Maximise your melon crop with better pollination

THE BASICS OF MELON POLLINATION 1

Watermelon, rockmelon and honeydew melon are commonly grown in Australia, and all are dependent on insect pollinators to produce large, evenly shaped fruit. Although their flowers look the same, each melon type has different pollination requirements.

Rockmelon and honeydew represent about 29 per cent of the melon industry in Australia. Each vine contains a mix of male flowers and fruit-producing flowers that have both male and female reproductive parts. These flowers don't need other plants to cross-pollinate, but they do need insect pollinators to dislodge pollen and move it onto the stigma for seed set and fruit development. Flowers that are cross-pollinated have been shown to produce heavier fruit than those pollinated from flowers on the same plant.

Watermelon makes up 70 per cent of melon production in Australia. Two types of watermelon are commonly grown: seeded (diploid) and seedless (triploid). Each type produces separate male and female flowers on one plant (Figure 1), and pollination requirements differ between types.

Seeded melons are self-fertile: like rockmelon and honeydew they require visits by pollinating insects, but do not require cross-pollination between plants.

Seedless melon plants have to be cross-pollinated to produce fruit, so pollen from seeded varieties is needed. Although no seeds are produced, pollen on female flowers initiates fruit development.

Typically, seeded 'pollinisers' are planted in the same row as the seedless plants at a ratio of 1:3 or 1:4. Interplanting like this (not in separate rows) gives even pollination throughout the block and allows for the maximum area to be planted with seedless varieties.

Choose polliniser varieties that are a good match for the growing conditions, and that flower at the same time as the seedless variety. In some cases, 'special pollinisers' may be used: these make a lot of pollen but have low space and nutrient requirements.

As seedless watermelon require cross-pollination, pollinating insects are especially important in these crops.

Figure 1 Watermelon flowers. Male flowers (bottom) have bright yellow, pollen-producing anthers, whereas female flowers (top) have greenish yellow stigmas and an expanded ovary beneath the flower.

What you need to know

- Pollinators need to transfer pollen from male to female flowers for fruit production.
- Flowers open once, some for just three to six hours in the morning. Hot weather often shortens the flowering time.
- At least twice as many pollinators are needed to produce seedless watermelons as for other melons.
- Optimal insect pollination leads to better fruit quality and desirable shape.
- A diversity of insects visiting flowers will ensure good rates of pollination no matter when the flowers open.
- Honey bees may visit other preferred crops or plants if they are also in flower.
- The number of pollinators working in your crop can differ from year to year depending on land management, weather and the health of local honey bees.

2 INSECT POLLINATORS

Insect pollinators are essential for the production of marketable fruit. The flowers are attractive to a diverse range of insect visitors such as solitary bees (Figure 2), many of which can contribute to crop pollination. In some parts of the world, several different species of wild or managed bees are the main melon pollinators, but most melon farms in Australia rely on managed honey bees (*Apis mellifera*).

Figure 2 A solitary bee in the family *Halictidae* visiting a female watermelon flower for nectar.

Honey bees

The ideal hive stocking rates for honey bees can vary depending on environmental conditions, the local population of unmanaged pollinators (i.e. feral honey bees and other wild insects), and flowers in the area surrounding the farm. Recommended rates for watermelon range from two to 7.5 hives per hectare, while for rockmelon and honeydew at least two colonies per hectare is suggested.

At least six honey bee visits are needed for optimal pollination of a single flower on seed producing watermelons. For seedless varieties, double the number of visits (twelve or more) is needed, so having more hives per hectare is recommended for a crop of seedless fruit.

Colonies should be spread evenly throughout the block, in groups of 2–4 hives. Placing hives within the field rather than on the edge can increase the number of visits to melon flowers. By monitoring pollination during flowering, you can decide on the best honey bee stocking rates for your farm.

In dry areas, bees may need a supply of water. Place buckets near hives, with rags draped over the edge to allow bees to drink from the water wicked up the fabric.

