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Pollination & Commercial Varieties of Pears in Oregon

R. Stebbins, W. Mellenthin, and P. Lombard

Why be concerned about pollination? While most varieties of pear will set some fruit without cross pollination, usually they will set more and better fruit with it. Cross pollination means the transfer of pollen from the anthers of flowers of one variety to the stigma of flowers of another.

For a seed to be formed, the pollen must germinate on the stigma and send its tube to the base of the style where it fertilizes the egg. The presence of seeds in pears has several beneficial effects. The initial fruit set is higher, fewer fruit fall in the "June drop," there is less preharvest drop, often seeded fruit of winter pears are larger than seedless fruit, and the presence of a seeded crop in one year increases the chance of a good fruit set the following year. The presence of seeds may give Bartlett fruit a more desirable shape.

The low average per-acre yield of pear orchards, contrasted with the best yields in certain orchards, indicates that productivity could be improved. Inadequate provision for cross pollination may be a major factor limiting yield.

One way to determine whether pollination is adequate is to cut fruit and count the well-developed seeds on trees adjacent to and distant from pollinizers. Seed counts averaging below 4–5 indicate sub-optimal pollination.

A high percentage of the fruit in a large block of a single variety of pear will be seedless. In years with favorable spring weather, such orchards may produce a full crop, but in cooler blossom seasons fruit set may be quite low. Frost or some other factor may be blamed, when in actuality the cause of low fruit set was lack of cross pollination. Seedless fruit set, called "parthenocarpy," is increased by high nitrogen levels and heavy pruning. Such stimulations to parthenocarpy may result in good production of some varieties in some years, but if cross pollination were added to the system, still greater production would be obtained over a period of years.

Varieties for pollination

The four main pear varieties grown in the Pacific Northwest—Bartlett, Anjou, Bosc, and Comice—will satisfactorily cross pollinate and set seed on each other. Seckel, a minor commercial variety, is cross incompatible (will not set seeds) from Bartlett pollinizers. Anjou can be used as a pollinizer for Seckel. The bloom periods of the main and pollinizer variety must overlap enough to provide at least several days over which cross pollination can take place. Although the pollinizer need not be a commercial variety, it's desirable if it is.

Although Bartlett usually blooms about 3 days later than Anjou, the bloom periods of Anjou and Bartlett overlap enough that they are adequate pollinizers for each other. Since Anjou is a notoriously shy bearer, especially if there is inadequate cross pollination, it's advisable to have at least 10 percent Bartlett pollinizers in a block of Anjous.

The variety Easter, which is an exceptionally good pollinizer for Bartlett and Anjou, has been replaced due to its low commercial value. Forelle blooms with Anjou but is not a satisfactory pollinizer for

R.L. Stebbins, W.M. Mellenthin, and P.B. Lombard, professors of horticulture emeritus, Oregon State University.

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Anjou, at least under some conditions, and is highly susceptible to fire blight. Doyenne Gris (Golden Doyenne) is an excellent pollinizer for Bartlett, but with the exception of local sales, it has no market. In the occasional year in the Hood River Valley, and perhaps in other districts, when Bartletts bloom from 5 to 10 days later than Anjou, having a second pollinizer variety such as Easter or Doyenne Gris would be of economic benefit.

For several reasons, growers may wish to have solid blocks of Bartlett. Because of poor fruit set, this is impractical in cool districts such as the Willamette Valley and Hood River. Although it is feasible in the Medford district, it is not desirable for reasons already discussed.

Anjou trees bloom too early to be reliable pollinizers for the later-blooming Bosc. Comice, and usually Bartlett, bloom late enough to pollinize Bosc, and Comice most often is used to pollinize Bosc. Although Bosc may set seedless fruit without pollination, especially on young trees, productivity is enhanced by pollination. Bosc needs a higher fruit set than the other varieties to be fully productive.

Comice is a notoriously shy bearer because the egg cells are short-lived. This means that, for fruit set to occur, pollination and fertilization must occur within a very few days after the blossoms open. Comice flowers do have excellent pollen, but like the other varieties, it is self-sterile. Only 20 to 30 fruit per 100 flower clusters need set a fruit to produce a full crop of Comice. Either Bartlett or Bosc pollen can be used for Comice. Solid blocks of Comice rarely set a good crop, even if the weather is favorable.

