

Honey bees in cherry and plum pollination

Agnote DAI/126
Revised August 1999

Doug Somerville
District Livestock Officer (Apiculture)
Goulburn



INTRODUCTION

Unsatisfactory crop yield from sweet cherries has been traced to insufficient or ineffective pollination. Most varieties of sweet cherries grown in NSW are self-sterile, while some varieties are cross-sterile with other varieties.

All commercial sour cherry varieties are considered self-fertile. They set good crops with their own pollen and can be planted in single variety blocks. They will not pollinate sweet varieties because they blossom too late.

The d'Agen or French prune, the dominant prune variety grown in NSW, is self-fertile although the majority of plums will not self-pollinate and require insect activity for cross pollination.

A study in Victoria demonstrated the importance of bees as the primary agent for pollinating cherries. Trees caged from bees had a 2% fruit set, as compared to uncaged trees exposed to the activities of bees which had a 35.9% fruit set. The yields were 1.9 kg/tree for the caged trees and 35.2 kg/tree for the uncaged trees. It was also found that 97% of the insects that visited the cherry flowers were honeybees.

It is important to ensure that suitable varieties with similar blossoming periods are planted throughout the orchard to ensure that there is adequate pollen variation for cross pollination.

For information on suitable varieties in your area contact your local NSW DPI horticulturist.

POLLINATING AGENTS

Under favourable conditions a bee will make from six to eight trips a day in search of nectar — more where pollen is being collected. On each occasion the bee may visit 400 or more flowers.

These figures serve to illustrate how great the pollinating potential of the bee is, even allowing for the fact that some flowers in the area will receive several visits.

Wind is not a factor in pollinating *Prunus* spp. (cherries and plums) and honeybees are by far the majority of the insect visitors to plum blossom. Honeybees collect nectar and pollen from blossoms and find this group of plants very attractive. Sugar concentrations as high as 55% in sweet cherry nectar have been recorded which makes the blossom very attractive to bees. Honeybees are particularly useful in pollination as they stay loyal to the one type of blossom when foraging, that is, when a field bee begins foraging on cherry blossom, it will continue to do so.

POLLINATION REQUIREMENTS

For plums and cherries a stocking rate of 2–3 hives/ha is generally regarded as adequate to pollinate most crops. Some researchers contend that a higher stocking rate may occasionally be desirable.

Considering the size and location of some blocks — and the possible activity of feral bees — estimating how many hives to move into orchards is not easy. A figure of 30–40 field bees per sweet cherry tree in full flower (and that has been in production for several years) would be considered desirable. Bees should be counted on warm sunny days on both sunny and shaded sides of trees.

Competition for bees may come from other species of flora. Even though *Prunus* spp. are attractive to bee colonies other flowering plants may be equally attractive, thus reducing the foraging level on plum and cherry blossom.

Little can be done about flowering trees or shrubs in and about orchards, but the main cause

of bees drifting from cherry and plum blossoms is ground flora. Species such as capeweed, Paterson's curse and white clover are often in flower at the same time as *Prunus* spp. In some cases these will be far more attractive to bees. Every effort should be taken to reduce this problem by slashing between rows and other areas of significant blossom before bees are placed in orchards.

Locate beehives away from competing sources, if possible, to force foraging honeybees to fly through the orchard. Placing bees on the orchard at 5% blossom ensures that foraging honeybees will have access immediately to the fruit blossom.

HIVE PLACEMENT

Temperature is very important to bee activity. Hive placement in an orchard will dictate the level of activity of the colony and also the degree of adequate pollination achieved. Hives should be located in an elevated position in a warm sunny area, protected from the prevailing wind. This will ensure maximum bee activity. In wet and cold conditions bees will only forage short distances from their hives.

In orchards larger than 20 ha it may be desirable to place bees in more than one location. Placing hives in threes and fours, up to 20 per site, is acceptable. Remember, when hives are placed in small numbers this creates considerable extra work for the beekeeper. Recent research has indicated that groups of 20–30 hives located at warm locations in and around the orchard increases cross pollination if correct strength colonies are used for the prevailing climate. From a beekeeper's viewpoint, all-weather truck access is highly desirable. Orchardists can expect to pay more for the hiring of bees to have them scattered about the orchard.

Hives should not be placed within 100 m of gates, lanes, stock troughs and sheds due to the amount of flight activity from those hives and the comfort of people and livestock.

Hives should not be placed in long rows, for example along a fence line. This leads to increased drifting and non-uniform colony strength, particularly with a large number of hives. Irregular layout patterns are best with the hives spaced apart and facing different directions.

It is important when planning the orchard layout to remember that, where spacing of trees across rows is greater than along, the bees will tend to work along rather than across the rows.

It may be desirable in some cases for suitable pollinator varieties to be planted in each row. The next best option is to have suitable pollinators planted in adjacent rows.

