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Vineyard Establishment II

Planting and Early Care of Vineyards

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MICHIGAN STATE UNIVERSITY EXTENSION

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Cover Photo: A Cabernet franc vineyard in its third growing season near Benton Harbor, Michigan. Vines produced a yield of approximately 2 tons per acre after being thinned to allow the development of vine size.

1. Preplanting Activities

Preparing the Soil for Planting

Most vineyards are planted after the soil has been tilled completely to provide a loose, workable planting bed for the vines. Plowing, disking, dragging, floating, etc., to prepare a field for planting requires more skill than one might imagine. Laying out the plow patterns to avoid dead furrows in the middle of the field, adjusting the plow so it rolls over the soil properly, cross-disking and dragging to ensure level soils, etc., require planning and skill. Seek counsel from local field crop experts on tillage operations when necessary. Heavy sods, excessively wet soils, excessive growth of cover crops before plowing, etc., can complicate the process. The soil should be not only level but also loose and workable to a depth of 8 to 9 inches so a planter can be readily pulled through the soil to open a furrow for setting the vines. This furrow is typically 12 to 15 inches deep, but some planters can open a trench as much as 24 inches deep. Most soils require only typical surface tillage operations to prepare them for vine planting. Some soils, however, have compacted layers of subsoil, which form either naturally, in the case of a pan soil such as a hardpan or fragipan soil, or through physical compaction by equipment. Because these layers can restrict vine root development, breaking up these layers, either by subsoiling or (less often) through deep plowing, can significantly improve vine size development.

Moldboard plowing works well on fields that have been managed uniformly without woody vegetation, such as those with a field crops history. Many growers prefer chisel plowing on old orchard or vineyard sites. Heavy sods may be killed with a herbicide treatment the previous fall and then rough-plowed so freeze/thaw cycles help break up large clods.

If the field to be planted has considerable slope and the soils are light enough to be erodible, then complete tillage of the vineyard site may be hazardous. In recent years, a number of vineyards with these characteristics have been planted by first rotovating strips of soil into which vines are then planted. Rotovation should be performed as deeply as possible. Placing small marker stakes at the ends of vine rows and at intermediate places in the field will provide a guide for the tractor.

Marking the Field

Marking a field for planting a vineyard is perhaps like brushing teeth — no two people do it exactly the same. Though numerous variations on this step in vineyard establishment are possible, the following guidelines will help focus one's creativity for this task.

The most common situation is a field that has been completely tilled and sufficiently leveled so that 3- to 4-inch deep grooves in the soil will be readily visible. A grid pattern of grooves is made in the soil (Fig. 1)

Fig. 1. Vertical grooves in the soil mark the spacing of rows. Less distinct horizontal grooves mark the vine spacing. This planting was on the Jim and Dan Nitz farm on an April morning near Baroda, Mich.

Fig. 2. This trailer field marker for planting grapevines on the Kerlikowske farm in Michigan uses two cultivating teeth to make grooves in the soil. Meanwhile a hydraulically extended disk marks the location for the next pass of the tractor. (Kerlikowske Farm, Berrien Springs, Mich.)

and then vines are planted at the intersections on this grid. The marking tools used to make this grid are often fabricated on the farm (Fig. 2) and vary considerably from farm to farm. A common method will be described first and then comment will be made on variations.

The marker is typically a tool bar behind the tractor, either on a 3-point hitch or trailered, on which cultivating teeth are spaced to make grooves in the soil. Three teeth often are used — one in the middle of the tractor and one movable tooth on each side. Begin by placing several stakes along what will be the second row of the vineyard (Fig. 3a). Then set intermediate stakes as needed, either by stretching a wire between end stakes or sighting between end stakes with binoculars to align a 6-foot pole held by one of the crew. Stakes in this row should be about 3 feet tall so the tractor driver can readily sight along them. Lath strips work well. They should be lightly staked in the soil so the tractor can easily push them over during marking. With the marking tool set so the distance between the cultivating teeth is at the desired row spacing, drive down the field along this set of stakes to make the first three rows (Fig. 3a). The third row marked with this first pass then becomes the guide for an outside

