

## Vine Training and Pruning for New England

William R. Nail

Assistant Scientist II

The Connecticut Agricultural Experiment Station

123 Huntington Street, New Haven, CT 06504 William.Nail@ct.gov

Grapevines in the wild naturally grow on adjacent structures such as trees and fences. This usually results in healthy plants that produce small quantities of fruit on small clusters. Hundreds of years ago, vines were typically grown on primitive stakes or adjacent trees. This is still seen in some parts of Europe and western Asia. This provided adequate support, but did not always provide optimal canopy microclimate for fruit production and plant health.

Early growers of cultivated grapevines learned that by severely pruning the previous year's wood, fruit production greatly increased. These vines were generally grown in low-vigor environments, so vines were usually pruned to a few short spurs. Trellising systems for grapevines are a relatively new phenomenon.

The availability of wire greatly increased the possibilities for training grapevines. The first wiring systems were relatively primitive, but still increased production and vineyard efficiency.

Training and trellising systems have been developed to take advantage of the natural growth habit of the plant. Shoot growth in the early part of the season is rapid, especially in the presence of adequate water typical of most growing seasons in the eastern United States. Shoots do not start to lignify until the beginning of autumn, making them amenable to many kinds of shoot manipulation during the pre-veraison period.

Different species of grapes have different natural growth habits. The traditional European grape, *Vitis vinifera*, has shoots that tend to grow upright. Many American species such as *V. lambruscana* have shoots that tend to grow downward (procumbent). Many popular winegrape cultivars in New England are hybrids of *V. vinifera* and American species. Their growth habits tend to vary by cultivar. Some grow upright, some are procumbent, and many have growth habits that are somewhere in between. Trellis systems should be selected to work with, not against, the natural tendencies of the vine.

The current commonly accepted principles of trellising, training, and canopy management were established largely based on the research of the late Nelson Shaulis at the New York Agricultural Experiment Station in Geneva. These principles were expanded on by his student Richard Smart. Dr. Smart's seminal book "Sunlight Into Wine" (1991) describes these principles and gives many case studies of how creative growers throughout the world have adapted these principles to their own vineyard environments. The basic overarching principles are 1) to expose as much leaf surface and fruit to sunlight as is possible throughout the season, and 2) to have enough sun-exposed leaf area to properly mature fruit and maintain plant health. While different cultivars have different leaf sizes and vary in fruitfulness, a general rule of 12 to 15 well exposed leaves per shoot, or about 36 to 40 inches of shoot growth is usually adequate. If leaf removal is practiced to improve sunlight to the clusters and spray penetration, this should be taken into account.

The fruitfulness potential of individual grapevine buds is established during the previous growing season. Inflorescence primordia for the following season are developed during the weeks between fruit set and veraison. This is typically between mid-June and mid-August in most of New England. Sunlight exposure to leaves that are during this period is critical for the

development of inflorescence primordia. This is especially important for shoots that will be retained as canes or spurs for the following year. Environmental factors during the current growing season can also have major influences on fruit set. However, even the most ideal conditions cannot overcome the lack of potential if buds did not develop inflorescence primordia during the previous growing season.

Grapevines, especially those intended for the production of high-quality wines, are an expensive crop to grow. Every unit of linear row should be as productive as possible for maximum profitability. Each vine should fill its allotted space with fruitful shoots that are in an environment that will properly mature the fruit and provide productive canes for the subsequent growing season. For any particular combination of cultivar, site, and trellising system, this can largely be addressed by spacing plants a proper distance apart in the rows. However, this decision is permanent. The variable weather in New England combined with relative lack of knowledge of the effects of cultivar or species and rootstock on a specific site make planting and the choice of training system difficult in many cases. Most growers begin with a given trellis system in mind. If problems arise, modifications ranging from minor alterations to complete changes can be instituted if necessary.

Besides providing an optimal environment for sustainably producing maximum quantities of high quality fruit, trellis systems should also allow for maximum efficiency of vineyard activities. These include, but are not limited to, pruning, shoot positioning, leaf removal, fruit thinning, and spray penetration.

There have been relatively few experiments with different trellis systems in New England. The four described below were chosen either because they are common, have shown some potential in some vineyards, or have potential but are still undergoing evaluation in the area. These four training systems, as well as vine spacing, are being compared for the hybrid cultivars St. Croix and Cayuga White at a commercial vineyard in Wallingford, CT. Vines on six foot spacing will also be pruned to both cane and spur pruned to compare pruning systems.

*Vertical shoot positioning (VSP)*

This is the most common trellising system in New England. Most vineyards employ cane pruning with this system, although it also lends itself to cordon pruning, which is favored in many areas of the country. It is well suited to vines with a vertical growth habit. Establishment costs are fairly high, as significant amounts of wire are required. This typically consists of single or double fruiting wires as well as two or, preferably, three catch wires or pairs of catch wires above. This can add up quickly. However the use pairs of catch wires greatly facilitates the efficiency of canopy management activities. By having a single fruit zone just above the fruiting wire(s), activities such as leaf removal and cluster thinning are easily done.

*Hudson River Umbrella (HRU)*

This is the most common trellising system for procumbent grapes in most of the United States. HRU is especially popular for juice grapes, which have a procumbent growth habit and for which production costs must be minimized due the relatively low value of the fruit. It consists of a single wire five to six feet above the ground, although a lower wire approximately 30-36 inches high is frequently used to train young vines. This system also lends itself to cane or cordon pruning. Ideally, shoots are trained downward during the growing season. Shoots generally do not need to be tied, as gravity does much of the work, especially as the fruit becomes heavy in late summer. Leaf removal and cluster thinning are easily done, although at a less convenient height for most people than VSP.

*Geneva Double Curtain (GDC)*

GDC was developed in the 1960's by Nelson Shaulis at the New York Agricultural Experiment Station for juice grapes, primarily Concord. It consists of a horizontally divided canopy with fruiting wires at a similar height to the HRU system. Vines are planted in between the wires and are trained to both wires. This effectively doubles the fruiting area per linear unit of row length compared to non-divided canopies. Shoots are trained similarly to HRU. More work is involved, as the vines need to be trained outward from the interior onto the fruiting wires.

There are several variations on how vines are trained on GDC. The most common are to train each vine to both wires, usually as a bilateral cordon. Other systems train alternate vines to alternate sides of the canopy.

*Scott Henry/Smart Dyson*

These are similar systems, and the nomenclature is frequently contradictory. Both systems divide the canopy vertically. These systems are particularly useful for devigorating excessively vigorous vines in established vineyards. Generally, Scott Henry is used to describe this system when cane pruned, and Smart Dyson when cordon pruned. However, the terminology is not always consistent. The upper portion is similar to a VSP system, although the fruiting wire is higher. Consequently, the trellis system is about a foot higher than a typical VSP system. The lower portion consists of a lower fruiting wire about 10 inches below the upper one. Shoots in the lower fruit zone are trained downward during the growing season. Since the lower portion of the vine receives slightly less sun than the upper portion, it is common practice to have 50% less fruit on the lower section. This can be accomplished through leaving fewer buds at pruning, cluster thinning during the growing season, or a combination of both. Like GDC, more labor is involved compared to single canopy systems, but yields per linear row length can be increased by 50%.

## **References**

Smart, R. and M. Robinson. 1991. Sunlight Into Wine: A Handbook for Wine Grape Canopy Arrangement. Winetitles, Adelaide, Australia.