Sweet Cherry Pollination Considerations for 2001

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Most sweet cherry varieties are self-incompatible and require proper cross-pollination from a compatible variety to set a crop. Choosing the correct combination of varieties for new orchards can be aided by new pollination compatibility charts developed from the latest research studies of pollination biology. Proper selection of varieties at planting will help prevent unproductive orchards due to poor pollination planning.

Tree fruit growing requires pollination knowledge. Sweet cherry culture is making a modest comeback on some New York fruit farms, but many pollination questions exist. This resurgence is largely due to availability of new rootstocks and some new, larger fruited varieties. These have become available right at the time that diversification of New York tree fruit farm businesses is becoming more of a recognized necessity. The goal of this article is to teach some important lessons about planning for adequate cherry pollination.

The cherry seed that is inside of the cherry pit results from fertilization of the ovary by a compatible pollen grain and the subsequent development of the seed and its bony endocarp (covering) that we call the pit/stone. The developing seeds also stimulate the tree to retain the developing flower parts. Unfertilized flowers drop off. So do some fertilized flowers if they lack vital resources. One thing is certain, without viable pollen and without the transfer of the good pollen to the healthy female flower parts, there will be no cherry crop.

Most sweet cherry varieties are self-incompatible meaning that pollen from one variety is incapable of growing down the style of the same flower that produced it and fertilizing the egg in the ovary below (Fig. 1). In contrast, most peaches, nectarines, apricots, tart cherries, many plums, and some new sweet cherry varieties are self-fruitful. Solid blocks of one variety of these crops can usually be successful while most traditional sweet cherry varieties require proper cross-pollination from a compatible variety to set a crop and must be planted in blocks with two or more varieties. Most existing New York orchards were planted using self-incompatible varieties and some of them have poor cropping levels due to poor pollination planning by the person who designed the orchard plan. Such unproductive orchards can be helped by corrective pollination planning. When planting new orchards proper selection of variety combinations will help prevent unproductive orchards due to poor pollination.

Good pollination is necessary for crops like this!

Key Facts About Sweet Cherry Pollination

Bloom emergence times can differ substantially between sweet cherry varieties. Non-synchronized flower emergence can cause poor pollination and light cropping when an early or late emerging variety does not have its flowers open at the right time. This lack of overlap of open flowers between late and early emerging varieties will not allow viable pollen to still be available for exchange between the varieties in some growing seasons. Such varieties should not be planted as pollinators for each other. Some fruit growers call this "poor bloom nicking."

Self-incompatible pollen will not grow down through the style of any variety that has the same genes controlling their pollen compatibility. This trait exists in most apples, most pears and occurs widely in nature in sweet cherries. Evolution researchers believe that this self-incompatibility trait helped ensure that out-crossing

would be required and that this would give more genetic mixing and greater chance for survival of off-spring. Figure 1 shows the parts of a typical sweet cherry flower. Four different pollination situations are outlined in Figure 2. Readers should study Figure 2 quite closely if they care to understand the basics about pollen incompatibility systems.

Self-fertile sweet cherry varieties have at least one-half of all of their pollen that will always be genetically compatible with all other varieties as well as themselves. Hence, they can be considered as universal pollinators so long as their bloom emergence time is appropriate.

Charts are available from sweet cherry breeder's research (Choi et al., 2000). Both bloom time and genetic pollen compatibility have been studied and useful charts were produced to guide growers and nurseries in choosing pollen compatible varieties (Figs. 3 & 4). Some are available electronically at the following web site:
http://www.nysaes.cornell.edu/hort/faculty/andersen/Pollination_Information/

Planning to Avoid Shy-bearing Situations

Two kinds of orchard pollination problems seem to merit generalized consideration: ones with non-synchronized blooming times of the pollinators, and ones with genetically incompatible pollen. Let's look at a problem orchard here in New York that has both problems. It is diagramed in Figure 5. Can you use the facts presented above and explain to yourself why this orchard often has poor yields even with nice weather? Hint: look at Figures 3 and 4. They provide the kind of information that is needed to diagnose why this sweet cherry orchard has been a light cropper in some seasons, even when the weather was nice and no frost event happened to kill the flower buds nor did cloudy, rainy weather happen during bloom. Note: It is not necessary to know the exact number designation of the genes for pollen compatibility to use the chart in Figure 3. We have grouped the varieties that carry the same genes.

