Maximise your avocado crop with better pollination

THE BASICS OF AVOCADO POLLINATION

Avocado flowers open first as females that are receptive to pollen, then close before reopening the next day as male pollen donors. Fertilisation only occurs when pollen is transferred to a female flower from a male flower.

Avocado plant cultivars are grouped into two types based on when the flowers are in the male or female phases. Type B (eg Bacon, Edranol, Ettinger, Fuerte) will generally be in the male phase and release pollen when Type A (eg Hass) is in the receptive female phase. Interplanting cultivars of the different types is therefore not only good for promoting cross-pollination, it also increases the chances that enough pollen will be available when the female flowers are ready to be fertilised and produce fruit.

It’s typical for about three fruit to be produced from one thousand flowers. This very low fruit set rate means that even slight increases in pollination can significantly increase fruit set and yield.

What you need to know

- Pollination of avocados is less predictable than for other crops
- Flowers open first as females, then open again as males
- Flowers open once as females, usually for only 4-6 hours
- Plants grown as pollen providers need to have their male flowers open when the main crop has female flowers open to make sure you have a good supply of pollen
- While self-pollination is possible, cross-pollinated fruit are more likely to stay on the tree until harvest
- When overnight temperatures are low, female flowers don’t open until the afternoon or evening
- Having a wide range of insects visiting flowers will ensure you get good levels of pollination no matter when the flowers open
- Honey bees often prefer other flowers over avocado
- High numbers of flies might be all you need to pollinate your crop, depending on where you are
- The number of pollinators can differ from year to year depending on land management and the health of local honey bees
Avocado flowers only open in the female stage once for less than a day (green bars). As overnight minimum temperatures decrease, female Hass flowers open later in the day, and can remain open overnight. Supporting a range of pollinators in your orchard, including those active in the evening, will improve the chances of pollination occurring.

### Efficiency of Different Pollinators

<table>
<thead>
<tr>
<th>Pollinator Type</th>
<th>Number of Insects 1</th>
<th>Bristle Flies</th>
<th>Blow Flies</th>
<th>Hover Flies</th>
<th>Lady Beetles</th>
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</thead>
<tbody>
<tr>
<td>Number of insects equivalent to 1 honey bee</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
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</tr>
</tbody>
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- Plant a mix of type A (eg. Hass) and type B (eg Bacon, Edranol, Ettinger) cultivars in a ratio no less than 8:1
- Check when your female flowers are open and whether pollen is available on other trees or flowers at the same time
- Identify and count insects that visit flowers in your orchard. At five hives per hectare, you should have a minimum of three foraging bees per tree on a fine sunny day
- Investigate other options for pollination if honey bees are not visiting your flowers
- Protect unmanaged pollinators if they are the main insects foraging on your flowers
- Agree to a pollination contract with your beekeeper
- Have a plan so you know what to do if pollinator numbers change suddenly
Honey bees

Honey bees might only pollinate one flower per minute, so generally the more you have on flowers the better. Counting bees and other insects on trees will help you to work out the amount and evenness of pollination in your orchard.

Even if you do not currently bring in hives, it is important to know how reliant you are on local honey bees to pollinate your crop.

Recommended hive stocking rate for avocados is 5–8 per hectare, but you should check bee activity in your orchard after hive placement. If you see few bees, and few other insect pollinators, then you need more hives.

The presence of other crops that are flowering at the same time can greatly reduce the numbers of bees foraging on your avocado. For this reason, new avocado orchards should not be sited next to other crops such as citrus that flower at the same time.

Honey bees that are gathering nectar can visit both female and male flowers while foraging.

It is important to order hives early enough in the season to ensure an adequate supply when trees are flowering, as beekeepers need time to prepare colonies suitable for pollination. To be sure of what you are getting, and there are no misunderstandings about what is being supplied, develop a pollination agreement with your beekeeper.

The placement of hives is important. Colonies should be spread evenly throughout the orchard in groups of 2–4 hives, to ensure bees visit flowers across the entire orchard.

Honey bees need water, so growers and beekeepers should agree on how this will be provided.

Flies

Flies can be better at cross-pollinating avocado than honey bees because they move randomly through an orchard between different cultivars, visiting male and female flowers.

The effectiveness of flies as pollinators varies between species, but there can often be more than 20 types in an orchard. This means it’s likely that some good pollinators will be present, and that pollination can occur whenever the female flowers are open.

When they are visiting in large numbers, flies can be the most important pollinators.

If you think flies are important pollinators in your orchard, they might be breeding in damp leaf litter (eg some hoverflies) or on other organic matter (eg blow flies, flesh flies). Although it’s easy to encourage flies to breed in your orchard, you should consider their potential negative impacts on you and your neighbours. Breeding sites may pose a biosecurity risk because they can attract disease carrying insects (eg mosquitoes), vermin and feral or wild animals.

Other types of flies can be beneficial because they are predators of plant pests. Aphids for example are preyed upon by the larvae of hoverflies, which may be breeding on long grass.

Top Tip

Having a wide range of abundant pollinators in your orchard is the key to good avocado yield.

Other pollinators

Beetles, moths and other small insects can also boost pollination in avocado orchards. Just like the benefits of fly diversity, having a range of other insects in your orchard can improve pollination and crop yields.
### DEVELOP A POLLINATION PLAN FOR YOUR ORCHARD

<table>
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<tr>
<th>ACTION</th>
<th>YES</th>
<th>NO</th>
<th>COMMENT</th>
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<tbody>
<tr>
<td>New orchards or blocks are established with an appropriate mix and spacing of type A and B cultivars</td>
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<td>Pollen donor ratios are optimised by replacing unproductive trees with pollen donors</td>
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<td>Crop loads (eg no fruit, light, average and heavy) are recorded on individual trees over multiple years, providing a benchmark to assess changes in pollination</td>
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<td>Orchard staff can identify female and male flower phases</td>
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<tr>
<td>Trees are regularly checked for open female flowers and pollen producing male flowers, along with weather records, to understand the pattern of flowering in the orchard</td>
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<td>Orchard staff can identify common insects visiting flowers</td>
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<td>The number of pollinators active on ten trees in a block is counted</td>
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<td>When or where pollinator activity is lower than usual, managed honey bee hives are brought in to maintain pollination levels</td>
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<tr>
<td>If hives are not usually brought in for pollination, the level of reliance on local honey bees is known and plans made to replace this service when needed</td>
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<td>Where dependence on unmanaged pollinators is known to occur (ie more than half of flower visitors), management plans are developed to protect or enhance their numbers</td>
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### HIVE MANAGEMENT

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<th>ACTION</th>
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<tr>
<td>Pollination agreements are drawn up with beekeepers, detailing respective responsibilities</td>
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<td>Beekeeper has provided evidence of compliance with the Australian Honey Bee Industry Biosecurity Code of Practice</td>
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<td>Honey bee hives are placed in small groups that are evenly spaced in the orchard, at an overall stocking rate of between 2-4 hives per hectare</td>
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Images courtesy of Brian Cutting and Lisa Evans of Plant & Food Research NZ, unless otherwise stated.
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