Red-fruited strains of Bartlett, Anjou, and Comice have the same pollination requirements as the green-fruited strains from which they originated. Packham's Triumph blooms early and is pollinized by Bartlett.

Pollinizer numbers and arrangements

When the pollinizer variety is marketable, solid rows of pollinizers every two or three rows is an optimum arrangement. This is better than placing pollinizers in the row of the principal variety, because it avoids confusion at harvest and is easier to spray when application to only one variety is called for. The pollinizer row idea becomes less practical as we try to reduce the percentage of pollinizers. In one case, the productivity of Anjou trees three spaces from a pollinizer row over a 30-year period was about 20 percent less than trees adjacent to a pollinizer row.

When the pollinizers represent less than about 30 percent of the planting, it's best to distribute them evenly through the rows of the main variety rather than keep them in solid rows. With shy-bearing varieties like Anjou and Comice, at least 17 percent of the planting should be pollinizers. A minimum for Bartlett or Bosc is about 10 percent.

An arrangement of every third tree in every third row gives about 10 percent pollinizers and puts every tree adjacent to a pollinizer at least on the diagonal. Every second tree in every third row gives about 17 percent pollinizers and places each tree with a pollinizer on two sides. Every second tree in every second row gives about 25 percent pollinizers and places a pollinizer on three sides of each tree of the main variety. In closely spaced hedgerows or fruiting walls, it's best to space the pollinizers evenly in the rows with any arrangement having less than 50 percent pollinizers. This is because bees tend to work up and down the rows and seldom cross over more than one row.

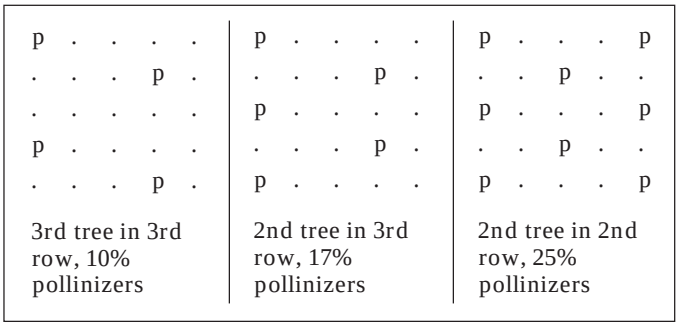
If the number of pollinizer trees in an existing orchard is inadequate, bouquets may be used as a temporary means of increasing cross pollination. Use large bouquets placed in containers of water and distributed in at least every third tree. Cut branches a yard long in full bloom and change them frequently to keep them fresh. Place them high on the south side of the tree.

Pollinator insects

Effective cross pollination depends on honey bees introduced for the purpose. Wild bees, flies, and other insects are not numerous enough and wind is not very effective. Since pear blossoms are relatively low in nectar and the nectar has a low sugar content, bees prefer to visit other kinds of flowers. If bees are brought into the orchard before the pear blossoms open, they will begin to work any other available bloom and may ignore the pears once their blossoms do open. Introduce the bees when 10 to 20 percent of the pear blossoms have opened. Destroy all competing bloom in the cover crop or fence rows. Bees will work stone fruits or early blooming apple varieties in preference to pears.

In Medford, one strong bee colony per acre is minimum and two is much better. In Hood River, three hives per acre is minimum. A strong colony has 2½ pounds of bees. Distribute the hives through the acreage in groups of three to five hives, with hive entrances facing south. On some sites, sheltering the hives from the wind will increase the number of bee flights. It's desirable to supply drinking water to the bees.

Bee hive pollen dispensers attached to the hives encourage bees to distribute pollen purchased from commercial



sources. Fresh pollen must be added every half hour because stored pollen retains viability for only a short time. The use of pollen dispensers is only a partial supplement to the use of pollinizer trees. Effectiveness is questionable and the dispenser system is too costly to be used as the principal source of pollen.

Bee attractants sprayed on pear trees to increase cross pollination are of doubtful value because the bees in pears are chiefly pollen collectors. Diluted solutions of molasses, honey, and cane sugar have been used. Spraying at 1- to 2-day intervals is necessary.

