin cultivars including Granny Smith, standard red cultivars, and young, vigorous Royal Gala types. Spray between petal fall and a maximum fruitlet diameter of 5 mm. NAA can result in overthinning in Granny Smith and must not be used in combination with other thinners in easy-to-thin cultivars.

In difficult-to-thin cultivars — red spur types, Braeburn, Cripps Red, Cripps Pink, full-bearing Royal Gala types, Golden Delicious and Fuji — application of NAA can be followed by 6-BA when fruitlets reach 8 to 12 mm diameter. Alternatively, NAA can be combined with 6-BA in a tank mixture and sprayed between petal fall and when fruitlets reach 12 mm in diameter. Later application can cause pygmy fruit in susceptible cultivars such as Fuji.

1-NAPHTHALENEACETAMIDE (NAD)

Trade name: Amid-Thin W

NAD is used as a single application on Golden Delicious and Royal Gala two to six days after full bloom. It is also registered for use with 6-BA plus GA in Golden Delicious, Granny Smith and Royal Gala. NAD has lost ground to better and safer thinners.

METAMITRON

Trade name: Nevis 150 SC

Metamitron is a photosynthetic inhibitor and used as a single application only. It is registered for use in Abate Petal, Cripps Pink, Early Bon Chretien, Forelle, Fuji, Golden Delicious, Granny Smith and Royal Gala. Spray from the end of flowering up to an average fruitlet size of 10 mm in diameter. Consult a specialist if a follow-up application of another agent is considered necessary.

CARBARYL

Trade names: Carbay 850 WP, Karba 850 WP, Karbacure, Sevin XLR Plus

Carbayl is best known as an insecticide, but it is registered as a thinner for apples, including difficult-to-thin cultivars like red spur types, Braeburn, Cripps Red, Cripps Pink, full-bearing Royal Gala types, Golden Delicious and Fuji. The dose is adjusted according to cultivar and a lower dose used when conditions favour thinning. Carbayl is no longer allowed in countries such as the United Kingdom and Germany. South Africa will probably follow this trend.

WHAT’S NEXT FOR THINNERS?

Researchers are always working to produce new agrochemicals. One exciting development is the evaluation of S-abscisic acid (S-ABA) on Forelle pears. S-ABA showed promise when applied at the 8 to 12 mm fruitlet stage. An increase in fruit size was observed in addition to thinning. S-ABA is already registered in South Africa for other applications, which should expedite registration as a thinning agent.

1-Aminocyclopropane-carboxylic acid (ACC) is a precursor of ethylene occurring naturally in plants. It is an effective chemical thinner of Japanese plums and some peach cultivars and is currently being evaluated on Cripps Red, Fuji and Royal Gala apples. Both S-ABA and ACC may eventually be permitted in organic agriculture.

FACTORS INFLUENCING THE EFFICACY OF CHEMICAL THINNERS

CULTIVAR

Less vigorous trees — those with low nitrogen or other reserves; moisture or other stress; shading; cold damage; or any condition that inhibits normal growth and fruit set — are more susceptible to chemical thinning. Weak spurs in the lower, inner parts of the tree thin more easily. Young trees thin more easily than older trees. In general, chemical thinners should only be applied to healthy, actively growing trees.

WEATHER CONDITIONS

Heavy flowering and fruit set, especially in successive years, facilitates chemical thinning. Thinning is easier when fruit set in clusters rather than singly.

Chemical thinning is optimal at 20 to 27 C. Cool temperatures, high humidity or rain, and low irradiance increase uptake of thinning agents by leaves, leading to more severe thinning. Spur leaves exposed to frost before flowering absorb chemicals more readily. Frost also damages flowers and lessens pollen tube growth and fertilisation, thereby increasing fruit abscission. Sunny weather directly after a cool period stresses the tree resulting in more severe thinning by chemical agents.

VIGOUR

CROP LOAD

Cluster thinning is more effective than single fruit thinning. Thinning is easier when fruit set in clusters rather than singly.
The large central blossom in this cluster will give rise to the king fruitlet.

