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Stone Fruit Pollination

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Cherries, prunes, plums, and peaches make up the common stone fruits produced commercially in Oregon. All varieties of sweet cherries, most plums, and some peach varieties, such as J. H. Hale and Alamar, are self-unfruitful—that is, they are unable to set and mature a commercial crop when self-pollinated.¹ Certain varieties of prunes are said to be partly self-fruitful—they may set commercial crops when self-pollinated, but usually benefit from cross-pollination. Most peach and a few prune (Italian) varieties are self-fruitful—they will set a commercial crop when self-pollinated.

Optimal pollination depends upon several factors, each of which may be limiting if not met. These include preparation of the orchard prior to introduction of the bees, good bee management practices, and favorable weather conditions during bloom.

Orchard management for self-unfruitful varieties

Pollinizer requirements. To insure consistent commercial yields of both the self-unfruitful and the partly self-fruitful varieties, adequate numbers of compatible pollinizer trees must be interspersed with the variety to be pollinized. Both the number of pollinizers as well as their placement should be determined by weather conditions that normally prevail during the blooming period as well as by the foraging behavior of honeybees. A pollen-collecting honeybee, which carries pollen from tree to tree, will usually visit only two to three adjacent trees in a single trip. Therefore, if pollen is to be effectively transferred from the pollinizer variety

to the blossoms of the variety to be pollinized, different varieties must be closely spaced.

The optimal arrangement is to have every other tree in every row a pollinizer. However, this presents harvesting difficulties and is often impractical if the fruit of the pollinizer variety lacks commercial value. With the development of marketable pollinizer varieties, such as the cherry Corum, every other row should be a pollinizer row. When mechanical harvesting methods are possible, this type of orchard plan is essential.

Competing bloom. Many of the weeds that are common to orchard floors, such as dandelion and chickweed, are often more attractive to bees than is the orchard bloom. In addition, when bees are moved into an orchard from an area where a particular weed predominates, they usually resume collecting nectar and pollen from the same or a related species at the new location. Honeybees may become readily conditioned to a weed such as dandelion, and few bees will change to fruit even when dandelion flowers cease yielding at midday. Thus competing bloom, both in and adjacent to an orchard, not only competes for bee activity but also presents a hazard in that it accumulates large amounts of pesticides that have been applied to the orchard prior to the time the bees were moved in. Mowing or disking an orchard floor immediately prior to the introduction of bees is a recommended practice.

Insecticides. Most pesticides applied for the control of orchard insects are highly toxic to honeybees. Every precaution should be taken to protect the pollinators during the pollination period. Only those pesticides recommended by the county Extension agents should be used, and these should not be applied while bees are in the orchard.

Losses of honeybees during the bloom period create not only a serious hardship upon the beekeeper but deprive the orchardist of the service for which he is paying.

Weather and bee activity

Honeybees are temperature and light sensitive and rarely will fly if the temperature is below 55° F and the wind is more than 15 to 20 mph. However, the stronger the colony, the lower the temperature at which the bees may initiate flight. Thus a strong colony is usually worth several weak colonies as pollinators. In poor weather when flight conditions are marginal, bees foraging at more distant locations will remain in the hive and only those that have been foraging nearby will be active. Therefore, where inclement weather is the rule during fruit bloom, colonies of honeybees should be placed uniformly throughout the orchard in order to benefit from the more frequent, shorter bee flights. This type of service is time consuming and costly to the beekeeper and requires additional compensation.

Both pollen and nectar collectors are most active between the hours of 9 a.m. and 1 p.m. Of the two types of bees, the pollen collectors are the most efficient pollinators. There is, however, no age-associated sequence of pollen and nectar gathering by adult bees and an individual may collect pollen one day and nectar the next, or pollen on one load and nectar on the next. Generally, however, a good nectar flow or supplemental feeding with sugar stimulates an increase in the number of bees collecting pollen.

Bee management

Introduction of bees. Bees should be moved into cherry orchards as soon after the start of bloom as possible, for cherry blossoms must be pollinated

¹OSU Fact Sheet 57 and OSU Station Bulletin 570 provide additional details on cherry pollination and pollinizers. OSU Fact Sheet 143 provides a list of recommended fruit varieties, their maturity dates, and pollinizer requirements.



