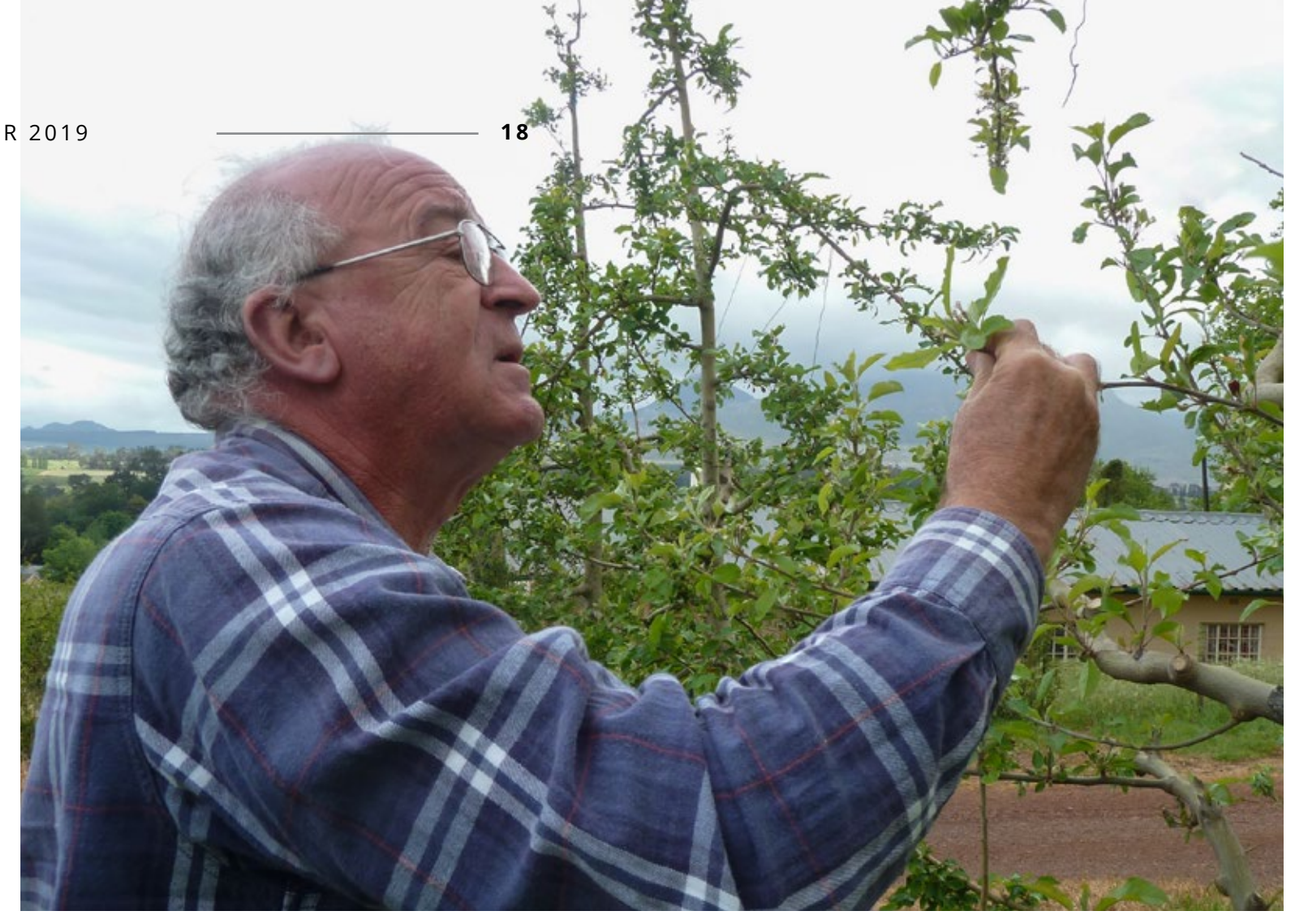
Healthy Tree, Healthy Fruit

Monitoring systems for pome and stone fruit

By Anna Mouton



ABOVE LEFT Ken Pringle developed the system that forms the basis of most monitoring in pome and stone fruit today.