How do the different chemicals thin?

Understanding natural and assisted abscission

By Karen Theron, Chair in Applied Preharvest Deciduous Fruit Research, Department of Horticultural Science, Stellenbosch University
Fruit growers use several chemical thinning compounds to control the number of fruit their trees produce — we discussed these in the preceding article. In this article, we explain how different chemical thinners work.

THE ABDSCISSON PROCESS

Abscission is how plants rid themselves of unwanted parts, like spent flowers and excess fruit. It helps to be aware of the natural process of abscission before trying to understand how chemical thinners work.

Abscission occurs in the abscission zone. For fruit, this zone lies between the stalk of the fruitlet and the short shoot — called the bourse — on which the flower cluster developed. Fruitlets drop when cell walls in the abscission zone break down. Breakdown is promoted by abscisic acid and inhibited by auxins. The interplay between these plant hormones is central to controlling fruit drop.

Ethylene plays a secondary role in abscission by reducing auxin levels and stimulating the breakdown of cell walls. In turn, auxins reduce the sensitivity of the abscission zone to ethylene. Other hormones that counteract abscission include cytokinins and gibberellins.

The relative levels of auxins to abscisic acid determine which fruitlets drop and which remain attached to the plant. The competition between fruitlets and the importance of each fruitlet to the plant is indicated by its sink strength. Strong sinks have high levels of auxins whereas weak sinks have low levels. Abscission is activated when auxin levels are low.

PRIMIGENIC DOMINANCE: KING FRUITLETS RULE

The terminal fruitlet in an apple cluster is called the king fruitlet. It usually sets first and dominates lower lateral fruitlets, causing many of these to drop. In contrast, the lowest lateral fruitlet in a cluster is dominant in pears. Lateral fruitlets have their own hierarchy. Dominated fruitlets grow more slowly and produce less auxin to prevent breakdown of their abscission zone.

The display of greater dominance by fruitlets that set first is called primigenic dominance. Vegetative growth can also exert dominance. Dominant fruitlets or shoots produce strong streams of auxins that inhibit the weaker streams from subsidiary fruitlets.

This effect disappears as soon as the dominant fruitlet or shoot tip is removed. The extent to which a fruitlet will dominate the rest of the cluster is influenced by:

1. the difference in time of fruit set. Older fruit, even by a few hours, are more dominant.
2. the number of seed per fruit. More seeds lead to greater dominance.
3. the proximity and vigour of vegetative shoots. Remember that shoots also compete for dominance.
4. the number of fruit per cluster.

As soon as a dominated fruitlet cannot produce enough auxin to maintain its abscission zone, it will drop.

SO HOW DO THE DIFFERENT CHEMICALS THIN?

6-BENZYLADENINE (6-BA)

6-Benzyladenine containing products (Bapsol, Eksis, and MaxCel) stimulate vegetative growth, especially of the bourse shoots — shoots arising from the shoot within the flower cluster. Stronger shoots produce more auxins and may, with the help of 6-BA, outcompete fruitlets, causing them to drop. 6-BA is effective on cultivars with prominent bourse shoot development and less so on spur types.

1-NAPHTHYLACETIC ACID (NAA), 1-NAPHTHAL-ENEACETAMIDE (NAD) AND CARBARYL

Fruitlets produce less auxin following application of NAA (PoMaxa), NAD (Amid-Thin W) and carbaryl (Carbaryl 850 WP, Karba 850 WP, Karbacure and Sevin XLR Plus). Auxin inhibits abscission, so less reaching the abscission zone will cause the fruitlet to drop. NAA and NAD are synthetic auxins and it may also be that they block the transport of natural auxins. Blockage would contribute to less auxin moving to the abscission zone. However, there are still many questions and uncertainties around the mechanism of action of these three thinning compounds.

