

## CHAPTER 3

### Diagnosing Unknowns Using Digital Platforms

This chapter covers a range of digital platforms available for plant health doctors to use for identification and diagnosis of plants pests and diseases.

#### What equipment do I need?



- ✓ **Smart phone**
- ✓ **WhatsApp membership of Plant Health Doctor group**
- ✓ **Access to PestNet via**
  - **the website**
  - **a mobile device**
- ✓ **Pacific Pests, Pathogens & Weeds app**
- ✓ **Hand lens**

In Chapter 2, your trainees worked through the 'possible and probable' process for the diagnosis of pests and diseases. However, trainees and even experts, will come across symptoms that they cannot diagnose. These are the 'confused and unknowns' (the 'C' in A, B and C). Confused and unknowns come about for a number of reasons:

- lack of experience with pests and diseases of the different crops
- too many symptoms are present and there may be more than one pest or pathogen present (i.e. the sample is confused)
- a problem has occurred that has not been seen in the area for some time (the sample is unknown)
- a problem has never been seen before, as it is newly arrived in the area or the country (the sample is unknown)

Chapter 3 introduces your trainees to digital resources to help them diagnose symptoms of pests and diseases that are confused or unknown. These resources are:

- WhatsApp groups
- PestNet
- The Pacific Pests, Pathogens & Weeds app

### 3.1 WhatsApp country plant doctor networks



WhatsApp groups have been set up for Fiji, Samoa, Solomon Islands and Tonga. These groups include extension, research and biosecurity staff as well as national and overseas experts, to assist in diagnosing unknown or confused pests and diseases. Images are posted via a smartphone or tablet for identification of problems encountered at a plant health clinic or in the field, and the plant doctor can also ask the network questions about all aspects of plant protection. This means that information on diagnosis and management of problems can be easily and cheaply shared. As well, many of the problems in the Pacific islands are now known and captured in the Pacific Pests, Pathogens & Weeds app with sufficient information for digital diagnosis. Hence, focus can be directed to confused or unknown cases to save cost, time and effort.

WhatsApp and similar networks are ideal for Extension staff and others to deal with unknowns for the following reasons:

- Exchanges between members are rapid
- They can be used in the field or at PHCs to contact experts when extension staff need help in making diagnoses or management decisions
- They provide a list of the pests and diseases of a particular crop in a locality, and alert plant health doctors to be prepared for problems farmers are likely to bring to a plant health clinic
- The information collected can be databased and used to build a knowledge bank of crop pests and diseases, location, frequency and relative importance, for research and training purposes. This database will become an essential tool for plant health doctors and the plant health system in general

Other benefits of these networks include:

- Promotion of the use of digital tools to complement plant protection research in filtering or prioritisation of field sampling and laboratory diagnoses
- Improving communication and networking of members
- Serving as a platform for continuous refreshing and updating of knowledge/information related to pest ID and management
- Providing aid to early warning and pest alert systems to support Biosecurity authorities
- Supporting further development of the Pacific Pests, Pathogens & Weeds app by supplying quality pictures and/or potential subjects for factsheets, and to update information on existing factsheets, wherever applicable

### 3.1.2 How to join a WhatsApp group

You and your trainees should work through these steps to ask the Administrator to join a WhatsApp group (e.g. Fiji Plant Doctor Network).

1

You MUST have the phone number (or email address) of an Administrator of the group.

2

Download WhatsApp from the Google Play Store or Apple App Store.

3

Open WhatsApp and follow this YouTube video to create your WhatsApp account:  
<https://www.youtube.com/watch?v=ugGyYJSAIgA>

**Then either:**

4a

Send a TEXT to the Administrator asking "Please add me to the Group"

**Or:**

4b

Send an EMAIL to the Administrator with your phone no.

5

Now watch for a WhatsApp message from the Administrator to say that you are now a member.

## How the Administrator invites you to join

WhatsApp has made it easy for others to join a group by introducing an invite link, which is visible only to the administrator.

- 1 Tap on the group name (e.g. Fiji Plant Doctor Network) at the top of the screen.
- 2 Scroll down to Invite to Group via Link.
- 3 To activate the link, the Administrator taps on Invite to Group via Link, and this will bring up a list of 3 ways to share the link: 1) Share Link, 2) Copy Link, 3) QR Code.
- 4 The Administrator will store your number in their contacts and then complete the task by adding you to the group.
- 5 The Administrator can then share these links to one or more people by email, text, twitter, WhatsApp or other platforms.
- 6 Tap on the link. The following information will be displayed: *'This group is created by [Name] and has [ x number] participants'*.
- 7 Tap on 'Join Group' to accept the invitation and activate membership of the group.



Don't forget, you can have more than one  
Administrator

### 3.1.3 How to send a photograph and information for diagnosis



Good quality pictures are essential for accurate diagnoses. Doctors need to practice their camera skills and always choose the best, clear and in-focus picture(s) from the gallery to post to WhatsApp

Plant doctors should take a picture using the WhatsApp app and send it directly to the group. Either a picture, record audio, or a video of the problem can be taken, but pictures are probably the best especially where internet costs are high.

In general, the images on WhatsApp need to be of sufficient quality to show fine detail, even when taken through a x10 pocket lens.

A number of pictures may be necessary for accurate diagnosis, so doctors should take a picture of the whole plant as well as the parts affected wherever possible. Also where possible, pictures of the plants in the field are helpful in making a diagnosis in the field.

The sender of the request should also add details about the picture that include:

- Date picture was taken
- Location
- Weather conditions – hot/cold; wet/dry
- Information on the host plant – parts infected, the extent of the infection
- Estimate of how many or what percentage of plants are infected
- Whether it is a new problem
- A possible diagnosis
- Any other information that might assist diagnosis.



You DO need a Wi-fi connection to upload a photo to WhatsApp. If you do not have one, you can still take a photo and then upload and send it later when you have internet access

The pictures in Fig 3.1 and Fig 3.2 show pictures sent to a country WhatsApp group for diagnosis.

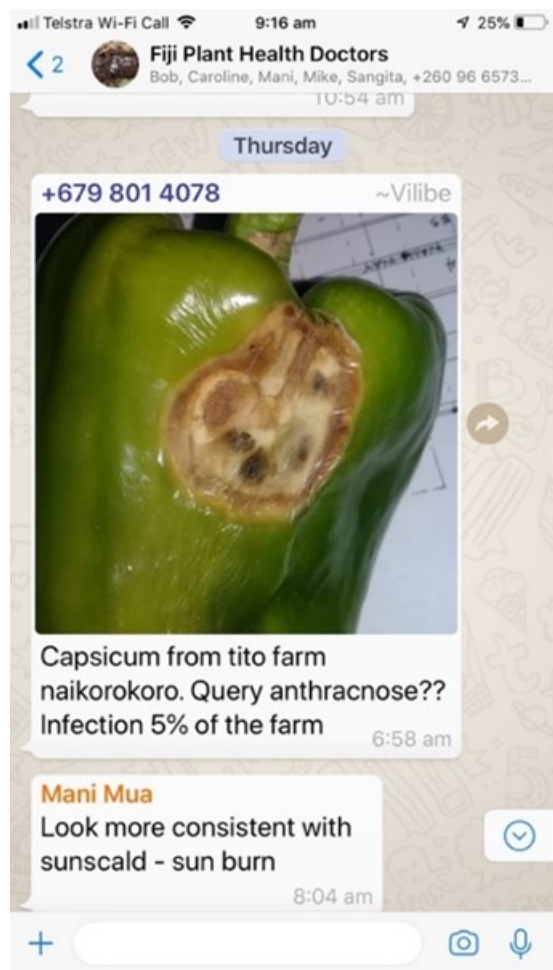


Fig. 3.1 Appearance of posts on WhatsApp Fiji Plant Health Doctors.

