

Pollination

Pollination involves the transfer of pollen grains from the male flower to a receptive female flower. For most berry crops, pollen must be transferred by pollinating insects. Without these insects fruit set will be inadequate and yields will be reduced.

Types of Pollinating Insects

The honeybee is the world's most important insect pollinator of commercial crop production. It is most widely used because colonies can be placed on site at crop bloom and promptly removed when pollination is complete. Honey-bee colonies are made up of tens of thousands of bees. These large numbers of pollinators are needed to meet the pollination requirements of large-scale crop settings.

Bumble bees are also important pollinators. For some crops, especially blueberry and cranberry, bumble bees are more efficient than other pollinators. There have been ongoing efforts at enhancing the use of laboratory-reared bumble bees in berry crop pollination. So far, nest availability, small colony size and high costs have limited the use of bumble bees in field settings.

Research has also been directed to using the Blue Orchard Mason Bee, or *Osmia* Bee. These naturally occurring bees may be reared similarly to the Alfalfa Leafcutter Bee. In the future, the *Osmia* Bee may prove a valuable supplementary pollinator to early blooming berry crops.

Other wild bee pollinators may include Leafcutter bees, Alkali and Sweat bees. In some areas and in some years, these naturally occurring bees may play an important role in crop pollination. Yet, since their populations tend to fluctuate between years, growers can not rely on these bees to meet crop pollination requirements.

Renting Honeybees

The standards of a honey bee colony rented as pollination unit includes:

- one (1) vigorous egg-laying queen,
- an adult bee population large enough to cover eight (8) standard comb frames,
- at least four (4) of these standard frames covered with bee brood in all stages of development,
- little or no sign of honeybee diseases and pests, and
- sufficient food reserves and pollen.

Any grower who questions the quality of the pollination unit(s) should contact the beekeeper and arrange for an inspection. If the grower feels that, following such an inspection, the hives do not meet basic pollination unit standards, BCMAL's Apiculture Program in Abbotsford can be contacted.

When grower and beekeeper agree on a pollination service, a simple contract should be written outlining the terms for the service. The contract should include:

- the number of colonies rented,
- a guarantee that these colonies will meet pollination unit standards,
- the total rental fee and/or fee per pollination unit,
- guarantee that no insecticides be applied during the period that the colonies are on-site,
- the dates and/or the conditions under which the colonies will be placed and removed.

Other conditions may include accessibility to the colonies and damage liability (e.g. vandalism, bee poisoning due to pesticides, accidental flooding, etc.).

For a sample of a Crop Pollination Contract, visit www.al.gov.bc.ca/apiculture and select "Crop Pollination".

Managing Honeybee Colonies

It is best to place colonies in small groups of 6 to 10, dispersed through the field or along the edges. Colonies should be placed on well-drained sites, free of grazing cattle and frequent farm traffic, while remaining accessible to the beekeeper. Bees require a great deal of water free of pollutants. Well-maintained drainage ditches are adequate but under dry conditions, additional water sources may be required.

To optimize crop pollination, a sufficient number of honeybee colonies must be moved into the planting. Guidelines are given in Table 3.

Bee Poisoning

Honeybee colonies and wild pollinators may be poisoned and killed if insecticides are applied during the blooming season. If bees are killed, growers lose their investment in pollination rental fees and, more importantly, may lose crop yields and quality from incomplete pollination. Honeybee poisoning occurs when foraging bees contact contaminated blossoms. Bees may also be killed when collecting water from contaminated sources or when flying through pesticide mists during applications.

Table 2 lists the relative toxicity of insecticides to honeybees. Refer to this table when selecting a pesticide. Also follow these precautions to reduce the risk of bee poisoning:

- Move honeybee colonies into the berry fields after pre-bloom insecticide sprays have been applied. (Recommended fungicide or herbicide sprays are generally not hazardous to bees.) Have the colonies removed as soon as pollination is completed.

Table 3. Guidelines for using honeybee colonies in blueberries, cranberries and raspberries

Crop	Comment
Blueberry	Place at 10% bloom and after insecticide spraying. Use 2 to 6 colonies/ha (1 to 2.5/acre) depending on variety. Colonies should not be placed too early, to prevent bees flying to dandelion and other floral sources. Control dandelion in planting through mowing.
Cranberry	Place at 10 to 20% bloom after spraying. Use 2 to 4 colonies/ha (1 to 2/acre). Colonies should be placed in small clusters or dispersed throughout the planting when possible. Remove after bloom is finished.
Raspberry	Place colonies at the start of flowering and after insecticide spraying. Use 2 to 3 colonies/ha (1 to 2/acre). Place bee colonies in small groups along cross roads in the fields, or around the edges. Remove colonies at the start of harvest.

- Do not spray insecticides on the crop when the blossoms are open, or where spray drift may contaminate the open blossom. If insecticides must be applied in an emergency situation, spray in the evening when bees are not foraging. Early morning sprays should not be applied as they pose high risk to bees. Bees usually do not forage at temperatures under 13°C.
- If insecticide spraying is necessary when colonies are on-site, always contact the beekeeper(s).
- Use insecticides that are relatively non-hazardous to bees whenever possible. Diazinon, Guthion, and Sevin are hazardous to bees when applied anytime during bloom and should be avoided. Malathion is hazardous to bees and may only be applied during the evening.
- Use the least hazardous formulation: liquid formulations are less toxic than wettable powder formulations.
- Ground applications are generally less hazardous than aerial applications as there is usually less drift.

Work closely with your beekeeper to maximize your crop pollination. This will minimize problems and misunderstandings.