

Honey bee pollination of blueberries

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Introduction

A number of species of blueberries (*Vaccinium* spp.) occur naturally in the northern hemisphere. Many have solitary bee species which are able to provide maximum pollination for the flower shape of each blueberry species.

Honey bees (*Apis mellifera*) managed by commercial beekeepers are currently the most suitable insect for commercial blueberry pollination in Australia. This Primefact summarises available information for growers intending to incorporate honey bee pollination into their management program.

Need for insect pollination

Three types of blueberry are commonly grown in Australia: northern highbush, southern highbush and rabbit-eye blueberry. Northern highbush can only be grown in areas with cold winters; southern highbush and rabbit-eye can be grown in areas with warmer winters. There are several varieties of each type.

Pollen from highbush blueberry is sticky and heavy and not easily transported by wind. Many solitary bee species associated with blueberries sonically vibrate the anthers, causing the pollen to be released. Honey bees do not do this and collect less pollen from the anthers at each visit than solitary bee species.

Blueberries benefit from insect pollination with increases in fruit set being reported in overseas research. Inter-planting varieties capable of cross pollinating one another has also increased fruit set and size over single variety plantings. Insect pollinated fruit has been found to mature 4–12 days earlier and to be up to 50% larger, depending on the variety. Fruit size has been found to be directly related to seed numbers with seed counts ranging between 3 and 75 per fruit.

Flowering

Flowering times vary, depending on the blueberry type and whether the crop is grown in a colder or a warmer region of NSW. The flowering period is usually four weeks.

Area	Type	Time of Flowering
Southern NSW	Northern highbush	September–October
Mid and Far North coast NSW	Southern highbush	August
Central coast NSW	Rabbit-eye Southern highbush	September

Insects pollinating blueberries

The blueberry flower has a bell-shaped corolla with the nectaries located at the base of the style. Flowers with short corollas are often more attractive to honey bees. A flower shape suitable for honey bee pollination would have a large corolla aperture and a short distance between the anther and the stigma.

Southern highbush flowers may have a wide corolla aperture but often have a long distance between the stigma and anther. Rabbit-eye varieties may have a deep corolla and a narrow terminal orifice, making it difficult for honey bees and large insects with short tongues to reach the nectar.

Blueberry varieties vary in their ability to attract pollinators with some varieties being more attractive to honey bees than other varieties. Attractive varieties may produce more nectar or nectar with a higher sugar content. Blueberry nectar usually contains between 12% and 21% sugar. Some varieties produce more pollen than others – this increases their effectiveness when used for cross pollination as they attract more pollen gathering bees.



Hive strength for pollination

Early flowering varieties start flowering in late winter, with later flowering varieties starting up to mid-spring. Pollination hives are required at a time of year when the bees are coming out of winter and generally have low populations. For adequate pollination, hives with 4 frames containing brood on both sides and 8 frames covered with bees are the minimum strength required for blueberry pollination.

Hive distribution in the crop

Data from the USA show that hives are not placed uniformly in all areas of the crop. Hive numbers are concentrated in areas where flowering is heaviest or in areas containing varieties less attractive to bees. Hive numbers are less concentrated in new areas of growth where plants are less dense.

Number of hives required

The number of honey bee hives required to pollinate blueberry crops varies considerably. According to the plant variety and pollination requirements, hive density in blueberry crops varies between 1.25 and 5 hives per hectare.

Hives are introduced at 5% flowering and remain until petals begin to drop. A general guide to honey bee population numbers in the crop is 2 bees per metre of row is considered satisfactory.

External factors affecting pollination

Low bee activity in the crop will subsequently affect fruit set, fruit size and crop earliness. The number of bees in the crop is affected by weather conditions such as rain, wind, cloud cover and air temperature. Little flight activity occurs below 16°C and during cool, wet periods flight activity may be confined to 1–200 m from the apiary. The attractiveness of surrounding flora can be of major importance in reducing bee numbers in a blueberry crop.

Value of blueberry pollen for honey bees

Blueberry pollen by itself may not be a satisfactory food source for honey bees. The crude protein level of one sample was 13.9% – all amino acids were balanced but colonies could not be expected to remain viable over a number of generations. Crude protein levels may be different for different varieties and more information is required. The limited protein levels need to be taken into consideration when operating hives on blueberries, particularly if other sources of pollen are not available. Feeding protein supplements could be considered as a means of maintaining colony strength although this will introduce an extra cost and may reduce pollen collecting behaviour.

Bees working blueberry crops have been identified with higher than normal levels of European foulbrood disease which have been associated with the chemical composition of blueberry pollen.

Pollination fees

The fee a grower pays to a beekeeper to provide pollination hives can vary. One important factor is the extra cost to the beekeeper in managing his bees to produce hives of a suitable strength at the time of year when the hives are to be placed on the crop. A second cost occurs if the beekeeper is required to move his apiary out of the crop for a pesticide to be applied and return the apiary after the residual toxic effect has passed.

As an example, a set fee is agreed per hive for hives of a pre-determined strength to be placed on a certain date and remain on the crop for up to four weeks. If it is necessary to remove the hives and return them at a later date to allow a pesticide spray to be applied then an extra amount per hive is charged to cover the extra costs.

Pollination contracts

Blueberry growers who are considering introducing paid pollination into their management program are encouraged to investigate and use pollination contracts. Design layouts of pollination contracts are available from NSW DPI Apiary Officers.

Acknowledgement

Mr G. Wright, Blueberry Farms of Australia, Corindi Beach, NSW provided much useful information on honey bee pollination in NSW.

Recommended reading

This Primefact should be read in conjunction with the following information available from the NSW DPI website at:

<http://www.agric.nsw.gov.au/reader/honeybees>

Seasonal management for winter/early spring pollination

Blueberry production in northern NSW

Honey bee nutrition and supplementary feeding

European foulbrood and its control

Best practice in a honey bee pollination service

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www.dpi.nsw.gov.au/primefacts

Disclaimer: The information contained in this publication is based on knowledge and understanding at the time of writing (August 2006). However, because of advances in knowledge, users are reminded of the need to ensure that information upon which they rely is up to date and to check currency of the information with the appropriate officer of New South Wales Department of Primary Industries or the user's independent adviser.