Grape training and pruning in Iowa

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Grape Training and Pruning in Iowa

S. W. Edgecombe and T. J. Maney

The Concord grape and grapes of this type and hardiness, which are the grapes most widely grown in Iowa, require yearly pruning if the grower wishes to obtain heavy annual yields of large-sized high-quality fruit. The illustration on the cover of this bulletin indicates the development and distribution of the fruit which may be expected on correctly pruned vines.

Far too many home vineyards are left unpruned or are incorrectly pruned with the result that they are unproductive and unsightly. There are many systems used in training the American grape, but the system which seems to be best adapted to Iowa conditions is the single-stem four-cane Kniffin system. The spur method of pruning, which has been employed to a considerable extent with the European grape, is still followed in many sections of Iowa. Unfortunately, this method is unsatisfactory with the Concord grape and, except with grapes trained on arbors, should not be used. The grapevines pruned by the long cane method and trained to the Kniffin system in certain Iowa tests have repeatedly out-produced those pruned by the spur method. The Concord produces the heaviest yield of fruit from approximately the fifth to ninth bud and the lowest yield from the first four buds on the cane. Therefore, it can be seen that with the spur method of pruning, when only the first two buds are left on each cane, the heaviest producing buds are removed. The characteristic bearing habit of the American grape explains why long cane pruning is more productive than the spur cane system.
GENERAL INFORMATION

To prune a vine intelligently one should have a knowledge of the behavior and function of each plant part. Many times, because of lack of knowledge of the fruiting habit of the vine, a pruner may remove all the fruiting wood. The continued use of spur pruning, or failure to prune vines annually, also often indicates a general lack of knowledge of the fruiting habits of most American grapes on the part of the pruner.

SOME TERMS AND FACTS

The grapevine under the Kniffin system of training consists, above ground, of a permanent trunk and four short lateral branches or arms which are more or less permanently fixed to the trellis wires. The bark on these older parts is distinctly rough and shredded. From the canes produced on the arms, an abundance of new long shoots grow annually and at the end of the growing season become canes smooth in
texture and light reddish brown. These canes are the parts of the vine in which the pruner is most interested, because the canes bear the fruit buds at the nodes and from these arise shoots which bear the fruit near the base. Since this is true, the pruner must select annually at least four canes to produce the crop, and furthermore he must make provision for the growth of properly placed renewal spurs to produce next year's crop.

**Trunk**

The main stem of the grapevine from the ground to the top wire is termed the trunk. It serves the plant mainly as the fundamental framework and translocates water, mineral elements and plant foods between the roots and the leaves. Hence a strong trunk from the ground line to the top wire is necessary. Longer trunks are of no practical value and are mechanically inefficient.

**Arms**

The short lateral branches of the trunk from which the canes and renewal spurs may arise are more or less permanent and are called arms. The two sets of arms are best located below the lower and upper wires respectively. The arms are used solely for the production and support of the canes and renewal spurs and are kept as short as possible. When they become more than a foot long, they should be renewed.

**Nodes**

The position on the cane where the leaves are, or have been attached, and where the bud is located is termed the node. The space between two nodes is termed an internode. Usually Concord canes which have a space of from 5 to 8 inches between the fifth and sixth nodes are most productive.

At each node the grape has a compound bud or "eye." This eye is composed of three or more buds of which normally only one grows and produces fruit. Under abnormal conditions, as when late frosts destroy the shoot from the first bud, one of the other buds may develop and produce a fair crop
The best fruiting canes are about the diameter of a lead pencil and 4 to 8 feet long with about 5 inches between the nodes. Generally, the most fruitful Concord canes are those having a diameter of $\frac{1}{4}$ inch or slightly larger between the fifth and sixth nodes. Canes with diameters more than $\frac{1}{3}$...
inch or less than ¼ inch are generally low in fruit production. When all the canes are larger than ½ inch, it may be desirable to save canes for fruiting which have short laterals rising from the nodes. These laterals should be cut back to two or three buds and the main cane headed back just beyond the last selected lateral. Excessively large canes are commonly called “bull” canes and indicate an over-vegetative condition in the vine.

