Managing the Gisela Cherry Rootstocks

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The new Gisela series cherry rootstocks are much more precocious than Mazzard, usually bearing a crop in the second year. However, they can overcrop resulting in smaller cherry fruit size. More intensive horticultural management outlined in this article may provide help to ensure good fruit size with these promising rootstocks.

The Gisela Series rootstocks for cherries have shown considerable promise in research trials in the United States and Canada. From these trials the three most useful clones are: Gi 5, (1/2 size tree), Gi 12, (3/4 size tree), and Gi 6, (3/4 to full size tree). All are much more precocious than Mazzard seedling. They usually begin to crop in the second year. All of these have been tested for and proven to be tolerant to the common pollen-born stone fruit viruses, prune dwarf, and Prunus necrotic ringspot.

The NC-140 research plots have shown that Gi 5 and Gi 6 are similar in their abilities to induce precocious bloom, high productivity, and more horizontal lateral branching than Mazzard. Where they differ is in their level of vigor control. On irrigated orchard sites, Bing on Gi 5 makes a small tree that is about half the tree size of Bing on Mazzard (or Mahaleb or Colt). Gi 6 makes a larger tree that can approach Bing on Mazzard in size, (yet with earlier and higher production, and a more spreading habit). In some eastern United States, cherry trials with other cultivars such as Hedelfingen (and/or under non-irrigated conditions), trees on Gi 6 have been somewhat smaller (3/4 size tree).

Despite the many positive attributes of these stocks, we are learning that they will all require a change to much more intensive horticultural management from that used for Mazzard, Colt, and Mahaleb. This article provides suggestions for the cultural management of the three promising Gisela Series stocks.

The Problems of the Gisela Stocks

The most problematic characteristic of all three of the Gisela stocks is that they tend to over-crop early in their orchard-life. As a consequence, leaf-to-fruit ratios can become unbalanced resulting in smaller fruit size. The severity of this problem depends on canopy and crop management. A second potential problem is that they induce earlier spring flower bud emergence than Mazzard seedling. This sets up the tree for an increased risk for frost damage to sensitive blossoms. Also, since the trees are shorter in stature, a greater portion of the crop on Gisela stocks are more prone to frost damage since frost always occurs first at ground level.

The clearest signal that can be garnered from growers experience to date with the Gisela stocks is that they seem like a "dream come true" in years two and three. They fill the orchard space quickly and have lots of fruit below 10 feet high. But, an intensive management plan will be needed from the outset in any orchard using Gisela stocks due to the over-setting described above. This plan could include more aggressive pruning than is currently used with the standard cherry stocks, additional fertilizers, irrigation, and even fruit thinning.

Strategies for Managing the Trees on Gisela Stocks

Select only the best sites. The most fundamental and irreversible decision in the life of any fruit planting is the choice of site. The site decision will influence the profitability of the planting. In warm/temperate regions the decision may be largely a matter of cost, proximity to markets, labor supply, availability of water, etc.; but in cold/temperate regions such as New York, identification of a site where the tree and fruit buds will survive winter cold, and flowers spring frost is crucial to the success of the planting. In the case of dwarfing sweet cherries, avoidance of frost is particularly important since varieties grafted to them bloom earlier, and the trees are shorter and hence more exposed to frosts.

Once the limits of the specific site are identified, additional questions regarding variety, rootstock, and row spacing and needed corrective pre-plant action(s) may be made, but the answers to the latter questions are site specific. They are only valid for a particular site. A valuable source of information about site selection is located on the world wide web at http://www.nysaes.cornell.edu/hort/faculty/pool/NYSite-Soils/SiteSelection.html and readers will benefit by substituting the word orchard for vineyard, etc.

Aggressive pruning. We are finding that mature trees on Gisela stocks must be pruned more aggressively than trees on Mazzard. The pruning must include the removal of most of the fine and shaded wood each year. This wood tends to set very heavily, especially on less vigorous,

precocious scion cultivars like Sweetheart and Somerset and on smaller fruited varieties like Kristin and Ulster. Dormant heading cuts should be made starting as early as the year after first full crop. In the eastern United States, care should be taken to delay making larger pruning wounds until near bloom time to reduce canker infections at the cuts. Research at Geneva has consistently shown that this type of pruning will increase fruit size by over one gram per fruit, and it always reduces total yield by approximately 25 percent. While a one-gram increase in fruit size may seem at first glance to be inconsequential, growers should bear in mind that 10 gram fruit are about one inch in diameter and that most eastern varieties have trouble achieving this size. An added gram is a 10 percent increase in fruit size. For middle-sized varieties like Kristin, Ulster, and Hedelfingen, which usually have eight-gram fruit on Mazzard rootstock, the one-gram gain is even more important.