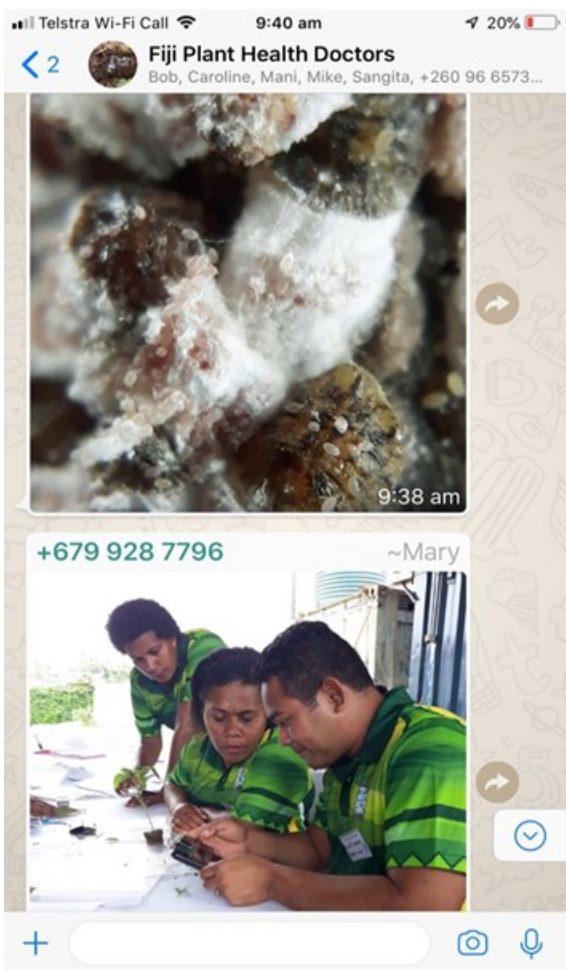
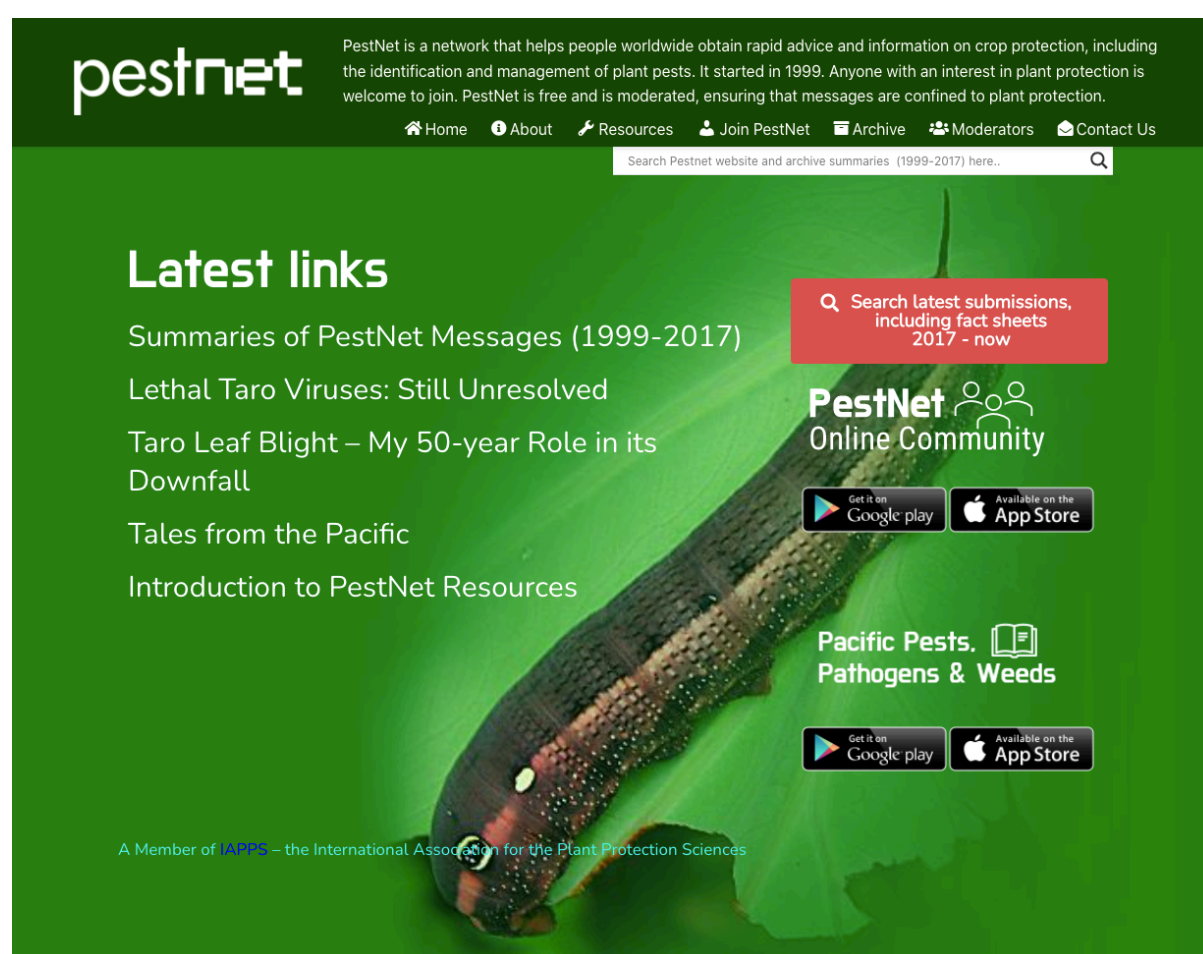


Fig. 3.2 Images from WhatsApp showing a cushion scale and nymphs from eggplant (top), and busy plant health doctors making a diagnosis (below).

## 3.2 PestNet

PestNet is an online service providing crop protection information of all kinds, in particular pest and disease identification and management. It was started in December 1999 and has about 1300 members. It is open to research and extension staff, farmers, and students, and uses emails to link members. Daily, it gives out information on plant protection from the Internet. To access PestNet go to [www.pestnet.org](http://www.pestnet.org).

PestNet is now amalgamated with the Pacific Pests, Pathogens & Weeds (fact sheet) app. So from the PestNet website ([www.pestnet.org](http://www.pestnet.org)) you can access PestNet's Online Community and more than 500 fact sheets, and from each of the fact sheets you can access PestNet.



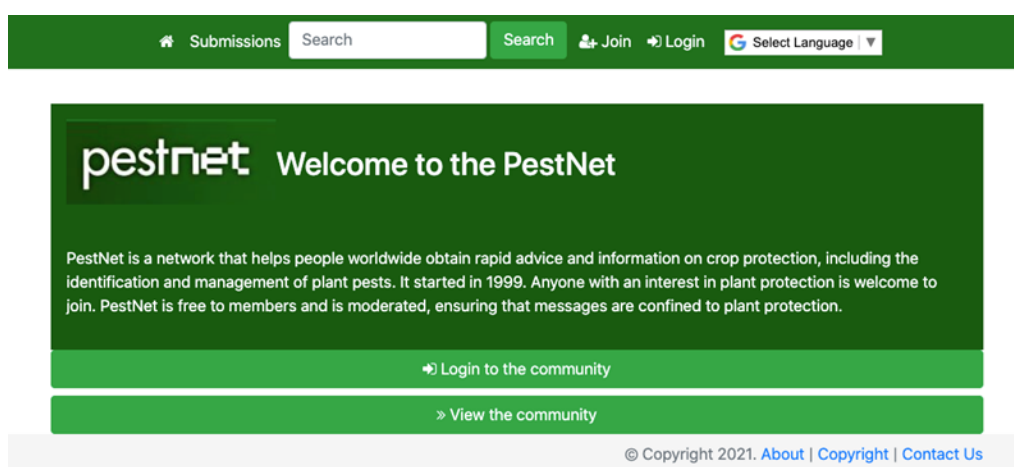
The next section shows you how to join PestNet, send a submission (e.g., request for an identification or for other information), and how to respond to someone else's submission.

