Module 11
Pre-Harvest Pest Control

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Introduction

Citrus pest management is one of the most dynamic aspects of pre-harvest production of citrus fruit.

There are dozens of different pests that can occur on citrus in Southern Africa, although usually there are only a few that occur and that require any form of control measure and these we would call key citrus pests. These would be pests such as:

- Citrus thrips
- California red scale
- Mealy bug
- Fruit fly
- False codling moth

Key Citrus Pests

Cosmetic Pests

These pests can fall into a number of different categories. The first is cosmetic pests. These are pests cause no harm to the actual quality of the fruit, but blemish the fruit and make the fruit less marketable. An example of a cosmetic pest would be citrus thrips.

Production Pests

The second would be what we would call production pests or pests that influence the crop size of the orchard. An example of a production pest, a pest that affects the yield, would be bollworm. Bollworm can also be a cosmetic pest.
Phytosanitary Pests

Another category of citrus pests would be phytosanitary pests and these are pests which are endemic to the production area, which means that they only occur in the production area.

A production area could be seen as Southern Africa or even Africa and phytosanitary pests are pest that the export markets don't want to get into their countries. These would be things like fruit fly.

Sometimes closely related to this category would be pests that cause waste, postharvest waste problems and fruit fly would also fall into this category, as would false codling moth.

Vectors

A further category would be vectors. Vectors are pests that are no problem to the fruit other than that they vector certain undesirable diseases such as the citrus psylla which is a vector of citrus greening disease.

Pest Control

How do we control these pests? Traditionally on all agricultural crops, chemical control has been the way in which all these pests have been controlled.

But on citrus, from about the 1950's, certain problems were experienced with chemical control. These were problems such as secondary pest outbreaks from the use of broad spectrum harsh chemicals and the increasing cost of chemical control related to rising oil prices.

Another problem was that the pests developed resistance to chemical pesticides. What developed as a result of that was an approach called integrated pest management.

Integrated pest management is the approach that the Southern African citrus industry adopts towards their pre-harvest pest control for the most part.
Integrated Pest Management

IPM is a holistic approach to pest management which consists of three main elements.

The first element is that it is a multifaceted approach and there are three main factors, being biological control, cultural control and chemical control.

The second element would be the use of economic thresholds, intervention thresholds or action thresholds, which would be measurements to determine when one needs to act.

And the third would be environmental responsibility or environmental conservation. This might sound just like an esoteric add-on, but in fact, very strong practical and commercial reasons can be given for adopting environmentally responsible approach.

Very often within the IPM approach the emphasis is laid on the integration of the three approaches – biological, chemical and cultural. However, the emphases should lay on management and management implies an understanding.

In order to be a good manager and to practice a good understanding, one needs to accumulate and interpret relevant, accurate and specific data for each and every orchard and for each and every single pest on that farm.

This will determine not only if and when or what it is necessary to spray, but almost more importantly, it will determine when it is not necessary to spray. This could be a great cost saving to the farmer and could also be very influential in preserving the beneficial natural enemies in that orchard which would be influenced by a spray.

**summary**

**IPM (Integrated Pest Management)**

The IPM approach consist of three elements, being:

- **Element 1** – Multifaceted approach, with factors being:
  - Biological
  - Cultural
  - Chemical
- **Element 2** – Economic thresholds
- **Element 3** – Environmental responsibility
The IPM Rating System

The CRI has a rating system that can be used to judge the effectiveness of an integrated pest management programme. Points are awarded with every application of pesticides, and the lower the score at the end of a season, the more effective is the IPM programme. For more information, contact the CRI or visit their website at www.cri.co.za.

Monitoring and Scouting

How does a farmer collect this data? He does so by monitoring. It is often said that monitoring is the cornerstone of an effective integrated pest management approach.

Monitoring is done through the usage of traps. These could either be traps which attract the pest through colour, for example leafhoppers which are attracted to a yellow colour, or through pheromones such as traps for false codling moth and California red scale, or through fruit attractants that is sometimes the case in fruit fly traps.

The other form of monitoring is scouting and most pests would be monitored through scouting. This is extremely important.

Farmers need to appoint their most trustworthy employees on the farm to this duty and make sure that they are properly trained. Also make sure that they are properly incentivised and that they have a proper understanding of the importance of their duties. Scouting also needs to be given priority and precedence on a regular basis on the farm.

Pest Occurrence

The farmer also needs to be aware of when these pests usually occur in the orchards. Certain pests already occur in spring, such as citrus thrips and bollworm. Then there are other pests which only become relevant later in the season. For example green citrus leafhopper would only appear once the fruit starts to colour up, so monitoring for this pest would only begin much later in the season.
Biological Control

Classical Biological Control

Classical biological control is the introduction and release of natural enemies – parasitoids and predators – which do not naturally or did not previously occur in that area. This is outside the hands of the farmer and would be conducted by researchers in the industry.