Renewal Spurs

Provision must be made for new canes each year, since the grape produces fruit only on canes grown during the previous season. This renewal is accomplished by leaving one or two renewal spurs on the arm as close to the trunk as possible. These two-bud canes are termed renewal spurs. The shoots developing from them may be used for fruiting canes the next year. This renewal system permits the removal each year of the cane which has fruited and enables the pruner to keep his vine within its allotted space on the trellis. When the fruiting canes used are not selected from those arising from renewal spurs, the pruner is forced to select desirable canes farther and farther from the main trunk each succeeding year. Thus the vine will be extended so that it will occupy the space which normally would be used by the adjoining vines.

Watersprouts

When shoots develop from buds on wood older than 1 year, they are termed watersprouts. They are similar to watersprouts which develop on fruit trees and are usually unproductive, but at times they may be used to develop new arms. They are the chief source of renewal spurs.

When watersprouts develop directly from the main trunk, at or below the surface of the ground, they are best removed early in the growing season. When the old vine is injured by insects or diseases or by any other cause, the sucker may be used to develop a new fruiting top and in this case is trained according to the directions described later.
TRAINING GRAPES TO THE SINGLE-STEM FOUR-CANE KNIFFIN SYSTEM

In Iowa grapes are set in early spring. For the home vineyard the ideal spacing is to set the vines 8 to 10 feet apart in the row with the rows 8 to 10 feet apart. If four or more rows are to be set, the space of 8 feet should be left between the first and second row, 10 feet between the second and third and 8 feet between the third and fourth. This arrangement will permit ample room for all cultural operations. When the grapevine is planted, select the most satisfactory cane and cut it back to two buds, and then remove all the other canes. The shoots arising from these buds may be tied to a single stake during the first season, although usually they are allowed to remain on the ground. Tying the shoots to a stake, however, will prevent damage to them during cultivation.

The pruning in the second spring is dependent on the amount of growth which the vine made during the first growing season.

If the cane is long enough it may be tied to the top wire of the trellis. If it has not made sufficient growth to reach the top wire, it should be cut back and tied to the lower wire. If the growth is not sufficient to extend the cane to the lower wire, it should be cut back to two buds as at planting time. This heading back will usually induce the vine to make vigorous growth the following summer.

The pruning the third spring depends largely on how the vine was trained the second spring. If the cane was tied to the top wire, it should have thrown out shoots which may be developed into side arms on each of the two trellis wires. These side canes, preferably just below the wires, should be headed back to four or five buds each. Such growth is rather unusual under Iowa conditions. If the vine was cut off at the lower wire, it should have made sufficient growth so that one of its most vigorous canes may be brought up and tied along the top wire. Undoubtedly other canes may have developed lower down on the vine, so that two of them may be pruned on the lower wire. These fruiting canes should be cut back to four or five buds. All other growth should be
Fig. 3. Diagrammatic representation showing the steps in pruning and training a grapevine to the single-stem four-cane Kniffin system. In the sketches, the light lines indicate 1-year-old wood and the heavy lines, older wood.

A—A newly planted vine cut back to two buds. B—Pruning in the second spring consists of cutting back a strong cane to the lower wire. The dotted line shows how a very vigorous cane might be trained. Weak vines are again pruned back as in "A." C—Pruning in the third spring consists of training two canes along the lower wire and cutting them back to four or five buds. Another vigorous cane is taken up to the top wire and bent along it right or left for four or five buds. D—Pruning in the fourth spring consists of selecting one fruiting cane arising from each of the three permanent arms. Renewal spurs are also selected on each arm. The fourth fruiting cane is selected for the top wire. E—Pruning in the fifth spring shows that the permanent framework of the vine with its trunk and four arms is now established. The pruning of this vine consists of leaving a fruiting cane with 10–15 buds on each arm; provision for the renewal of these canes is made by leaving two-bud renewal spurs somewhere on the arm back of the base of the fruiting cane. All other cane growth is removed.
removed. The vines which were cut back to two buds should have made sufficient growth to carry the most vigorous cane up to the top wire to which it is tied and subsequently trained as indicated for the more vigorous vines.