### 3.2.1 Accessing PestNet from a computer

Trainees should work through the following process to become familiar with accessing and using PestNet on a computer. From the PestNet website (above) they should go directly to the 'Welcome to PestNet' page to join, login or view submissions via the 'PestNet Online Community' link.

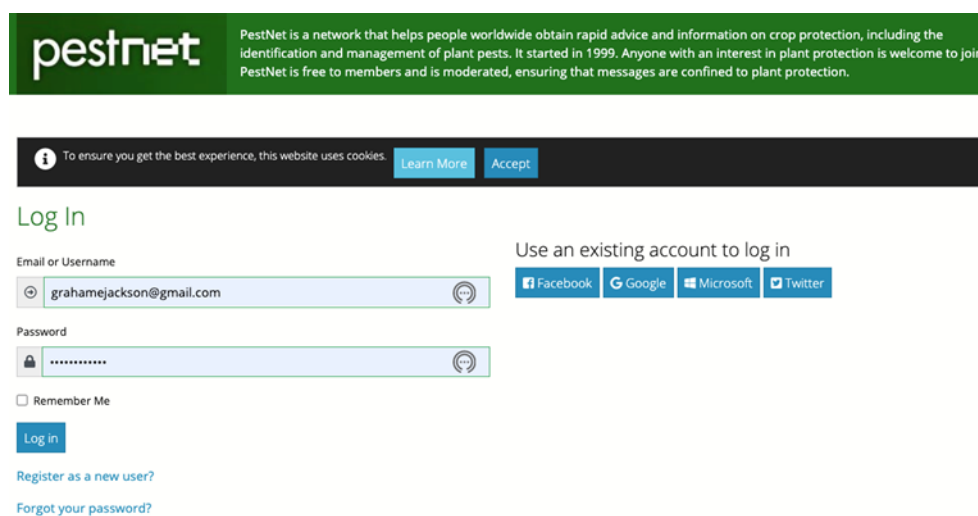
1

Welcome Page: [www.pestnet.org](http://www.pestnet.org).

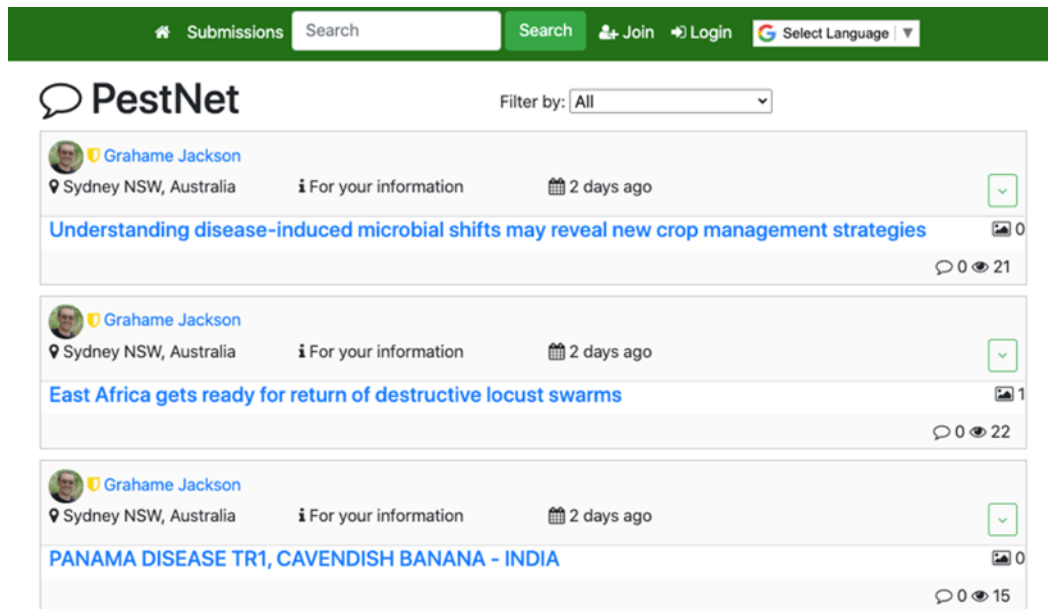


2

Choose 'Join PestNet' and either register with an email and password or use a social media account.



Or choose 'View the Community' just to look at submissions without signing in. In this view you will not be able to make a submission or respond to one. If you are already a member, go to Login.



3

Once you have been accepted as a member, tap + in the green circle, fill in the form and save. Submission goes to moderators (Note, tags are optional).







The screenshot shows the 'New Submission' form. At the top is a green navigation bar with links for Submissions, Search, a notification bell with 126 alerts, and a language selector. The form itself is titled 'New Submission' and contains the following fields and controls:
 

- Your location (Nearest town/city):** A text input field with the placeholder 'Enter a location'.
- Post Type:** A dropdown menu with the placeholder '<-- Please select -->'.
- Subject of Post:** A text input field with a red flag icon and the text 'Waiting for approval'.
- Media:** Two buttons, 'Add media...' and 'Clear new media items', with a note below stating 'Note: Images will be automatically adjusted to their preferred orientation once saved.'
- Content of Post:** A rich text editor with various formatting options (bold, italic, underline, link, unlink, list, indent, outdent, table, image, video, code) and a text area with the placeholder 'Add your submission text here...'. The text area has a character count 'Text: 0 / HTML: 11'.
- Tags:** A text input field with the placeholder 'Enter tags'.
- Visibility:** A green button labeled 'Visible'.
- Save:** A blue button labeled 'Save'.

 At the bottom of the page is a copyright notice: '© Copyright 2021. About | Copyright | Contact Us'.

# 4

To add submissions to PestNet - Click on headings to expand.

<a href="#">Understanding disease-induced microbial shifts may reveal new crop management strategies</a>				0
0 61				
 <a href="#">Grahame Jackson</a>	For your information	6 days ago		
Sydney NSW, Australia				
<a href="#">East Africa gets ready for return of destructive locust swarms</a>				1
0 37				
 <a href="#">Grahame Jackson</a>	For your information	7 days ago		
Sydney NSW, Australia				
<a href="#">PANAMA DISEASE TR1, CAVENDISH BANANA - INDIA</a>				0
0 32				
 <a href="#">Pierre Silvie</a>	Identification request	7 days ago		
Montpellier, France				
<a href="#">Identification of Chrysomelidae on Moringa leaves and twigs</a>				4
1 112				
 <a href="#">Grahame Jackson</a>	For your information	10 days ago		
Sydney NSW, Australia				
<a href="#">Study Shows How Groups of Bacteria Can Work Together for Better Protection of Crops</a>				0
0 33				
 <a href="#">Grahame Jackson</a>	For your information	10 days ago		
Sydney NSW, Australia				
<a href="#">Dung Beetles Use the Sky to Navigate – but How Exactly?</a>				0
0 31				
 <a href="#">Joel Miles</a>	Request for information	13 days ago		
Koror, Palau				
<a href="#">Interveinal chlorosis on Bauhina seedlings</a>				4
1 53				




An expanded submission. Note that images can also be expanded.

