Growing grapes in Iowa

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GROWING GRAPES

... in Iowa

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AMES, IOWA
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Growing Grapes in Iowa

The Concord and grapes of this type and hardiness, which are the most widely grown in Iowa, require yearly pruning if the grower wishes to obtain heavy annual yields of large-sized high-quality fruit.

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 outproduced 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.

* Prepared by Department of Horticulture.
Fig. 1. Typical fruiting cane showing the number and type of clusters from each node. It should be noted that the heaviest production is from the fifth, sixth and nearby nodes on the cane. (The first node is on the left side of the picture.)

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; at the end of the growing season the shoots 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; 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 removed.

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 of fruit. Normally each “eye” gives rise to a shoot which may produce from one to five clusters of grapes. Three clusters are the common number. Shoots arise mostly from buds on the year-old wood or canes, but they may arise from buds on older wood. While shoots which arise from older wood may not be fruitful, they often may be used for replacement spurs and general rebuilding of the grapevine.
Fig. 2. The upper cane is too small for an ideal fruiting cane, the lower is an excessively vigorous growing cane which is commonly called a “bull” cane. It may be used for fruiting if the lateral which rises from the seventh node is cut back to two or three buds. The fifth, sixth and seventh nodes are marked on three types of fruiting canes. An examination of the internodes between the fifth and sixth nodes will show that the center cane is between 4 and 8 inches in length and the diameter of the cane is between $\frac{1}{4}$ and $\frac{1}{2}$ inch. These two dimensions indicate an ideal fruiting cane of the type that should be selected in pruning.

**Canes**

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 $\frac{1}{4}$ inch are generally low in fruit production. When all the canes are larger than $\frac{1}{3}$ 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 should be headed back just beyond the last selected lateral. Excessively large canes are commonly called “bull” canes. They 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. In this case it is trained according to the directions described later.

TRAINING GRAPES TO THE SINGLE-STEM FOUR-CANE KNIFFIN SYSTEM

Grapevines may be trained or shaped in a number of ways. The best system is one that requires a minimum of time for pruning and locates the fruit so it is easy to pick and spray. The fruit should also be produced high enough above the ground to lessen the danger of disease.
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.
attack. The single-stem four-cane Kniffin system is the best to use under most Iowa conditions. The pruning methods described below explain how to train grapevines to this system.

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 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 frame-
work 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; 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 vines. 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.

In this and all subsequent prunings 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.

Fig. 4. A mature Concord grapevine trained to the single-stem four-cane Kniffin system before the annual pruning. Note the abundance of canes which may be selected for fruiting.
Fig. 5. The same grapevine as in fig. 4, after pruning. 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.

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 annual 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 late February or March. 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, however, 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 current season’s 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 trunk 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. Usually the neglected vine is full of dead and weak wood. This should first be removed. Often these vines are so lacking in vigor that there are no canes having 10 to 15 good buds. In such cases a larger number of canes should be left, each with a smaller number of buds. Old vines usually have large root systems; consequently, it is necessary to leave 70 to 80 buds for fruiting, rather than the usual 40 to 50.
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. With the above arrangement, there will be two vines between every two posts. Posts set otherwise complicate the training, pruning and tying. Number 9 wire should be used.

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 moderately 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.

**VARIETIES**

The Concord is the leading variety of blue grape for Iowa. Practically 90 percent of any commercial planting, and 75 percent of any home planting, should be Concord. Fredonia, a relatively new variety, ripens about 2 weeks earlier than Concord and is worthy of trial. Moore's Early, ripening 2 weeks earlier, and Worden, ripening a few days later than Concord, are two commonly planted blue varieties. Neither, however, is as hardy as the Concord. Beta is a small, blue grape, reliably hardy, even in northern Iowa. It is suitable for juice and jelly making. Red and white varieties are not reliably hardy, even in southern Iowa, but are worthy of planting for home use because of their high quality. Caco and Lucille are the most satisfactory red varieties, while Niagara and Diamond are the leading white varieties. Two early white grapes worthy of trial in home plantings are Portland and Ontario. In northern Iowa the recently named, new Minnesota varieties, Moonbeam (white), Red Amber (red) and Blue Jay (blue) are worthy of trial.

**PLANTING**

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, a space of 8 feet should be left between the first and second, and the third and fourth rows, with a 10-foot space between the second and third. This arrangement will permit ample room for all cultural operations.

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. In those sections of the state where grapes are
planted on hillsides, the land should be terraced before planting, and the vines should be planted on the terrace ridge.

Plant a well-grown, 1-year-old vine in a hole about 6 inches to 8 inches deep. Immediately after planting, cut back the top to allow only two shoots to grow.

**SOIL MANAGEMENT**

Grapes produce best if they are clean cultivated during the early part of the growing season. In mid-July or early August, a cover crop of oats, rye or buckwheat should be planted. 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.

In home vineyards, a straw mulch heavy enough to prevent weed and grass growth may be substituted for clean cultivation. Bluegrass sod in the vineyard will materially reduce yields.

Grapes do not require a soil of high fertility, but they are benefited by any cultural practice which incorporates organic matter into the soil. Excessive use of nitrogen fertilizers or manure tends to promote wood growth at the expense of fruitfulness.

**INSECTS AND DISEASES**

Sometimes high-quality grapes may be produced without spraying. However, leaf hoppers, flea beetles, grape berry moth, rose chafer, grape root worm and other insects, together with diseases such as 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 spray consisting of \( \frac{3}{4} \) pound of Fermate and 1 pound of 50 percent wettable DDT in 50 gallons of water. Apply four sprays: (1) just before bloom, (2) just after bloom and before the berries begin to touch each other in the cluster, (3) 10 to 14 days after the preceding spray and (4) 10 to 14 days after the third spray.
A 4-6-50 bordeaux mixture plus 1½ pounds of lead arsenate has been the standard spray for grapes and still is extensively used. However, DDT has proved very effective in controlling leaf hoppers and flea beetles. Fermate causes less injury to foliage and gives satisfactory control of black rot.

Under no circumstances should lime sulfur 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.