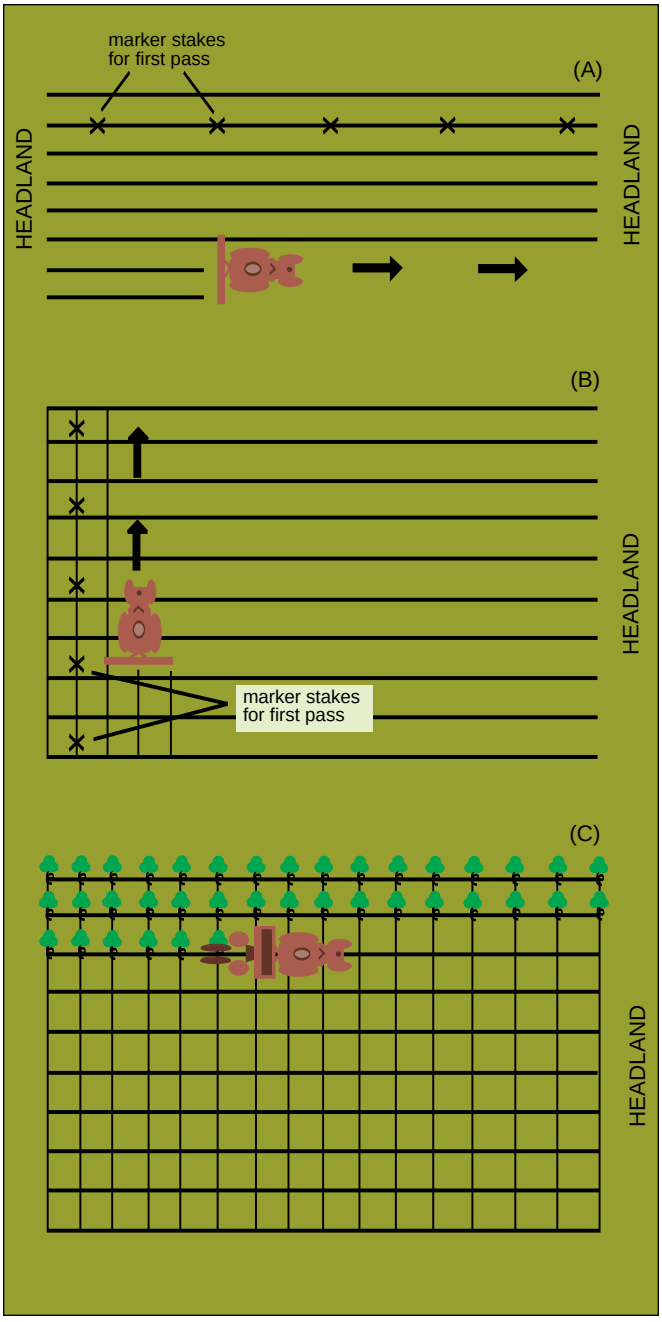

Fig. 3. Steps in planting vines include (A) marking rows, (B) marking vine spaces and (C) planting vines.

feasible to mark vine spaces perpendicular to these strips as described above, mark vine spaces with spray lime as described below.

On an outer row of the vineyard, lightly tension a wire between the end stakes. Use a 100-foot measuring tape to mark the wire for the desired vine spacing. Begin at an end stake to mark a half-vine space for the first vine and then full vine spaces. Using a bucket of spray lime, put a narrow strip of lime about 2 feet long perpendicular to the wire where each vine space is marked on the wire. When complete, relocate this wire to the other outside row of the vineyard, or at 15-row intervals on large vineyards. Repeat the marking with lime. Then a rope or wire can be stretched temporarily across the 13 or fewer unmarked rows between these marked rows. Beginning at the first vine space at one end of the vineyard, place a 2-foot strip of lime to mark the vine space where the rope crosses the unmarked rows. Repeat the process down the row until all the vine spaces have been marked.

In reality, growers will be highly influenced in their approach to the task of marking a field for planting by the resources available among their grape-growing neighbors. Nevertheless, the very important goal of straight, uniformly spaced rows and vines is universal.

11. Planting Vines

Preparing and Handling Vines

Keep grapevines moist at all times. If the nursery from which you are purchasing vines is storing them well in a moist, cold storage, do not accept delivery of vines until you are ready to use them. Vines that arrive with chlorotic emerging shoots indicate poor storage techniques. Vines should not experience extended periods of shipping. When you receive vines, immediately inspect and water them and place them in a cool, moist environment. If a cold-storage facility is not available, plant as soon as possible. Vines may be kept in a cool cellar for a few days as long as they are watered often and kept covered to prevent their drying out. Check tags on all bundles to make sure they are true to variety and rootstock as per your order. Do not prune the roots of vines. Plant as much of the root system as can be well distributed in the soil (see discussion below). Vines shipped from commercial nurseries often will have had their top portions pruned so that no further pruning is required. Vines that you propagated should have the tops pruned back to 5 to 6 inches. If vine tissues seem dry at planting, soak bundles of vines in water for 4 to 6 hours prior to planting. Vines should be transported to the field under tarps or in covered containers (Fig. 6).

Fig. 6. Grapevines being loaded on a planter. Vines were transported to the field on a hay wagon and kept covered with a tarp to prevent drying. (Jim and Dan Nitz Farm, Baroda, Mich.)

Planting Techniques

Most vineyards are planted with a modified tree planter (Fig. 5). This piece of equipment seats one or two people. When there are two, individuals may alternate planting vines or one may prepare vines for insertion into the furrow while the other plants. While the tractor driver keeps the planter in line with the row markings, the person(s) planting vines places a vine in the furrow each time it reaches a cross marking (Fig. 5). When vines are planted, place roots as deep in the trench as possible (Fig. 7), make a quick swirling motion of the vine, and then pull it up slightly to get good root distribution. Some growers have usefully modified the flanges on a tree planter to open a furrow as much as 9 inches wide and 24 inches deep (Fig. 8). Grafted vines should have the graft union situated approximately 2 inches above the level of the vineyard floor (Fig. 9). This facilitates both hilling and removing soil from around the graft union. If the root systems of vines are so large that they cannot be well distributed in the trench at planting, then modest root pruning may be warranted. Nevertheless, for the health of the vine and to promote its maximum rate of establishment, make the extra effort to plant as much

Fig. 7. A vine being planted in a trench. It is placed as deep as possible, shaken slightly to distribute roots and then lifted to the proper height. Blades attached to the planter are pulling soil into the trench. (Oxley Farm, Lawton, Mich.)

Fig. 8. This planter has been modified to open a trench as much as 24 inches deep and 9 inches wide so that the large vine root systems can be planted with good distribution in the soil. Blades behind the planter fill in the trench with soil. (Oxley Farm, Lawton, Mich.)

