



Beekeeping Basics - Certificate II
Participants Learning Guide

RTC2016A Recognise plants



Australian Government
**Department of Agriculture,
Fisheries and Forestry**



**Australian Honey Bee
Industry Council**

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What this learning guide covers

This learning guide will help you meet the requirements of the unit of competency:

- *RTC2016A Recognise plants*

Resources you will need for this unit

For this unit of competency, you should have:

- Participants Learning Guide (this booklet)
- Participants Assessment Worksheets
- an experienced beekeeper or someone to help you.

The Participants Learning Guide is designed to introduce the topics and to provide you with some practical and written activities which will allow you to develop both your knowledge and skills in each area.

The Participant Assessment Worksheets include activities that you will be completing as part of your formal assessment for this unit.

Please record as much detail as you can. Your responses to these activities will form part of your assessment.

You will need to send the Participants Assessment Worksheets to your assessor. Check with your assessor to find out if they need you to submit this Participants Learning Guide as well.

Introduction to this unit

In this unit, you will learn about:

- principles of plant recognition
- recognising specified plants
- recording information about plants.

Before you start this training you should be confident about your skills to:

- recognise the range of plants specific to the enterprise, and describe their attributes, main purpose within the enterprise, specific handling requirements and growth requirements
- use simple keys to distinguish plant types
- communicate with customers and clients, interpret questions effectively, and provide limited advice and information about the plants specific to the enterprise.

You should know about:

- a range of plant identification techniques.
- conventions for naming plants
- workplace procedures for obtaining and giving advice and information about plants
- workplace expectations about the range and number of plants that you need to recognise.

1. Honeybees and plants

Worldwide, honeybees can collect nectar, pollen, propolis and honey dew from a very wide variety of plants. The most important plants will be those that yield large amounts of either nectar or pollen. Bees need both nectar and pollen.

What is nectar?

Nectar is produced by a plant from its stored reserves of nutrients. Nectar production is affected by environmental factors such as soil moisture, humidity, temperature and sunlight. The specific requirements can vary greatly for each plant. Nectar provides the energy in a honeybee's diet. Bees also use nectar to prepare food for the developing larvae. Nectar is secreted through a plant's nectaries. Some plants also have 'extra floral nectaries'.



Honeybee collecting nectar from a pumpkin flower

Source: Bruce White

Bees use their proboscis to collect nectar from the nectaries of plants and carry it back to the hive in the 'honey sac' in their abdomens. The nectar is then passed to another worker bee that then mixes it with an enzyme from her salivary glands and deposits the liquid into a honey comb cell. This liquid is further treated by the bees who fan their wings to warm the liquid and remove moisture. Once this is complete, the honey is considered to be 'ripe' and the bees seal the cells with a wax capping.

What is pollen?

Pollen provides the protein in a honeybee's diet. It also provides starch, fat, vitamins and minerals. Pollen is essential for the bee's development and for brood rearing.

Plants produce pollen in their anthers. As they mature, the anthers will shed the pollen. Individual grains of pollen are then transferred onto the stigma of a flower. It then travels to the female part of the flower, the ovary, and produces seeds. Pollen is transferred by bees and other pollinating creatures, as well as the wind.

Bees gather pollen when they are foraging for nectar. The foraging bee will use her antennae on her front legs to clean the pollen off her hair and move it to her back legs. Pollen is easily seen on the back legs of bees. The bees return to the hive and pack the pollen into empty or partly-filled honey comb cells, mostly close to the brood.

If the pollen is not needed immediately then the bees can convert it into 'bee bread' by adding more nectar or honey. If the cell is sealed, the pollen can be kept in good condition for many months.

Pollination

Pollination is needed for plants to be able to produce seeds and so reproduce themselves. While some plants are 'self-pollinating', other plants need help with pollination, and for many plants, especially those important to humans as crops, the European honeybee is the ideal pollinator.

Australian native plants evolved for pollination by native species of insects, birds, bats and other small animals. To attract these pollinators, native plants often produce nectar and pollen in abundance. This makes life relatively easy for the introduced honeybee which evolved to pollinate European plants which tend to produce less nectar and pollen.

