Pecan Pollination

Patrick J. Conner
Horticulture Dept.
University of Georgia – Tifton Campus
4604 Research Way
Tifton, GA 31794

Poor pollination in pecan orchards is a vital, but often overlooked, factor which can cause major reductions in both yield and quality of nuts. In nature, pecan is nearly always cross-pollinated. When pecan is artificially self-pollinated, the resulting seedlings have greatly reduced vigor and the majority of these seedlings die before flowering. The pecan tree has, therefore, evolved a system of flowering which prevents self-pollination and insures its seedlings have hybrid vigor.

Flowering in pecan is relatively complex. Pecan is monoecious, meaning that the male and female flowers are located separately on the same plant. The female flowers are produced at the end of the current seasons growth, and consist of a spike of immature nuts. The male flowers are produced at the end of the last seasons growth and consist of catkins. A large amount of pollen is produced by the catkins, which is then blown by the wind to the female flowers where fertilization takes place. Now, remember that the tree wants to prevent self-pollination. Since the female flowers and male flowers are on the same tree, self-pollination would be very likely. To prevent this, the tree matures its flowers at different times, so that receptive flowers are not present on the tree when it is shedding pollen. In order for this system to work, different cultivars must mature their flowers at different times. For example, if all trees matured their female flowers first, and then they all produced pollen, there would be no pollen available when the female flowers are receptive. Instead, pecan trees are divided into two broad categories. The first category is termed Type I, or protandrous. In these trees the pollen is matured and released first, and several days to a week later the female flowers become receptive. The second category is termed Type II, or protogynous, and in these trees the female flowers are receptive first, and then after the female flowers are no longer receptive, the pollen is released. In nature there are approximately equal numbers of Type I and Type II trees, ensuring pollen is available throughout the flowering season.

While flowering times are broadly controlled by the two types of flowering, other factors also play a role. Tree age can be influential, with older trees often flowering at somewhat different times than younger trees. Flower positions within the canopy also affect flowering, with interior and lower positions often maturing more quickly. Bud break also affects flowering times. Those varieties that leaf out sooner generally will flower sooner. Thus a Type I tree that leafs out quickly will shed pollen earlier than a Type I tree that leafs out later. In fact, a very late Type I variety may shed pollen at the same time as an early Type II

variety. Because of these factors, flowering times can vary widely by location and year.

In nature, where every tree is unique, self-pollination is usually quite limited. We hand pollinate a lot of trees in the breeding program and I have almost never seen a tree that had receptive flowers at the same time it was shedding pollen. However, in orchards which consist of large blocks of a single variety, especially when they contain young and old trees of the same cultivar, self-pollination can occur fairly frequently. This is detrimental to the grower in two ways. Firstly, self-pollinated nuts do not grow and mature as well cross-pollinated nuts, and will have a reduced kernel percentage and smaller nut size. Secondly, self-pollination usually indicates that there is inadequate pollen available during peak female flower receptivity and that yields have been reduced due to inadequate pollination.

Now that we see the need for adequate pollination within the orchard we must look at how best to achieve that goal. The first step is to determine what varieties will best pollinate each other. In the past, it was recommended to simply combine Type I and Type II varieties to pollinate each other. However, we now know that not all Type I and Type II varieties match each other, or may not match in all seasons due to yearly fluctuations. Also, if the pollinator variety has an OFF year, no pollen will be available for the main variety. This can be an important factor when a highly alternating cultivar like 'Elliott' is used as a pollinator for a more regular bearing cultivar like 'Desirable'. For these reasons, I generally recommend that at least two pollinators be included in the orchard layout, with three or four pollinators being ideal. Choosing a pollinator is usually accomplished through the use of a pollination chart (Table 1). These charts list the pollen shedding and pistil receptivity times of the major cultivars. Growers then try to find 2-3 varieties which are shedding pollen at the same time as their main cultivar is receptive. Another method that can be used is to simply plant a range of pollinators in the orchard to provide pollen throughout the pollination period. Pollination charts of additional cultivars can be found online at the following sites:

http://sacs.cpes.peachnet.edu/pecan/pollen_pistil.htm
http://pubs.caes.uga.edu/caespubs/pubcd/C898/C898.htm#Pollination
http://www.alabamapecangrowers.com/Members/cult%20home%2006.asp
http://www.aces.edu/pubs/docs/A/ANR-0674/

Once you know which pollinators you wish to include, you must decide where to place them. In studies of 'Wichita' and 'Western Schley' orchards in the western U.S., it was found that yield losses began when a tree was more than two rows away from a pollinator. Much of this loss was from reduced kernel quality due to self-pollination (Wood, 2000). In the southeast we have often felt that there is sufficient "wild" pollen from yard trees and forest trees to pollinate our orchards. However, in a study of a large Southeastern 'Desirable' orchard

with ‘Stuart’ as a pollinator, fruit set in a light crop year declined from 1.2 nuts per terminal in trees next to the ‘Stuart’ pollinator to 0.2 nuts per terminal when more than 250 feet from a pollinator (Wood, 1997). A 30% loss of occurred when only two rows from the pollenizer. Because of this, we recommend that blocks of the main variety should not be more than four rows wide, so that every tree is no more than two rows from the pollinator (figure 1). Another option is to place pollinator trees throughout the orchard by planting them as every 5th tree in every 5th row (figure 2). This will provide adequate pollination and will not cause the crop to bring lower “blended” prices (Wells, 2007). As a final note, growers should exercise caution in removing off varieties from their orchards. These trees can at times perform a vital role in helping to pollinate the main variety, and their removal may lower production in orchards that consist of large blocks of a single cultivar without adequate pollinators.

Literature Cited.

Wells, L. 2007. Pollination. Southeastern Pecan Grower’s Handbook. 81.

Wood, B.W. 1997. Source of pollen, distance from pollenizer, and time of pollination affect yields in block-type pecan orchards. HortScience 32:1182-1185.

Wood, B.W. 2000. Pollination characteristics of pecan trees and orchards. HortTechnology 10:120-126.