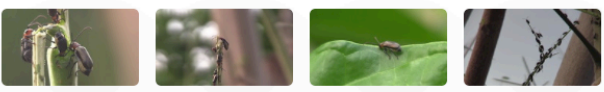
[Submissions](#)

[Search](#)
[Join](#)
[Login](#)
[Select Language](#)

[View Submissions](#)

 [Pierre Silvie](#)  
 Montpellier, France      Identification request      3 days ago

[Identification of Chrysomelidae on Moringa leaves and twigs](#)      4



Has somebody and idea of the scientific name of these Chrysomelidae-like insects found on Moringa leaves in Madagascar ?

1 54

# 5

Members will receive an email link to view submissions.

## PestNet Community Notification

8 Jan 2021, 12:20 (2 days ago)



to me ▾

Wednesday, 06 January 2021 20:52:44

**[Pierre Silvie posted a new submission 'Identification of Chrysomelidae on Moringa leaves and twigs'](#)**

### Submission

#### Identification of Chrysomelidae on Moringa leaves and twigs

Has somebody and idea of the scientific name of these Chrysomelidae-like insects found on Moringa leaves in Madagascar ?

Please do not reply to this email. Visit your community via <https://app.pestnet.org/me> to adjust your email preferences.

# 6

Members respond by clicking on the white curved arrow in the green circle, filling in the form and sending.

### Add your reply

Add media...
Clear new media items

Body

Add your response text here...

Text: 0 / HTML: 11
Text: 0 / HTML: 11

Tags:

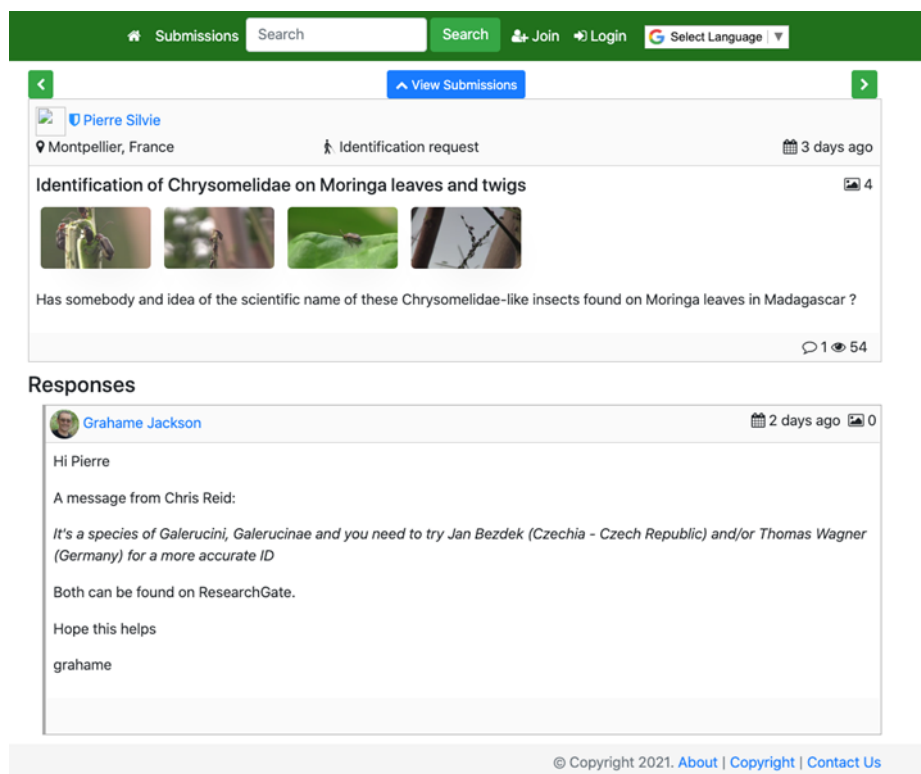
Enter tags

Post reply



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Members receive a link to the response and can reply.



## 7

Managing your PestNet profile (*optional*) - click on 'small man' symbol next to 'Join'.

Below are the definitions of the default position:

- **Emails:** When 'Enabled', you will receive ALL emails from PestNet
- **Notification emails:** When 'Enabled', you receive notifications (see bell and number in the top banner) for all posts and responses other than your own, generated daily and sent in an email (a digest)
- **Global watch:** When 'Enabled', you watch all the posts (by default)
- **Watch own submissions:** When 'Enabled', you will be notified if there are responses to any submission you have made
- **Watch own responses:** When 'Enabled', you will be notified if there are responses to any responses or comments you have made
- **Timing:** You will receive notifications depending on the time set: immediately, daily, weekly, etc.

Show apps
Submissions
Search
Search
126
Select Language

## My Community Profile

Update your profile details.

First name

Last name

Display name

User Type

Profile description

**B** **I** **U** **S** **X'** **X**, **A**

No description yet.

Crop

Your location

Interest Tags:

Member since:

Monday, November 19, 2018

No# of submissions:

1

No# of responses:

2

No# of followers:

0

Last active on:

Monday, November 19, 2018

Emails:

Notification emails:

Global watch:

Timing:

Watch own submissions:

Watch own responses:

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If you do not want all emails, go to My Community Profile and select:

- **Emails:** Stop – you will not get any emails from PestNet.
- **Global watch:** Stop – then choose 'My Watches' to make selections
  - My Watches: You can select any of the filter items: Submissions, Responses, Tags, Users or Location
  - To watch a tag, click on the tag and then the 'clock' (or for submissions just the 'clock')
  - Timing: You can determine when you want to receive your watches
- **Notification emails:** Select Enable or Stop, depending on whether you want to receive emails with a submission or tag that matches your watches

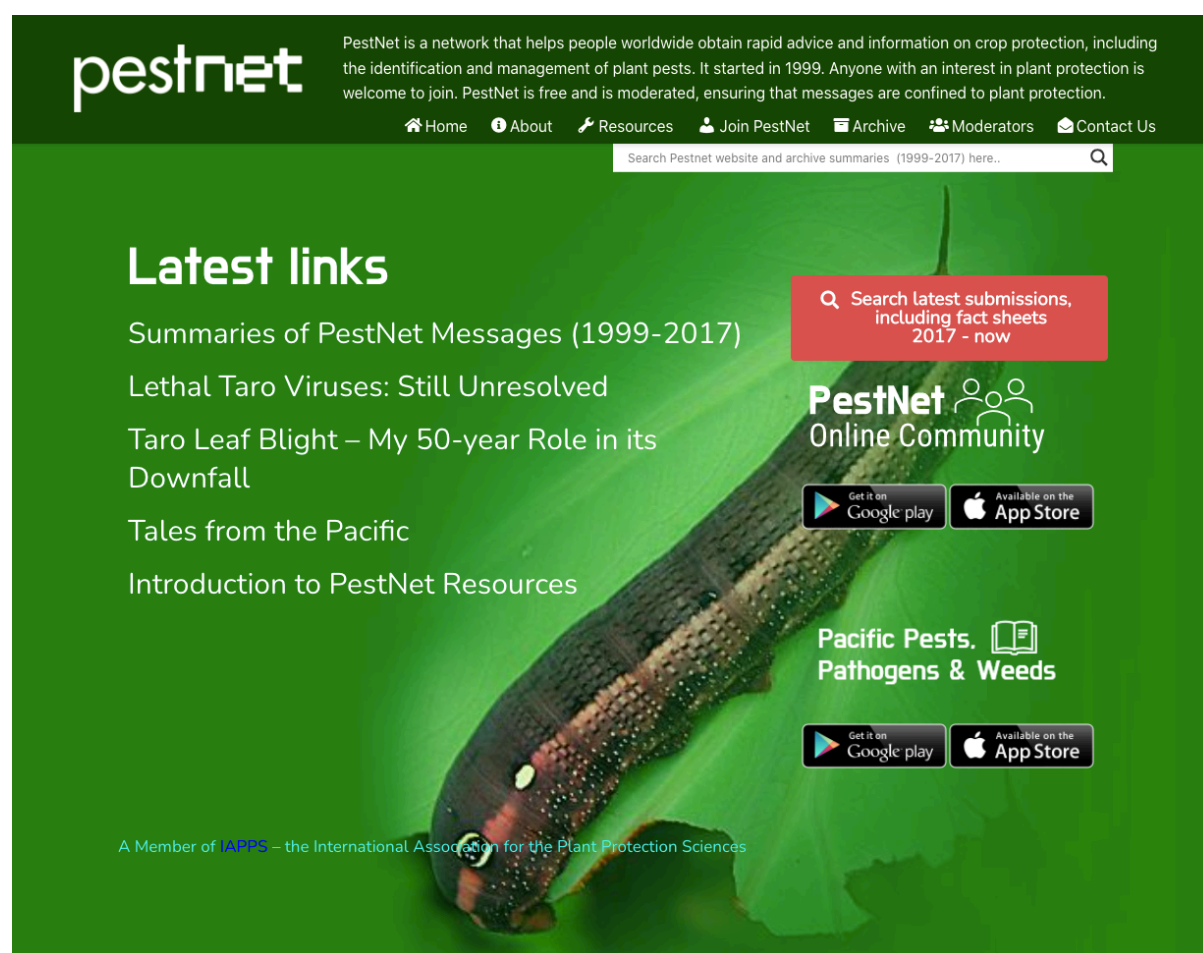
## 3.2.2 Accessing fact sheets via PestNet using a computer

