Grapevine Training System Trends in the South

While VSP trellises still rule in Texas, other systems have their own advantages

By Fritz Westover

With traditional VSP training systems, yields vary depending upon site, variety, canopy management and seasonal conditions.

During the past decade of working as a viticulturist in the eastern and southern United States, I have observed that the vertical shoot positioned (VSP) vine-training method is the most commonly used of all available systems *(see photo at right)*. There are many good reasons for the dominance of the VSP system: It is relatively simple to install and implement, and it adapts to a wide range of grape varieties including *vinifera* and interspecific hybrid winegrapes. In-row vine spacing, between-row spacing and canopy height can all vary a great deal within the VSP-training system, and both spur- and cane-pruning techniques can be applied within its confines, resulting in a wide range of canopy architecture. Furthermore, the VSP system seems to best conform to vineyard mechanization, which is a big advantage at a time when decreases in labor input and production costs per acre are ever present.

Although the apparent simplicity and adaptability of the VSP system is evident, not all new vineyards in the South are being installed exclusively with VSP. Several other training systems have their place in the hot southern climate. In this article I will summarize some of the non-mainstream systems that are being implemented in Texas and how they are adapted to fit the needs of local grapegrowers.

Divided-canopy training systems

VSP (or some modified version thereof) remains the most widely used training system for *vinifera* and interspecific hybrid winegrapes in the majority of Texas vineyards. However, yields with this system are quite variable across the state depending upon site, variety and seasonal conditions. As with other hot growing regions, there are concerns regarding excessive sun exposure and uneven fruit ripening if canopies are not managed accordingly.

The hybrid grapes steal the show with respect to the use of divided canopy training systems, perhaps as a function of the climate where those varieties are grown in Texas. On average, the Gulf Coast region experiences approximately 40 or more inches of rainfall annually. Soils tend to be deep and either sandy loam, clay or a mixture of clay loam and clay. The high-vigor capacity of these soils, combined with plentiful annual rainfall and inherent high vigor of the hybrid grapes, often results in the need for larger canopies, hence a trellis and training system that can allow for larger canopies.

Divided canopy training systems have long had the reputation of producing greater yields than traditional, non-divided systems such as VSP. Divided-canopy training systems can be designed to separate two canopies horizontally (such as with the Geneva Double Curtain and the Lyre training systems) or vertically (such as with the Smart-Dyson or Scott Henry systems). For a review of these systems I recommend the "Wine Grape Production Guide for Eastern North America" [1] or "Sunlight into Wine."[2]

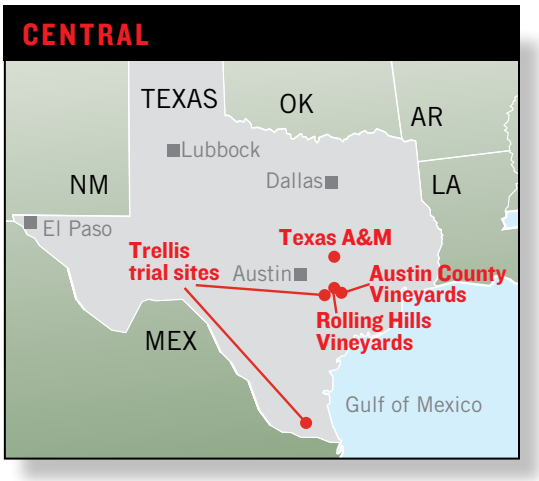
The two major divided canopies that are utilized in Texas are the Geneva Double Curtain and a modified version of the high-wire system known locally as the Watson System. Where VSP training systems have been implemented on high-vigor sites, there is room for modification

The Geneva Double Curtain training system originally was developed for vineyard sites with high-vigor capacity.

of those systems into vertically divided systems in an attempt to balance excessive vegetative growth by production of additional fruit. The Texas A&M AgriLife Extension Service has been evaluating the use of divided-canopy training systems over the past five years on both red and white Pierce's disease-tolerant hybrids in the Gulf Coast region.

Geneva Double Curtain

The Geneva Double Curtain (GDC) training system, developed in Geneva, N.Y., by Dr. Nelson Shaulis, is a benchmark example of a divided training system originally intended for juice and hybrid winegrape production on vineyard sites having high vigor capacity *(see photo at left)*. Since its adoption with juice grapes, the GDC system also has found increased popularity with interspecific hybrid winegrapes.