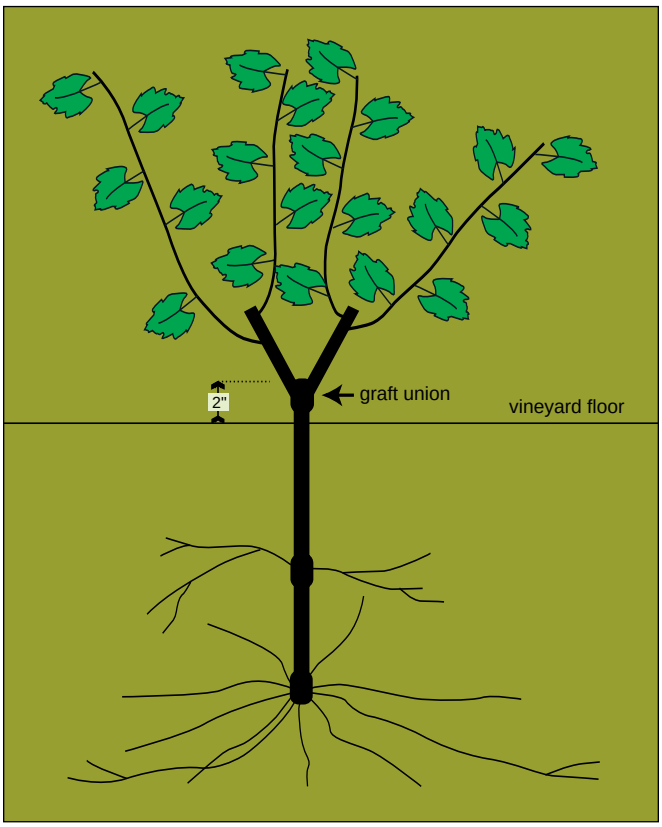

Fig. 9. A young grapevine showing a root system that was well distributed at planting and the proper height placement of the graft union.

III. Steps Immediately After Planting

Hilling Soil Around Vines

The soil around vines immediately after planting is generally level or slightly depressed. Before the introduction of preemergence herbicides in the early 1950s, weed control around vines was accomplished by alternately hilling and removing soil around vines. Though weed control around vines is now accomplished chemically in most vineyards, hilling soil around vines is still desirable for several reasons: vineyards are often planted with rows across sloping ground so that ridges of soil under the trellis interrupt the highly erosive downhill flow of water during heavy rains; depressions in the soil around grapevines may concentrate herbicides at the bases of young vines and lead to vine injury; and hilling soil around graft unions during the winter is the best known method of affording winter protection to those tissues.

Offset plows, disks, cultivators, etc., are commonly used to hill soil around newly planted vines immediately after planting (Fig. 12). Perform this task before applying any herbicides. A ridge of soil 4 to 6 inches above the level vineyard floor is a reasonable goal. If a deep furrow was created during the planting process, a somewhat higher hilling will be necessary to compensate for settling of the soil. Although covering graft unions may initiate scion rooting, it keeps young graft unions moist during the early growth of vines. Scion roots that form should be removed when soil is cleared away from around vines the following spring.

Fig. 12. A new planting of 'Cabernet franc' vines showing hilling of soil in a ridge around vines. (Doug Nitz Farm, Baroda, Mich.)

Hilling soil around grafted grapevines is often considered as protection for the graft unions against winter injury from low temperatures. However, what is really desired is to protect not only the graft union but also the scion tissues 2 to 4 inches above the graft. This affords the opportunity to renew a severely winter-injured grapevine (Figs. 13-A to 13-D). Otherwise, winter injury could occur immediately above the graft union (Fig. 13-E) and prevent any possibility of renewing the vine (Fig. 13-F). Therefore, be sure that hilling of grafted vines is sufficient to provide 2 to 4 inches of settled soil over the graft.

A second strategy uses hilling around new grapevines as a means of weed control. A light cultivation about 3 weeks after the planting begins to fill in furrows and cover any newly emerged weed seedlings. A second and possibly a third cultivation at 2- to 3-week intervals gradually fills in planting furrows and creates a ridge of soil around vines while suppressing emerging weed seedlings.

Controlling Weeds

Weed control is the single most important cultural practice in vineyard establishment. It should dominate site preparation as well as vine management immediately after planting. Without weed control, other cultural practices such as nitrogen fertilization,

