NURSERY PAPERS

THE IMPORTANCE OF CORRECT PEST AND DISEASE IDENTIFICATION IN NURSERY PRODUCTION

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Pest ID (*www.pestid.com.au*) is now freely available to all of industry as an identification tool to inform your pest management programs. The public release of the tool complements the general rise in growers who have embraced Integrated Pest Management (IPM) in recent years.

In this Nursery Paper, we look at how Pest ID can help to identify pests, diseases, beneficials, weeds and disorders to support your IPM program. We also demonstrate how effective pest management depends on a grower's ability to recognise symptoms early, through consistent and structured crop monitoring.

BACKGROUND

The conventional use of pesticides for the management of key pests* is based on a broad-spectrum approach, whereby it destroys a wide range of organisms simultaneously. This strategy tends to be applied at set times of the year, where decision-making for growers is relatively simple.

The consequences of relying on this strategy are significant as pests can build resistance, which then render many chemicals ineffective, similar to what has happened with Western Flower Thrips (*Figure 1*). It can also cause secondary outbreaks of pests with high and rapid reproduction rates, such as Two Spotted Mites and Aphids, resulting in increased pesticide applications.

As a result, IPM was developed as a more sustainable and alternative approach to combating pests in nursery production. IPM uses a variety

Figure 1: Pest ID contains an appropriate level of detail to identify pests such as Western Flower Thrips pictured above. Source: https://www.pestid.com.au/pest-insect/western-flower-thrips.

of biological and cultural controls such as applying pesticides selectively, so as not to destroy natural enemies of pests, and to prevent pests from reaching an economically damaging level.

Some measures of IPM can be as simple as growers using biological microbial chemicals, for example, *Bacillus thuringiensis* (Bt) for Lepidopteran (caterpillar) control. Another is a procedure from the best practice scheme BioSecure HACCP, including its guidelines on inspecting and quarantining incoming

stock, which can help to prevent potential crop contamination.

While the conventional approach is more forgiving if a pest is misdiagnosed, IPM requires management tactics to be targeted and, more importantly, accurate. A misdiagnosis of the pest causing damage may result in economic loss as well as reduced grower confidence in continuing with IPM.

For the purposes of this article pests are defined as insects, diseases, and weeds.

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REQUIRED KNOWLEDGE

Growers need a good understanding of the pests likely to affect the crops they grow including a pest's lifecycle, feeding habits, favourable environmental conditions, as well as the relationship between harmful and beneficial insects.

Having this knowledge will help you to select the right type of management technique. It will also identify the best time and place to treat the crop. By obtaining this information, you are more likely to correctly diagnose the pest and select an appropriate management option.

An effective way to manage pests is to monitor pest populations during crop development and to ensure data is collected on a consistent basis (*Figure 2*). Over time, this allows growers to identify any abnormalities and to make an informed decision on crop protection.

KEY POINT: To practice IPM effectively, make sure you know the insect, disease, weed and disorder problems that can occur for particular crops.

PROCESS OF ELIMINATION

Growers now have access to resources that explain how to monitor and carry out inspections, such as the BioSecure HACCP manual, which standardises the process and has a function to capture and record data on a regular basis.

Additionally, when it comes to identifying pest problems in crops, it is important to include logical observations that can be answered as a process of elimination and drill down to the root cause. This complements the monitoring and inspections being carried out.

When monitoring, pests are either not present, hidden, or are in a form that is not readily identifiable. It is important to gather as much observational evidence as possible to assist diagnosis and decision-making.

For insects, this involves investigating the life stage and whether it is complete (egg, larva, pupa and adult) or incomplete (egg, nymph and adult). For weeds, it's understanding if it is at a seedling or vegetative/flowering stage and, for diseases, it's the infection stage and severity.

Figure 2: Monitoring for pests during crop development and collecting data is a vital component for diagnosis. Photo: Tony Filippi.

On page 3, *Table 1* has a list of observations to assist with crop monitoring, as well as useful tips to help identify likely causes of plant damage.

Narrowing down the possible cause(s) will make it easier to gather further information that can eliminate suspected causes. This way you are more confident you have correctly identified the problem.

For the experienced pest scout, many of these questions can be answered on farm due to the level of experience and knowledge acquired over time. A beginner will need to build this knowledge and experience via resources at their disposal such as experienced scouts, extension officers, consultants,

publications, and of course, the Pest ID tool, an online site specifically for Australian nursery producers (*Figure 3*).

