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Vine Pruning

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Raisin vines are pruned for three main reasons:

- to keep the vine in a shape that conforms to the trellis system and facilitates vineyard operations
- to remove old wood and retain fruiting canes or spurs for the current season crop, plus spurs for future fruit wood placement
- to select a quantity and quality of fruiting wood that is in balance with vine growth and capacity

The choice of pruning method is largely influenced by the fruitfulness characteristics of the vine variety. 'Thompson Seedless,' 'Fiesta,' and 'DOVine' are cane-pruned because of their low fruitfulness at the basal node positions. In Figure 13.1, the basal three node positions on a 'Thompson Seedless' fruiting cane are shown to be of low fruitfulness. These positions, normally used for fruit production in spur pruning, are too low in fruitfulness on a 'Thompson Seedless' vine to be useful as fruiting wood. Instead, 12- to 15-node canes are retained because of the higher fruitfulness throughout the remaining node positions, particularly in the middle of the cane.

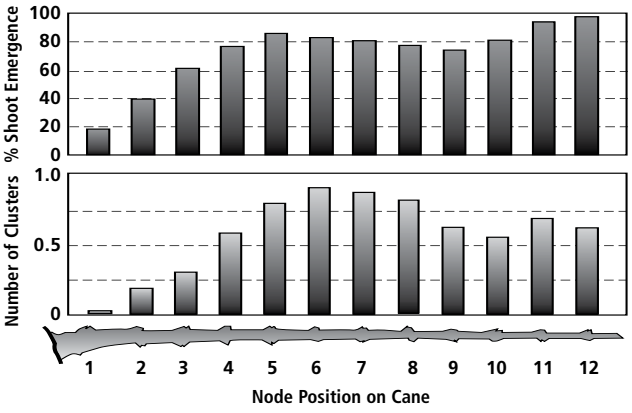

Figure 13.1 Bud break and fruitfulness pattern of 'Thompson Seedless' fruiting canes. The mean percentage of shoot emergence and number of clusters per node are shown for each node position, 1 through 12, from the base. The graph represents a mean of 48 data canes recorded over 3 years.

'Zante Currant' is fruitful throughout the cane length, including the basal nodes, so it is sometimes spur-pruned. Most often, however, this variety is cane-pruned to produce a greater number of clusters in order to compensate for its small cluster size. 'Muscat of Alexandria' is always spur-pruned because of its high fruitfulness. Its basal nodes are fruitful, as are many of the latent buds that emerge from older wood. It also produces many large clusters, further contributing to its potential for large crops. Look for further information on pruning these varieties in chapter 6, Raisin Grape Varieties.

BASIC CANE PRUNING—'THOMPSON SEEDLESS'

For 'Thompson Seedless' vines, pruning has traditionally been regarded as a practice that can regulate crops and enhance raisin quality. Pruning is only one important factor among several others that play important roles, however: yearly climate variations, vineyard health and vigor, and irrigation practices. Weather events can affect bud fruitfulness, fruit set, and berry growth. A grapevine also tends to adjust the size of the crop to suit the vine's capacity. This adjustment can take the forms of reduced bud break, smaller clusters, reduced fruit set, and smaller berry size—regardless of certain pruning levels. This is not meant to minimize the crop-adjustment benefits of pruning, but to maintain perspective with regard to other influencing factors. Above all, pruning is an essential tool that allows you to retain enough quality fruiting wood to ensure sufficient cluster count and crop potential. Don't expect pruning level adjustments to improve raisin quality significantly unless you are willing to reduce cane numbers by one-third or more.

Vine shape. Fruiting canes and renewal spurs are borne from the head, which originates at the top of the trunk. Ideally, the head should be a narrow fan shape, with arms that do not extend too far into the row middle. The head is usually located within 6 to 18 inches (15 to 45 cm) of the fruiting wires onto which canes are wrapped, and is kept at a desirable height by permanent branches, or arms. Poor placement of the arms may not affect vine yield, but it certainly makes cane selection and efficient pruning more difficult. Poorly placed arms are either too high or too low, or are crowded or in a position that interferes with cultural practices and the use of vineyard equipment. High arms tend to become dominant, shading lower growth, and often result in poorly shaped, "bald-headed" vines with no arms. Low-headed vines have canes that originate in low, shaded portions of the canopy, and must extend a distance upward for tying. These conditions reduce bud fruitfulness and bud break on much of the length of the canes.

