



Apples

Malus × domestica



Mating & Breeding System

The flowers of apple have both male and female reproductive parts, with five stigmas and styles and numerous stamens. In certain cultivars, not all stigmas in an apple flower need to receive pollen in order for all ovules to be fertilized, as pollen grains delivered to one stigma can fertilize ovules associated with a different stigma. Apples are incapable of self-fertilization, even within a cultivar, and require cross-pollination by insects in order to set fruit and produce seeds.

Pollination, Quality & Yield

When full pollination occurs, large, symmetrical, and thus valuable, apples are produced. Malformed and small fruit develop when fertilization is incomplete. Apples often produce more flowers than can develop into fruit and growers generally thin flowers to favour larger fruit development. Pollination of the desired flowers is still required, and insects must carry the pollen from a pollinizer to those blossoms. Early fertilization is desirable to allow the most time for development of mature fruit. Some cultivars may show ovule degeneration before fertilization, which results in fruit with few seeds that are ultimately shed.

Pollination Recommendations

Apples are self-incompatible, and trees cannot be fertilized by their own pollen or by the pollen of a tree of the same cultivar. It is necessary to plant pollinizers of a different cultivar in the orchard such that no tree is more than 20 meters from a pollinizer tree. The ideal pollinizer will have similar flowers and rewards as the main cultivar, so that pollinators do not display a preference for one over the other. Some *Malus* species such as crabapple have been bred to produce huge numbers of flowers and their resulting fruit are unlikely to be confused with the apple crop. In some modern orchards, a branch of the pollinizer is grafted onto the production trees, but pollinizer branches must be plentiful enough and flower sufficiently to adequately service the production trees. The effectiveness of cultivars as pollinizers varies, so when planning an orchard growers should confirm that their choice of pollinizer is suitable for cross-pollination with the production cultivar.

Apples are traditionally pollinated by honey bees, with a conventional recommendation of 2-5 colonies per hectare, depending on orchard age and tree size (modern orchards with trellised dwarf trees require the high end of the range or more). Orienting hive or domicile openings to the south facilitates warming in the morning and encourages bee activity. Honey bees will not forage below 15°C or in excessive wind or dampness, so pollination may suffer if there is inclement spring weather during early flowering.



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Pollination Recommendations (cont.)

Cold temperatures can hamper fertilization in the flower itself, leading to problems with fruit set and seed production. More colonies and/or the use of appropriate pollen dispensers can help. Bumble bees and blue orchard bees have been shown to successfully pollinate apples during inclement weather. Wild pollinators are also valuable, particularly in small orchards adjacent to areas such as forests and wetlands that provide nesting habitat.

Managing competing blooms is an important concern when managing pollination. If encouraging wild pollinators or establishing an alternative pollinator, such as the blue orchard bee, is of interest to the orchardist, alternate forage is required for these bees to complete their life cycle. One option for orchardists is to plant forage which will flower after the crop bloom period between tree rows. Weeds or alternative forage should not be allowed to compete with crop blooms (especially if the crop is less attractive to foraging insects than the weeds). Growers should mow (not apply herbicide to) competing blooms during fruit bloom only. Growers should also be aware that alternative forage may attract bees to orchards off-bloom, and this can result in bee kills for neighbouring beekeepers if the grower uses insecticides.

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