At the time of the fourth pruning the permanent framework of the vine should be well established, and considerable fruit production should be expected during the fourth season. Therefore the vines should be pruned with fruit production and framework in mind. A portion of each of the fruiting canes left the preceding year becomes a permanent arm. From each of these arms there should have developed strong lateral growths, and from each of these a cane of the most fruitful type, as previously described, should be selected. Also, a renewal spur is selected on each arm back of the fruiting cane. Usually, when the pruning is finished, a total of 20 to 24 buds is left on the four canes on the 3 to 4-year-old vine. The distribution is five to six buds on each cane. However, if the vine is very vigorous a few additional buds should be left on each cane. If the growth has been weak, fewer buds than 20 should be left.

![Fig. 4](http://lib.dr.iastate.edu/bulletinp/vol1/iss7/1)
Fig. 5. The same grapevine as in fig. 4 after training. Note that the fruiting canes have been selected close to the trunk, and their renewal has been provided for by renewal spurs at A. The canes marked B are those which were selected for the fruiting wood. On them one can detect the nodes from which the shoots will develop with the clusters of grapes.

In this and all subsequent pruneings it is highly important that provision be made for the annual renewal of fruiting canes. This is best done by leaving one or two renewal spurs on each arm as close to the main trunk as possible. If this practice is strictly adhered to the vines can always be kept within their proper boundaries. After the four fruiting canes and the renewal spurs are selected all the other growths must be removed.

Pruning the fifth spring and each spring afterwards is very similar to the fourth spring pruning. A normal vigorous vine will be able to produce high-quality fruit on 40 to 60 buds. More vigorous vines will produce high-quality fruit on more buds, while weak vines will be unable to produce good fruit on 40 buds. The amount of pruning given the grape, therefore, is a matter of good judgment on the part of the pruner as to how many buds to leave in order to produce a normal crop. More buds should be left on vigorous vines and fewer on weak vines. Once the vine is permanently established under the Kniffin system, the pruning is practically the same as outlined for the fifth spring.
TIME OF PRUNING

Since freezing injury may occur to the vines in Iowa during the winter months, experience indicates that the time to prune grapes is after the period of injurious low temperatures is past. Pruning in most home vineyards can be done easily in a few hours’ time in late March or early April. Pruning should be done before the buds become swollen, since such buds break off easily during the pruning operations. Late pruning of the vine frequently results in "bleeding." Research has shown that late pruning with heavy bleeding does not injure the grape. It is better, therefore, to prune late rather than not at all.

Summer pruning, which consists of pinching off the tips of new shoots and cutting off vigorous growing shoots, has sometimes been used indiscriminately and unintelligently. Summer pruning has been used with the idea that it tends to produce early-ripened, high-grade fruit. Summer pruning will weaken the vine and may cause sunburning of the berries and reduce the yield. In general, it is not recommended. The successful maturing of the fruit of our common grape varieties is dependent on the vigor and health of the foliage rather than on the exposure of the fruit to the sunlight.

PRUNING NEGLECTED GRAPEVINES

Old vines, no matter how old, may be rejuvenated and brought back into good production. Grapevines, due to their habit of bearing on year-old wood, can be quickly rejuvenated.

Before starting to prune an old vine, one must select suitable canes. It is most desirable to select four canes, each having 10 to 15 buds. These canes should originate as close to the main trunks as possible. Generally the fruiting wood or canes on the neglected vine will be 10 feet or more from the trunk. After the fruiting canes are selected, several renewal spurs should be selected on the main trunk back of the fruiting canes. Sometimes a new cane will be found growing near the base of the main trunk. When such a cane occurs, it should be brought up and tied to the upper wire. If the growth is sufficient this cane should be trained along the
wire for a distance of a foot or two. Subsequent training of this vine is as outlined under the Kniffin system. With this provision for renewal the original trunks of the old vine may be entirely removed as soon as the new vine has sufficient fruiting wood. If the pruner does not care to rejuvenate the old grapevine in this manner, he may cut it off at the surface of the ground. Usually several new shoots will arise from the stub to provide for the remaking of the new vine on the trellis.