PEST ID TOOL

Since February 2019, the Pest ID tool (*www.pestid.com.au*) has been made available to all production nurseries and their staff in Australia. It contains useful information and images about the most common pests in Australia's nursery industry.

It includes pest stages, lifecycles, as well as signs and symptoms to watch out for. It is easy to navigate via an effective category search that lists crop type, insects, diseases, weeds, disorders and beneficials.

The tool provides tips and guidelines to enhance your ability to correctly identify the issues and implement appropriate measures. New information and images are added on a weekly basis, keeping it up to date, comprehensive and relevant for growers.

For biosecurity purposes, there is also information on emergency plant pests that are not yet present in Australia, but could assist with early detection when monitoring and inspecting crops, particularly in the case of an incursion.

The tool is easily accessible via smart phone, tablet or desktop and is convenient to use by all staff when identifying pests during field monitoring or inspections of incoming or outgoing stock.

Pest ID is part of the levy-funded project, *Building the resilience and on-farm biosecurity capacity of the Australian nursery industry* (NY15002), funded by Hort Innovation using nursery industry levies and funds from the Australian Government. The project partner is the Queensland Department of Agriculture and Fisheries.

INVESTIGATIVE OBSERVATIONS WHEN MONITORING

Define the problem	1. Establish what the 'normal' plant would look like at this time of year.
	2. Describe the 'abnormality' – what are the symptoms and signs?
	3. Examine the entire plant and its surrounds to determine the primary problem and part of the plant where initial damage occurred.
	4. Check to see if there is an external source harbouring pest and disease, such as weeds and drainage.
Look for patterns	1. Is it on only one plant or more than one plant? Same crop type or are there others?
	2. **Non-uniform damage pattern** is indicative of living factors (pathogens, insects, etc).
	3. **Uniform damage pattern** over a large area indicates non-living factors (mechanical, physical, or chemical factors).
Delineate area of developed damage pattern	1. Has damage progressively spread on the plant, onto other plants? Over an area with time indicates damage caused by **living organisms.**
	2. Damage occurs, but does not spread to other plants or parts of the affected plant. Clear line of demarcation between damaged and undamaged tissues indicate **non-living damaging factors.**

LOGICAL STEPS FOR CAUSES OF PLANT DAMAGE PROBLEMS

Ask yourself these questions from gathered information.

Distinguish among living factors	1. Symptoms and signs of pathogens, is it fungal, bacterial, viral or nematodes (water-soaked marks, gumming, leaf and stem rots, etc).
	2. Symptoms and signs of insects, mites, and other animals (chewing, rasping or sucking damage).
Distinguish among non-living factors	1. Mechanical factors such as girdled, bruised, punctured roots.
	2. Physical factors, excess heat or cold and moisture stress.
	3. Chemical factors can be pesticide or foliar nutrition phytotoxicity.
	4. Nutritional disorders caused by deficiency or toxicity.
Check records	1. Check monitoring and spray records, nutritional program and irrigation records.
	2. Keep records of pest and disease outbreaks.
	3. Write down the dates you noticed the problem and acted on it.
	4. Plant's stage of development; the temperature and general weather conditions.
	5. Trace it back to source of origin i.e. supplier or motherstock.
Collect samples	1. Collect representative samples and field information to share with other qualified persons or submit to a diagnostic laboratory.
	2. Remember to take pictures to send with your analytical sample and for your scout protocol manual.
	3. Share process and outcomes with relevant staff and advise next steps