The winegrape variety Norton (also known as Cynthiana) is often grown on this system due in part to two of its major morphological characteristics: procumbent (downward or trailing) shoot growth and moderate cluster size. The high-wire fruiting zone of the GDC system accommodates the downward shoot growth, while the increased yield from the divided canopy helps to improve yield per acre of a relatively modest cluster size. Because Norton works well with GDC, growers are now experiencing better economic returns

Fruit hangs under catch wires with the Watson System, increasing the chance clusters will be shaded from full sun exposure.

per acre. University research has been initiated to refine canopy management and crop balance on GDC-trellised vineyards in order to improve wine quality.[3]

Of the hybrid winegrapes tolerant of Pierce's disease (PD), Blanc Du Bois is one of the best adapted for high-wire systems such as the GDC.[4] Blanc Du Bois is a vigorous grape variety similar to Norton in that it has both modest cluster size and a procumbent growth habit. Commercial yields of Blanc Du Bois on vigorous soils in the Gulf Coast are reported in the range of 6 to 8 tons per acre on 8-foot in-row vine spacing and 12-foot between-row vine spacing.

While the yield benefits appear obvious with the GDC system, disadvantages include possible uneven ripening of fruit, sunburn (the fruit zone is at the top of the canopy and may become overexposed) and the potential to over crop if vines are not properly pruned and thinned. Occasionally, growers also will lament that clusters can become covered by excess leaf layers on the sides of the canopy, which may reduce spray penetration and increase rot susceptibility. Almost all GDC-trained vines in the East and South are hand-harvested. However, there are vineyards utilizing mechanical harvesters that have implemented this system in other areas of the country such as the San Joaquin Valley of California.

The Watson System

The Watson System, developed by Jerry Watson of Austin County Vineyards, has gained much popularity in the United States' Gulf Coast region during the past five years. Initially, Austin County Vineyards was planted on 8x12 spacing on a vigorous sandy loam topsoil over clay subsoil. The original training system consisted of a high-fruiting wire at 66 inches and bi-lateral cordons. The procumbent growth of the shoots resulted in excess leaf layers in the fruit zone, causing difficulties with spray penetration and hand harvest. This problem may not be the case with high-fruiting wire systems in other parts of the country, but with the high rainfall and humidity of the Gulf Coast climate and susceptibility to rot of local hybrid grapes, the need to adapt to a more open fruit zone is imperative.

Clusters growing on Watson System-trained vines hang free under the catch wires, allowing them to be easily sprayed and hand harvested.

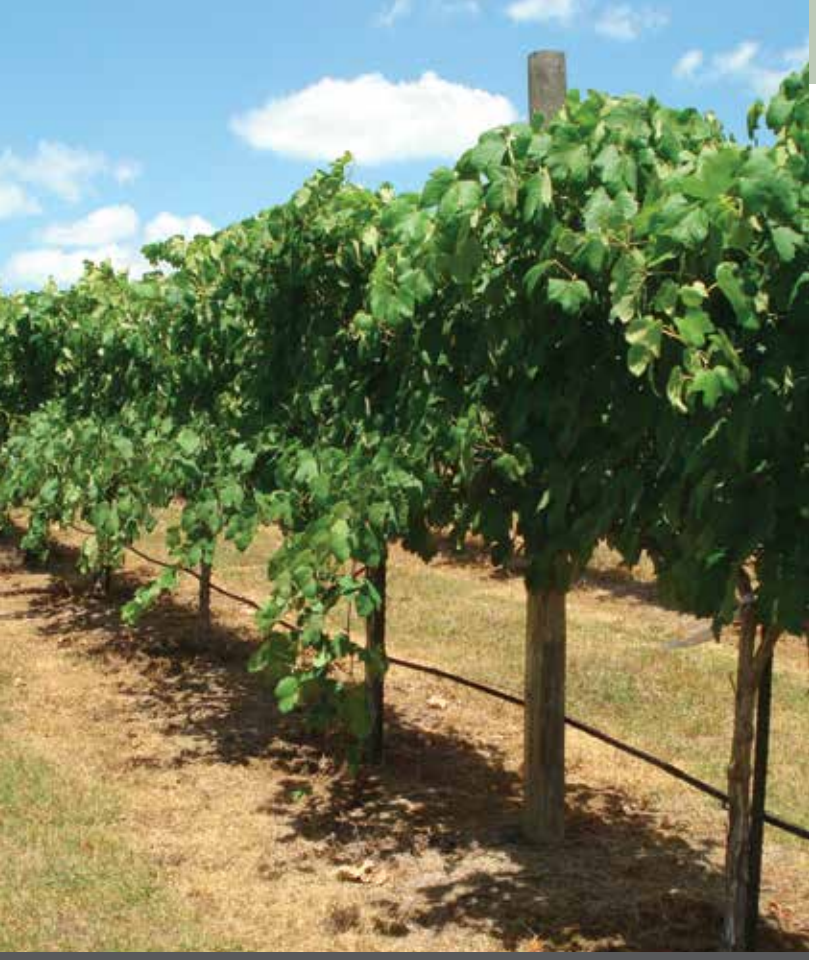
To do so, the trellis was modified by installing 4-foot V-cross arms at an angle of 120° just above or below the 66-inch fruiting wire and installing foliar catch wires at 12- and 24-inch intervals on those cross arms on both sides of the fruiting wire. Shoots are trained at a wide "V" from the central cordon, horizontally dividing the canopy down the middle. This split allows for an increased number of shoots per linear foot of cordon (up to eight, compared to three to five for VSP), and the fruit hangs under the catch wires, where it is more apt to be shaded from full sun exposure *(see photo on page 55)*.