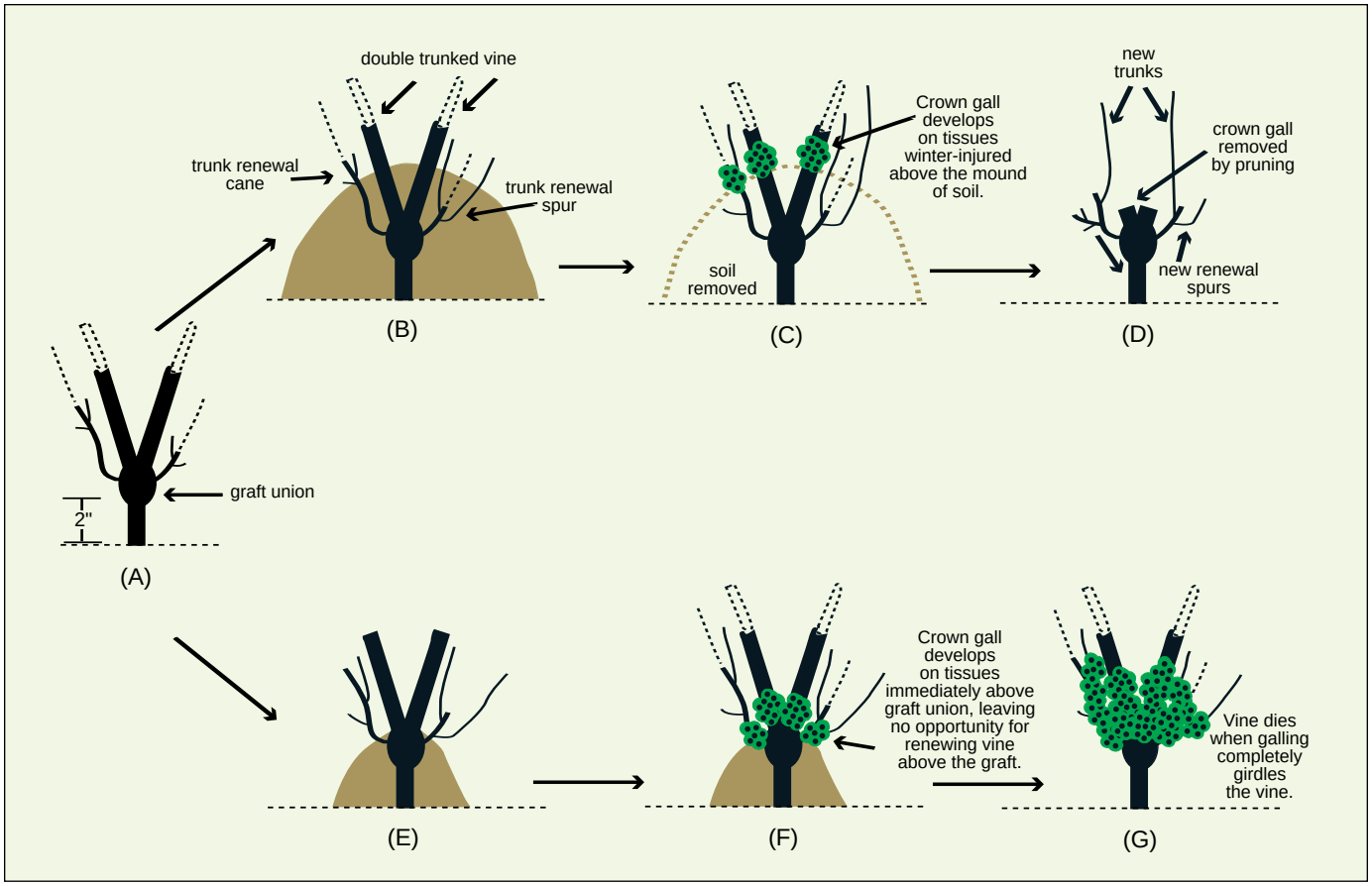

Fig. 13. A schematic of the base of a grafted grapevine (A) showing the progression of crown galling after a winter injury episode, depending on whether hilling of soil covers the graft union and vine tissues several inches above the graft union (B-D) or covers only the graft union (E-G).

irrigation and vine pruning severity will be incapable of promoting vine size development (Fig. 14). When these cultural practices are used in combination with weed control, however, they can have a positive, additive influence on vine growth (Fig. 14).

If vineyard site preparation properly eliminates perennial weed growth, weed control after planting is a matter of preventing weeds that develop from seed. Two fundamental questions relate to that task: how much weed control is desirable around newly planted vines and how can it be accomplished?

Weed control around grapevines typically is established in bands along the vine rows. Vineyard row middles are a separate aspect of vineyard management.

A quarter-century ago, most eastern U.S. vineyards were managed with a 30- to 36-inch-wide weed-free band under the trellis. That width has evolved to approximately 40 to 48 inches. However, even wider weed-free bands — up to 96 inches around newly planted vines — can promote significantly greater vine growth (Fig. 15).

IV. Year 1 Vine Management

The primary goal of vine management in the first 2 years of a vineyard is to develop large, healthy vines with large root systems. It is possible, under ideal conditions, for vines to fill the trellis totally with a healthy, functional canopy by the end of their second growing season and to produce significant crops of quality fruit in the third year. To accomplish this goal, all the vineyard tasks in the first 2 years are aimed at reducing or eliminating stresses on the vines. These stresses include pests (weeds, diseases and insects), drought, nutritional deficiencies and cropping stress.

Adjusting the Number of Shoots Per Vine

A basic strategy for developing vine size is to promote the development of as much functional leaf area as possible. Traditional vine management of newly planted vines involves reducing shoot numbers to two to four per vine when shoot growth is 6 to 10 inches long, which is compatible with the contemporary use of grow tubes.

Research on newly planted vines of the 'Niagara' variety at the Southwest Michigan Research and Extension Center indicates that when vines were well managed with regard to weed control and nitrogen fertilization, those left unpruned after planting produced more leaf area and larger root systems than those that were adjusted to two shoots per vine.

Defruiting

It is often surprising to new grape growers that vines can produce fruit the year they are planted. However, producing a crop is detrimental to the development of young vines. Therefore, vines should be defruited at least their first 2 years of growth or until they have adequately filled the trellis. Growers can perform this task with shoot adjustment when shoots are approximately 10 inches long. Retain one cluster per vine when there is a need to check the trueness to variety of vines.

Controlling Pests

Keep the leaves of new vines healthy. Powdery mildew and downy mildew can attack the leaf area of young vines. Fungicide spray programs to prevent these diseases should be part of the first-year management of vines but need not be as rigorous as programs for mature vines with crops. Locally systemic fungicides to control these diseases, applied at spray intervals of 14 to 21 days, generally are adequate. Insect control in new vineyards is a matter of scouting weekly because both traditional grape and non-grape insect pests may attack new vines. Particularly check portions of vineyards that border hedgerows or woodlands. Consult with Extension personnel and refer to current grape pest spray guides to determine pesticide materials, rates and times of application appropriate to your situation.