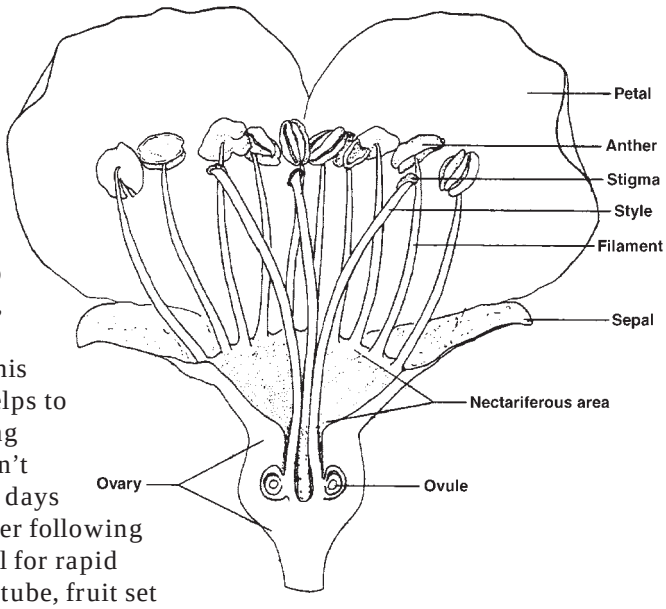
Artificial distribution of pollen by spraying or dusting is ineffective. The stigma of the pear flower is small and not very sticky. For it to germinate, pollen usually must be pressed or brushed onto it. Applying pollen by hand with a camel hair brush is effective, but costly. Probably the only time it could be economically justified is to set the first crop on young trees.

Do not apply pesticides toxic to bees when the hives are in the orchard, or when any blossoms are open. Organophosphates such as azinphos-methyl and carbamates such as carbaryl may cause severe losses if contacted by bees. Some insecticides, and most fungicides and herbicides, are relatively nontoxic, but read the pesticide label first and notify the beekeeper before applying them.

Before pesticide spraying, be sure the beekeeper removes the hives from the orchard as soon as practicable after pollination.

Weather and fruit set

The average daily temperature greatly influences the rate of pollen *tube* growth. The pollen grain germinates and sends out a pollen tube which grows down the style carrying the male nucleus. In 2 days with average temperature of 60°F, a pollen tube on a Bartlett style could reach and fertilize the egg, but at 40°F, 12 days would be required. The effective pollination period is the period of egg longevity (after the flower has opened) minus the time required for the pollen tube to grow down the style. At 40 to 50°F, this period is estimated to be, for Bartlett, 6 to 7 days; Bosc, 9 to 10 days; and Comice, 1 to 2 days.



The shortness of this period for Comice helps to explain its shy bearing habit. If the flower isn't pollinated in the few days available, or if weather following pollination is too cool for rapid growth of the pollen tube, fruit set will be low. High humidity increases pollen germination on the stigma. Cool, rainy weather inhibits bee flight. Bees from the local area may fly at lower temperatures than bees from warmer areas.

Parthenocarpic fruit set is affected by temperature in a 10-day period during bloom. If there are 50 hours with temperatures over 60°F, Bartlett will set parthenocarpically. More than 150 hours over 60°F gives a bumper crop, provided there is no frost injury. When there is substantial parthenocarpic fruit set, cross pollination will not increase set, but it will increase fruit set when weather is too cool for parthenocarpic set. Although Anjou sometimes will set parthenocarpically, it is a notoriously shy bearer and usually will set much more fruit if cross pollinated.

Varieties that bloom relatively late, such as Bosc, have a greater chance of blooming during warm weather. Comice will benefit from cross pollination almost every year.

Tree physiology, management, and rootstock

Trees on quince, *Pyrus calleryana*, or Old Home x Farmingdale clones tend to set more fruit than trees on domestic seedling or *P. betulaefolia.* This difference is especially important with young blocks of Anjou or Comice.

A pruning system has been developed for Anjou and Comice that can increase fruit set. The previous season's shoots are entirely removed or left unheaded. After they have formed flower buds, in the second or third season, they are headed at a flower spur. The heading cuts increase fruit set on spurs next to the cuts. Pruning and applications of nitrogen fertilizer help to maintain a good equilibrium between blossoming and new growth. Old, weak, and shaded flower spurs tend to set few fruit, especially in cool weather. Proper pruning removes old spurs and exposes young fruiting wood to sun.

Lime sulfur sprays before bloom can reduce fruit set. The fungicide dodine, used to control scab, reduces fruit set if applied during the bloom period. A dormant oil spray may increase fruit set of Anjou regardless of distance from pollinizer. Poor control of mites the previous season can result in reduced fruit set.