Here we take you through the process of accessing the fact sheets via Pestnet's website using a computer. From the fact sheets you can access the PestNet Community. Having a direct link to PestNet from every fact sheet has advantages. It means that should you wish for more information on any pest you can quickly access PestNet to make a submission. If the two apps were separate then you would have to leave the one to access the other.

Note, the two apps (PestNet and Pacific Pests, Pathogens & Weeds) have been amalgamated.

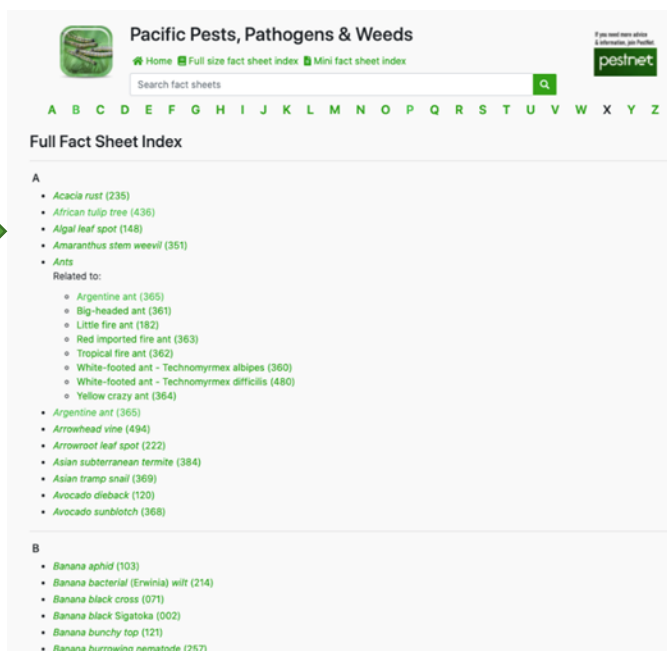
1

From the PestNet website, choose Pacific Pests, Pathogens & Weeds.



2

From the home page, choose either full or mini fact sheets.



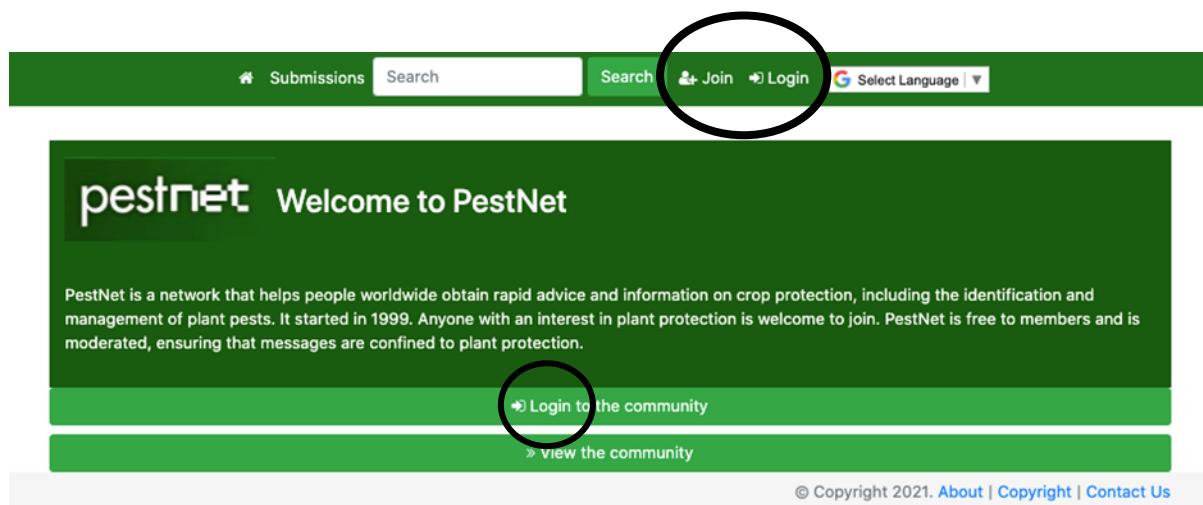
3

Select any fact sheet and click on the PestNet logo (top right).



# 4

By bringing up the 'Welcome to PestNet' page you can Join or Login to send a submission, as explained under 3.2.1.



## 3.2.3 Accessing PestNet on mobile devices (tablets and phones)

# 1

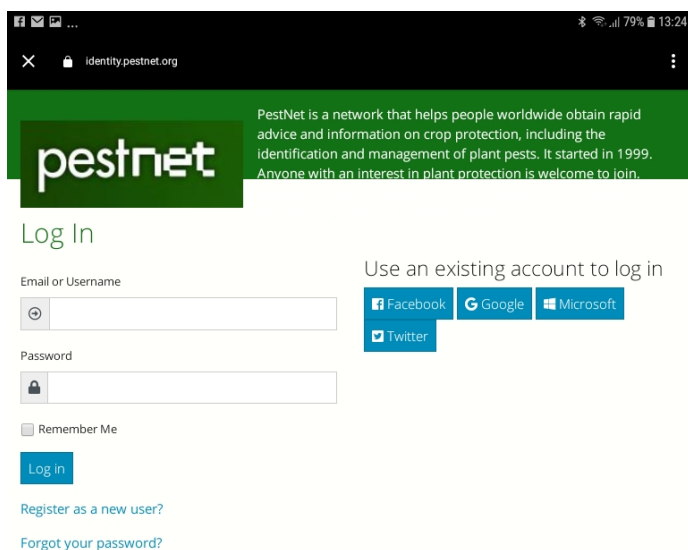
Download the app from either the Google or Apple app store. Note that PestNet and Pacific Pests, Pathogens & Weeds are now together in the one app.

# 2

Read and accept the Disclaimer by tapping on 'Continue'. Tap on 'PestNet Community' to go to the Welcome page.

# 3

Either View the messages without joining or Join (or login). You need to join if you want to post a submission or reply to one.