You can lower or eliminate high arms by pruning to lower cane growth and replacement spurs. Add or raise arms by leaving canes and spurs on two-year-old wood at the desired position and height. Radically reshape vines only if it is absolutely necessary. It will cause large pruning wounds, which provide infection sites for the canker-producing fungal diseases Eutypa dieback and bot canker. These diseases cause the gradual die back and loss of permanent vine structures.

Cane selection. In cane selection, you determine the quality, position, and number of fruiting canes to be retained. Cane quality influences the bud break percentage, fruitfulness, and shoot and cluster development. Preferred canes are mature, round, and of medium diameter and internode length, and have buds that appear to be well filled. Of equal or greater importance is the position of the canes in the vine canopy when they were green, growing shoots during the previous spring and summer. Their performance is greatly enhanced if they have developed in a high light environment. Such canes are commonly called *sun canes,* as opposed to *shade canes,* which develop in low light conditions inside the canopy. A graph of this effect (Figure 13.2) demonstrates the relative fruitfulness of sun canes and shade canes in a trial near Reedley, California.

Research has clearly demonstrated that good light exposure is the most important factor in bud fruitfulness and cane performance. Fruit bud differentiation occurs during May and June when the buds are developing on the growing shoots. Shoots that are shaded during this period are much less likely to develop flower cluster primordia in their buds. It has also been shown that shading of the shoot and its leaves later in the growing season can further contribute to bud death. This is referred to as *bud necrosis*. It may be an important reason why shade canes have reduced bud break (blanks or blind eyes), as well as lower fruitfulness.

The presence of lateral or secondary shoots on a cane also influences its fruitfulness. Studies have demonstrated that buds at nodes that bear a strong lateral shoot tend to produce more shoots and clusters. This is especially true at nodes that produce woody lateral shoots that persist at pruning time. Nodes with woody laterals have been shown to produce about twice as many clusters as nodes without woody laterals on the same cane. This is useful knowledge during pruning, as it enables the pruner to look for fruiting canes that bear woody laterals.

Fruiting canes are usually selected from mature primary shoots. Sometimes vigorous primary shoots also produce one or more strong lateral shoots that mature as canes. These lateral canes tend to have a smaller diameter and shorter internodes than primary canes, but are worthy of consideration in cane selection. Sometimes they are of better quality than the primary canes from which they originate. You can select them by simply removing the primary cane beyond where the desired lateral cane originates. These lateral canes are unique in that they have fairly uniform fruitfulness at all node positions throughout their length.

Sucker canes or *bull canes* are canes that grow very rapidly, with long internodes and a somewhat flattened shape. They often originate from older wood on the vine and often they do not fully mature. Pruners usually avoid selecting these canes because of their appearance and questionable performance reputation. Such canes can be of normal fruitfulness, however, if they are mature, if they have grown in good sunlight

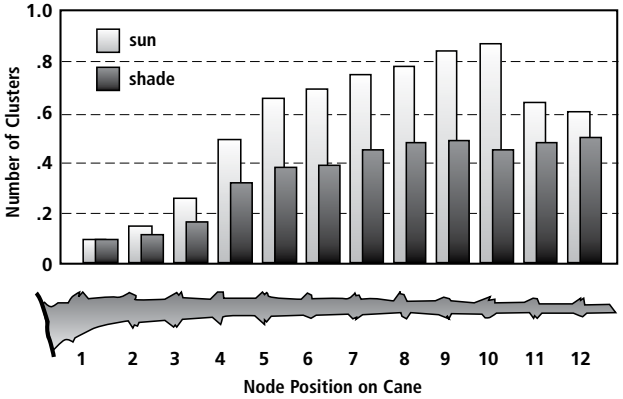

Figure 13.2 Fruitfulness pattern comparison of 'Thompson Seedless' sun and shade canes. The mean number of clusters per node is shown for each node position, 1 through 12, from the base. The graph represents a mean of 30 canes of each type, selected from trial vines.

conditions, and especially if they bear woody laterals. Such canes can be important in very vigorous canopies where you want a greater number of canes but your selection is limited by immature wood and excessive shade canes. The acceptability of sucker canes that are also sun canes reinforces the strong influence of sunlight on bud fruitfulness and cane selection.