METAMITRON

Metamitron (Nevis 150 SC) is a photosynthesis inhibitor. It increases competition among fruitlets by reducing available carbohydrates, causing more to drop. The efficacy of metamitron is increased by low irradiance (lowers photosynthesis), high temperatures, especially at night during bloom (increases respiration); high previous crop load (low carbohydrate reserves of tree); and strong shoot growth (increased competition for carbohydrates).

ETHEPHON AND 1-AMINOCYCLOPROPANE-CARBOXYLIC ACID (ACC)

Ethephon releases ethylene whereas ACC is converted to ethylene. Ethylene reduces auxin levels within fruitlets and inhibits movement of auxins to the abscission zone. ACC is currently being evaluated as a chemical thinner for apples.

S-ABSCISIC ACID (S-ABA)

S-ABA could be directly involved in abscission by stimulating enzymes in the abscission zone which cause cell walls to break down. S-ABA may also act by reducing carbon availability. It is known that application of S-ABA results in stomatal closure, which results in a reduction of photosynthesis and therefore lower carbohydrate availability. Restricted carbohydrates result in stronger competition between fruitlets and shoots leading to increased fruit abscission.

SCORCHERS

So-called scorchers include ammonium thiosulphate and terbacil (a herbicide). They are applied during bloom and scorch the flower parts of open flowers, preventing fertilisation, seed formation and thus often fruit set. Fruit that have few or no seeds tend to abscise. Scorchers are most effective when trees have a condensed bloom period. There are no scorchers registered for fruit thinning of apples and pears in South Africa.

The different chemical thinning compounds have different modes of action. The preceding article in this series discussed when each product should be used and what factors influence their efficacy. It is important to integrate all these aspects when selecting a product and deciding whether to incorporate more than one in a programme. Understanding their mode of action will assist in making an informed choice.
A SOUTH AFRICAN PERSPECTIVE ON CHEMICAL THINNERS

Fresh Quarterly interviews a deciduous fruit expert

Professor Karen Theron has been with the Department of Horticultural Science at Stellenbosch University since 1985. She currently holds the Chair in Applied Preharvest Deciduous Fruit Research. For the past eight years, Theron has participated in the European Fruit Research Institutes Network (EUFRIN), an organisation that specialises in research, development and extension on temperate fruit crops. She attends meetings of the EUFRIN fruit thinning working group. Theron shared some of her insights on chemical thinners with Hortgro Science’s Wiehann Steyn.
What makes a good chemical thinner?

A good chemical thinner needs to be reliable, consistent and predictable in the response obtained, while not inducing phytotoxicity on leaves or fruit. This is however not so easy, as many factors influence the efficacy of a chemical thinning application, among others tree condition, and weather before, during and after application.

A good thinner will also have a positive linear dose response — the higher the dose, the stronger the thinning effect. The thinning response should preferably happen quickly and be uniform. This means that only one or two fruitlets remain while smaller ones are abscised.

Unfortunately, this is not always achieved in South Africa as our bloom is often protracted. In addition, fruit set in pears but then end up having to thin. Does that make any sense?

I’m excited about both these products as they are naturally occurring in plants and therefore environmentally softer than the synthetic auxins and carbamates. Also it appears as if ACC might work as a “rescue” thinner in a late window when fruitlet diameter is 15 to 18 millimeters.

What chemical thinners are available to South African producers targeting the organic market?

What’s allowed in organic production depends on the specific organic certification, as far as I know: I recall that lime sulphur was allowed in certain cases while in others not.

Depending on formulation, it’s possible that S-ABA and/or ACC might be regarded as suitable for use in organic production. S-ABA has Organic Materials Review Institute (OMRI) classification in the U.S. OMRI is an international nonprofit organisation that determines which input products are allowed for use in organic production and processing. OMRI Listed products are allowed for use in certified organic operations under the USDA [U.S. Department of Agriculture] National Organic Program.

It’s been noted that producers try to increase fruit set in pears but then end up having to thin. Does that make any sense?