Join PestNet by completing the form or by logging into social media

# 4

Post a submission - Tap on the white + in the green background, and fill out the form. Tap on the arrow (bottom right) to send.

**New Submission**

**Your location** (Nearest town/city)

Enter a location

**Post Type**

<-- Please select -->

**Subject of Post**

Add media... Clear new media items

Note: Images will be automatically adjusted to their preferred orientation once saved.

**Content of Post**

Add your submission text here...

Text: 0 / HTML: 11

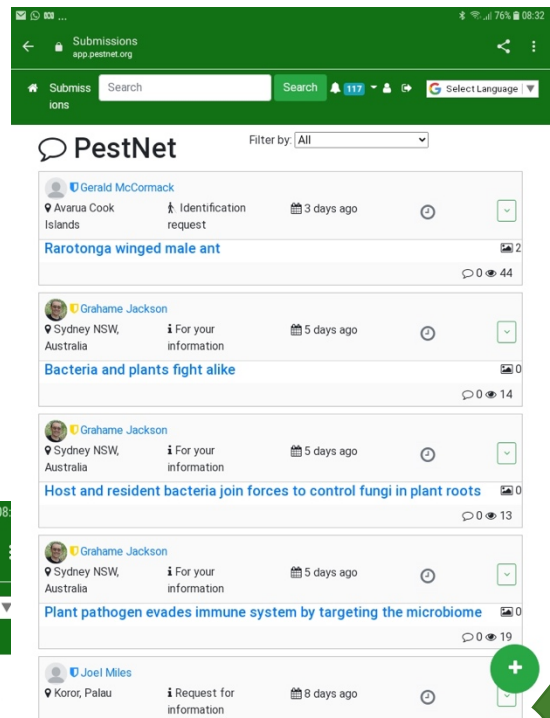
Text: 0 / HTML: 11

**Tags:**

Enter tags

Visible

Save



5

Submissions are cleared by moderators, added to PestNet and sent to members. Tapping within each submission opens it.

**Pierre Silvie**  
 Posted a week ago

**Identification of Chrysomelidae on Moringa leaves and twigs**  
 Has somebody and idea of the scientific name of these Chrysomelidae-like insects found on Moringa leaves in Madagascar ?  
 Montpellier, France

109 1

**Grahame Jackson**  
 Posted a week ago

**Study Shows How Groups of Bacteria Can Work Together for Better Protection of Crops**  
 The Science Times <https://www.sciencetimes.com/articles/28851/20201229/study-shows-groups-bacteria-work-together-better-protection-crops.htm>  
 Olive Marie Certain bacteria, also called plant-growth-promoting-bacteria or PGPB, can improve or shield plant ...  
 Biofilms Growth\_promoting\_bacteria  
 Sydney NSW, Australia

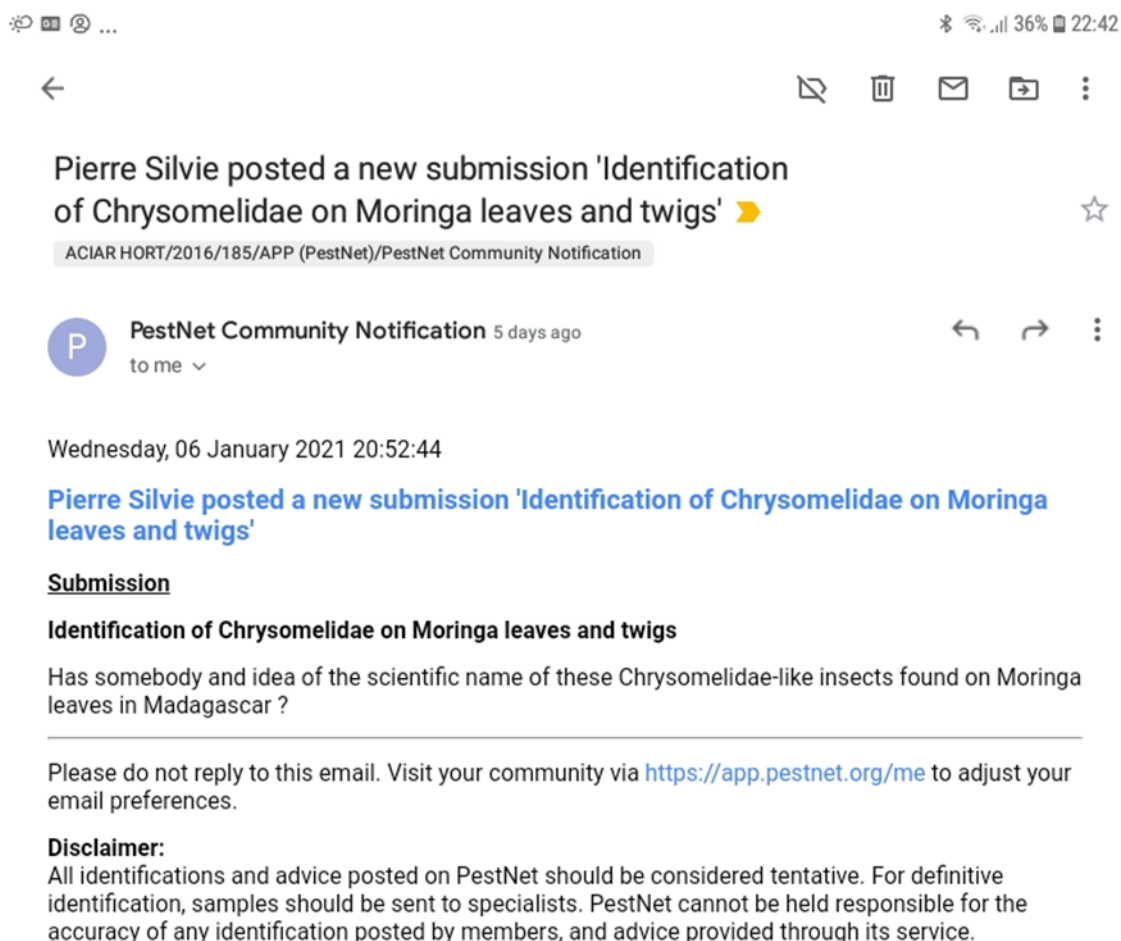
33 0

**Grahame Jackson**  
 Posted a week ago

**Dung Beetles Use the Sky to Navigate – but How Exactly?**  
 WireScience <https://science.thewire.in/environment/dung-beetles-movement-sky/1>

# 6

Members get an email with a link to the submission.





7

[illegible]

Optional to add an image and tags

← Identification of Chrysomelidae on Moringa leaves and twigs


 **Pierre Silvie**  
Posted 3 days ago



**Identification of Chrysomelidae on Moringa leaves and twigs**

Has somebody and idea of the scientific name of these Chrysomelidae-like insects found on Moringa leaves in Madagascar ?

📍 Montpellier, France

 **Grahame Jackson**  
Posted 2 days ago

Hi Pierre


A message from Chris Reid:

*It's a species of Galerucini, Galerucinae and you need to try Jan Bezdek (Czechia - Czech Republic) and/or Thomas Wagner (Germany) for a more accurate ID*


Both can be found on ResearchGate.


Hope this helps

grahame

 **Pierre Silvie**  
Many thanks to Chris Reid !! Pierre

7 hours ago

 Add a comment...



# 9

Checking responses - From the PestNet list of submissions you can click on the squarish box (below right) to see number of responses (in this case 1).