After taking all of these factors into consideration, pruners should select first for sun canes, especially if they retain woody lateral shoot growth. This can include selecting strong woody lateral shoots themselves as canes. It can also include selecting sucker canes that could be classified as sun canes. Other factors to consider include the canes' overall appearance and maturity, their position for ease of wrapping on the trellis, and their conformity to the overall vine shape.

Amount of fruiting wood. The number of fruiting canes you will want to retain depends on the vineyard's history, vine growth and vigor, and the availability of suitable canes. A vigorous vineyard on a deep, fertile soil with a history of large, well-matured crops should retain a high number of canes per vine; a vineyard with small, weak vines should have only a few canes per vine. Individual vines that performed well with high cane numbers the previous season can continue with similar cane numbers. Reduce the number of canes on vines with poor growth and poor cane renewal.

Typically, large canopied vines, especially those on a crossarm trellis, should retain six to eight canes, medium or average growth vines should retain about five canes, and below-average vines should have three to four canes. These are very general recommendations and should be adjusted to the vineyard situation and individual vine appearance. For example, vineyards that typically bear large crops of poor maturity should be pruned more severely, while those that bear medium-sized crops on a very large canopy should retain more canes. Cane numbers should be based on the pruner's judgment of total vine growth, potential cane selection, and knowledge of cropping patterns.

Studies have shown that seasonal differences often have a greater effect on cluster numbers and crop development than do differences in pruning levels. Leaving fewer cane numbers to reduce the crop level and improve fruit maturity may have a minimal effect, compared to normal variations in fruitfulness and extreme weather differences. Vines with high numbers of canes tend to have a lower bud break percentage, reduced fruit set, and smaller berries. These normal vine adjustments will often result in crops comparable to those of vines with lower numbers of canes. Leaving fewer canes will have the opposite effect: a higher bud break percentage, increased fruit set, and larger berries.

This normal vine compensation modifies those crop size and quality differences that one can achieve with pruning. Leaving one or two canes fewer or one or two canes more per vine may have little or no influence on yield or quality in any single year. It may take variations of 50 to 100 percent in cane number to significantly influence raisin quality. By simply following the guidelines explained above for determining the number of canes according to vine growth, you can maintain vines at close to their production capacity of normal quality raisins in most years.

Some situations require special consideration in cane numbers. 'Thompson Seedless' vines are extremely fruitful in the first bearing year during vineyard establishment. This is normally when the new vineyard is in third-leaf. That year, the fruiting canes are about twice as fruitful as normal. These vines have unusually fruitful basal node positions and very fruitful spurs. Thus, it is normal practice to leave only two 12-node canes on a vine of average to above-average vigor. Such vines will typically produce 40 to 50 clusters that year. Weaker vines should have no canes, or one cane at the most.

You may need to leave as many canes as possible on an excessively vigorous, mature vine in order to both ensure adequate cluster numbers and slow vine growth. Such vines will have a high proportion of shade canes and poor-quality canes, some of which you may have to leave on to achieve adequate vine node numbers. Thus, because you expect low-average cane performance, you may want too leave as many as 10 to 12 canes on each vine.

Spur selection. Renewal spurs are intended to produce canes for the following year. They are usually left on the vine's arms to ensure that canes will develop from acceptable positions with regard to maintaining vine shape. You should, where possible, choose from behind the fruit canes in order to prevent the vine from spreading too rapidly. Spurs that project too far toward the row middle should be removed. A narrow, fan-shaped vine should be your goal.

Number of spurs. As a general rule, a few more spurs are left than the number of canes. This is because some of the spurs will fail to produce suitable canes. However, canes are just as often selected from latent bud positions and last year's canes as from renewal spurs. Thus, it seems reasonable to leave only those spurs that are in a good position for renewal or replacement and of sufficient diameter to ensure good growth (i.e., ⅜ inch [9 mm] or more). Typically, this will result in about five to eight spurs per vine.