Some pear cultivars set fruit with very few seeds and fruit set needs to be stimulated by applying gibberellins as the yield will otherwise be too low. However, the set following these gibberellin applications is often too high and therefore needs to be reduced again chemically or by hand. In an ideal world, one would be able to increase set only to the extent that the correct crop load is achieved, but increasing set with plant growth regulators is as difficult as chemical thinning.

How should a producer evaluate new chemical thinning compounds or recipes?

I believe that it’s important for a grower to evaluate new products or programs relative to the one they know. I suggest they apply their old recipe to one part of the orchard and then apply the new option to at least a few rows. It’s important that these rows are representative of the orchard and that the trial does not include a weaker part of the orchard. These trees can then be harvested separately and yield determined as well graded for size distribution. It’s also very important to keep accurate information on aspects like tree condition, bloom density and distribution, previous crop load, and weather conditions before, during and after application. Such trials should be repeated over a few seasons.

Tell us more about your involvement with EUFRIN.

I was informally asked to join the group and attended my first meeting in 2011. I’ve been privileged to attend annually since then. The big advantage of being at these meetings is that one is at the forefront of what’s being researched internationally and data is discussed that’s still confidential. Therefore, I’m aware of what is happening long before any scientific papers are published. Also, the bigger companies that are involved in chemical thinner development, for example Valent BioSciences, Fine Agrochemicals, and Adama Agricultural, are present and as researchers we are also aware of what is happening on the commercial side of things.
RESEARCH INVENTORY

Thinning of pome fruit

A list of research projects and publications related to thinning of apples and pears. Our three articles on chemical thinning were compiled using information from industry-funded research.

COMPLETED PROJECTS

2002 Increasing fruit set and fruit size in problem cultivars (Karen Theron)

2004 Evaluation of alternative chemical thinning programs for apples (Karen Theron)

2006 The influence of climate stress and source/sink manipulations on gas exchange, size and colour development of bicolor apples (Stephanie Midgley)

2014 Cost effectiveness of the Nblossi picking platform and the Hermes harvesting system relative to conventional, labour-intensive farming practices (Wiehann Steyn)

2015 Mechanical thinning of pome fruit (Karen Theron)

2016 Evaluation of apple thinning programmes (Daan Brink, Willie Kotze, Xolani Siboza)

2016 Evaluation of pear thinning programmes (Daan Brink, Willie Kotze, Xolani Siboza)

PROJECTS COFUNDED BY PHILAGRO

Evaluating NAA and 6-BA as chemical thinning options on Forelle pears (Karen Theron)
Evaluating ACC and ABA as chemical fruit thinners on Forelle pears (Karen Theron)
Evaluating ACC as chemical thinner on apples (Karen Theron)

PUBLICATIONS

Scientific conference proceedings


Popular articles

Canker development in newly established apple trees has been increasing in the Western Cape, with stem cankers responsible for losses of 30 and 70 percent respectively in two affected orchards. The deciduous fruit industry has also observed significant mortalities due to dieback. Wood rot and canker-related diseases pose a large risk of critical damage to young trees and threaten the establishment of new orchards.

Left: Canker causing severe dieback of a one-year-old apple tree.
“Cankers appear on trees young and old, but the largest impact is on young trees,” says Lizel Mostert, associate professor at the Department of Plant Pathology, Stellenbosch University. “It can cause the death of young trees.”

WHAT ARE CANKERS?

Cankers are areas of dead or damaged tissues that show up on stems, branches and trunks due to bacterial and fungal infections. Cankers do not have a consistent appearance and can be hard to spot. Mostert points out that young trees may have internal infections without external signs. “When those trees are confronted by stressful circumstances, the symptoms will show,” she warns.

Mostert emphasises that a whole spectrum of fungi can cause cankers, as well as other symptoms such as twig blight and wood rot. Dieback is the premature death of trees due to infection by agents of canker and wood rot. These microbes — referred to as pathogens — enter trees through wounds and grow in the vascular tissues. Vascular tissues are essential for transport of water; obstruction leads gradually to the death of infected stems, branches and, eventually, entire trees.