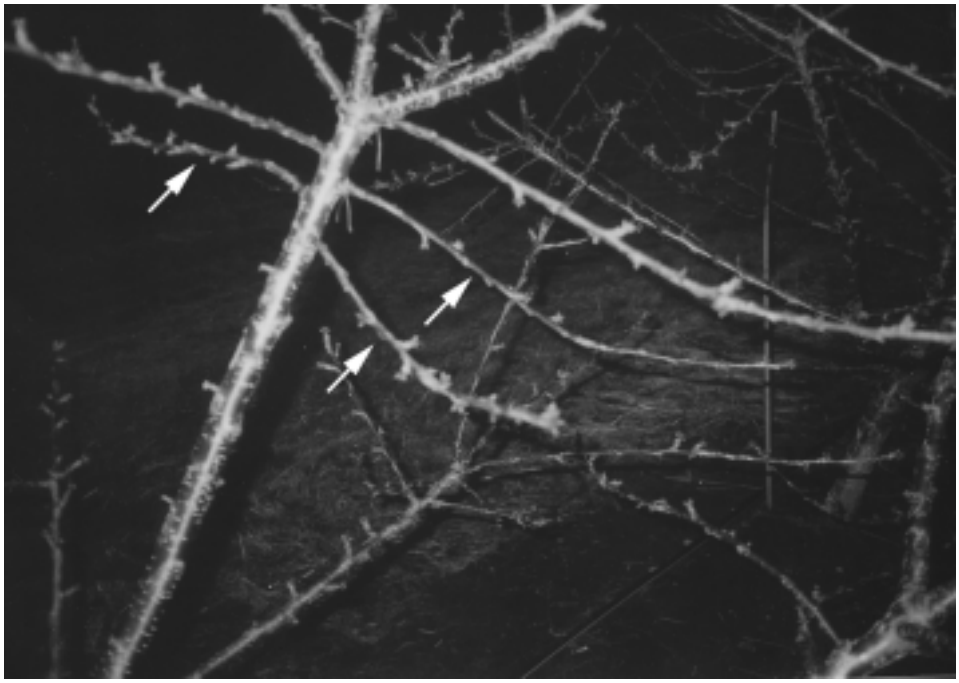

Figure 1. Removing most of the fine and shaded wood every year will result in larger fruit size.

Additional fertilizer in year three. Raising nitrogen levels in year one and two is dangerous in most eastern United States sites due to potential winter damage to the trunks of young trees that are pushed too hard. Experience has shown that year-one and year-two growth rates of Gisela Series trees normally parallel those achieved with Mazzard and Mahaleb with normal nutrition if weed control and water are not limiting. The big difference between properly starting a Gisela rootstock orchard as contrasted to ones on Mazzard or Mahaleb occurs in year-three. With Gisela, cropping bursts onto the young trees in their 3rd leaf and often stresses them in their first major cropping season. This stress isn't readily apparent in year-three, but if the 3rd leaf orchard is not irrigated and has not been well pruned in the following spring after its first crop, it is very common for the over-setting phenomenon to be quite severe in 4th leaf. Many Eastern growers will have had apple growing experiences similar to this with combinations like Empire/M.9 that runt out if not staked properly, and if not thinned. This negative experience should be ample warning to alert growers to take care to not let this happen with cherry trees on Gisela rootstocks. With Mazzard, the young trees usually start to crop more gradually with very light crops in year three, and progressively adding somewhat larger crops in year four and year five and reaching a full cropping potential about in year six or seven. This allows the Mazzard trees sufficient time to develop a larger root system and sufficient vigor so that undercropping and not over-setting is usual in the early years of a new Mazzard planting.

Most cherry growers in major commercial production regions have traditionally utilized split applications of nitrogen annually as a nutrition management strategy. This is done to allow the farmer the chance to gauge the crop load subsequent to frost events and adjust nitrogen upward in heavy-set years. This concept seems particularly important for trees on Gisela Series stocks since they tend to over-set causing poor fruit to leaf ratios. The desired result would be to cause some spurs to produce vegetative shoot growth along with achieving at least 12 inches of extension growth of all shoot terminals. The most important on which vegetative growth is needed are the ones located at the base of secondary laterals in the interior of the tree. This is easily accomplished with hand pruners at bloom time (Fig. 1). This practice removes the undesirable cropping potential of this type of weak, pendant growth and ensures that the terminal bud on the bottom spur will become vegetative and provide leaf surface to support cherries on stronger spurs.