CANE PRUNING PRACTICE

To prune dormant, mature grapevines, you remove old fruiting wood, select next year's fruiting canes and cut them back to the desired length, select renewal and replacement spurs, and remove any unwanted canes and arms from older growth. A typical sequence of this selective process is diagrammed in Figure 13.3, and can be described as follows (parenthetical notes refer to the figure). First, examine the vine to determine the previous season's pruning level and the approximate number of canes present that are suitable for the coming season. For example, a vine of adequate growth and wood maturity that carried six canes the previous season can carry at least six canes next year. Next, select the best canes to retain while you remove the previous year's canes from the wires. If possible, prune (*cut 1*) the previous year's cane (*OC*) back to near its origin on the arm, while leaving at least one well-placed, mature new cane (*NC*). Sometimes you will need to leave a new cane (such as NC_2 or NC_3) out on the old cane just because of poor cane selection nearer the arm. The selected cane (NC_1) is cut back to 12 to 15 nodes (*cut 2*).

In this example, the retained fruiting cane (NC_1) originated from a two-node spur that had been left the previous year (*OS*). This spur produced two strong shoots. The upper one was retained as a fruiting cane; the lower one was pruned back to two nodes (*cut 3*) for a renewal spur (*RNS*). A water sprout had also emerged from a latent bud near the base of the arm. It could be retained as a fruiting cane or pruned back (*cut 4*) as a replacement spur (*RS*). The replacement spur can be used as a new fruiting cane position in future years. This is desirable if the arm is extending out too far or does not renew desirable fruiting wood at its apex.

An *ideal vine structure* after pruning is shown in Figure 13.4. The ultimate goal is to produce a symmetrical vine with four or more arms extending along the row at a height from which the canes can easily reach the trellis wires. Renewal and replacement spurs are positioned to help ensure cane selection and arm maintenance. While this type of ideal vine can be difficult to achieve and maintain, you can use it as the ultimate target when instructing pruners.