The Watson System (perhaps similar to the French system *livre ouvert*) has been reported to produce yields in the range of 4 to 6 tons per acre for Blanc Du Bois on 8-foot in-row vine spacing and 12-foot between-row vine spacing. Newer vineyards are being planted with variations of in-row spacing. A minimum of 11 feet between rows is favored due to the width of the cross arms and foliage; 12 feet between rows is the standard spacing. Clusters in the Watson System hang free under the catch wires, where they can easily be sprayed and hand harvested *(see photo at left)*. Shoot positioning is required to keep the canopy open, and hedging may be required to keep vigorous shoots from reaching the vineyard floor. Row orientation perpendicular to seasonal wind direction may also cause difficulties with maintaining canopy division. The Watson System also is being implemented with red hybrid winegrapes including Lenoir.[5]

Modifications of VSP

Occasionally a vineyard is installed using a VSP system, only to find when it comes into production that the system and vine spacing may not have been the best match for soil, climate and grape variety. For example, a grower may plant on a soil with high vigor capacity, perhaps with a vigorous rootstock, and then find that the shoot length grows considerably above the allotted trellis height, with excessive production of lateral shoots and large-caliper "bull canes," and the need for seasonal hedging more than twice per year.

This is a common problem in the eastern United States, and much research has been devoted to finding methods to balance vines in these situations (such as by using competitive cover crops and strategically reducing fertilizer and water input). Another alter-

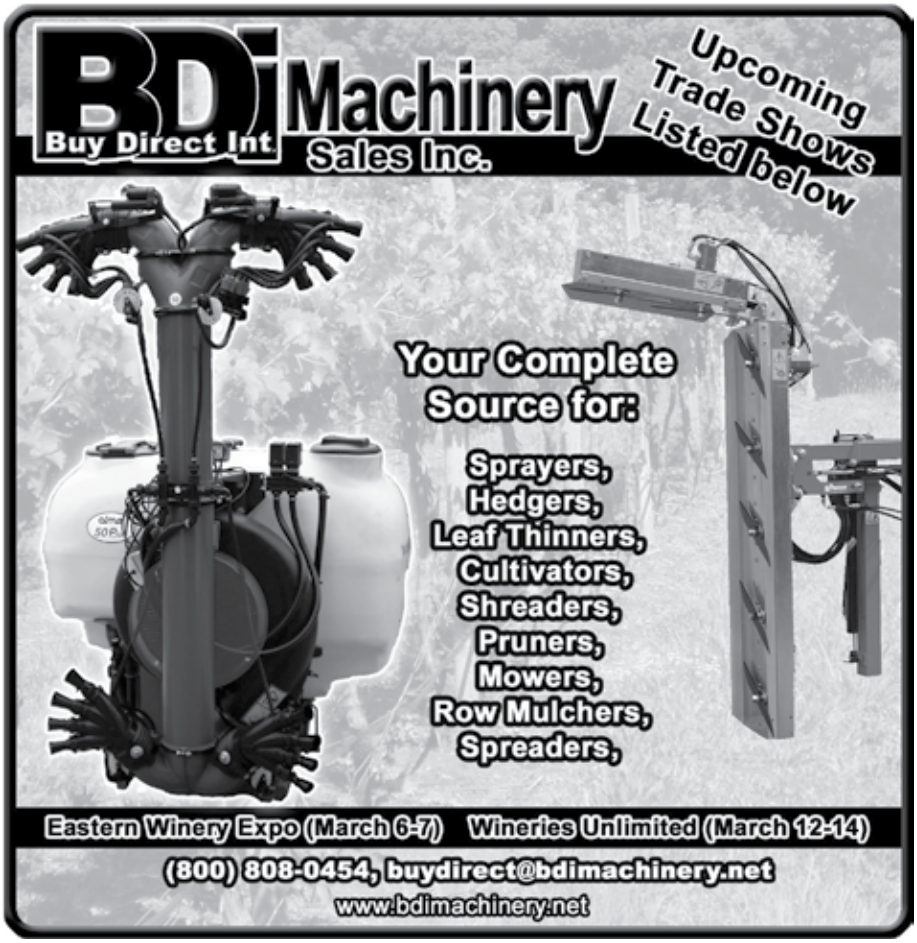


Shoots are trained in both upward and downward directions on this Favorite cultivar, shown next to a VSP-trained canopy for comparison.

native for a grower is to divide a vigorous canopy in order to capitalize on the extra vigor by producing additional fruit.