**Pierre Silvie**  
 Posted 3 days ago

**Identification of Chrysomelidae on Moringa leaves and twigs**  
 Has somebody and idea of the scientific name of these Chrysomelidae-like insects found on Moringa leaves in Madagascar ?  
 Montpellier, France

73 1

**Grahame Jackson**  
 Posted 6 days ago

**Study Shows How Groups of Bacteria Can Work Together for Better Protection of Crops**  
 The Science Times <https://www.sciencetimes.com/articles/28851/20201229/study-shows-groups-bacteria-work-together-better-protection-crops.htm>  
 Olive Marie Certain bacteria, also called plant-growth-promoting-bacteria or PGPB, can improve or shield plant ...  
 Biofilms Growth\_promoting\_bacteria  
 Sydney NSW, Australia

19 0

**Grahame Jackson**  
 Posted 6 days ago

**Dung Beetles Use the Sky to Navigate – but How Exactly?**  
 WireScience <https://science.thewire.in/environment/dung-beetles-movement-sky/1>  
[CHARLES Q. CHOI, KNOWABLE MAGAZINE](#)

### 3.3 Accessing fact sheets via mobile devices

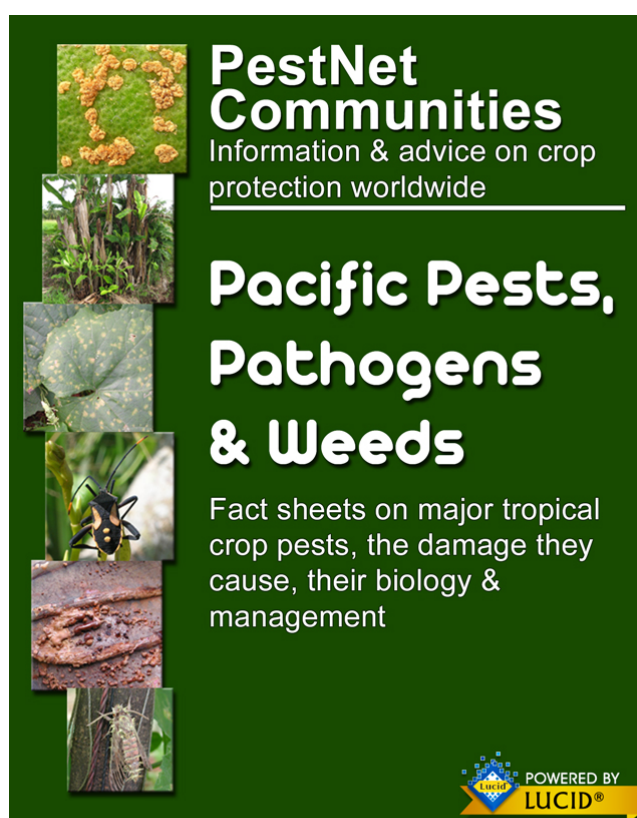
The Pacific Pests, Pathogens & Weeds app gives trainees accessible and valuable information on a wide range of plant pests, diseases and weeds found in Pacific islands. Trainees will need access to a smartphone or tablet, and internet access to download the app. Once downloaded from the Google or Apple stores, internet access is no longer needed.

Note, you can access PestNet from within any fact sheet, full or mini, in case you want more information and wish to send a message to the PestNet Community.

You can download the app from both the Google and Apple stores.

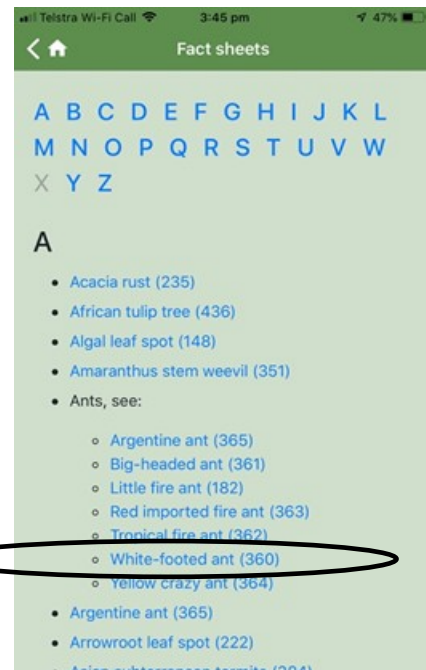
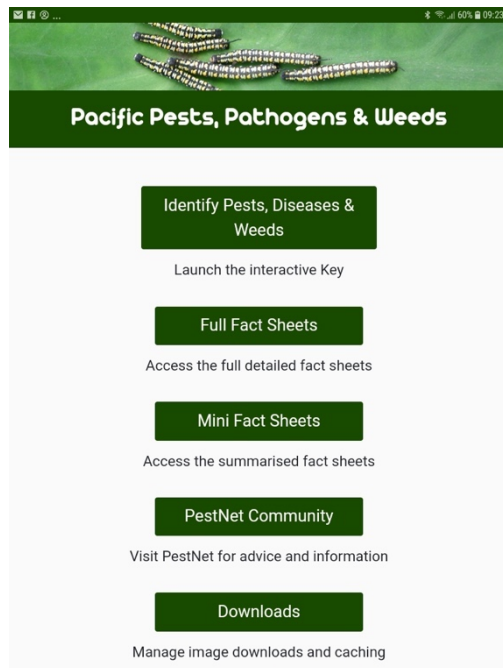
1

This app contains Full and Mini fact sheets designed to assist plant health doctors to diagnose pests and diseases to give sound management options to farmers



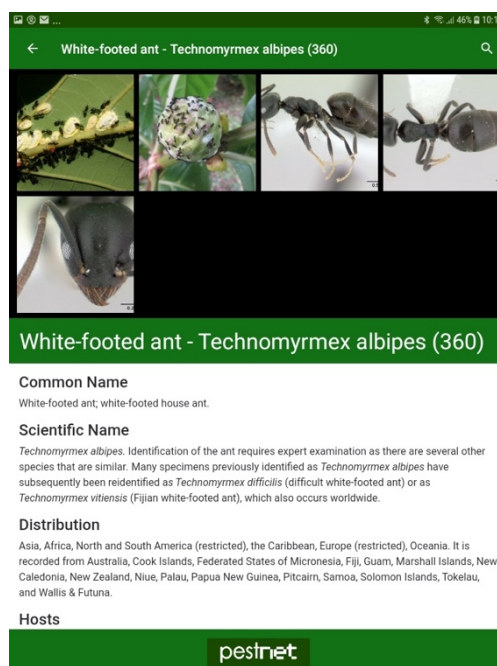
2

This app opens to a screen giving a choice of Full or Mini fact sheets, image downloads, and how to use the app.