You may have noted the following:

1. All of the varieties are self-incompatible, so there will be no self pollination in this orchard. In itself, this fact need not be a problem so long as the self-incompatible varieties are cross-compatible and overlapping in their bloom times.
2. Somerset™ and Royalton™ have bloom emergence times that are classified as early to mid-early while Sam and Hedelfingen are classified as mid-late and late, respectively. This means that in some seasons the earlier two might not over-lap in flower emergence with the later two.
3. Royalton™ and Schmidt are genetically incompatible with each other with respect to pollen being able to grow down the style of their own flowers or vice versa. This is the same as Situation A in Figure 2.
4. Royalton™ and Schmidt are planted side by side. This decreases the likelihood that bees will bring pollen from Somerset™ to Royalton™ or of Hedelfingen to Schmidt.
5. Somerset™ is planted downwind from Royalton™ and is too far away to effec-

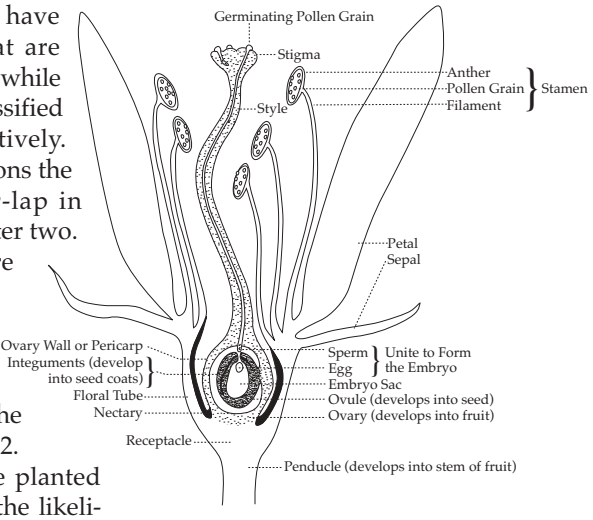
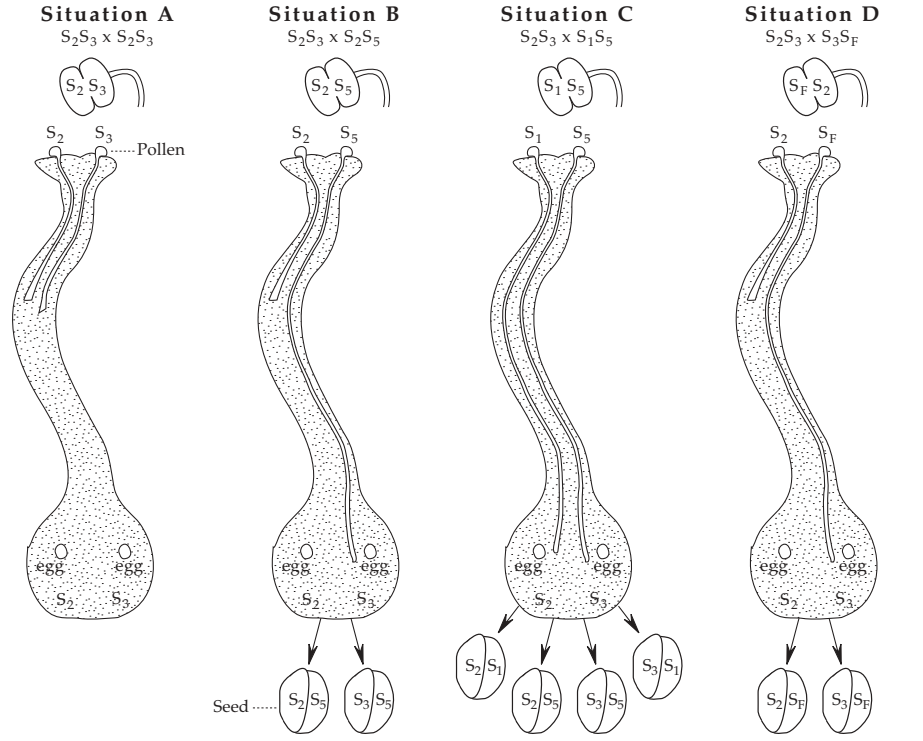