Managing Shoot Growth

Trellises with one or two wires — one at the top of the vineyard posts and possibly another at 30 inches above ground level — provide a structure for supporting vines during the first 2 years of their growth (Fig. 20). One strategy for supporting shoot growth in a first-year vineyard involves tying twine to a shootless vine spur (Fig. 22), then looping the twine around the lower wire (if there is one) and then tying it to the

Fig. 22. A close-up view of the trunk of a vine at the end of its second growing season. Twine was tied to a shootless spur at the base of the vine and then to the top wire of the trellis. The new trunk was gently wound around this twine to keep it straight.

upper wire (Fig. 23). This provides a structure for attachment of upward-growing shoots. Large bales of twine and boxes of several thousand wire twist ties are common, low-cost commercial tying materials for grapevines. Walk the new vineyard periodically through the growing season to loosely tie shoot growth. Distribute growth over the trellis as much as possible.

If a trellis was not installed (Fig. 21), use a pitchfork or rake to move shoots out of the vineyard row middles before mowing, spraying, etc.

Managing Row Middles

Any growth of weeds or sod in the row middles of the newly planted vineyard is likely to reduce the growth of new vines. Therefore, this growth should be kept to a minimum, especially in the first half of the growing season. If the vineyard site will permit it, a light, trashy cultivation of the row middles works well. Other options include close mowing or arresting growth in the middle with herbicide sprays. The width

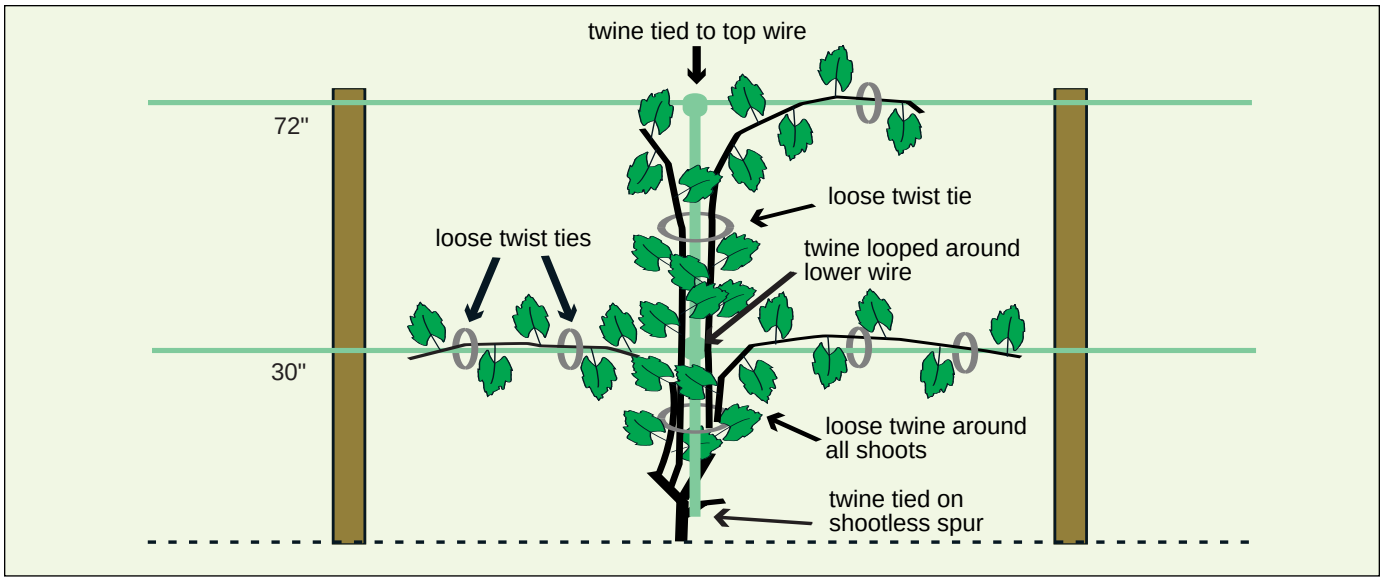

Fig. 23. A piece of twine tied vertically from a shootless spur to the trellis wire. Shoots are then tied loosely around this vertical twine support and the trellis wires with twist ties and other pieces of twine to distribute growth on the trellis.

of the row middle will depend on the width of the weed-free band established in the vine rows. The majority of vine growth should have occurred by early August. Then it is time to establish a cover in row middles to stabilize the vineyard floor against fall-winter erosion and to help slow vine growth so tissues will develop hardiness before winter. Allow weed growth to regrow (Fig. 22) or, if the row middles are cultivated, sow a cover crop in early August. Rye is a good choice if it can be sown precisely in the row middles (Fig. 24). If seed must be broadcast in a less precise manner, then oats are a good choice because they will not overwinter to become a weed problem under the trellis the following spring.

Fig. 24. A well managed vineyard after its first growing season. Rye has been sown in the row middles and trellis posts have been installed in the outer and middle rows. Posts will then be installed in the rest of the rows. (Humphrey Farm, Lakemont, N.Y.)