PHOTOS: KEN PRINGLE | STELLENBOSCH UNIVERSITY

ABOVE RIGHT Monitoring allows the early detection of pests like woolly apple aphid.

Orchard health is essential to ensure consistent yields of quality fruit. Growers have to counter the ever-present threat of pests and diseases while meeting phytosanitary requirements from importing countries as well as consumer demand for food that's free of chemical residues. The upshot is that data-driven management is as critical to maintaining tree health as it is for other aspects of modern fruit production.

Current monitoring systems all have their roots in work done by Dr Ken Pringle of the Department of Conservation Ecology and Entomology at Stellenbosch University. He started out developing a system for assessing mite populations in commercial apple orchards and then went on to create a programme that covers all pests. "The system is based on inspecting a bit of all the plant parts — the fruit, the shoot, the leaf, etcetera — so I try and cover all the possible niches where a pest could be," explains Pringle, "If a new thing comes in, the system should pick it up."

The monitoring of pome and stone fruit is similar. "You aren't going to find exactly the same pests, but the system for pome fruit covers the pests of stone fruit as well," confirms Pringle. He recommends dividing orchards into blocks of two hectares. The shape of the blocks will depend on that of the orchard. Within each block a sample of 25 trees is selected for monitoring. "I count how long a row is and how many rows there are and then I work out many rows to monitor and how many trees per row. Then I use equally spaced trees in those rows."

Pringle advises choosing trees within the orchard rather than ones on the perimeter. The same trees are monitored throughout the season. "The reason is that, if the monitor sees something odd, you can go back to the specific tree that he was using to check on it."

The monitors are employees who've been trained in pest and disease recognition. "We run several of those courses every year," confirms Bekker Wessels, managing director of ProCrop, a company that provides specialised consulting services relating to pest and disease control. "They're very popular. The fruit monitoring course includes pome and stone fruit — it's a combined course because the methodology is basically the same with small differences in tree monitoring."

Monitors are responsible for scouting and damage assessments. "We use Pringle's system with a few slight adjustments," says Wessels. "There are the red spider mite guidelines on which he did most of the work. And the woolly apple aphid guidelines on which his students worked — we use all those as is." Scouting involves checking shoot tips, fruit clusters, leaves and leaf axils for evidence of pests. Scouting should be done every two weeks during the growing season.

PEST DETECTION IN PRACTICE

"There are a few areas where we deviate slightly," adds Wessels. "If you look at something like codling moth, in practice we're only interested in damage to the fruit. We don't do counts. The monitors must check for damage — then it's a yes or a no. The same applies to something like weevils."

In Wessels' experience the height at which codling moth damage occurs is beyond the reach of the monitors. If they rely on fruit counts, they may miss the damage and record an orchard as undamaged. Mating disruption further complicates monitoring by reducing the number of moths caught in traps. "Since the strategy for codling moth is that you spray the first generation and then base your follow-up treatments on the presence and extent of damage during that first generation, it's extremely important to register an orchard as positive or not."

The significance of pests varies from farm to farm. "A good example is the Langkloof," recounts Wessels. "I've been involved there since 2004 and we've never had to spray for red spider mite. If you search hard you'll find it there, but it's never been a problem." He explains that pests are classified into four categories — as described in a publication by Pringle in which he details the use of economic thresholds in pest management.

The first category contains non-pests — potentially damaging but don't cause economically significant losses in practice. They're monitored to ensure early detection should their numbers increase beyond the threshold that would translate into significant losses. "Second you've got sporadic pests," says Wessels, "that only become a problem in some seasons. These are typically things for which you scout, like woolly apple aphid."

Perennial pests, in contrast, make their appearance every year. "But the time of year when they exceed the threshold value will vary — one year it may be December and another January. So you scout to see when that is." The last category is chronic pests, described by Pringle as usually the key scourge of a crop. Chronic pests are naturally present in damaging numbers and require preventive measures to suppress the population. Monitoring for chronic pests will show whether the control strategy is effective or not.

