

Sweet Cherry Training Systems: Current Practices in North America and Europe

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Fifteen years ago the vast majority of cherry orchards in the Pacific Northwest of the United States were made up of trees grown on mazzard rootstock in a low-density planting. Trees were trained to an open-vase system. In older orchards most of the production had moved to the top of the tree with bottom limbs dying due to excess shade.

By the late 1990's that situation had begun to change. Growers, especially in the Mid-Columbia region of Oregon, had begun to purchase trees for new orchards on dwarfing rootstock. Growers were looking for new training systems that would allow them to grow a pedestrian orchard, where at least 70% of the fruit could be harvested from the ground without the use of ladders. Northwest growers learned from their counterparts in Europe that pedestrian orchards significantly increased productivity and reduced labor needs in both harvest and pruning. In fact, in a comparison study conducted in The Dalles, harvest productivity increased from 45 to 78 kg/hr/picker in a pedestrian orchard compared to a standard orchard of tall trees harvested with ladders.

Tree precocity was another advantage of these high-density pedestrian orchards. Rootstocks such as Gisela 5, 6 and 12 impart precocity on the trees, allowing growers to totally recover the cost of investment in a high-density orchard in eight years when it is planted at 3x5 m on Gisela rootstock. This compares to 15 years with an orchard planted on mazzard rootstock at 5x6 m (Seavert, et al, 2002).

Most Pacific Northwest growers are now choosing one of three systems, Steep Leader, Vogel Central Leader and Spanish Bush. The first system was developed in Washington State and the latter two in Europe.

Steep Leader

The Steep Leader system is generally a low-density system, grown with full size rootstocks; however, it can be used in a moderate-density orchard with dwarfing rootstocks. Typical tree spacing with mazzard and other full size rootstocks is 4.5 to 6 m between trees and 5.5 to 7 m between rows. On dwarfing rootstocks the tree spacing can range from 3.5 to 4 m between trees and 5 to 5.5 m between rows.

Heading cuts are made on young trees to form three to four upright permanent leaders. These are subtended by a like number of permanent horizontal branches that form the base, providing a wide base and narrow top, encouraging good light penetration (Fig. 1). Each leader is treated as an individual scaffold tree with fruit grown off of young laterals. These laterals are being constantly renewed by stub cuts so that spurs are never older than five years. Since heading cuts form the structure of this tree, this system is not precocious.



Fig. 1 The Steep Leader tree consists of 3 or 4 upright leaders and a bottom whorl of branches.

Vogel Central Leader

The Vogel Central Leader is a spindle system developed by Mr. Tobias Vogel in Franconia, Germany (Fig. 2). This system is best with dwarfing rootstocks, as the central leader tends to grow too tall unless tree size is controlled by the rootstock. Typical spacing is 2.5 to 3 m between trees and 4.5 to 5.5 m between rows. The maximum height is 3 to 3.5 m.



Fig. 2 Mr. Tobias Vogel exhibits a well trained Vogel Central Leader tree.

The tree structure is developed using little pruning resulting in a very precocious system. Clothespins are used to bend newly forming laterals on young trees to the horizontal. As branches mature they are tied down or spread with spreaders to maintain branch angle at approximately 60°.

Dominant branches with a base diameter of more than ½ the diameter of the trunk are removed so that the shading potential is reduced. This removal, along with the Christmas tree shape, provides good light penetration throughout the tree. This factor is an advantage when growing a variety such as ‘Rainier’, where good light penetration is important to provide adequate blush, but a potential disadvantage for varieties such as ‘Skeena’ that are sensitive to heat.

All laterals are eventually renewed in order to keep spurs young and fruit size large. Several laterals should be stubbed back each year. On moderate to highly productive varieties oversetting may become a problem. Pendant wood must be removed and one-year-old wood should be headed to reduce the potential for fruit clumping.

Spanish Bush

The Spanish Bush system was developed in the Ebro Valley of Spain and is grown there on a Mahaleb rootstock. On more fertile soils, such as those found in the Pacific Northwest of the United States, dwarfing rootstocks are preferred. Typical tree spacing is 1.8 to 2.5 m between trees and 4.5 to 5.5 m between rows.

This system creates a true pedestrian orchard, as trees are kept to a maximum of 2.5 m. Multiple heading cuts over a two-year period makes this system non-precocious. These same heading cuts, however, create the multitude of branches that absorbs the energy of the tree, allowing the tree to remain small (Fig. 3).



Fig. 3 After 25 years, Spanish Bush trees remain only 2 ½ m tall.

In areas where growers are concerned about the potential for bacterial canker or low precocity due to the heavy pruning, alternative methods of branch inducement are being practiced. Growers in Chile and Spain are now using Promalin® or notching immediately above a bud in order to obtain branching without pruning. These methods produce the branches that keep the tree small, yet increase precocity and reduce the risk of bacterial canker.