MISCELLANEOUS INFORMATION

TRELLIS

Durable wood or steel posts should be used for the trellis. The end posts should be braced firmly. The lower wire of the trellis should be fastened 30 to 36 inches above the ground and the top wire 30 inches above the lower. The line posts in a row of vines spaced 8 to 10 feet should be set 16 to 20 feet apart. Each post should be set midway between two vines which, with the above arrangement, will leave two vines between every two posts. Posts set otherwise complicate the training, pruning and tying.

TYING

The main trunk should be fastened firmly to the upper and lower wires of the trellis. The tie to the upper wire should be tight, the lower rather loose. Each of the fruiting canes should be fastened to the trellis wire by two ties, the first near the base of the cane, the other just back of the last bud. The basal tie should be made loose enough to prevent girdling of the growing cane, but the end tie should be applied tightly to prevent the canes from slipping due to wind or weight of fruit. Almost any sort of strong cord or twine may be used in tying, although soft jute twine is the most desirable because it adheres firmly to the wire. In tying, the cord should be wrapped twice around the wire and then once around the cane or trunk. The double wrapping will tend to keep the cord from slipping. Wire is undesirable as a wrap.
INSECTS AND DISEASES

Sometimes high-quality grapes may be produced without spraying. However, leaf hoppers, flea beetles, berry moth, rose chafer, grape root worm and other insects together with the diseases like mildews, black rot and anthracnose, may destroy the crop unless the grapevines are properly sprayed. The recommended spray schedule for grapes is to apply a 4-6-50 bordeaux mixture and 1½ pounds of lead arsenate (1) when the shoots are 1 to 2 inches long, (2) just before bloom, (3) just after bloom and before the berries begin to touch each other in the cluster, (4) 10 to 14 days after the preceding spray and (5) 10 to 14 days after the last spray. When leaf hoppers are numerous, ½ pint of nicotine sulphate to 50 gallons of the spray should be applied as soon as the young insects are readily noticeable on the under side of the leaves. Under no circumstances should lime sulphur be used as a summer spray. In some cases the grapevine borer has done considerable damage to Iowa vineyards. This insect is best controlled by burning the prunings. Consequently, the prunings should not be left in or near the vineyard or used in dams to control soil erosion.

VARIETIES

The Concord is the leading variety of blue grape for Iowa. The Fredonia, a relatively new variety, is earlier than the Concord and is worth planting. The Worden and Moore Early are two other desirable blue grapes. Beta is a small blue grape reliably hardy even in northern Iowa. It is suitable for juice and jelly making. The red and white grapes are not very hardy even in southern and central Iowa, but they are worth planting on account of their high quality. The most satisfactory red varieties are Caco and Lucile, and of the white varieties, Niagara and Diamond are very good. Purchase good grade year-old plants. Plant the vines in early spring, as fall-set plants are very likely to be heaved by frost and to suffer winter injury.

SOIL MANAGEMENT IN THE VINEYARD

Grapes do best on a moderately light, well-drained soil, with an east, southeast or south exposure. A west slope is
usually too dry and too hot while a north slope delays maturity. Grapes do not require a soil of high fertility but are benefited by any cultural practice which incorporates organic matter into the soil. Excessive use of nitrogen fertilizers tends to promote wood growth at the expense of fruitfulness. Clean cultivation should be practiced, and provision should be made for planting of a cover crop of oats, rye or buckwheat in mid-July or early August. Such a cover crop will in itself provide some winter protection and by holding the snow will tend to lessen winter injury to the roots. The cover crop also will compete with the vines for moisture and excess available nitrates and thus will encourage early ripening of the wood.

FURTHER INFORMATION

Additional information on the grape or general fruit culture may be obtained by writing the Agricultural Extension Service, Iowa State College, Ames, Iowa.

The following list of bulletins dealing with specific fruit topics may be obtained at your local County Agricultural Agent’s office or by writing the Agricultural Extension Service, Iowa State College, Ames, Iowa:

- Orchards—planning, planting, management. Ext. Cir. 258 (revised).
- Refrigerated locker storage for fruits and vegetables. Ext. Cir. 259.
- Top-working on hardy apple stocks. Ext. Cir. 236 (revised).