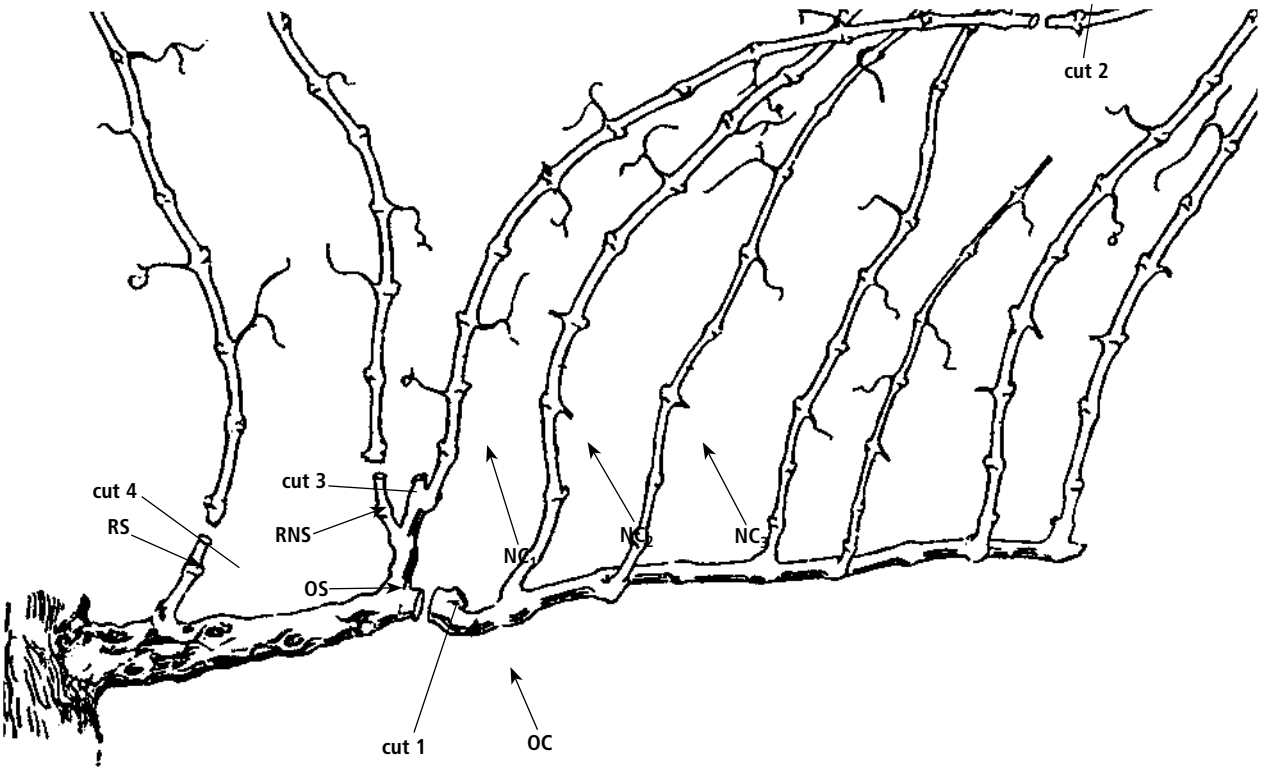

Figure 13.3 A 'Thompson Seedless' grapevine arm, showing pruning cuts for old cane removal and selection of new fruiting canes and spurs. OC = *older cane* retained the previous pruning season; NC = *new canes* from previous season's shoot growth for fruit cane selection; OS = *old spur* retained the previous year for renewal of fruit canes; RS = *replacement spur* retained for reserve of a new cane position; and RNS = *renewal spur* for the renewal or production of fruit canes for next year.

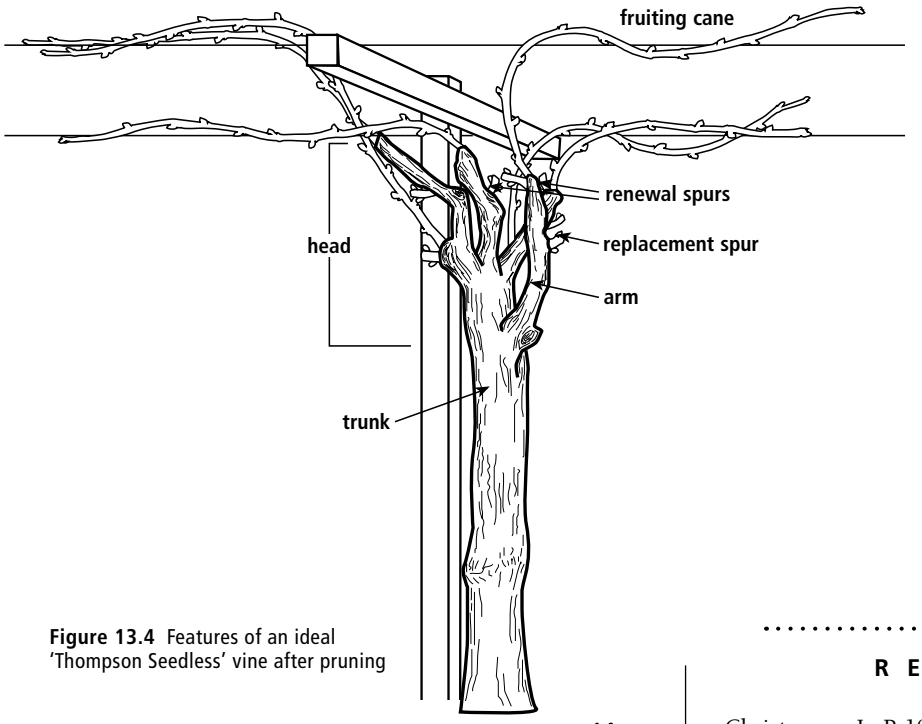

Figure 13.4 Features of an ideal 'Thompson Seedless' vine after pruning

RESTRICTION OF PRUNING WOUNDS

All pruning wounds should be as small as possible, especially in the main body and other permanent parts of the vine. Large pruning wounds are more susceptible to infection by the canker-causing fungal diseases Eutypa dieback and bot canker (see chapter 22, Diseases). Avoid making large saw cuts unless necessary, especially if they would serve aesthetic purposes only. If you must make large cuts, you can treat the pruning wounds with fungicide or prune late in winter when wound invasion by fungal diseases is less likely.

DISPOSAL OF PRUNINGS

A typical two-wire trellised 'Thompson Seedless' raisin vineyard will produce about 4,444 pounds of prunings per acre (4,977 kg/ha). The dry weight would be about 2,000 pounds per acre [2,240 kg/ha). These prunings are approximately 0.305 percent nitrogen and 0.252 percent potassium on a fresh weight basis (0.685 percent nitrogen and 0.560 percent potassium on a dry weight basis). If incorporated into the soil, they will return approximately 13.7 pounds of nitrogen and 11.2 pounds of potassium per acre (15.3 kg N and 12.5 kg K/ha). This nutrient contribution, along with the organic matter the prunings provide, are incentives for shredding and incorporating prunings into the field rather than removing them.

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