Fruit is grown on laterals that develop off of the permanent scaffold branches. These laterals are renewed through stub cuts, assuring that spurs remain young and fruit size large.

Zahn Spindle



Fig. 4 Cherry trees trained to the Zahn system are planted on Colt rootstock at 1 meter (3 feet).

The Zahn Spindle was created by Fritz Zahn in northern Germany. This system was originally designed as a high-density system for standard size rootstocks such as Colt. Tree size is controlled through pruning and tree-to-tree competition. Typical in row spacing for full size rootstocks is 1 to 2 m (Fig 4). In recent years dwarfing rootstocks such as Gisela 5 have been utilized.

Unlike the Vogel Central Leader, laterals are not bent, but rather horizontal branches are formed through heading. If a branch is too upright it is headed about 15 cm from

its base. A more horizontal branch is selected from the regrowth and the branch is headed again until a flat shoot is produced. Since branches are not tied down or spread, the system is less labor intensive than the Vogel system, but also less precocious.

Bacterial Canker is a major concern for growers in northern Germany. Frequent summer rains make the potential for bacterial canker infection high. The Zahn system was developed, in part, to battle this disease and some credit it with saving the cherry industry in this region.

Three factors associated with the Zahn system are said to contribute to the reduction of bacterial canker incidence. The first is the use of stub cuts, where a small 3 to 4 cm stub is left when a pruning cut is made. Growers throughout Europe assert that this stub will trap the pathogen and prevent it from moving into the tree. Secondly, small branches are ripped, rather than cut out of trees, and finally a proper branch to trunk size ratio must be maintained. Branches that have a diameter at the base greater than $\frac{1}{2}$ the diameter of the trunk are removed. It is believed that all of these factors will help to reduce the incidence of bacterial canker.

Solaxe System

The Solaxe system was developed in France as an apple system but has since been adapted in France, and especially in Chile, to cherry trees. Trees are usually grown on a dwarfing rootstock such as Gisela 5, 6, or MaxMa 12. Typical spacing is 2 to 3 m in the row by 5 m between rows, depending on rootstock selection, with Gisela 5 being planted most densely.



Fig. 5 The Solaxe system features pendant branches and spur thinning to increase precocity and balance crop load.

Trees are grown as a central leader with branches tied down to 120° to remove vigor and encourage precocity (Fig.5). Branches are seldom pruned except to remove young limbs that are too closely spaced. Limited branch renewal helps to improve light penetration, as does the creation of a light tunnel next to the trunk where all buds within 30 to 40 cm of the trunk are removed. Where adequate branching is lacking, buds are notched or Promalin® applications are made to increase branching. As the tree reaches 3.5 to 4 m the top is bent to the horizontal so the maximum height can be maintained. Lack of pruning and branch bending makes this a very precocious system. Little pruning also means that bacterial canker infection is generally low.

Crop load and fruit size are controlled by spur removal. The number of spurs left per branch is determined by the productivity of the variety and the diameter of the branch. ‘Bing’ branches are often thinned to approximately 10 cm between spurs and ‘Van’ branches thinned to 20 cm. Spur removal and branch bending makes this a highly intensive system and potentially a very expensive system to establish and maintain.

The Solaxe system contradicts some of the principles that are the foundation of other systems. For example, most other systems are based on the principle that fruit should never be grown on pendant branches as they will tend to overset and produce small fruit. However, French scientists claim that pendant branches will produce large fruit when spurs are properly thinned so that oversetting and fruit size are not a problem.

In addition, most other systems have some method of renewing spurs so that fruit is not borne on old spurs. It is generally believed that old spurs produce smaller fruit than young spurs. French scientists maintain, however, that the removal of spurs will divert energy to the remaining spurs allowing for large fruit size, no matter the age of the spur. Spur breakage during the harvest of old spurs, however, may be a problem that will be hard to overcome.

Summary

With the diversity of cherry training systems now available, growers have many options that allow them to choose the right system for their specific needs and growing conditions. Growers planting a non-productive variety can choose the Vogel, Zahn or Solaxe system to help encourage productivity, whereas a productive variety does well on a system that helps to control fruit set such as the Steep Leader, Spanish Bush or Solaxe. Orchardists wanting to use a full size rootstock may want to choose the Steep Leader, Zahn or Spanish Bush system while a grower concerned about bacterial canker infection might choose the Vogel, Zahn or Solaxe system to reduce the potential for infection.

References:

Long, L.E. (2003). Cherry Training Systems: Selection and Development. PNW 543. Oregon State University, Corvallis, OR. 26 pp.

Seavert C.F., M.K. White and L.E. Long (2002). Orchard Economics: Establishing and Producing Standard- and High-Density Orchards in Wasco County. EM 8802. Oregon State University, Corvallis, OR. 34 pp.