However, it is not all a free lunch for the honeybee! Beekeepers have found that some pollens from native species do not provide their honeybees with an adequate supply of nutrients, so if their bees have been foraging on plants with low value pollen, then they must supplement their honeybees' diets.

Honeydew

Bees also gather honeydew. This substance is secreted by plant-sucking insects and gathered by bees, especially when there is insufficient nectar producing flora in the area.

Propolis

Propolis is a combination of gum, sap and resin exuded from the bark, leaves and buds of trees and shrubs. Its chemical make up and other properties will depend on the plants from which it has been collected. Bees collect it and use it to fill gaps or holes in their hives. It can be very sticky when warm; when cold it is quite brittle.

Plants important to honeybees

Broadly speaking, there are two types of flowering plants that honeybees visit:

- ground flora – small plants, such as wildflowers, pastures or crops
- woodland flora – shrubs and trees.

In Australia, these plants may be either native plants or introduced species. 70% - 80% of Australia's honey is produced from native plants such as eucalypts.

Much of Australia's beekeeping is migratory. This means that beekeepers move their hives from site to site, seeking suitable sources of nectar and pollen for their bees.

The beekeeper's challenge is to know which plants are flowering at any particular time and place and be able to take advantage of this 'floral calendar' to provide honeybees access to a suitable menu for as much of the year as possible.

Bee sites that provide good access to nectar and pollen-producing plants are very important assets for beekeepers.

Plants visited by honeybees can be:

- forest areas of native species
- roadside verges – for example weeds
- pastures

- crops
- plantations of either native or introduced species.

The main groups of plants that are most useful to honeybees in Australia are:

- eucalypts, such as gums, box, ironbark, stringy bark, peppermints and mallees
- corymbia, such as bloodwoods, Spotted Gum
- grevillia
- hakea
- lophostemons (brush box)
- callistemons (bottle brush)
- melaleuca (tea trees/paper barks)
- leptospermum
- angophora
- banksia
- acacia
- casuarina
- mangroves
- crop plants
- wildflowers
- weeds
- rainforest plants.

2. The how and why of recognising plants

In the previous section, it was suggested that you confirm your identification of plants by asking an experienced person, such as a fellow beekeeper or a forestry officer or checking with a field guide. Recognising a plant usually requires you to distinguish it from another, perhaps very similar, plant. The features of a plant that will help you do this include:

- size
- flower – shape, arrangement and colour
- buds - shape, arrangement and colour
- leaves - shape, arrangement and colour
- when the plant flowers (season)
- bark, if a tree or woody shrub
- whether it has nuts or fruits, and if so, their characteristics
- where the plant is found – its natural habitat and range of places where it lives.

Botanists have developed tools and techniques to help them identify any plant using details about the plant, such as those in the list above. These tools are binomial or dichotomous keys and they work like this:

Flower Type	Leaf Arrangement	Leaf Type
<input type="checkbox"/> Irregular	<input type="checkbox"/> Alternate	<input type="checkbox"/> Entire
<input type="checkbox"/> 2 regular parts	<input type="checkbox"/> Opposite	<input type="checkbox"/> Toothed or Lobed
<input type="checkbox"/> 3 regular parts	<input type="checkbox"/> Whorled	<input type="checkbox"/> Divided
<input type="checkbox"/> 4 regular parts	<input type="checkbox"/> Basal	<input type="checkbox"/> None
<input type="checkbox"/> 5 regular parts	<input type="checkbox"/> None	<input type="checkbox"/>
<input type="checkbox"/> 6 regular parts		
<input type="checkbox"/> 7 or more parts		
<input type="checkbox"/> Parts Indistinguishable		

To use a simple key like this you would:

- Firstly, look at the flower and see how many parts it has.
- Secondly, you would look at the leaves to see how they are arranged on the stalk or stem.
- Thirdly, you would look more closely at the leaf shape.

At each step of this process you are narrowing down the number of possible plants.



The bark of the Spotted Gum (Corymbia maculata) is a clear distinguishing feature. Source: Jude Nettleingham

If possible, you should use some of the online keys that are now available on the internet. The reference section at the end of this Learning Guide lists some online keys.

Trees are best identified by where they are naturally growing, their stem or trunk type, their height, form and bark type.