Figure 1. Longitudinal section of a flower that produces a stone fruit. Polllination has occurred. The pollen tube formed by the subsequent germination of a pollen grain carries two sperms to the embryo sac, where one of them unites with the egg (fertilization). This union results in the production of a seed (embryo) and the development of the ovary into a fruit.



Situation A	Situation B	Situation C	Situation D
Selfed pollen or pollen from another variety with the same pollen compatibility gene. No seed results because female tissue and the egg have the same genes as the pollen.	Same female as in **A**, male pollenizer introduced carries only one different pollen compatibility gene. Only 1/2 of pollen works. Two kinds of seed result because one kind of pollen carries a different gene than the female tissue and the eggs.	Same female, male pollenizer introduced carries two different pollen compatibility genes, so all of its pollen tubes will grow through the style tissue and 4 kinds of seed result because both kinds of pollen carry different genes than the female tissue and the eggs.	Same female, male pollenizer introduced carries universally effective fertility genes that allow its pollen tubes to grow in any sweet cherry style tissue and 2 kinds of seed result.

Figure 2.

tively pollinate Royalton™ in adverse conditions.

6. Sam has rows of both Royalton and Schmidt planted between it and Hedelfingen thereby reducing the likelihood of bees carrying pollen of the two later blooming varieties to each other.
7. This orchard layout could have been improved even if the same varieties were to be kept. Somerset™ should have been planted in the west row to increase the chances that its early bloom emergence would allow it to pollinate Royalton™. Hedelfingen and Sam should have been planted between Royalton™ and Schmidt with Hedelfingen next to Royalton™ and Sam next to Schmidt.
8. The pollination plan for this orchard could have included the use of self-fertile varieties like Sweetheart (early-mid) being planted every sixth tree among the Royalton™ trees and BlackGold™ every sixth tree among the Sam trees. Whole rows of either or both of these self-fertile varieties could have been placed between Somerset ™ and Royalton™ and between Sam and Schmidt, respectively. This would have provided greater quantities of viable pollen located closer to the self-incompatible female varieties.

Correcting Existing Shy-bearing Situations

Topwork grafting of sweet cherries is feasible and should be considered as a viable solution for helping alleviate pollination problems in healthy orchards that had poor pollination planning. The bark graft is the easiest type of graft to use to achieve a high percentage of "takes." Cleft grafting is less desirable because cherry bark on older scaffolds does not split smoothly, so little cambium contact often results (Fig. 6). Bark grafts must be completed while the bark is slipping (about bloom time) and must be supported by a temporary stake/pole to prevent wind breakage of the new graft . Anyone can learn to do bark grafts in less than fifteen minutes of instruction. Video tapes about techniques are readily available. Such grafts should be completed in at least one major scaffold of every eighth tree and offset by four trees in the adjacent row using a genetically compatible pollenizer variety that has a bloom emergence time that overlaps with the problem variety. It is absolutely essential that the budwood for such topwork grafting be completely dormant at grafting time. So planning ahead is imperative! It is essential that the exposed surfaces be covered with a wound dressing. As mentioned above, it is desirable to support the emerging shoot during the first growing season. Such grafts should be marked with paint so that pruners will not accidentally cut them out.