The method of cutting off branches of pollinator varieties, placing the cut ends in water and distributing them throughout the orchard during blossom time, has been used when pollinator varieties are scarce. Such branches will live for several days and continue to bloom, providing pollen for bees to transfer to self-sterile varieties.

TIMING

Be careful when placing bees in orchards for pollination purposes. In general, the introduction should be made when sufficient blossom is already in evidence to encourage bees to start working it right away. Once foraging has begun, bees will show a marked fidelity to the chosen species and may stay on the blossom for a considerable time.

On the other hand, should the bees be installed earlier it is probable they will search for other sources of nectar. Should they succeed, some are likely to become 'fixed' on these sources instead of fruit blossom.

BEE ACTIVITY AND CLIMATE

Temperature and rainfall have a marked effect on honeybee activity. At temperatures below 13°C honeybee flight activity will virtually cease. Between 13°C and 19°C activity increases sharply; above 19°C it tends to reach a relatively constant high level. Colony strength is directly related to the temperature at which bees forage. Only strong colonies fly any distance at low temperatures.

With rainfall, flight activity ceases. Under showery conditions bees will fly between showers but only for very short distances — up to about 150 metres. Optimum conditions for pollen release are temperatures of 20°C and over and humidity of 70% or less. Low temperatures and high humidities have the double effect of reducing bee activity and slowing the release of pollen from the fruit blossom.

Wind, particularly strong wind, tends to reduce the ground speed of bees and hence reduce the number of flights per day.

Temperature, humidity and wind all affect the quantity and sugar concentration of nectar and, as a result, the flowers' attractiveness to bees.

HIRING BEES

There are often more attractive sources of bee forage available than cherry and plum blossom and beekeepers are inconvenienced by having to place hives in small numbers around orchards. Canola, for instance, is very attractive to bees and beekeepers alike. Hives can be placed in large numbers, which are easily managed. A honey crop is sometimes obtained from canola.

In addition, September/October is important to the beekeeper seeking to build up hives prior to the main spring and summer honey flows. The beekeeper's objective is to seek the best floral sources for bees.

To induce beekeepers to place hives in orchards, a financial incentive is necessary. From the orchardist's point of view, the choice is to shop around for the cheapest hives of bees. At the same time, the quality and reliability of the pollination service must be a high priority. Over a period of years the beekeeper will consider honey production over pollination so, for pollination to be financially attractive, the net returns must be greater than for honey production.

When working flora for honey production, hives are usually placed so the foraging range is less than one hive per hectare. When pollinating cherries and plums, a heavier stocking rate is necessary to saturate the area with bees to pollinate the fruit blossom and stocking rates of two or three hives per hectare are necessary. With such a high stocking rate bees are unlikely to store any surplus of honey.

Costs associated with placing bees in orchards include loss of honey production, transport, extra labour with loading, unloading, hive management, and spray risk.

Beekeepers who are pollinators require advance notice of the number of hives required for pollination. Hives can require up to 12 weeks to prepare for pollination contracts.

For further information see Agnote DAI/27, *Best practice in a honeybee pollination service*.

CONDITION OF HIVES

For a hive to be able to adequately pollinate fruit blossom, the colony strength must be above a minimum. Hives left on orchards for 12-month periods seldom do a good job of pollination, primarily because of lack of management and the resulting small bee population at blossom time.

Well-managed bees are usually stimulated well before blossoming starts by moving them onto other floral sources in late August/early

September. An ideal pollination unit is about six frames of brood and bees. With an expanding brood nest, the bees have greater need for pollen to feed their larvae. Therefore, they show far more enthusiasm for flying even during less than ideal conditions. The number of combs of brood and bees per hive should be agreed on before hiring bees.

SPRAY AND PESTICIDES

For the beekeeper, one of the biggest drawbacks of placing bees near any orchard is the possibility of colonies or field bees being sprayed by pesticides either on the property where the bees reside, or on a neighbouring property.

Pesticide use while hives remain in the orchard or a neighbouring orchard should be kept to a minimum. Most poisoning of bees occurs when pesticides are applied to flowering crops, pastures and weeds. It is strongly recommended that fruit growers take the following steps to prevent or reduce bee losses.

- Follow the warnings on pesticide container labels.
- Select the least harmful insecticide for bees and spray at night.
- Mow all flowering weed growth before spraying orchards.
- Do not spray in conditions where spray might drift onto adjacent fields supporting foraging bees.
- Dispose of waste chemicals or used containers correctly.
- Always warn nearby beekeepers of your intention to spray in time for steps to be taken to protect the bees. Give at least two days' notice and also advise nearby farmers.

Edited by Robert West
Produced by Information
Delivery Program, Orange
Approval No. PLO(IL)/21
Agdex 217/26
This Agnote was originally
published as Reg 4/53

© State of New South Wales
NSW Agriculture (2000)

The information contained in this publication is based on knowledge and understanding at the time of writing (August 1999). 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 Agriculture or the user's independent adviser.