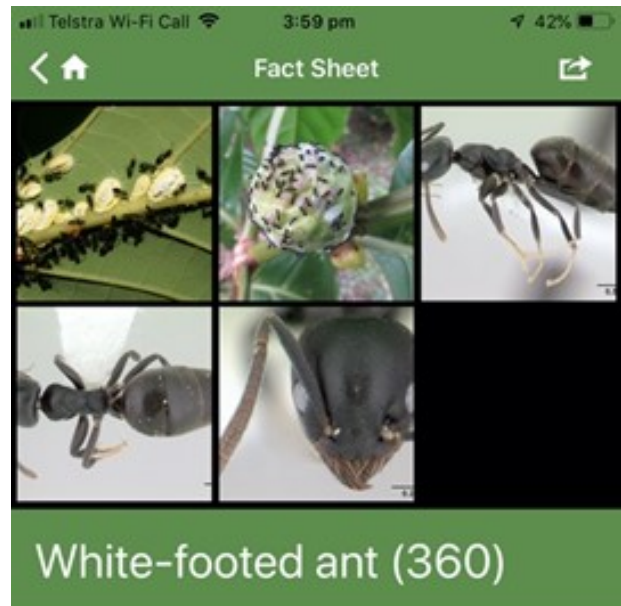
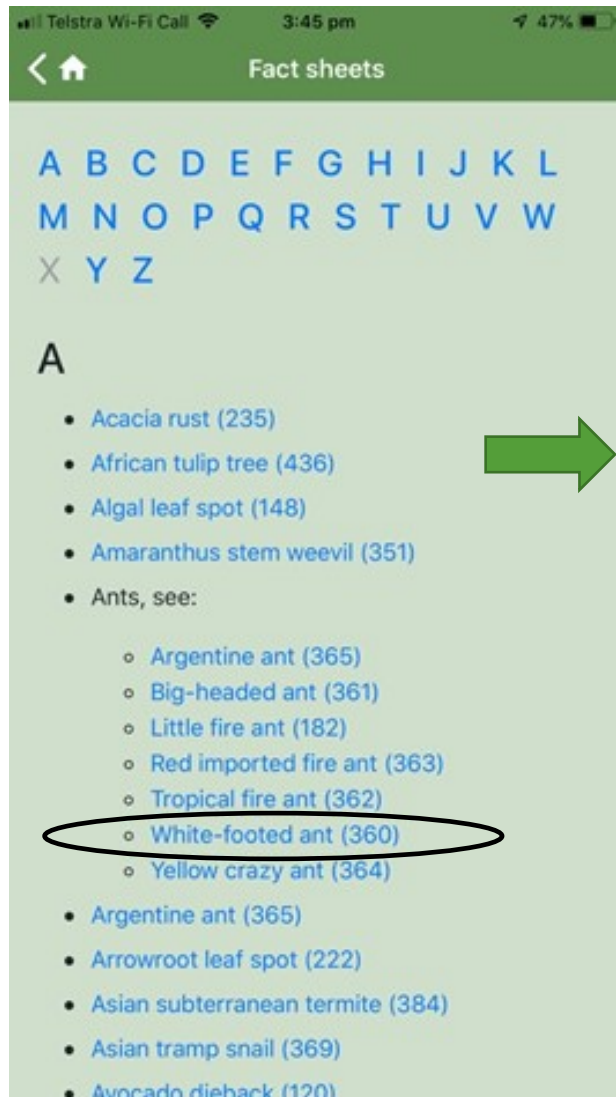
3

Tapping on Full fact sheets takes you to a lists of pests, pathogens and weeds in alphabetical order. Select a fact sheet (Full).



# 4

Tapping on Mini fact sheets takes you to a list of pests, pathogens and weeds in alphabetical order. Select a fact sheet (Mini).



## Summary

- Worldwide distribution. Three similar white-footed species, needing specialist identification. Common in Pacific island countries.
- Tent-like nest of debris on ground, in trees, in houses. Do not bite humans.
- Males, winged and wingless; three kinds females (queens, workers, intercastes). Queens establish colony, reproductive intercastes later take over. Eats living/dead insects, and honeydew.

Note, all fact sheets (either full or mini) can be shared by email. The link is at the top right corner. Once received, they can be downloaded as an attachment and printed.

# 5

To use the interactive key tap on 'Identity Pests, Diseases & Weeds' under step two above. Select 'Crops' and then answer the questions.

The screenshot shows a mobile application interface for pest identification. The top bar is green and contains a hamburger menu icon, the text 'Features: 4', and three icons: a circular arrow, a magnifying glass, and a vertical ellipsis. The main content area is white with a light green header bar. It contains several sections, each with a title and a list of items. Each item has a checkmark icon to its right. The sections are: 'Crops' (with a circular arrow icon), 'Find a fact sheet?' (with a circular arrow icon), 'Diseases' (with a checkmark icon), 'Insects' (with a checkmark icon), 'Mites' (with a checkmark icon), 'Nematodes' (with a checkmark icon), 'Weeds' (with a checkmark icon), and 'Other' (with a checkmark icon). Below these are three more sections: 'What do you see?' (with a circular arrow icon), 'Where is it?' (with a circular arrow icon), and 'What do you see?' (with a circular arrow icon). Each section has a list of items with checkmark icons. The bottom bar is green and contains three icons: a checkmark, a square, and a list icon, with the labels 'Selections', 'Features', and 'Remaining' respectively.



**IMPORTANT:** Many pests and diseases occur on more than one crop. The pest that the plant health doctor is looking for MAY be described under another crop. For example, if the problem is scale on cassava, it would commonly be white peach scale. But there is no fact sheet for cassava. The scale is described under *bele*, where it is also a common pest. So, how would the plant health doctors go about finding it?

The way to do it is through 'Identify Pests & Diseases'.

- i. Tap on Identify Pests & Diseases.
- ii. Open Crops
  - Scroll to *Bele*
  - Scroll up and close 'Crops'
- iii. Open Find a fact sheet?
  - Tap on insects
  - Close 'Find a fact sheet?'
- iv. Tap on 'What do you see?'
  - Tap on Insects or Mite
  - Close 'Insects or Mites'
- v. Open 'Where is it?'
  - Tap on 'Above ground'
  - Close 'Where is it?'
  - Scroll to the left
  - There are eight possibilities
  - The only scale is Cassava White peach scale
  - Open it and look at the photos: two show the scale on bele

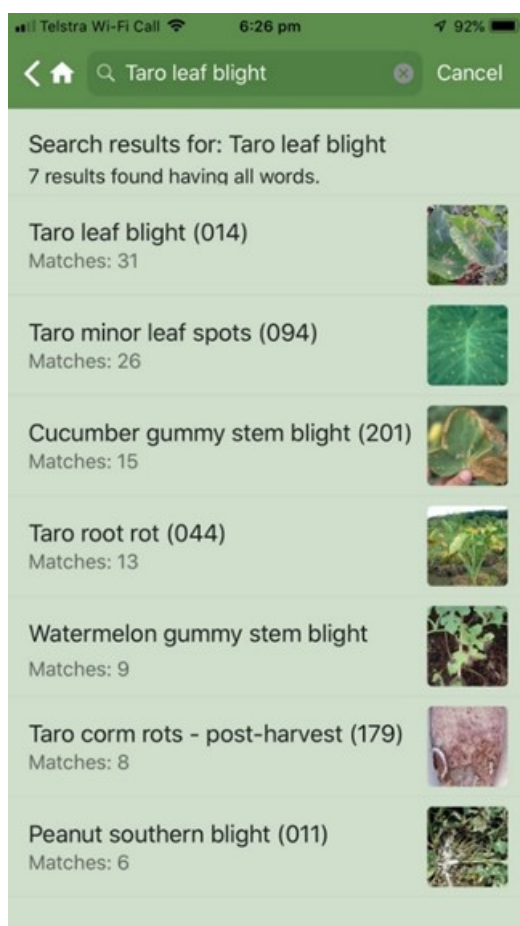
Trainees can practise by trying to identify the problem on a tomato plant that has wilted and there are small seed-like balls in a white cottony growth at soil level. This is possibly a disease. What is it?

# 6

## Using the search engine.

It is important that the trainees become familiar with the search facility. It allows them to:

- Quickly see thumbnail photos of all the pests and diseases for each crop
- Search on several words together, or the words independently – compare 'taro leaf blight' matched to 'any word' compared to 'all words'.
- Sort a list alphabetically



Searching for Taro leaf blight when 'all words' is selected results in 7 results, but when 'any word' is selected there are 316! To sort any list alphabetically select 'item name'.



***Your trainees should practice using this app with a range of pests and diseases. In a clinic it is very useful AFTER they have gone through the process of identification and diagnosis using the A,B,C and Possible/Probable processes first***