Controlling Weeds Around Vines

Good weed control should be maintained around newly planted vines until at least the end of July. If all the weed control steps discussed previously were properly applied, no additional effort will be required. Unfortunately, imperfect weed control around newly planted vines is all too common. Options for controlling weeds after vine growth has begun are few, and the task becomes considerably more difficult as the season progresses. Therefore, attend to such problems early in the growing season when they begin. Mechanical approaches such as gas-powered weed whips or cross-disking are not capable of weeding close to the vine. Therefore, hand hoeing and weeding around vines are the last resort. Spot spraying with Gramoxone Extra herbicide must be applied very carefully to avoid injuring young vines.

V. Engineering A Modern Trellis

Building a good vineyard trellis is very important, not only because it can be the single largest cash expense in the establishment of a vineyard but also because it can influence significantly the long-term productivity and profitability of a vineyard. Durability is important because the real cost of a vineyard trellis is determined by its years of service rather than initial cost. Considerable annual maintenance of trellises and frequent replacement of trellis components are inefficient and unnecessary with today's technology. A good trellis promotes good canopy management with well exposed leaves and, when desired, well exposed fruit. It facilitates efficient performance of vineyard tasks. The trend toward increased mechanization of vineyard tasks requires precise vine structures, which begin with a proper vineyard trellis. Crooked vineyard rows, sagging trellis wires and bowed vine trunks jeopardize the precise management of vines.

When a trellis is installed in stages for reasons of labor management and/or cash flow, install posts and two wires either at planting or in the fall/spring

between years 1 and 2, then install end post anchors and the full complement of trellis wires in the fall/spring between years 2 and 3.

Types of Posts

Selection of trellis post materials will be influenced by the types of posts available, post installation equipment available, choice of a vine training system, cost and personal preference.

Metal Posts

Metal vineyard trellis posts are an attractive option because they are relatively easy to handle and install. Their cost can also be competitive with that of wooden posts. Metal posts specifically fabricated for trellises are in use in some viticultural regions. Those in use in Midwestern vineyards, however, are typically generic fence-type posts. Many types of metal posts have questionable lateral strength. Metal posts have been known to bend when supporting large crops in windy locations, and they may be difficult to use with complex trellis designs. Relatively new specialized metal posts for vineyards may overcome these limitations. However, their durability under Midwestern conditions is unknown. Growers occasionally have installed metal posts in predominantly wooden post vineyards to serve as grounding rods against lightning strikes on vineyard rows. The worth of that strategy is undocumented.

Wooden Posts from Native Tree Species

Vineyard trellis construction a half-century ago was dominated by the use of posts cut from native tree species. These posts occasionally were subjected to on-farm preservative treatments but often were untreated. Because most native tree species are not rot-resistant, random selection of trellis posts from woodlots is likely to result in a high percentage of post failure in 10 years or fewer, with some posts failing in as few as 4 years. The annual cost of a post is its cash cost plus the labor required to install it divided by its years of service. Inexpensive posts with a short life are costly per year of service.

Black locust is the woodlot tree species most frequently used for vineyard trellis posts. Split posts from large black locust trees or slow-growing small trees that contain a very high percentage of heartwood typically provide more than 20 years of service. They have even been documented to be in service more than 50 years! In contrast, locust posts from a suckering second growth that has a very small proportion of heartwood may fail in fewer than 10 years. The sapwood of black locust is very yellow. Some veteran grape growers refer to black locust posts with considerable sapwood as "yellow locust posts." Black locust posts become very hard when they are fully seasoned, so some growers install staples to hold wires on them before that happens.

White cedar is another native tree species that is still used for vineyard trellis posts (Fig. 20). When these posts have 80 percent or more of their cross-sectional area composed of heartwood, they have a life expectancy of 20 years or more. However, white cedar posts with relatively little heartwood, such as those typical from a so-called second-growth woodlot, may fail in as few as 5 years, which is why the reputation of white cedar posts is so variable. On-farm preservative treatments of white cedar were fairly common many years ago. Reference materials from the U.S. Department of Agriculture and other sources provide recipes for this activity, which rarely is practiced today.

Pressure-treated Wooden Posts

Wooden posts that have been commercially pressure-treated with a preservative are the predominant type of trellis post used in Midwestern vineyards today (Fig. 24). Red pine or southern yellow pine is commonly used. Although these posts would fail in 4 to 5 years if they were not preservative treated, with proper treatment they have a 20- to 30-year life expectancy. Characteristics that will influence post life

Installing Line Posts

Posts installed within the vineyard rows are called line posts. A typical 8-foot line post is set 24 to 30 inches into the ground so that the top of the post is 66 to 72 inches above the vineyard floor. A measuring stick can be used to guide uniform height installation of posts. Installation of these posts is best accomplished when there is good but not excessive soil moisture. Posts should be installed with their larger diameter end down in the soil because this portion of the post will decay more rapidly than the aboveground portion and ultimately cause the post to fail at ground level. Vineyard posts are sharpened at their bottom end in some viticultural areas, either prior to purchase or on the farm. This is especially useful when pounding posts into heavy soils, either with a hydraulic post pounder or with a post maul. In contrast, vineyard posts are rarely sharpened when they are installed in Michigan's light sandy soils. Hydraulic pounding of posts (Fig. 25) is advantageous because it is relatively rapid (several times faster than augering). The posts can be set to a precise desired depth and they are immediately firm in the ground. Augering of postholes is also common and requires less expensive equipment than post pounding. Light soil tends to backfill around and firm up posts installed in augered holes relatively quickly, but posts on heavier soils can remain loose for long periods. Bucket loaders and other hydraulic equipment have also been used to push posts into the ground.

Fig. 25. Vineyard trellis posts are often installed with a hydraulic post pounder like the one shown here. (Stamp Farm, Rock Stream, N.Y.)