Canker and wood rot pathogens form spores that can be carried in the air. Spores transmit from tree to tree through wind or the splashing of water. Infected plant material then spreads disease from nurseries to orchards, placing farms everywhere at risk of tree damage and losses.

Stress affects how trees respond to infection. Mostert’s research has shown that orchards on suboptimal soils are more prone to cankers. She believes that dieback of newly established trees in commercial orchards may be related to the stress associated with marginal soils. Drought, waterlogging, co-infections, pests and nutrition are all factors that may play a role in the susceptibility of trees to cankers.

“If the trees are under extremely stressed circumstances, up to 70 percent may die,” says Mostert. “It also depends on where the infection is situated: if it only occurs on the scion, it can still be pruned away. However, if it sits on the rootstock, it can potentially cause the entire tree to die.

“There are lots of different things that can cause stress and if it comes to things that need to be further researched, this is definitely it.”

KNOW YOUR ENEMY

Mostert and her team — including postgraduate students Minette Havenga and Greg Gatsi — recently completed a survey to determine the prevalence of organisms that cause canker and wood-rot in apples. They collected samples from all phases of the tree production process, including scion and rootstock mother plants, and nursery and newly established trees.

“To work out management strategies, you must first determine where the infection occurs and which pathogenic fungi are present,” says Mostert.

Her team isolated and identified disease-causing fungi from tissues that showed signs of canker. They found potential canker and wood-rot pathogens in 55 newly established trees out of 150 that were sampled. Nearly two thirds of certified nursery apple trees were infected. Canker-causing organisms were also present on propagation material including rootstock cuttings and scion shoots used for budding. The researchers identified 44 fungal species that are associated with disease in woody plants like fruit trees.

The study linked the fungal species that were present in nursery apple trees to those infecting diseased trees in newly established orchards. This suggests that nursery trees are a significant source of infection and that better pathogen control must be applied in all production phases.

“The young trees go through a certification scheme where inspectors classify them as visually clear, but there may still be infections internally,” cautions Mostert.

THE FIGHT CONTINUES

The survey conducted by Mostert and her team filled a gap in the field, because it focused on young trees. Whereas a lot is known about cankers and wood rot in older orchards, no one has investigated propagation material or looked at the disease status of nursery trees.

Starting an orchard with uninfected young trees is the first step in reducing losses. But this can be difficult when nursery trees have hidden infections. Mostert advocates reducing the spread of pathogens through improved nursery practices.

“One of our big control measures that needs to be applied is sanitation throughout the entire production process, especially regarding tools — pathogens spread via tools used during the budding process,” explains Mostert. “Sanitation across the whole spectrum of phases must be better applied.”

Further research on controlling cankers is already underway. One project is investigating ways to reduce infection of pruning wounds as a possible control measure. Mostert considers that many nursery practices can be improved, for example general sanitation of pruning wounds. She also recommends the removal of dead shoots and branches from nursery fields and orchards, as these can shelter disease-causing fungi.

Mostert is encouraged by the positive feedback she has received from industry. “They are very glad about the outcome, because it identifies certain areas in the plant propagation process where we can improve,” she says. “And that is really the purpose of the project — to see which areas we can improve.”

Above: These nursery trees showed no external symptoms of disease. Cross sections through the pruning wound and the bud union tell a different story. a) Wood rot developing from the rootstock pruning wound and b) brown discoloration due to canker.
RESEARCH INVENTORY

Stem cankers and dieback

A list of research projects and publications related to stem cankers and dieback in apple trees.

CURRENT
2018-2020  Evaluation of pruning wound protectants on nursery apple trees (Lizel Mostert)

COMPLETED
2018  Survey of stem cankers and dieback symptoms of young apple trees and possible inoculum sources (Lizel Mostert, Minette Havenga, Greg Gatsi)

PUBLICATIONS

Scientific articles


Popular articles


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.

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.

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.”

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.”

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