Watermelon nectar and pollen alone do not provide good nutrition for bees over long periods. While sugar syrup or protein cakes may enhance bee activity, a recent study showed that feeding bees sugar syrup within the crop had no effect on bee visits to flowers and pollination.

Always use strong hives for melon pollination. A hive should contain at least five frames covered with bees and 4000 cm^2 of brood prior to being moved into the crop.

Ordering hives early in the season allows beekeepers to supply the required numbers at the appropriate strength. A formal pollination agreement will help to ensure that good quality hives are provided.

Honey bees can potentially spread some plant diseases, including cucumber green mottle mosaic virus (CGMMV). Work with your beekeeper to minimise biosecurity risks associated with the introduction of hives.

Figure 3 A honey bee visiting a male melon flower can collect both pollen and nectar.

Top tip

Honey bees are usually critical for pollination of melons in Australia, particularly for seedless watermelons

Work with your beekeeper to ensure strong hives are placed appropriately on the farm.

Other pollinators

A wide range of insects – including stingless bees (Figure 4), other non-managed solitary native bees (Figure 2), flies and beetles – can pollinate melons, boosting yields above what can be achieved by honey bees alone. Other pollinators can complement honey bees because they are active at times when honey bees are not.

While small insects like stingless bees can move pollen between male and female flowers, they do not distribute pollen as evenly on the stigma as larger bees like honey bees. Because of this, more visits may be needed to get evenly shaped fruit.

If you see large numbers of wild insects (other than honey bees) visiting your crop, they are likely to be contributing to pollination. Try to avoid using pesticides during the flowering period, as this may affect their numbers. Some pollinators such as flies and beetles shelter within the crop during periods of inactivity, so if you have to treat your crop, use pest control products that are listed as being safe for beneficial insects to help protect them.

Figure 4 A stingless bee (*Tetragonula hockingsi*) collects pollen from a male watermelon flower.

How to boost pollination

- For seedless watermelon, make sure seeded and seedless plants flower at the same time. Maximise cross-pollination by planting at least one seeded to four seedless plants within a row.
- Identify and count insects that visit flowers in your field. At most times, you should see a minimum of one foraging bee per plant on a fine sunny day.
- Check to see if honey bee foraging is consistent throughout your crop. Rearrange or bring in more beehives if bees are not evenly distributed.
- Protect unmanaged pollinators. Learn what they look like, and their preferred habitat, and protect their nesting or shelter sites.
- Avoid the use of pesticides during flowering. If unavoidable, choose those labelled less toxic to bees and apply only after flowers have closed.
- Agree to a pollination contract with your beekeeper and ensure you receive strong hives.

3 CHECKLIST

DEVELOP A POLLINATION PLAN FOR YOUR FARM			
ACTION	YES	NO	COMMENT
If multiple melon varieties are required for cross pollination, planting ratio and spacing is appropriate (one polliniser for every four seedless plants).			
Crop loads (e.g. number and quality) are recorded over multiple years, providing a benchmark to assess changes in pollination.			
Number of flowers and flowering times of different varieties planted on farm are recorded and adjusted as required.			
Staff can identify common insects visiting flowers.			
Bees and other insects on flowers are counted along several 10 metre stretches of the crop distributed around the farm, for about 10 minutes during peak activity times, usually mid-morning.			
If pollinator activity is low on parts of the farm, nearby honey bee hives are checked for activity, and additional honey bee hives placed in the area if required.			
Managed and unmanaged pollinators are protected by limiting sprays, not spraying while flowers are open, and conserving areas where unmanaged bees live and breed (undisturbed soils and bush with diverse year-round flowers).			

HIVE MANAGEMENT			
ACTION	YES	NO	COMMENT
Pollination agreements are drawn up with beekeepers, detailing respective responsibilities.			
Beekeeper has provided evidence of compliance with the Australian Honey Bee Industry Biosecurity Code of Practice.			
Honey bee hives are placed in small groups that are evenly spaced in the field, at an overall stocking rate of between two and 7.5 hives per hectare.			

Goodwin (2012) *Pollination of Crops in Australia and New Zealand* 121 p.
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