Conservation Biological Control

Then there is conservation biological control. This involves recognising the potentially highly effective complex of beneficial natural enemies which are already resident in the citrus orchard. These parasitoids and predators can very effectively reduce pest numbers, prevent pest outbreaks and even make any further intervention – particularly chemical intervention – unnecessary.

All the grower needs to do is preserve these natural enemies by only spraying when absolutely necessary and then judiciously selecting minimum-impact, short-residual pesticides. In addition, ants, which can disrupt natural enemies, should be kept out of trees.

Augmentation Biological Control

Finally, there is augmentation biological control. In South Africa there are some commercial insectaries, which rear natural enemies for mass release for the control of certain key citrus pests.

An example is a small wasp for control of citrus mealy bug, commonly called Coccis or Perminutus. Research trials have shown that such releases can effectively control mealy bug, eliminating the need to spray.
**Cultural Control**

Two good examples of important cultural control are: one, to keep ants out of the tree.

Ants treat sucking insects as if they were their cows. They milk these insects and they protect these insect against the attack of the beneficial natural enemies such as parasitoids and predators. Ants are very often responsible for serious outbreaks of sucking insects such as red scale, mealy bug and leafhoppers.

The second example of cultural control is orchard sanitation. Orchard sanitation is the regular removal of damaged and infested fruit, both from the orchard floor and fruit still hanging in the trees, and the destruction of these fruit.

Research has shown in the case of, for example false codling moth, in certain areas on average 75% of the false codling moth larvae occurring in that orchard can be removed by simple weekly orchard sanitation over the whole season.

**Chemical Control**

The third and last aspect of the IPM approach is chemical control. Chemical control should only be adopted as a last resort and when one does decide to spray, one needs to select very carefully which chemical to use.

Information on the non-target impacts of most pesticides is available to the citrus industry. This data, generated by CRI research, shows which the most harmful pesticides to beneficial insects are, and which the least harmful.

Unwise selection of a broad range, long-residual pesticide can cause secondary pest outbreaks. The farmer can then find himself on a chemical treadmill, with little choice other than to apply spray after spray or alternatively suffer significant pest damage.

This is where the intervention thresholds mentioned earlier come in. Growers should only spray if absolutely necessary, and if they do spray, they should apply pesticides which will assist, rather than disrupt valuable beneficial insects.
Pest Management Planning

And lastly very important is the planning of one’s pest management program before the season begins.

Planning already begins during the previous season and this would be done by the farmer conducting a pre-harvest blemish analysis in his orchard before he harvests the fruit.

He would do this by doing a survey of the fruit hanging in his orchard and determining what the major causes of damage or blemishes or infestation of the fruit in the orchard are. He would quantify these and the results would dictate which pests would be necessary to control the following season.

Control Options

Some pests are better controlled by preventative treatment. These would be pests such as California red scale and mealy bug.

By preventative treatment we mean that treatments are applied before the pest appears on the part of the plant on which it needs to be controlled, usually the fruit.

Some pests are better controlled only by corrective treatment and this means treatment takes place only once the pests has appeared on the tree or on the part of the plant usually the fruit where it needs to be controlled.

An example of this would be citrus thrips, the reason being that one would want to use a short residual IPM compatible product to treat this pest as there is no point in applying a treatment for citrus thrips before the pest has appeared.

It is essential to use the appropriate traps to monitor the populations of pests that are prevalent just before harvesting, especially pests such as fruit fly and false codling moth that can contribute to postharvest decay.

Orchard sanitation is the most important cultural practice during this time of the year. Good orchard sanitation will not only ensure that the spore load in the orchard is kept down, but also assist in controlling pest insect populations.
Module Reference

More on information on orchard sanitation can be found in module 10 – Orchard Sanitation.

active learning

Watch the DVD clips, read through the learning material and do workplace research to gather the knowledge and information to complete the assignments below.

Activity 11.1 – Research Project

Find out who on your farm is responsible for monitoring pest activity. Ask them what the most common pests on the farm are, and what measures are used to control them.

Do research into other ways of controlling these pests that may be more effective and / or environmentally friendly.

Activity 11.2 – Mind Map

In your group, discuss the effect that chemical pest control can have on the environment (including the natural environment and human population) and what can be done to lessen the impact.

Activity 11.3 – Workbook

In your own words explain the difference between the IPM approach and the traditional approach towards pest management.
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