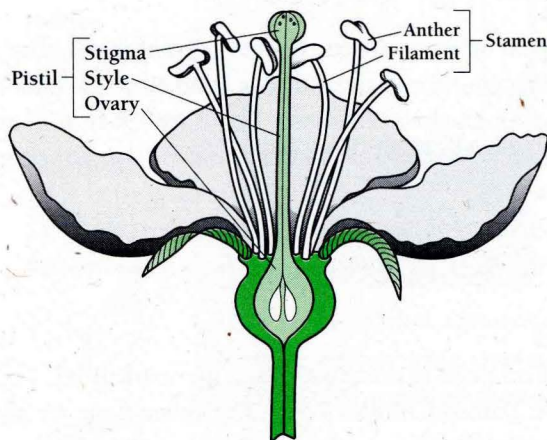


Tree Fruit Pollination

by Linda Naeve

The production of fruit on most plants, trees, shrubs, and vegetables results from pollination of the blossoms.

Pollination is the transfer of pollen from the anther (male organ) to the stigma (female organ) in the flower illustration below. The stigma has a sticky surface upon which the pollen grains are caught and stuck. The pollen grain germinates and produces a tube which grows down the style and unites with the female cell in the ovary. This union is called **fertilization**. After fertilization takes place, the seeds develop and the fruit enlarges.



Flower anatomy

Pollination must occur when the plant is in bloom. If pollination and fertilization take place, the flowers will remain on the plant and begin to develop into fruits. If limited or no pollination occurs, the flowers will drop, or small fruits will form that drop off the plant early.

There are different types of pollination that take place in fruit trees. If pollen is transferred from the anther to the stigma on the same flower or to the stigma of another flower of the same cultivar, it is known as **self-pollination**. If after self-pollination, a fruit develops and matures, then the cultivar is said to be **self-fruitful**. Sour or tart cherries are self-fruitful fruit trees.

If pollen is transferred from the anther of one cultivar to the stigma of another cultivar, it is known as **cross-pollination**. Cross-pollination is common in all tree fruits but is essential for fruit set in most pears, sweet cherries, plums, and apples.

Some cultivars of fruit trees cannot pollinate their own flowers. These are considered **self-unfruitful**. Therefore, in order to obtain fruit set, another cultivar of the same fruit is needed for cross-pollination. Most apple and pear cultivars are self-unfruitful. Cross-pollination can be accomplished by having a pollinizer cultivar within 50 feet of the self-unfruitful tree.

There are some fruit tree cultivars that are **cross-unfruitful** because they do not produce good, viable pollen for proper pollination of the same fruit. Jonagold is an apple cultivar that is cross-unfruitful and should not be relied upon as a pollen source. Some hybrid plum cultivars are self-unfruitful and cross-unfruitful, requiring special pollinizing cultivars.

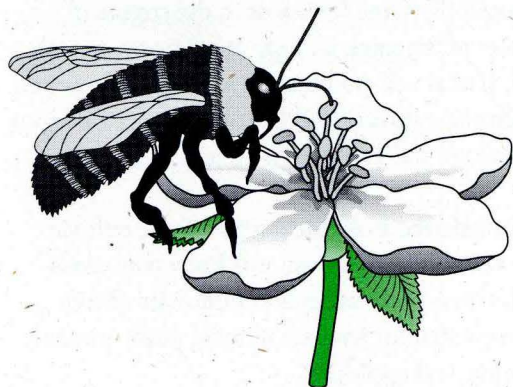
Methods of Pollination

The pollen of fruit trees is heavy and very little is carried in the wind. Cross-pollination is achieved by insects, especially honey bees. The honey bee is responsible for about 90 percent of apple pollination. As the honey bee flies from blossom to blossom and tree to tree in the orchard collecting nectar, pollen sticks to its body hairs. The bee rubs off the pollen onto the stigma and picks up additional pollen from the anthers as it visits the flowers.

A honey bee may visit 5,000 blossoms a day. This brings about self- and cross-pollination.

Good weather is important while the tree is in bloom. Bees are most active when temperatures are above 65°F. There is little or no flight of honey bees on cold, rainy, or windy days. Two or three warm, sunny days during the blooming period are important to set a good crop.

Many fruit tree insecticides are very toxic to honey bees. Thus, the trees **should not** be sprayed while they are in bloom and the bees are active in the orchard.



Protect bees—don't spray fruit trees during the blooming period.

Blooming Times

In order for cross-pollination to take place, it is critical that the pollenizer cultivars of a crop bloom at approximately the same time as the self-unfruitful cultivars. Some cultivars, such as McIntosh, bloom early in the spring. The late bloomers, such as Rome Beauty, follow about a week later.

The length of time a fruit tree is in bloom varies from 1 to 2 weeks, depending on the cultivar and weather conditions. If the temperature is high during the blooming period, the early- and late-blooming cultivars may be flowering at about the same time or overlap, resulting in good pollination. However, when spring temperatures are cool, the overlap in blooming time may be insufficient to provide adequate cross-pollination. This is why it is a good idea to plant different cultivars of a crop that bloom at nearly the same time or plant more than one early- and late-blooming cultivar.

For information on fruit crop selection and recommended fruit cultivars for Iowa, pick up a copy of PM 453, *Fruit Cultivars for Iowa*, from your Iowa State University extension office.