Fig. 26. This post maul has a head with a 3.5-inch diameter. It is used for installing or replacing a small number of posts.

A hand-held posthole digger is the common method of installing posts in small backyard plantings. Another easy method for installing a small number of posts or replacing posts uses a pinch bar and post maul (Fig. 26). Begin with the pinch bar to punch a hole and then use it to "auger" the hole deeper and wider with a circular motion. Put the post in this hole and finish the job with a post maul. A post maul is a specialized sledgehammer with a head face about 3.5 inches in diameter (Fig. 26). When using this venerable tool, stand on a platform such as the trailer that carried the posts into the vineyard.

Fig. 35. A high-carbon trellis wire that has been attached to an end post by wrapping the wire around the post and then attaching the wire to itself with a soft-metal crimp.

of these wires, which are pulled tight and hooked over nails on the end posts to retension wires after they have been moved.

Tools and Gadgets for Installing Trellis Wires

Basic hand tools for installing vineyard trellis wires include fencing pliers for pulling misguided staples and cutting lengths of wire, a standard claw hammer and a ratcheting wire tightener (Fig. 36), which is preferable to a chain grab wire puller. A wire gripper (Klein Tools, Chicago, Ill., model #1613-30F) can be added to the ratchet tightener at one or both ends to hold even high-tensile wire quite well (Fig. 36). A wire reel, which can be purchased or fabricated in several designs, is essential for unwinding rolls of wire. Crimps (Fig. 35) and a crimping tool, a post maul (Fig. 26), a pinch bar and a carpenter's apron to hold staples are also useful.

Fig. 36. A ratcheting wire tightener. A wire gripper has been welded on one end to reliably hold high-tensile wire.

VI. Year 2 Vine Management

Early-season Weed Control

A second-year vineyard should be inspected in early spring for weed control in the vine rows. Before vine growth begins, there is a window of opportunity to control any weed growth around vines that has overwintered with green leaf area. Quackgrass is a common overwintering weed problem (Fig. 37). An application of the systemic herbicide glyphosate can be made over vines before they start to grow to control such weed problems. Because the target for this herbicide is mature leaf area, an application will be most effective if the weed leaf area is allowed to green up in the spring. However, the application must be made before vines start to grow. Therefore, optimum timing for this application can be determined by watching for the first sign of bud swell on vines. A moderate rate of glyphosate in a low volume of water (approximately 10 gallons per acre sprayed) often will be effective. Check the product label for application details.

Fig. 37. This vineyard was overrun with quackgrass at the start of its second growing season. Glyphosate herbicide applied before bud break killed this weed infestation except in the area to the left of the post, which was left unsprayed.

Growers who miss this opportunity will be left to rely on more difficult, more costly, less effective efforts to control these weed problems during the growing season.

Replanting

It often will be necessary to replant a small percentage of vines that either never grew or did not survive the winter, as well as those with extremely weak growth. Plans should be made to obtain the necessary vines. Replant as early as the ground can be worked in the spring and before applying preemergence herbicides.

Year 2 Vine Management

Year 2 vine management continues to focus on the development of vine size. If vine growth in year 1 was exceptionally good, then year 2 pruning may involve the first steps in establishing the permanent vine training system. Information on vine training systems is presented in other publications (Zabadal, 1996a, and Zabadal, 1996b). However, most vines in their second year can be pruned and trained in a standard manner that will permit the grower to select any vine training system in year 3. Retain one or two canes per vine with a maximum length extending to about 4 inches below the top wire of the trellis (Fig. 38). The goal in year 2 will be to approximately triple the number of shoots that grew well in year 1. A shoot will have grown well if it attained a minimum length of approximately 30 inches. A quick evaluation of the vineyard at the start of year 2 will indicate the average condition of vines. For example, if vines average four canes at least 30 inches long, then aim for about 12 shoots to be grown in year 2. Double or even multiple trunking of vines is often desirable in cool-climate vineyards. If growth was good in year 1, it may be possible to establish two trunks in year 2. If the vines are self-rooted, the goal is to have trunks arise independent of each other from the ground (Fig. 38a). If the vines are grafted, both trunks must originate just above the graft union area (Fig. 38b). It often will be possible to obtain enough shoot growth from just one long cane in year 2 so that other canes on grafted vines can be pruned to one- or two-node spurs to create a reservoir of growth near the graft union (Fig. 38c).

If the winter was severe, the variety being grown is relatively cold tender or both, check the nodes on vines before pruning to determine the extent of bud mortality. Compensate for bud mortality by pruning less severely. When winter injury is extensive, delay pruning until after shoot growth has begun.

Tying Grapevines

The second and third years of the vineyard are important formative years for the structure of vines. If the trellis is properly constructed and vines are properly pruned and tied to the trellis, vines with straight trunks will develop. The vineyard task of tying can proceed after pruning and trellis maintenance on days when it is warm enough to work with bare hands.

VII. Year 3 Vine Management

Some aspects of vine management in year 3 of a vineyard will be similar to that in year 2. Inspect the vineyard in early spring to determine if overwintering weed growth under the trellis warrants an early-season spray of glyphosate or if there is still a need to replace a few vines. Trellis construction, including end post anchoring, should have been completed by the start of year 3.

Vines at this stage of the vineyard can vary from being as small as those originally planted to being large enough to fill the entire trellis. Pruning, fertilization and crop adjustment of vines at this time should be based on the size of the vine, which is conveniently determined by its weight of cane prunings, not its age.

