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POLLINATION REQUIREMENTS OF NUTS IN THE PACIFIC NORTHWEST

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C. E. Schuster, Horticulturist
Division of Fruit and Vegetable Crops
and Diseases
Bureau of Plant Industry
United States Department of Agriculture

Federal Cooperative Extension Service
Oregon State College
Corvallis

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Wm. A. Schoenfeld, Director
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During the past twenty years of observation and experimentation some very definite information has been obtained on the pollination requirements of the nut crops grown in the Pacific Northwest. It is well at this time to summarize this information and bring it together in one paper so that it can be readily available for the use of growers. The term "pollination" refers specifically to the operation of placing pollen on the stigmas of the female blossoms. After pollination, the pollen grains germinate, producing a pollen tube containing a male nucleus. The pollen tube grows toward the egg cell and after a time the male nucleus and the egg unite, thus causing fertilization. In most fruits fertilization follows within a short time after pollination, but in the filbert two to four months may elapse before it takes place. The two processes, pollination and fertilization, are generally, but incorrectly, included in the single term "pollination" and in this paper they are so used.

Filbert (Corylus avellana)

The idea of a need for cross-pollination of filberts was not new even in 1905 since A. A. Quarnberg, of Vancouver, Washington, brought up the question in a letter to Felix Gillette, of Nevada City, California, the pioneer filbert nurseryman of the Pacific Coast, who brushed the idea aside with the statement that all filberts needed was pruning. However, by 1920 the demand of the growers for such work was so strong that investigations were begun in that year and the results were later published in Oregon Agricultural Experiment Station Bulletin 208.

The Filbert is Self-Sterile

The filbert is self-sterile from a commercial standpoint, i.e., trees of this species will not set sufficient nuts for a crop when the pistillate blossoms are pollinated with pollen from the same tree or from trees of the same variety. Probably no variety is totally or completely self-sterile. The degree of self-sterility varies from year to year but the set of nuts in any block of one variety, self-pollinated, will probably not be over one or two per cent as a maximum. When cross-pollinated, 50 to 75 per cent of the female flowers will set fruit. Therefore, from a commercial standpoint the filbert must be considered self-sterile.

The time of blooming for both staminate (catkins) and pistillate flowers presents one of the greatest obstacles in combining desired varieties in an orchard to insure adequate pollination. In some seasons early blooming varieties may begin shedding pollen during December and late varieties still have receptive pistillate flowers in April when pollen is no longer available. Again, no pollen may be shed before the middle of January. There is a general order in the time of blooming of many varieties from early season to late, but the same sequence may not always be followed since so many conditions affect the flowering of the trees.

Pollinizers for Barcelona

For the Barcelona, three varieties may be used as pollinizers: White Aveline for the early bloom, Daviana for the mid-season, and DuChilly for the late bloom. This combination of varieties is as good as any now known and for all seasons they will effectively cover the long blooming season of the Barcelona. Daviana is used exclusively by some growers and probably is as effective as any single variety can be. Some growers have used the DuChilly in the same way but the yields have been light and for some reason every three or four years such orchards produce a very high percentage of blank nuts. The White Aveline is a poor growing variety and for that reason many people have discarded it, but yet we find growers with old orchards who, in planting young orchards, are again including this variety as a pollinizer.

Substitutes for the above varieties are now known. Montebello can be used in place of White Aveline as it sheds pollen early. However, there have been at least two importations known as Montebello, indistinguishable from a third, that have been nearly inter-sterile with the Barcelona. If trees of the variety Montebello are to be used as pollinizers, the performance of the mother trees should be checked and layers taken from only those that have proved to be excellent pollinizers for the Barcelona. The Du Provence (Creswell) has a pollen-shedding season covering part of that of the Daviana and DuChilly. The Nottingham and Daviana liberate pollen at about the same time. Bolwyller and other late pollen shedding varieties are of value in certain seasons but occasionally pollen is not available until after the pistillate flowering period of the Barcelona.

In addition to the varieties listed there are undoubtedly hundreds of seedlings that would make excellent pollinizers for the Barcelona, but with a single seedling mother tree available from which to propagate, only a few saleable layers can be had. Because of this scarcity, the prices asked by some for the Nottingham years ago, when it was first mentioned as a pollinizer, were very high. Numerous named and unnamed seedlings have been tested, which, if blooming at the proper time, would be satisfactory as pollinizers. However, the matter demanded so much detailed and endless study that such work has not been undertaken. So many new seedlings or newly named varieties are appearing that checking them would demand all the available time for experimental work at the pollinizing time of the year.

Inter-sterility or sterility between varieties is not common but must be taken into consideration when providing for cross-pollination in an orchard. In the case of the five or six distinct types of Barcelona, the question has been raised as to the possibility of these cross-pollinating each other. In

experimental work and apparently in some orchards this does occur at times. However, all of these types generally shed the pollen at about the same time, which is too early for more than the earliest of the pistillate bloom. In one season one of these types produced pollen fairly late and in experimental work gave a set of nuts only a little less than that of the standard pollinizers. In other seasons the results with this type were not so good because the time of pollen shedding did not coincide with that of the receptivity of the pistillate flowers. This type bore very poor nuts and would have no value over the varieties now used. The better types of Barcelona have almost identical blooming dates so the pollen of one would be available for the later pistillate bloom of the others only in small quantities. That feature alone would disqualify them. While these types are not entirely inter-sterile, the results of trying to cross-pollinize them have been so poor that the possibility of using them for pollinizers has been discarded.

