Determining the best Monitoring Schedule for your orchard

Monitoring is the key to achieving more effective pest control and to adjusting the controls to fit the pest situation on your orchard. A Monitoring Schedule outlines the plan of monitoring rounds to be undertaken throughout the season and below we describe how this is put together.

Monitoring and Risk

How often you should monitor depends on the risk of damage on your orchard which in turn depends on pest pressure. This varies with a number of factors, but firstly with the time of year. The frequency of monitoring is also affected by how quickly pest populations change. On avocado trees, populations of greenhouse thrips (GHT) change more rapidly than do those of other pests, especially when conditions favour the thrips. This is why during the high risk period for thrips, monitoring should be no more than two weeks apart, while it can remain at three week intervals for leafrollers—even at times of high risk for these pests.

The extent and periods of risk for each pest vary from region to region, within regions and also from season to season. Growers need to use their experience including any information from past seasons to judge when a risk occurs on their orchard for each pest. Remember that pest damage may have occurred because a critical timing was missed, or because an applied spray did not achieve the desired kill of the pest targeted. Avocados are not an easy crop to spray well and although there has been much recent progress, there is still often room for improvement.

Flowering and Harvest

Flowering and harvest periods also affect what can be done about pests and hence whether a grower monitors or not at such times. However a quarantine monitoring for LRs should be carried out shortly before each harvest.

During harvest, only products with a short **Pre-harvest Interval (PHI)** can be used, while during flowering great care must be taken to avoid any impact on pollination. Only bee-safe products can be applied over flowering, and as water droplets can impact on flying bees; even these products are best applied when bees are not actively foraging. Where possible avoid spraying at all while bees are present. Growers use two basic strategies at such time. One approach is not to monitor because you are not going to spray, while the other is to continue to monitor to find out what is going on and, should spray be needed, then determine what is possible.

How do you combine all these considerations into a Monitoring Schedule?

Three ways that can be used to derive a Monitoring Schedule are described below; others are possible.

Note that a Monitoring Schedule is a flexible planning tool – things change as the season progresses and the actual schedule will need to be altered accordingly. Record the reasons when major changes are necessary.

1. **Pest Up approach:**
    a. Take a year calendar and mark on it the flowering period and anticipated harvest periods for your orchard based on past experience (see Figure 1.)

    b. Green House Thrips (GHT) – now consider the pest with the shortest interval between monitoring rounds; GHT at two weeks. GHT are abundant in the warm moist conditions of late summer into autumn. In the example the risk period is estimated as mid-February to mid-March, but your experience may indicate an earlier or later start or finish for your orchard. Note that if a spray is required against GHT, two sprays should be applied 14-21 days apart without monitoring between them.

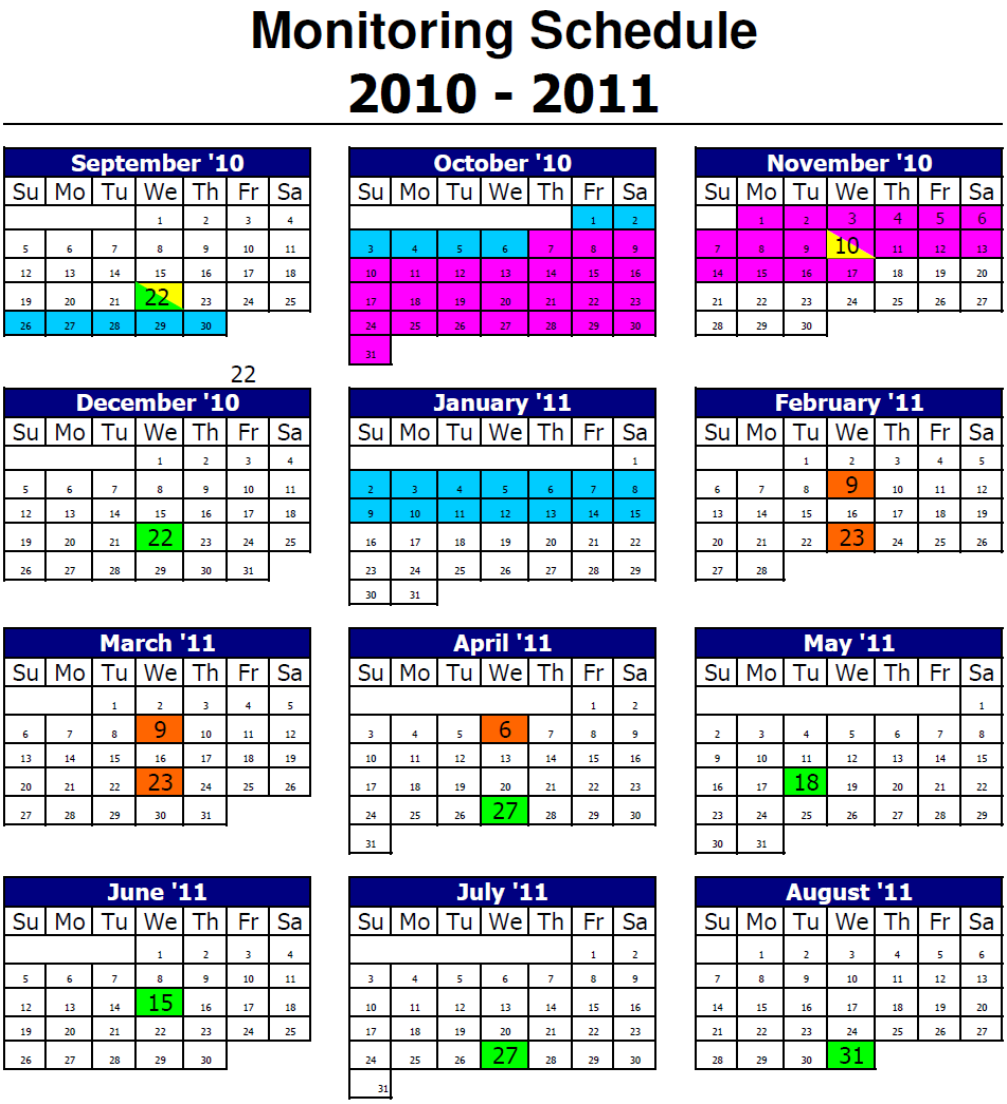
    c. Leafroller (LR) – Next consider leafrollers (LR). These occur all year round but are worst for a couple of months from fruit set. The monitoring interval for LR is three weeks stretching to four or even more in winter. So as GHT pressure falls, LR becomes the main reason for monitoring, although both pests are sampled each time. Add LR-focussed rounds onto the calendar after the risk period for GHT, through winter to spring the approach of both first pick and flowering. Once again local knowledge will indicate whether more or fewer rounds are needed.