In 2009 a Texas vineyard planted with the PD-tolerant hybrid "Favorite" (a grape similar to Lenoir) was identified as having excessive vigor on its VSP training system (average cane weights greater than 40 grams and shoot hedging two or more times per year). In collaboration with the Texas A&M AgriLife Extension service, owners Louise and Ed Rice of Rolling Hills Vineyard implemented a replicated comparison of their existing VSP system with one modified to vertical canopy division. The VSP system consisted of bi-lateral cordons spur-pruned to five buds per linear foot. The divided system was the same, with the addition of two buds per foot retained in even spacing on the west side of the cordon (north-south oriented rows). During the growing season, the east side of the canopy was maintained as standard VSP, having all shoots trained vertically, and the two buds per foot on the west side grew fruitful shoots trained in the downward direction *(see photo at left)*. Shoot positioning was performed once on upward and downward shoots, approximately two weeks before bloom plus one follow-up pass, if needed, after fruit set.

Sorokowsky[6] has evaluated a similar modification to VSP, referred to as the "southern sprawl," and other similar modifications to VSP have been used in Virginia with success. The single-sided vertical division allows a grower to apply herbicides more easily under the vine row compared to a double-sided division and focuses the extra growth on the side of the canopy receiving the hotter, late-day sun.



In the Texas trial, leaves were removed once in the fruiting zone on the east side only, just after fruit set.

In the first year of this project, the divided vines produced the equivalent of approximately 1 ton per acre more than the non-divided vines, with no significant differences in Brix, pH and titratable acidity at harvest between the fruit produced on upward and downward oriented shoots or between training systems *(see photo at right)*. In this example the winemaker was primarily interested in fruit chemistry at harvest, and wines were not produced separately from the treated vines.

During years two through four, the vines trained with divided canopies produced the equivalent of 2 tons or more per acre more than the non-divided vines. At this site, we observed that an increase greater than 2 tons per acre was undesirable, as it delayed ripening and reduced cane weights below the desired vigor levels. In this case, a four-year evaluation was required to establish how much yield increase could be achieved before negatively impacting fruit quality and vine balance.

As a result of this trial, the Rolling Hills Vineyard has been converted to the vertically divided system, and the grower maintains a projected 1-2 tons per acre increase in yields while still producing fruit of the desired quality parameters of the winemaker. Hedging was reduced to one pass per season over the four years and in some years was not needed at all. While the application of herbicides is more challenging on the western side of the vine row, the grower has managed to adapt their spray application.

Downward-trained shoots on the vertically divided training system produced about 1 ton per acre of additional fruit during the first year of transition from the standard VSP training system.

Trellis requirements for VSP modification

Certain requirements must be met in order to vertically divide a VSP training system. For the training system modification at Rolling Hills Vineyard, the height of the fruiting wire was set at 42 inches above the ground. This height allowed enough room to produce the needed leaf area on downward-oriented shoots to achieve equivalent ripeness that coincided with the fruit on the upward-oriented shoots. The trellis above the fruiting wire must also allow for sufficient shoot length to ripen the fruit (usually 3.5- to 4-foot shoot length is sufficient). Some growth will occur above the top set of catch wires, thus a mammoth 8-foot top wire height should not be in order.

One strategy I am implementing for new vineyards on sites with high vigor potential is to insist on a minimum fruiting wire height of 38 inches above the ground in order to allow for canopy division (should it be desired in future years). After all, there really is no need to get the fruit closer to the ground to accumulate heat. (Heat is not a limiting factor in the South!) Another noteworthy benefit of this modification is the ability for a grower to easily transition back and forth from VSP to the vertical canopy division as the seasons and vine age dictate. The decision to allow downward shoots occurs during dormant pruning, thus there is zero transition time between the two systems.

Future work

Several projects have been initiated by the Texas A&M AgriLife Extension service to evaluate the effects of training systems on yield and fruit quality. A replicated trial comparing Blanc Du Bois trellised on the GDC, Watson and VSP (both cane and spur pruned) training systems over five years was started in the Rio Grande Valley in 2011 in collaboration with USDA-ARS and Rio Farms Inc. The four-year study comparing Favorite winegrapes trained to VSP and vertically divided training systems at Rolling Hills Vineyard is complete, and this system is currently being evaluated for Blanc Du Bois winegrapes in Texas. WE

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