Irrigation. The next cultural step after such thorough trimming of weak secondaries is to ensure that spurs "break" by having adequate water. Irrigation is essential for trees on Gisela Series rootstocks. With young trees, dry periods in late May and early June can cause the trees to stop growing and exacerbate the precocious fruiting character of these stocks. Consistent water supplies can ensure that adequate shoot growth is obtained. When water is combined with aggressive pruning the vigor level of the Gisela trees should remain moderate to high, which will ensure good fruit size the next year.

On the negative side, irrigation has only a small improvement in current year fruit size in trials we have done at Geneva. Nevertheless, irrigation is an essential management tool for Gisela stocks since it can help maintain vegetative vigor for future fruit size.

Avoid winter injury. Great care should be taken in the Eastern United States to protect young trees from winter injury and canker infections with both Gisela Series and full-vigor sweet cherries. Although management of the mature Gisela tree is aimed at increasing vigor with pruning, irrigation, and extra nitrogen, excessively vigorous trees are much more susceptible to winter damage especially in colder, non-desert climates! Desert climate growers can simply shut off the irrigation to put their trees to sleep. In humid climates such as New York, it is more difficult to manage vigor so that trees are adequately hardy to survive the winter. We suggest the following cultural practices to help: (1) applying white paint

Figure 2. Removal of these weak branches (arrows) will stimulate vegetative growth providing leaf surface to support cherries on stronger spurs.

to entire trunks at planting time to shield the trees from herbicide damage and to reflect away the sun's radiant heat during cold, bright winter days; (2) choosing or creating wide crotch angles of scaffolds; (3) planting cover crops in June and/or July in a manner that provides competition for resources within one foot of the tree row; (4) shutting off irrigation after 18 inches of new growth has occurred, because another 18 inches is almost sure to be added even without the irrigation in most Eastern sites; and (5) using phytotoxic leaf treatments like fall copper sprays to defoliate trees and give them greater protection from leaf scar and bud infections of bacterial canker. Probably the best avoidance is gained through choice of scion varieties that are cold tolerant plus the above management, but the larger fruit size of less cold tolerant varieties tempts many to ignore this strategy.

Reduce flowering or thinning of fruits. Research has been initiated to try both mechanical and growth regulator means of crop load adjustment. We have ample evidence to prove that thinning does increase fruit size, but it also reduces total yield. However, no adequate studies have been done to determine if labor expenses counter-balance such gains. If cherries are so small that they can't be marketed in the fresh market thinning may be required. We plan to continue to study ways of reducing flowering and/or cropping of Gisela trees. It may be that we can reduce flowering with gibberellin. If it is proven to be a useful tool for trees on Gisela Series stocks, it will undoubtedly become a routine cultural practice as it is in tart cherry orchards. No recommendations are yet available for sweet cherries in the Eastern United States.

The Gisela 5/6 Switch

A further problem that growers have to contend with in some current orchards on Gisela stocks is that there has been a mix-up in the nursery industry with Gisela 5 and 6. Thus, some growers have planted what they thought were Gi 5 trees but they are really Gi 6 trees. Gisela 5 is a fully dwarf tree while Gisela 6 is a semidwarf tree and when planted at Gi 5 spacings will likely cause overcrowding. This problem will require intensive management strategies to make these orchards successful.

Of course, the training system, tree architecture, soil type, and possibly even the scion variety will play a modifying role in specific management strategies growers should consider. In some cases, the inadvertent use of Gi 6 may have been a better choice than Gi 5 given the management challenges of producing large cherries on naturally heavy-bearing varieties.

However, there are indeed situations where overly close orchard spacings are likely to require considerable new strategies. As one good example situation, a grower planted the "now-Gi 6" trees at 8' x 15' (about 360 trees/acre), which is a more appropriate spacing for a high density orchard on Gi 5. This happens to be the exact spacing that is currently under test for Bing and Rainier on five rootstocks (including Gi 5 and Gi 6), trained to eight tree architectures, in one of Washington State University's experimental orchards.

One option for this overly tight situation for Gi 6 would be to transplant every other young tree into a new orchard this winter by tree spade or backhoe. This would result in a modified original orchard that is spaced 16 by 15 feet, certainly a manageable spacing. Some Great Lakes Region cherry orchards with Mazzard and Mahaleb already use a 15-foot in-row spacing. So, for these Gi 6 trees that are going to require more rigorous pruning to balance fruiting capacity with leaf area, the 15 x 16 foot spacing might work.