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shortly after they open. On prunes and plums, however, bees should not be introduced until the pollinizer and the variety to be pollinated are in at least 25% bloom. Moving bees into an orchard prior to bloom will result in the establishment of the field force at pollen and nectar sources other than the fruit to be pollinated. The introduction of bees into an orchard free of competition, and in which the fruit is in at least 25% bloom, usually results in the entire field force visiting the trees adjacent to the hive in the process of reorientation.

Number of colonies required. There has been a general rule of thumb established that one good colony of honeybees per acre is satisfactory for tree fruit pollination. However, some consideration must be given to tree size, pollinizer placement, competition both within the orchard and without, as well as to weather conditions normally experienced during the bloom period. Whereas one colony of bees per acre is routinely used in many of the sweet cherry producing areas of the state, with good management many growers in the Willamette Valley are regularly achieving yields of 10 tons per acre when using four colonies. Two to four colonies per acre also are recommended for those areas such as Union County where inclement weather conditions are common during bloom. One colony per acre appears to yield satisfactory results in plums, prunes, and peaches.

Spacing of colonies in the orchard. When colonies are introduced into an orchard at the rate of one colony per acre, optimal pollination is achieved when the bees are located in groups of four spaced uniformly throughout the orchard. Such placement is often impractical because of weather conditions at the time of bee introduction or because of the contour of the land on which the orchard is located. Generally, beekeepers will cooperate in spacing colonies throughout the orchard in

groups of six to eight per location, but will charge an additional fee for the location of smaller groups. Where pollination is a consistent problem, growers may find it economically profitable to pay up to twice the normal rental fee for bees spaced in groups of two to four throughout the orchard.

Colony strength. Standards of colony strength for bees used for commercial pollination purposes have been established by the legislature and appear in Section 55-005 of the Oregon Administrative Rules. In addition to freedom from disease, the Rules state that each colony should contain 3,000 square inches of comb, with 600 square inches occupied by live brood; contain enough bees to cover six standard Hoffman frames or their equivalent, have a laying queen, and 10 pounds of honey or bee food. Orchardists usually have neither the time nor the inclination to inspect all of the colonies provided them and must rely on the rental of bees from reputable beekeepers.

Removal of bees. The type of weather during the bloom period should determine when bees are to be removed from the orchard. During good flight weather a pollen-collecting bee will visit from 10 to 20 florets per minute. A uniform distribution of only four pollen collectors per tree throughout the orchard would result in 2,400 to 4,800 visits to florets per tree every hour. Thus it is understandable why good commercial yields of fruit have been realized during seasons when there was but a single day of good flight weather during the blooming period. In seasons of good flight weather, when the pollinizer and the variety to be pollinated have bloomed synchronously, bees may be removed well before one-third of petal fall has occurred. However, in seasons of adverse weather conditions bees should be left in the orchard until petal fall is almost complete. It should be made clear that colonies used in pol-

lination produce no surplus honey while in orchards and bees kept unduly long in a spent orchard suffer severe losses in honey and bee strength.

Artificial pollination

The use of pollen inserts to effect cross-pollination and the application of pollen through the use of a speed sprayer have not given consistently good results in Oregon tests. The application of pollen by brush to individual florets or by hand duster to floret clusters is a satisfactory means of fertilization, but it is slow and expensive.

Contract agreements

Beekeepers and orchardists have found that a written contract does much to prevent misunderstanding and thus insure better pollination service. The following points should be covered:

- ✓ Date of movement of bees into orchard, or the time relative to a certain condition of bloom, and the date on which bees are to be removed.
- ✓ Colony strength to meet standards agreed upon by beekeeper and orchardist.
- ✓ Pattern of colony placement in the orchard.
- ✓ Rental fee and the date(s) on which it is payable.
- ✓ Orchardist agrees not to apply bee-toxic pesticides while bees are in the orchard, but if necessary to do so, the beekeeper will be given 48 hours notice.
- ✓ Orchardist agrees to reimburse the beekeeper for additional movement of colonies in, out, or around the orchard.
- ✓ Orchardist will provide right of entry of beekeeper for management of bees.
- ✓ Beekeeper is obligated to inspect colonies to be sure they are queen right and in good condition when bees are kept in a given orchard for more than one week.