Table 1: *A routine of observations and questioning carried out to correctly identify the problem through the process of elimination. Green, Maloy & Capizzi. (1990).*
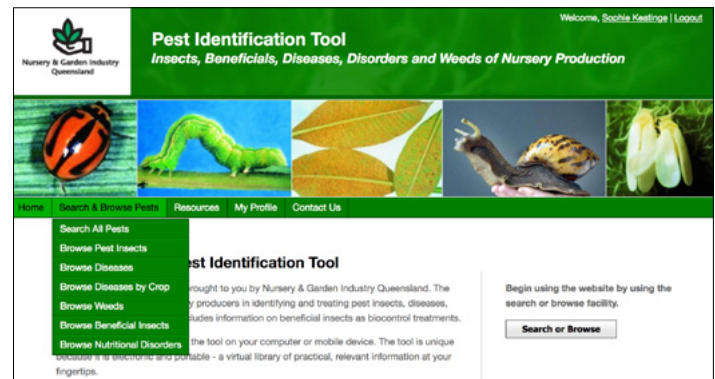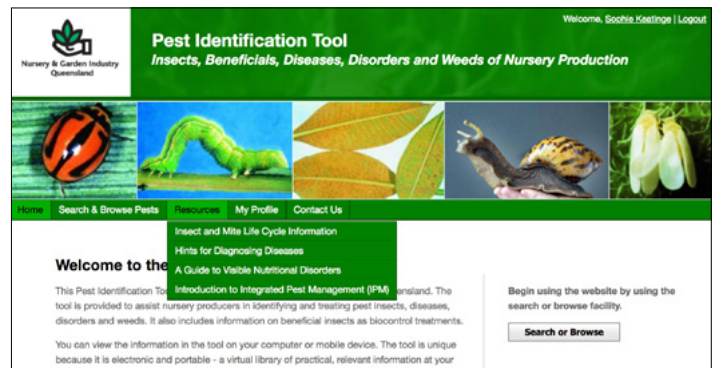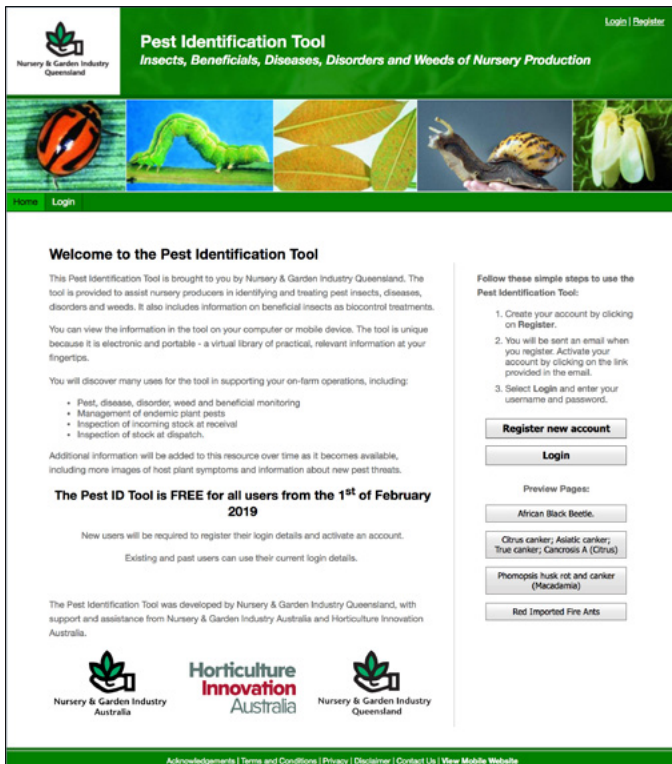
Figure 3: *The online Pest ID tool is a useful resource to build confidence in correctly identifying crop issues.*

EVIDENCE OVER ASSUMPTIONS

While the majority of pest problems can be identified using such resources, caution needs to be exercised when complex or difficult situations arise, particularly when symptoms such as fungi, bacteria and viruses or a secondary invading organism can be identical to the host pest.

Trained specialists can diagnose unknown or complex pest problems and, fortunately for Australia's nursery growers, a valuable resource is currently available under project NY15002. Growers can send samples to Grow Help Australia, a plant pest and disease diagnostic service.

The service is free of charge for Nursery Industry Accreditation Scheme Australia (NIASA) accredited businesses. For more information, visit: ***https://www.business.qld.gov.au/industries/farms-fishing-forestry/agriculture/agribusiness/grow-help-australia/techniques-costs***.

An explanation on how to collect and handle samples, along with requests for accompanying information for diagnosis, can be found in the 2014 NGIA Nursery Paper 'Accurately diagnosing weeds, pests and diseases affecting nursery crops' available at ***https://www.ngia.com.au/Attachment?Action=Download& Attachment_id=1469***.

Building your knowledge on how to correctly diagnose pest problems in your production nursery and utilising resources such as Pest ID is an investment in your business. It provides a pathway for better management of pests, which in turn can boost business productivity and sustainability.

REFERENCES

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Goodwin, S., & Steiner, M. (2002). *Pests, diseases, disorders and beneficials in ornamentals: field identification guide* (No. Ed. 2). NSW Agriculture.

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