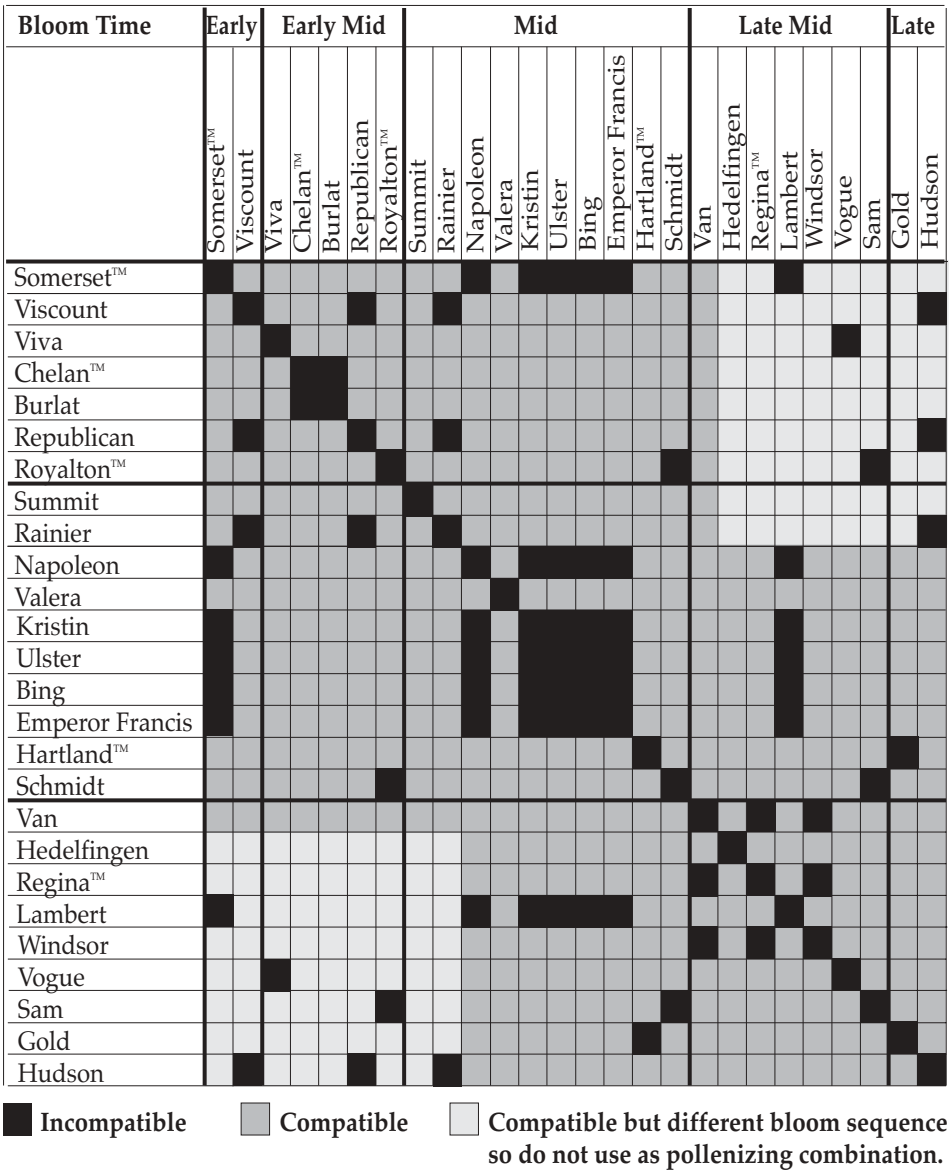


Figure 3. Bloom time and incompatibility groups of self-incompatible sweet cherry varieties.

Other, more temporary solutions for shy bearing orchards are inserting bouquets of flowers from compatible varieties near the bee hives and also scattering them down the rows. Another helpful pollen source is dried pollen which can be purchased and duster-applicator-spread during bloom. Ensuring that the pollen is compatible with the problem variety is essential.

What About Self-fertile Cherry Varieties?

