

Bumblebees

Bees for biological pollination

Biocontrol organisms

- ☞ *Bombus terrestris*
- ☞ *B. occidentalis*
- ☞ *B. impatiens*
- ☞ *B. canariensis*

The most commonly used bumblebee species is *Bombus terrestris*, but *B. occidentalis*, *B. impatiens* and *B. canariensis* are also used where appropriate.



Plate 87: *Bombus terrestris*

The bumblebees in New Zealand used for biological pest control are derived from feral stocks of *Bombus terrestris* introduced in the early 1900s. A feral population of *B. terrestris*, thought to be of New Zealand origin, has become established in Tasmania.

In recent years applications have been made to import bumblebees to the Australian mainland, but these have been rejected due to some environmental concerns. These concerns include unknown effects on local bee populations and the bumblebees' potential to improve pollination of some weed species. Studies are currently in progress to assess these threats. Attempts are also being made to colonise with indigenous bee species. At present, it is illegal to move bumblebees around Australia.

Suitable crops/environments

Bumblebees are not only excellent pollinators in open air, but are also especially well suited to greenhouses and tunnels.

Bumblebees are used in many countries for pollination of tomatoes, melons, strawberries, eggplant, zucchini (courgettes), cantaloupe, blueberries, cranberries, peaches, apples, kiwifruit and many others.

They are excellent pollinators under circumstances where other bees cannot be used. Unlike honeybees, bumblebees are active at low tem-

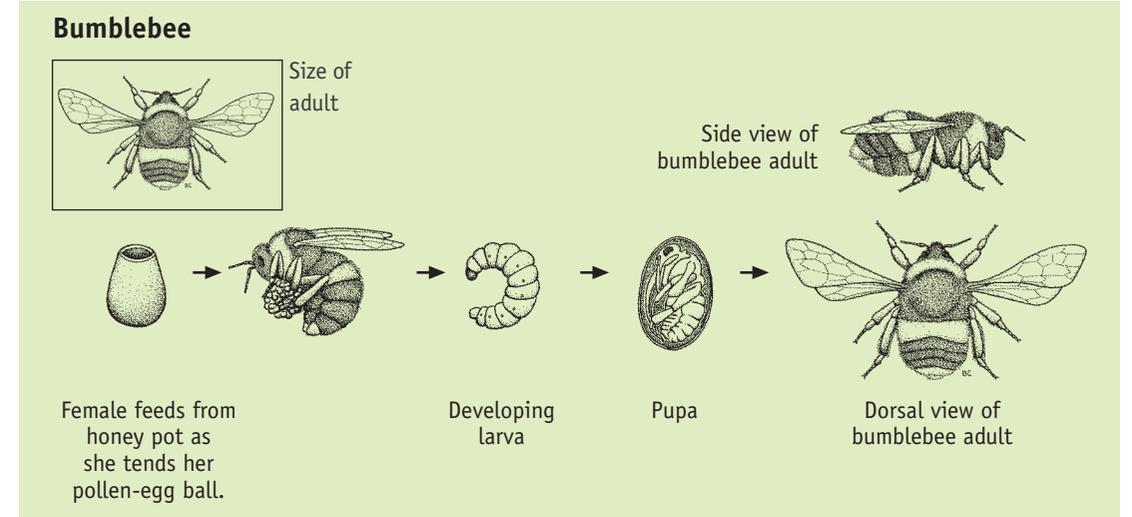


Figure 17: Life cycle of bumblebee

peratures, in high winds and under cloudy skies. Since they can be used year round, they are well suited for pollination of early and late crops.

The use of bumblebees

During visits to flowers, bumblebees cause vibrations which are necessary for the optimum pollination of crops such as tomatoes and eggplant. Provided the plant produces living pollen, bumblebees can completely replace manual pollination and the use of hormones. The advantages of this type of pollination are



Plate 88: Bumblebee pollinating a tomato flower (left) and the brown bruise mark left from a bee's visit (right). Note the pollen sacs on the bee's legs.

numerous, including less physical labour, better labour management, and environmentally friendly production involving no hormones.

Every time a bumblebee visits a tomato flower it leaves a brown bruise mark. This gives the grower a permanent monitoring of the pollination level. In crops such as tomatoes and peppers, pollination by bumblebees results in increased production and larger, higher-quality fruit.