For example, a Spotted Gum (*Corymbia maculata*) has the following distinguishing features:

- grows in a range of locations, typically in coastal areas of New South Wales (but can also grow elsewhere)
- has a single, tall, even trunk
- grows up to 45 metres high
- has a conical shaped crown
- its bark is smooth and mottled and sheds in oval shaped patches.



A typical stand of Spotted Gum (Corymbia maculata)

Source: Jude Nettleingham

If you needed more details about the tree to be sure of its identification, you could look at its leaves, flowers, buds and fruits.

3. Recording information about plants

Once you have identified the plant, you then need to determine whether it is useful for your purposes as a beekeeper.

Different plants, including native trees, produce varying amounts of nectar and pollen and have different flowering times. Beekeepers can use this information to decide when to migrate their hives and, in some cases, which potential sites are worth seeking a permit to use.

Activity

Choose a plant that you believe to be useful for nectar and pollen production.

Research its flowering habits and its locations.

Using this information, plot on a map the main areas where the plant grows well and add the information about when it flowers.

Floral calendar

If you are able to identify the location and flowering cycles of the main nectar and pollen producing plants, then you can produce your own floral calendar. Depending on whether you have access to apiary sites at those locations, you can then plan your beekeeping activities according to the flowering pattern of these plants.

Some beekeepers use a GPS or navigator to record information about the exact location of a potential apiary site and the date on which they visited it.

Specimen sheets

Specimen sheets can also be a useful way to record information about plants, especially while you are still learning how to distinguish one plant from another similar one.

Useful material to collect for each specimen would be:

- leaves (preferably showing the stalk if there is one)
- buds
- flowers.

You should note the time of day, date and exact location when each specimen was collected and include a photo or sketch of the whole plant or tree. It is also useful to have space to record new information about the plant, for example how its flowering was affected by heavy rain or drought, logging etc.

You can store your specimen sheets in plastic sleeves in a box or folder. The way you set out and store your specimen sheets should be what is useful to you.

Final activities and assessment

Now that you have completed all the activities in this Learning Guide, take some time to look at and research plants that might be useful to you as a beekeeper.

When you are ready, you can complete the assessment tasks that are listed in the Participants Assessment Worksheets for this unit of competency.

Useful references

Australian Forests, National Forestry Education and Awareness Network, <http://www.australianforests.org.au/>

Bee Agskills: A Practical Guide to Farm Skills, 2007, NSW Department of Primary Industries

The Bee Book: Beekeeping in Australia, 2nd edition, 2005, Peter Warhurst and Roger Goebel, Queensland Department of Primary Industries and Fisheries available from <https://www.publications.qld.gov.au/>, or phone 1800 801 123.

Commercial Beekeeping in Australia, 2nd edition 2007, Frederick S Benecke, Rural Industries Research and Development Corporation, Publication No. 07/059. Available from <http://www.rirdc.gov.au/fullreports/hb.html>

Effects of Logging on Nectar-Producing Eucalypts - Spotted Gum and Grey Ironbark, August 2007, Bradley Law and Mark Chidel, RIRDC Publication No 07/138 RIRDC Project No. SFN-2A

EUCLID, Centre for Plant Biodiversity Research and Australian National Herbarium an interactive key for Australian eucalypts, covering Angophora, Corymbia and Eucalyptus <http://www.anbg.gov.au/cpbr/cd-keys/euclid3/index.html>

Fat Bees Skinny Bees - a manual on honey bee nutrition for beekeepers, 2005, Doug Somerville, Rural Industries Research and Development Corporation, Publication No. 05/054. Available from <http://www.rirdc.gov.au/fullreports/hb.html>

FloraBase, Western Australian Herbarium, Department of Environment and Conservation, This is an online interactive set of keys to identify Western Australian flora. <http://florabase.dec.wa.gov.au/>

Forests Australia, website maintained by the Bureau of Rural Sciences for the Department of Agriculture, Fisheries and Forestry. IT information on Australia's forests - from links to forest management organisations and institutions to the latest forest-related publications, maps and tools. <http://adl.brs.gov.au/forestsaustralia/>

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Securing Long-Term Floral Resources for the Honeybee Industry, May 2008, David C. Paton, RIRDC Publication No08/087 RIRDC Project No UA-66A