Boron deficiency can reduce or even prevent fruit set. It may occur during the bloom period and disappear later when the soil warms up. In severe cases, whole blossom clusters dry up. Blossom blast, caused by the bacterium *Pseudomonas syringae*, resembles boron deficiency. Application of boron fertilizer to the soil every third year, or an annual boron spray in late September, will prevent boron

deficiency in the bloom period. In some orchards on certain soils in the mid-Columbia area, soil-applied boron has been ineffective.

Pear variety list

Anjou (Beurré d'Anjou)

Origin: France near Angers, early 1800s. Grown commercially in Oregon and Washington for storage, and sold after Bartlett from October through May. Shorter and rounder than Bartlett, Anjou is picked green in September and ripens only after cold storage for a month or more. It softens and becomes light green or greenish-yellow upon ripening. Once ripe, it's soft, juicy, sweet, and smooth-fleshed, with few stone cells.

Anjou trees are vigorous, and begin bearing only after 7 to 9 years, (unless they are on special rootstocks and given special treatment). Anjou is a shy bearer, rarely requiring thinning. The fruit are susceptible to internal cork spotting, which is especially severe in hot climates. It's slightly less susceptible to fire blight than Bartlett. It also is more cold-hardy in winter than other commercial varieties.

Bartlett (Williams' bon Crétien)

Originated in England, late 1700s. This is the principal variety grown commercially in the United States and the principal one used for canning. Bartlett, with its long, thick neck, has the classical "pear" shape. It is picked in August when it can be removed easily by an upward rotation and after it has some shine to the skin and has lost some of its green color. If a Bartlett is allowed to ripen on the tree, its core becomes mushy and the flesh pithy. Bartlett will ripen without cold storage. It can be held in good cold storage (at 30°F) for about 2 months. When ripe, the skin is golden yellow, thin, waxy, and smooth. The flesh has superior aroma and flavor, and is juicy, soft, and melting, with few grit cells.

Bartlett is well adapted to hot summer weather, but its buds require adequate winter chilling. "Sensation" and "Max-red Bartlett" are red-skinned sports of Bartlett.

The Bartlett tree is only moderately vigorous, upright, but with limbs that are easily bent over by the weight of fruit. It is susceptible to fire blight. Most strains of Bartlett are not graft-compatible with most quinces.

Bosc (Buerré Bosc)

Originated in Belgium. Bosc is the principal "bronzed" (russeted) pear produced and sold commercially in the United States. It matures 4 to 5 weeks after Bartlett, and can be held in good cold storage for 3 to 4 months. Bosc has a long, tapered neck and a long, often-curved stem, and tends to be of medium to large size. It usually is eaten fresh or baked. The flesh is juicy, sweet, slightly mushy, grainy toward the core, and sometimes chewy.

Since it is late-blooming, it often avoids spring frosts and is more consistently productive in cool springs than is Bartlett. The tree is vigorous, upright, with branches that tend to bend and break easily under crop load. It isn't compatible when grafted directly on quince. It's very susceptible to fire blight and stony pit virus, and is less cold-hardy than Bartlett.

Comice (Doyenne du Comice)

Origin: France, 1849, at Angers. Considered by most people to be the best European pear for eating fresh. The fruit is large and roundish-turbinate. The fruit is picked while still green (5 to 6 weeks after Bartlett) and ripened off the tree after a month or more of cold storage. Comice can be stored 3 to 4 months at 30°F. Once ripe, the fruit is extremely juicy and sweet, with a delicate, distinctive flavor, and melting, white flesh free of grit. It also bruises easily.

Comice can withstand hot summers, but may reach better quality in climates that aren't extremely hot. The tree is upright, stiff, and vigorous. The young tree is slow to begin bearing, often requiring 8 to 10 years, unless grafted on quince. It is moderately susceptible to fire blight.

Seckel

Origin: Pennsylvania, late 1700s. Seckel is tops in flavor. The fruit is small, almost round, and the skin is reddish brown over yellow-brown with brown russett, and smooth texture. The flesh is creamy white, sweet, and good for eating fresh or in preserves. The tree is slow growing, productive, and somewhat fire blight-resistant; it is good for mild winters. Extensive fruit thinning is required to achieve medium size.

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