Threshold values above which diseases cause significant economic losses have not been determined, but Wessels says this doesn't prevent effective monitoring. "Because nearly all of them are handled on a preventive programme, it's really about presence or absence."

MULTIPLE REASONS TO MONITOR

Monitoring systems for pests and diseases can assist growers in several ways. "The use of information that's linked to a threshold value is one part of this," says Wessels. "So it's about a decision made during the season — must I take action or not?"

Monitoring is also essential for determining whether an existing strategy is successful. "Take something like codling moth," explains Wessels, "where you roll out a strategy and then assess damage to tell you whether that strategy is working or not. If I see damage at the end of the first generation, I know the strategy hasn't worked well and I need to make changes in the second generation. The result at the end of the season informs my strategy for the following season. It's about prevention and the monitoring programme is a barometer of whether my system works."

When it comes to exports, monitoring of phytosanitary pests is important. "For example, if you look at apples, codling moth is a problem for the Taiwanese and Chinese markets. So for these markets you'll have stricter regulations in terms of placing traps — one per hectare instead of one per two hectares — and you have to make damage assessments."

Mealy bug can also cause difficulty. "We record presence and if it's found we flag the orchard and heighten control," says Wessels. "Then at harvest there's the normal sorting process and you quickly detect if there's a mealy bug problem. You inform the pack house and the fruit will be handled separately."

LEFT A standard bucket-trap — used here for monitoring fruit flies.

MONITORING IN THE DIGITAL AGE

Although many producers still operate with clipboard and pen, Wessels encourages his clients to switch to digital. "We've taken the monitoring system and transferred it to a digital platform. So now the monitor has a tablet and stylus and he ticks exactly the same options on his tablet as he did on his clipboard. And the minute he submits the data it's uploaded to the cloud and once the farmer has approved it, I get it. It's fantastic."

One such digital system is called Keyphase and was developed by Wessels in collaboration with an ex-commercial fruit grower and an engineer. "You have a dashboard for your traps and another for pest monitoring. Everything is beautifully charted and linked to a Google map of the farm — you can see exactly where the problems are."

Pringle believes that monitoring programmes can reduce the need for spraying, but producers haven't always embraced this option. "The thing is that, in comparison to other costs, the insecticide programme is very inexpensive. People are motivated to monitor because reduced spraying improves market access. And also there's a huge panic when one of these pests develops resistance."

Pressure on growers to spray less is likely to increase as regulators respond to consumer demand for chemical-free produce. One effect that will soon be felt is the banning of organophosphates in Europe. Other pesticides are likely to follow. More strategic use of chemicals to control pests and diseases is set to become the new normal — an approach that will only succeed if informed by regular and careful monitoring. **FQ**

Basic scouting system for pome fruit

- Divide orchard into blocks of two hectares
- Select and mark 25 evenly spaced trees per block.
- Scout these trees every two weeks.
- Specifically check five shoot tips, five leaf axils, five fruit clusters, and one leaf from the outside and one from the inside of the tree.
- All pests and diseases should be recorded, not only those for which a threshold is listed below.
- Scouting is supplemented by trapping, and fruit damage assessments before thinning and harvest.

Adapted from Brown L. and Pringle K.L. 2006. Monitoring system for pests on pome fruit. Pamphlet published by the Department of Conservation Ecology and Entomology at Stellenbosch University.

Thresholds for specific pests

PEST	PROCEDURE	THRESHOLD WHICH TRIGGERS ACTION
Codling moth	Inspect 5 fruit clusters per tree.	Presence of damage. Used to monitor efficacy of control strategy.
Bollworm	Inspect 5 fruit clusters and 5 shoot tips per tree.	Presence of pest and/or damage.
Fruit weevil	Inspect 5 fruit clusters per tree.	Presence of damage.
Mites	Inspect one leaf from the outside and one from the inside of the tree.	40 % of leaves infected if predators absent. 80 % of leaves infected if predators present..
Woolly apple aphid	Inspect half the tree for woolly apple aphid colonies in leaf axils. Record presence of parasites.	7/25 trees if no parasites present. 13/25 trees if colonies are parasitised.