Training

Year 3 is often the time to initiate the permanent vine training system. The choice of a vine training system is a major decision in the life of the vineyard. Factors to consider when choosing a vine training system (Zabadal, 1996a) and training system options for cool-climate vineyards (Zabadal, 1996b) are presented in other publications.

Pruning

Vines should be managed in year 3 according to their size. The actual size of individual vines is not apparent after they have been pruned, so as a part of the pruning process in the third year of the vineyard, growers need to determine the average size of vines and employ a strategy to identify vines that are considerably smaller than the average.

To determine the average size of vines, identify sections of the vineyard according to their apparent uniformity of vine size. Prune and weigh the cane prunings of 10 vines in each section.

Vines are considered small, medium, large or extra large when they develop approximately 0.2 or less, 0.3, 0.4 or greater than 0.4 pounds of cane prunings per foot of trellis (per foot of canopy on three-dimensional trellises). For example, vines on a 6-foot vine spacing would be considered small, medium, large or extra large if they developed approximately 1.2 or less, 1.8, 2.4 or more than 2.4 pounds of cane prunings per vine, respectively.

The smaller the vine, the less it should be cropped. However, it is not possible to apply such management if differences in the sizes of vines are not identified in some way during pruning. One strategy is merely to prune small vines as severely as required to reduce the fruiting potential of the vine. If the vine is not much larger than it was when it was planted, prune it to three to four nodes. If the vine matured only four canes that were 30 inches or more in length, prune it back like a second-year vine — i.e., to a 12-node cane. That is the easiest approach.

With such severe pruning, however, winter injury could result in fewer shoots growing out than desired. Regardless of winter injury, severe pruning will limit leaf area development on vines that are already smaller than average. Therefore, a second strategy for small vines is to prune them with the same pruning severity as the other vines in the vineyard but mark them with flagging tape at the time of pruning. In its simplest application, all marked vines are completely defruited to promote their vegetative development. Two colors of tape may also be used to indicate partial or complete defruiting. In this way, small vines can be pruned to develop substantial leaf area without adding crop stress.

Controlling Weeds

Preemergence herbicides that were not legally available for the first 2 years of the vineyard may be registered for use in year 3. Growers should seek counsel from Extension and private consultants on options for preemergence weed control in vineyards 3 years old and older. Nevertheless, the strategy is the same as in previous years — i.e., apply preemergence weed control early in the spring so that the relatively water-insoluble herbicides may be fully activated in the surface of the soil early in the growing season.

Fertilizing with Nitrogen

Nitrogen fertilization in the third-year vineyard will be guided by soil type and the average vine size that has developed in the first 2 years of growth of the vines. Increase fertilizer rates on light soils that have low organic matter and, therefore, release less nitrogen to vines. If vines are already larger than 0.4 pounds of cane pruning per foot of trellis, do not apply nitrogen fertilizer. Large vines (approximately 0.4 pounds of cane prunings per foot of trellis) with good weed control under the trellis should be fertilized with approximately 30 to 60 pounds of actual N per acre. If vine size is less than 0.4 pounds of cane prunings per foot of row, apply 60 to 100 pounds of actual N per acre. A maximum application of 100 pounds of actual N per acre is recommended for all vineyards with a single-curtain trellis.

Controlling Pests

The pest control strategy in most third-year vineyards changes from that in years 1 and 2 because vines will be managed to produce some crop. Diseases such as black rot, *Phomopsis* cane and leaf spot, and *Botrytis* bunch rot, as well as insects such as grape berry moth, may now threaten the health of the fruit itself. Therefore, growers should apply a spray program that also includes control of these potential problems.

Pesticide information for these sprays is presented in Michigan State University Extension bulletin E-154, "Fruit Spraying Calendar."

Controlling Crop

Overcropping is the greatest hazard to a vineyard in year 3. Several factors predispose vines to this stress. First, the establishment of a vine training system in year 3 often causes a grower to retain more live nodes with more total fruitfulness on the vine than is warranted. Second, vines in year 3 often have highly fruitful nodes that developed on non-fruiting, open-canopy vines in the previous year. Third, a vineyard in its third year presents the first opportunity for a grower to easily place more fruiting nodes on the trellis than are warranted. Fourth, a grower is often understandably eager to obtain income from a new vineyard. Therefore, even veteran growers too often retain too much crop on third-year vines. Such a large crop may not acceptably mature and, more importantly, vine size may decline rather than increase in year 3. Income derived from heavy cropping in year 3 can be offset in later years by costs required to regain vine size. For all these reasons, crop control is a major focus of good vine management in year 3 of the vineyard.

If large vine size has developed during the first 2 years of the vineyard, then cropping at 4 tons per acre or even more may be fully warranted. For example, it has been possible to crop the 'Niagara' variety at 7 tons per acre in year 3 without any harm to the vines. However, if the development of vine size is lagging going into year 3, then cropping at 1 or 2 tons per acre, or even no cropping, may be the appropriate management for year 3 of the vineyard.

Information on vine size that was obtained at the time of pruning can be used to determine the desired level of cropping for the vineyard in year 3. For juice grape varieties, vines that average 0.1, 0.2, 0.3, 0.4 or more than 0.4 pounds of cane prunings per foot of trellis should be managed to produce no crop, 1 to 2 tons, 3 to 4 tons, 5 to 6 tons or 6 or more tons per acre in year 3, respectively. For vines on a 7-foot spacing,

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Other Extension Bulletins in this series:

E-2642, Table Grape Varieties for Michigan
E-2643, Wine Grape Varieties for Michigan
E-2644, Vineyard Establishment I: Preplant Decisions

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