d. Six-Spotted Mite (6SM) – before flowering it is important to monitor for 6SM, doing it early enough before flowering starts so that a spray can be applied if one is needed, as the mite controls are all bee toxic. 6SM is the pest that varies most throughout the country, and the number of monitoring rounds specifically focussed on this mite also varies considerably. In the example, rounds targeting 6SM were only needed at the beginning and end of flowering. The latter timing allows for spray as soon as bees are removed, if one is needed.

e. Harvest – The time of harvest determines what happens from flowering until GHT–focussed monitoring begins again in mid to late February. Before each picking round, a quarantine monitoring for LR (including egg rafts) is recommended. If all fruit is picked early there is little point in monitoring before late January unless 6SM is a real concern, or even later if a 'risk period' LR spray is applied by mid January.

f. After spraying – whenever a spray is applied in response to monitoring, there is no need to monitor until three weeks after the application. If you are concerned with coverage, or the effectiveness of the application, a two week interval is better, but effectiveness can also be addressed in other ways such as direct observations.

Figure 1.



2. **The "Periods of Risk" approach**

This was the approach used previously in AvoGreen. It uses a generalised diagram showing the period of risk plus a recommended frequency of monitoring for each pest. The periods of risk, called the periods for monitoring, can be adjusted to reflect variability in pest pressure by including the optional periods indicated. Users need to specify a start date as a fix point as the approach itself does not require a finalised or overall schedule.

This is a useful and flexible technique which remains valid, and when used well is very similar to the "pest up" approach. There has been a tendency to see the generalised example provided as being optimal for all situations, which it isn't. The range which recent diagrams represent has been identified, for example the one below is for moderate to low pest pressure.
The "Pest up" approach has been introduced to overcome some of the perceived shortcomings in the "Periods of Risk". It focuses on the situation of an orchard, and on combining the information for each pest into an actual proposed schedule.

Figure 2.

The Periods for Monitoring giving Best Practice with Low to Moderate Pest Pressure

Pests	Monitoring interval	Sample type	Periods for Monitoring											
			Month											
			July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Leafrollers	Every 3-4 weeks	Fruit												
		Shoots												
Greenhouse thrips	Every 2 weeks	Fruit												
6-spotted mite	Every 2-3 weeks	Leaves												
Armoured scales	If needed	Leaves or fruit												

KEY:

Recommended
Optional

Recommended
Optional
Rare

Notes:

- The recommended monitoring periods above are for when pest pressure is **low to moderate** for each pest. More or fewer rounds may be needed on your orchard.
- Undertake more monitoring if the orchard has a past history of problems with a particular pest, the weather favours a pest outbreak, or if a pest is still present at the end of recommended monitoring.
- Monitoring in mid-flowering is optional.
- Additional monitoring can be done at any time by mutual agreement between the Operator and Grower.
- Decrease the time to the next monitoring round if a pest is present at levels below the threshold.
- Once a threshold has been exceeded and it is decided to spray, another monitoring round is not required until after the spray has been applied. Sprays should be applied as soon as possible once recommended.
- For leafrollers, fruit monitoring is the preferred method; shoot monitoring is only an alternative when no fruit sites are available. Ensure that a monitoring is done just before the first pick.

3. **From a spray programme**

Another possible way to derive a Monitoring Schedule is to use your spray programme from the last year as a base. **However this approach runs a real risk of missing ideal timing, and is unlikely to increase packouts.**

Looking at every spray applied and what the target pest was, go back at least one and preferable

two pest monitoring intervals and plan a monitoring round. Two steps back is to help avoid missing the best time for application. Improved timing is indicated when at least one round occurs before the threshold is exceeded.

Mark these planned dates for monitoring on a calendar together with your anticipated flowering and harvesting periods and make sure that there is no obvious and extended gap for any pest.

Caution
Reducing the number of monitoring rounds will increase the risk that a pest may cause damage before it is detected. Careful use of past and current information from your orchard lowers the risk but does not eliminate it.

Once your Monitoring Schedule is drawn up...
Attach a copy of your Monitoring Schedule to your Sample Plan.

The Schedule can be varied during the season as results come in and things happen. Record the reason for any major change.

Evaluate and revise the Schedule at the start of each season using reject analyses from harvest