The bees act as an indicator of the health of the plant. Plant stress shows up very early in the palatability of the pollen. If the bees are not working the flowers, it is time to examine the environment.

In the early days problems were experienced with bumblebee pollination in plastic greenhouses. It was suggested that UV inhibitors in the plastic were also UV blockers, and the bees, which see well into the blue end of the light spectrum, were literally attracted to the 'bright lights' outside. Newer plastic formulations seem to have reduced or removed this effect.

Application

Typically a commercially produced bumblebee hive is supplied in a box about the size of five reams of photocopier paper. It consists of a chamber for the bees, a reservoir of sugar syrup, some insulating material and a means of controlling the entry and exit of the bees.

Recommended application rates

The number of colonies required per surface unit depends upon the crop, variety, season, plant density, and type of glasshouse or tunnel. On average one colony can pollinate:

- 1000–2000 m² of tomatoes
- 3000–5000 m² of sweet peppers
- 1000–1500 m² of melons, zucchinis or strawberries.

Bumblebees can be used in every crop that requires pollination for its fruit to set. Bumblebee colonies pollinate for 8–10 weeks.

Life cycle of a bumblebee colony

Overwintering or hibernation of bumblebee queens

Unlike honeybees, bumblebees do not have a perennial nest; the colonies do not persist through the winter. In autumn the colonies die out and only the young mated queens overwinter (hibernate), each separately burrowing several centimetres into the soil.

Nest searching and foraging

When the soil temperature rises in spring the queen emerges from hibernation and may be seen foraging on early flowers. At first she forages only for herself, eating large quantities of pollen and nectar while her ovaries develop, and

roosting at night under moss and other vegetation. She then seeks a place to establish her nest.

Nest initiation

Having found a suitable site and established nesting material, the queen goes out to collect pollen. She processes the pollen into a mass, on top of which she builds a cell made of wax in which she will lay her first batch of eggs.

She then constructs a wax honey pot, taking occasional sips of nectar from this honey pot as she broods the egg clump, keeping it warm. During this stage of colony development the queen spends much of her time in the nest brooding her eggs, and makes only occasional foraging trips.

Colony development

Eggs hatch after 4–6 days. The resulting larvae feed on the pollen mass, and are supplied by the queen with a mixture of nectar and pollen. After 10–20 days the larvae pupate. The queen then constructs one or more new chambers, between or on top of the cocoons, in which she lays her second batch of eggs.

Adult workers emerge after a pupal stage of about 2 weeks. At first silvery-grey, touselled and soft-winged, the worker acquires her full colours and fluffy appearance after a few hours, and her wings harden within about a day. New workers soon begin foraging, as well as helping the queen to tend the brood. Once there are enough workers to take over foraging duties the queen remains within the nest, where she devotes herself to housework and egg-laying. She will lay batch after batch, producing 150–400 workers.

Production of males and queens

When the colony is mature, some eggs develop into males and queens instead of workers. Neither males nor queens take part in the work of

the colony, but leave the nest after a few days. After they have mated, the male bumblebees die, but each young queen will build up a fat body and fill her highly distensible honey stomach with thick honey. Each then seeks a site in which to overwinter.

The overwintered queens do not return to their parental nest to establish a new colony but will search out a new, clean nest site.

Colony decline

Queens and males are the last brood to be reared. When they have left, the old nest has no further role to play. The few remaining workers forage only for themselves and will have died off by the end of the season.

Safety aspects

Contrary to a common myth, bumblebees do sting, although *Bombus terrestris* is not normally aggressive. If you leave them alone, they will leave you alone.

If you are stung the result is usually temporarily painful, like pricking a finger with a needle. This usually fades after a few minutes. The pain can be relieved if necessary with an ice



Plate 89: Bumblebee hives in position

pack or ice cube. The next day there is typically some localised swelling with some itchiness. Antihistamine and insect bite ointment can relieve the symptoms.

Some people are more seriously affected, however. Severe symptoms can range from breathlessness to anaphylactic shock. Treatment can include an adrenalin injection, through to hospitalisation. If you believe you may be allergic, see your doctor. In the event of your developing a serious allergy a desensitising program may be available through your doctor.

If you don't like the bees too close, remember they are attracted to blue colours, and refrain from wearing blue clothes around them.