A second option would be to prune every other tree (the "primary trees") normally for an orchard with a final 16 x 15 foot spacing. The intervening trees (the "temporary trees") would be pruned to fill their space rapidly to contribute to early yields, but as the primary trees reached the temporary tree space, the temporary trees would be pruned back more severely over time until the primary trees could fully fill a 16 foot spacing and the temporary trees could be removed. This dedication to differential pruning is critical if the eventual removal of intervening trees is not going to disrupt annual yield capacity.

A third option, and probably the best one for Gi 6 since it is so prone to overcropping, is more intensive pruning. As the trees develop, more effort could be spent on tying or weighting limbs down to develop flat fruitful branches. As the trees mature and fill their allotted space, the orchardist could utilize more aggressive pruning to contain tree size while maintaining tree vigor. The goal would be to wisely balance annual thinning cuts and heading cuts to intensively regulate tree size and crop load. This is what most Great Lakes Fruit growers are already doing with higher density plantings on Mazzard and Mahaleb if they are growing them for fresh market at 12 foot or 15 foot in-row, where fruit size is a premium factor. Summer thinning cuts would help control tree size while dormant thinning/heading cuts would help induce young replacement wood close to each tree's permanent structure. Dormant or post-harvest heading cuts would help prevent excessive expanses of pendant (drooping) fruiting wood with weak spurs that tend to set more fruit than the leaves can support for good fruit size. This intensive management option is under study at both Washington State University and the Geneva Experiment Station, with performance over the next few years (years 6-10) required to judge its possibility for success.

What if orchard spacings are different from the above example? Trees on Gi 6 spaced 12 feet or more apart in-row, on a moderate to vigorous growing site, are probably readily manageable as is, utilizing the increased management intensity one should expect with any Gisela series rootstock. Trees spaced at 10 feet or less are likely candidates for any of the strategies outlined above.

Trees spaced at six feet are likely to be too vigorous for the traditional intensive management strategies. However, the free-standing "V" system developed for peaches in California by DeJong and Johnson could be adapted to sweet cherries on Gisela stocks. In this system, the

canopy of the tree is trained out over the tractor drive-row thus allowing close in-row spacing. The trees are trained in a V-shape without a trellis by removing the central leader and pruning out the center of the V each year. Each arm of the V is pruned with renewal pruning and only small fruiting branches are allowed on the scaffold arms. Larger branches that would develop into scaffold branches are removed back close to the trunk when they compete with the main scaffold arms.

What about management of the real Gisela 5 orchards? Gi 5 needs the most intensive management plan from the outset. It should include the most rigorous application of the strategies described above. Most fine wood and shaded wood must be pruned away each year. If such wood is left it sets very heavily, especially on less vigorous, genetically precocious scion cultivars like Sweetheart and Somerset and on smaller fruited sorts like Kristin and Ulster. Dormant heading cuts should be made starting as early as the year after its first full crop. In the East, care should be taken to delay these cuts until near bloom time to reduce canker infections.

Gisela 12 Rootstock

Little has been said about Gi 12 in printed research articles, and since many fewer growers have experience with it, we want to suggest that it deserves trial in the Great Lakes and Eastern United States regions. It is about three-fourths the size of Mazzard and is from different parentage than Gi 5 and Gi 6, which are sisters. So, there is reason to go cautiously with Gi 12 since it has different ancestors and there is very little grower experience with it. But, the size of tree seems interesting. This means that it should fit the normal spacings used for Montmorency tart cherries. What is needed is for growers to try it for its adaptation to their climate. They'll also want to determine if it will withstand shake-and-catch harvesting for processing sweets. We already know that Gi 5 and Gi 6 have proven to be quite well adapted to colder climates. We wonder if Gi 12 will be better than Gi 6 for processing sweets? No such experience exists with side-by-side rows of both Gi 12 and Gi 6.

Conclusion

Clearly, the three Gisela Series stocks, Gi 5, Gi 6, and Gi 12, deserve continued exploration in grower trial plantings where precocity and smaller trees are desired. What should not happen is for the industry to drop them as dangerous risks. NC 140 trials were planted across North America in 1987 that proved that these three were the top high-precocity, candidates. New NC 140 trials planted in 1998 include about 20 newer rootstocks in comparison to these three Gisela Series stocks. For the time being, these three are the most researched and best understood of those rootstocks that are available.

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