Walnuts (Juglans regia)

In California, pollination of Persian walnuts is an important problem but under Oregon conditions it is of minor importance and as a rule can be disregarded in the Pacific Northwest. Persian (English) walnuts are self-fertile. If cross-pollination is of value in this section, it is when the catkins are shed before the pistils are receptive. No case is known of varieties maturing the pistillate bloom before the catkins shed pollen. The Franquette variety while young often sheds the catkins before the pistillate flowers are visible. As the trees become older the tendency is for the catkins to be retained longer. When the trees are old enough for the inside wood to be weak and devitalized, many late catkins will be found on this weak wood.

Receptivity of the flowers is best when the flowers or pistils are in the red tip stage, just about the time when the pistils are separating. By the time the pistils are full grown and most conspicuous they are practically incapable of setting nuts if pollen is placed on them. In the case of mature trees, there are few seasons when there are not enough catkins to pollinate the female flowers at the red tip stage.

Cross-Pollination of Walnuts Sometimes Advantageous

In young orchards of Franquettes, and possibly other orchards so located that winds strip off the catkins, cross-pollination may be of advantage. For this purpose the Late Meylan, King Franquette, and a host of late flowering seedlings will be found suitable. Of over 80 varieties and seedlings tested, only one gave an indication of cross-sterility. Hence, we feel safe in saying that almost any seedling of Juglans regia will be satisfactory if it sheds its pollen at the proper time.

The Mayette in a few cases has been a light producing variety, evidently due to very early shedding of catkins. However, most of our orchards of Mayette have enough other varieties mixed in to afford good pollination and good production. When they have not, we have used late flowering seedlings of Juglans regia and been able to get a good set of fruit by blowing the pollen through blowers, by hanging wire baskets or cheesecloth sacks full of shedding catkins in the tree, or by grafting in the desired variety. Like the Franquette, the Mayette tends also to carry more catkins later in life, but not to the extent

the Franquette does. Thus in some seasons a very few orchards may have a short crop, but on the whole, Mayette pollination is not a serious problem today.

Black Walnuts Disappointing as Pollinizers

Black walnuts (both Juglans nigra and J. hindsii) as pollinizers for Juglans-regia varieties have proved very disappointing. In one season we had reason to believe that some varieties would cross-pollinate the Franquette, but repeated tests since then have been almost failures. The same results have been reported by growers so it may be possible that in an occasional season a black walnut like the Stabler may cross-pollinate the Franquette, but they have not been consistent in their performance, therefore they cannot be recommended.

Chestnuts

In the 1923 report of the Proceedings of the Western Nut Growers Association, it was reported that chestnuts were self-sterile and also that the Numbo and Paragon varieties did not produce pollen in the catkins. Later work on a few seedlings and varieties confirmed the fact of self-sterility so far as the work was conducted on European varieties and seedlings. There were no tests made on any of the Asiatic species or varieties. Later it was found that the Large American Sweet and Colossal varieties never produce any pollen. One tree listed as Hathaway as well as several seedlings produced no pollen. So far no other named varieties known of or for sale in this section have been found that fail to produce pollen. If trial plantings are made, combinations of varieties must be made to include enough to pollinize those producing pollen as well as those not producing pollen. If both types are included, two varieties shedding pollen are needed in addition to those planted that do not produce pollen.

Almonds

Almonds are self-sterile and two cases of inter-sterility are known. The blooming season for all varieties covers several weeks, so that varieties must be chosen that bloom during the same time to afford effective cross pollination. Recommended combinations of satisfactory varieties are:

(1) Ne Plus Ultra and I.X.L.
(2) Nonpareil and Eureka
(3) Drake and Texas

Those that do not cross-pollinate, though blooming at nearly the same time, are:

(1) Texas and Languedoc
(2) Nonpareil and I.X.L.

Some of our nurserymen are propagating from groups of bearing trees without regard to true name, if any is known. Such trees should be as good as any for experimenting. Even though the almond is now in a favorable part of a periodic cycle, it has still not proved satisfactory for Pacific Northwest conditions.

Pecans

Since pecans do not mature the fruit in the Pacific Northwest even where it sets, there is no need to list the varieties with their pollination requirements.

Butternuts

When butternut trees have been planted in groups, the production has been heavy. Single trees have been reported as not bearing, but the cause is not known. If anyone wishes to try butternuts it might be advisable to plant two or more trees.

Hickories

Single trees are known to bear well, though it often takes many years for them to become mature enough to bear.

Beechnuts

Beechnut trees in the Pacific Northwest seldom bear. Even in their native habitat they are reported as not bearing before they are 35 years of age and then only at intervals of three to five years.

Filbert Planting Arrangement

Planting arrangement for a Barcelona filbert orchard with recommended pollinizers.

x = Barcelona Du = DuChilly D - Daviana W = White Aveline

Place first row of pollinizers in outer row of trees toward the winds prevailing in the spring of the year.
Note that each Barcelona tree is in contact with a pollinizer on one side.
If more or fewer varieties of pollinizers are used, rotate the pollinizing varieties according to the number of each and the number of varieties used.

Du	x	x	D	x	x	W	x	x	Du
x	x	x	x	x	x	x	x	x	x
x	x	x	x	x	x	x	x	x	x
D	x	x	W	x	x	Du	x	x	D
x	x	x	x	x	x	x	x	x	x
x	x	x	x	x	x	x	x	x	x
W	x	x	Du	x	x	D	x	x	W
x	x	x	x	x	x	x	x	x	x
x	x	x	x	x	x	x	x	x	x
Du	x	x	D	x	x	W	x	x	Du
x	x	x	x	x	x	x	x	x	x