There are two primary reasons for the continued interest in self-incompatible varieties and not switching entirely to the use of self-fertiles. First, the adapted self-fertile varieties may not yet have proven their merit for the ripening time that the grower seeks to target. Second, some self-fertile

SF Sweet Cherries	Bloom Time
Lapins	Early
Skeena™	Early
Sweetheart™	Early Mid
Vandalay	Early Mid
WhiteGold™	Early Mid
Sonata™	Mid
Stella	Mid
Symphony™	Mid
Tehranivee	Mid
Celeste™	Late Mid
Sunburst	Late Mid
BlackGold™	Late

Figure 4. Bloom time of self-fertile sweet cherries.

varieties have a strong tendency to over-set, especially on precocious rootstocks, and this can cause small, bland tasting fruit that are not suitable for fresh market sales. Since there are no reliable fruit thinning methods for sweet cherries other than hand thinning and/or pruning, it is essential that growers know their orchard conditions well enough to know if their sites have a tendency to over-set. In such cases, growers should be wary of choosing a self-fertile fruiting variety that is prone to over-set if they want size and quality in their fresh fruit. Some self-fertile varieties have large fruit size. They are preferable for fresh cherry production. Growers will also need to take into consideration whether the rootstock that they use will induce small fruit due to heavy crop set. Unfortunately, the current situation for New York conditions is that our climate is so stressful for many of the available, large fruited, self-fertile, varieties that the trees do not live well here. Winter cold, bacterial canker, and perennial canker all can hurt sweet cherry trees in some winters in New York. Hence, there is a strong need to continue to use some self-incompatible varieties that have proven themselves to grow successfully in our climate. To do this effectively, growers will have to have an orchard plan that puts the right pollinator(s) in place.

Figure 6. One season's growth of topwork grafts made in young sweet cherry tree. Such grafts should be completed in at least every eighth tree and offset by four trees in adjacent rows.

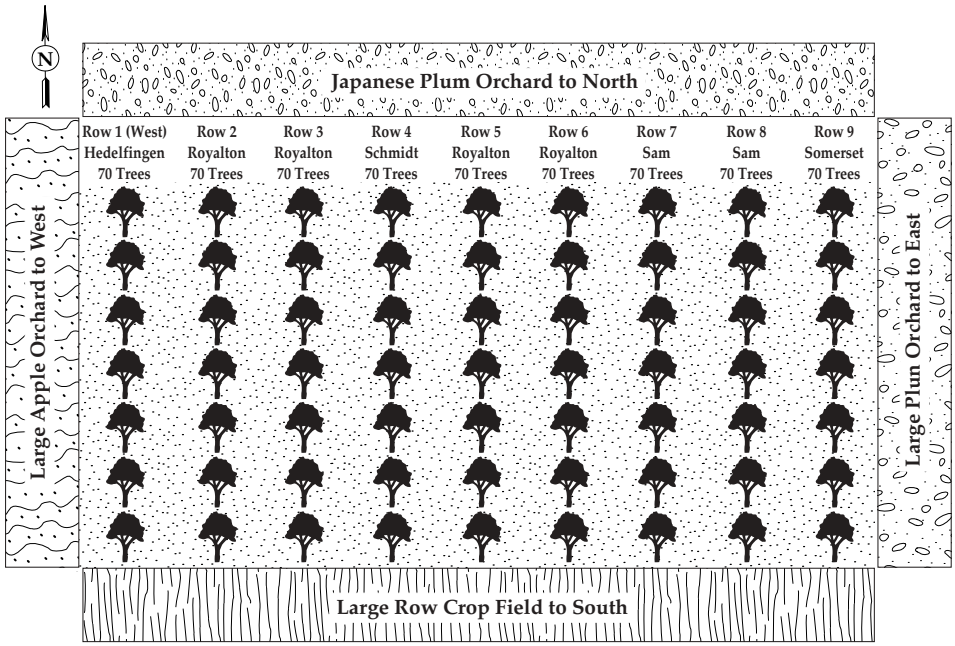


Figure 5. Typical sweet cherry orchard with pollination problems.

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