Pollination must occur when the plant is in full bloom.

Apples

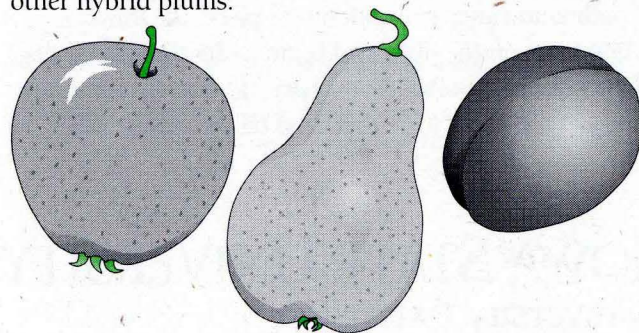
Apples are considered self-unfruitful. However, a few cultivars, such as Golden Delicious, set a good crop without cross-pollination. Most apple cultivars will set a small crop with their own pollen. For best production, plant two or more apple cultivars to ensure cross-pollination and fruit set. See the chart on the following page to determine which apple cultivars are suitable pollinators.

Pears

Most pear cultivars are considered self-unfruitful, thus requiring another cultivar to set a good crop. Exceptions are Kieffer, Duchess, and Bosc. These are self-fruitful and will set an adequate fruit load without cross-pollination. Bartlett and Seckel will not pollinate each other. Thus, another pear cultivar is needed as a pollen source for Bartlett.

Plums

Most European or domestic plums are self-fruitful. Stanley, Damson, Mount Royal, and Green Gage are all self-fruitful European cultivars. Japanese × American hybrid plums are self-unfruitful and require another hybrid cultivar for cross-pollination. Toka is an excellent pollinator for Underwood, Alderman, Superior, and other hybrid plums.



Pollen source	Cultivar to be pollinated																					
	Liberty	State Fair	Lodi	McIntosh	Idared	Paulared	Empire	Jonagold	Haralson	Red Delicious	Jonathan	Chieftain	Gala	Honeygold	Honeycrisp	Redfree	Jonafree	Golden Delicious	Enterprise	Prairie Spy	Rome Beauty	
	Early bloom						Midseason bloom													Late bloom		
Early bloom	Liberty	State Fair	Lodi	McIntosh	Idared	Paulared	Empire	Jonagold	Haralson	Red Delicious	Jonathan	Chieftain	Gala	Honeygold	Honeycrisp	Redfree	Jonafree	Golden Delicious	Enterprise	Prairie Spy	Rome Beauty	
Liberty	Shaded																					
State Fair		Shaded																				
Lodi			Shaded																			
McIntosh				Dark																		
Idared					Shaded																	
Paulared						Shaded																
Midseason bloom	Empire						Shaded															
Jonagold																						
Haralson								Shaded														
Red Delicious									Dark													
Jonathan										Shaded												
Chieftain											Shaded											
Gala												Shaded										
Honeygold													Shaded									
Honeycrisp														Shaded								
Redfree															Shaded							
Jonafree																Shaded						
Golden Delicious																	Shaded					
Late bloom	Enterprise																		Shaded			
Prairie Spy																				Shaded		
Rome Beauty																					Shaded	

- Can be relied upon to pollinate this cultivar
- Partially self-fruitful; better fruit set may result with another cultivar as the pollen source
- Self-unfruitful; should not be relied upon as the only pollinizer for this cultivar

To use the chart, make two cross readings for each pair of cultivars, using each one as a pollen source. Start with the cultivar to be used as a pollen source (left side) and move across the row to the column of the cultivar to be pollinated. This will be the first reading. For the second reading, switch the two cultivars, making the pollen source the pollinated cultivar. If the intersections of both readings show white squares, you can expect good cross-pollination from the two cultivars. Some fruit may be set on both trees if the intersection is a shaded square; however, better yields will result if another cultivar is used as the pollen source. If both readings show a dark square, you should not depend on them to pollinate one

another. If one reading shows a white square and the other a dark one, then the two cultivars should not be the only cultivars planted. A third cultivar that gives a white square reading with the other two should be planted to ensure good cross-pollination. For example, if Jonagold and Haralson are selected with Jonagold as the pollen source for Haralson, the result is a dark square. When Haralson is the pollen source for Jonagold, the intersection is a white square. Thus, a third cultivar, such as Jonathan, should be planted with Jonagold and Haralson to provide a pollen source for the Haralson apple tree.

Peaches

With few exceptions, peach cultivars are self-fruitful. The primary reason for little or no fruit set on peaches in Iowa is due to winter injury to the fruit buds.

Cherries

Sweet cherries are generally self-unfruitful, with the exception of 'Stella,' which is a self-fruitful sweet cherry cultivar. Unfortunately, they are not adapted to the climate found in most of Iowa due to lack of winter hardiness in the fruit buds.

Cultivars of sour or tart cherries can be grown throughout Iowa. All cultivars are self-fruitful.

Bush cherries also are self-fruitful and can be grown almost anywhere in Iowa.

Apricots

All apricot cultivars grown in commercial and home orchards in this country are self-fruitful, except Moongold. Sungold is the recommended pollen source for Moongold apricot trees.

Prepared by Linda Naeve, former extension horticulture associate.
Revised by Richard Jauron, extension horticulturist.

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