GRAPE PRUNING IN ILLINOIS

Circular 468

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CONTENTS

Vines of Moderate Vigor Give Highest Yields. ........................................... 4
Kniffin System of Training Recommended. ............................................... 4
Building the Kniffin System Trellis...................................................... 6
Training the Vine on the Trellis.......................................................... 6
Prune Annually After Establishment on Trellis....................................... 9
Determine Bud Number by Vine Performance.......................................... 9
Renew Neglected Vines Gradually......................................................... 11
Arbor Training a Compromise Between Fruit and Shade........................... 14
Long-Cane System Superior to Spur Method........................................... 15
Very Early Spring Is Best Time to Prune............................................... 15
Other Phases of Vineyard Management................................................. 16

COVER ILLUSTRATION

The photograph on the cover page shows the position on the cane where most of the fruit is borne. This vine was pruned to a long-cane system rather than a spur system, so that the best-producing buds would be retained for fruit production (see page 15).

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Grape Pruning in Illinois

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Pruning is essential to the production of high-quality grapes. Neglected grapevines always lack vigor and bear small straggly bunches of small berries. Such vines, however, respond to proper pruning and may be restored to profitable production if there is nothing fundamentally wrong with them.

One of the most common mistakes in grape growing is to prune the vines too little. Grapes require heavier pruning than any other Illinois fruit. More than nine-tenths of the new wood in the Concord vines at the Illinois Agricultural Experiment Station is removed every year, and this practice is recommended to the growers of the state. Concord vines planted before the Civil War in the Nauvoo grape region along the Mississippi river (Fig. 1) have been pruned severely every year since planting, and are still vigorous and productive. An apple tree pruned as severely as these grapes would become a mass of water sprouts, would bear little or no fruit, and would probably die after a few years, but grapevines need this treatment.
Vines of Moderate Vigor Give Highest Yields

The grape requires moderate pruning to produce a medium type of growth which is conducive to the production of a large amount of quality fruit. If the pruning is too light, the vine will make a weak growth and bunches and berries will both be small; if too severe, overvigorous, unproductive shoots, called "bull canes," will develop (Fig. 3).

Well-matured canes of medium size—about 3/8 inch in diameter between the third and fourth nodes, which is somewhat larger than an ordinary lead pencil—are the most fruitful (Fig. 4).

Kniffin System of Training Recommended

Of the many systems of training grapes, five—based upon the direction given to the bearing shoots, that is, whether upright or horizontal—are in prominent use in the United States.

The Chautauqua system, widely used in the Chautauqua grape belt of New York, the Keuka high renewal system, named after Lake Keuka in one of the New York regions, and the fan system, so named because the form of the trained vine resembles a fan, are all based on training the shoots in an upright direction. The Kniffin\(^1\) and Munson

\(^1\)This system is named after William Kniffin, a stone mason of Clintondale, New York, in the Hudson river grape region. It is said that he discovered the method quite by accident about 1850.
Too vigorous shoots on the above vine are the result of severe pruning to 16 to 25 buds for six years. "Bull canes" were already evident in June when this photograph was taken. Such extreme vigor reduces fruit production.

Moderate pruning each year of the vines on the right has resulted in moderate growth, which is most desirable for fruit production. The vines on the left, unpruned for four years, have short shoots and small leaves. This weak growth will bear poor fruit.
systems, named after the men who designed or perfected them, are based on the principle of allowing the shoots to droop.

For Illinois growers the Kniffin system of training is recommended. Of the several Kniffin methods the chief ones are the single-trunk, two-trunk, y-trunk, four-arm, and six-arm. The different trunk forms appear to be equally good, but the single-trunk four-arm form is the one most commonly used. Six arms are recommended for vines growing on soil that is especially rich, for a variety that is unusually vigorous, or when the planting distance is so close that not enough buds per vine can be left on four arms.

In this circular trunk refers to the central stem of the vine; shoot to a growth of the current season; cane to a growth one season old; arm to a cane selected for renewal; and spur to a cane located near the trunk which has been cut back to two buds to produce shoots to be used as arms the following season.

Building the Kniffin System Trellis

The first pruning problem in starting a vineyard is to get the vines established on the trellis as quickly as possible. The trellis may be built at any time before the beginning of the second season. Durability and strength are essential for a good trellis since its renewal is an item of considerable expense.

To make the trellis, set strong durable posts of wood, iron, or concrete about 20 feet apart at regular intervals in the row, with the end posts well braced. Then tightly stretch and fasten to the posts two galvanized wires, preferably No. 9 or No. 10. The lower wire should be about 32 inches from the ground and the top one about 2 feet higher. If a third wire is needed, place it about 2 feet above the second. Well-built trellises may be seen in Figs. 2, 3, and 4.

The trellis is more durable if the wires are placed on the side of the posts from which the prevailing winds come. Do not staple the wires tightly to the posts as in making a fence, but leave them free enough so that they may be restretched as often as necessary to prevent sagging.

Training the Vine on the Trellis

At planting time the one-year-old vine as it comes from the nursery should be cut back to a single stub with two buds in order to increase the vigor of the shoots. During the first season the young shoots may be loosely tied to a building lath as they grow, in order to induce the trunks to grow straight and to make cultivation easier (Fig. 5). By the beginning of the second season the trellis should have been built.
In training the vines select the strongest cane and tie as high on the trellis as its length will permit. Remove all other canes.

If the vine has grown properly, by the beginning of the third season canes in the vicinity of the wires may be selected for arms, two in opposite directions at each wire, or four arms in all. Remove all other lateral canes along the trunk. If the selected arms are long enough, cut them back, leaving the number of buds best adapted to the variety and environmental conditions. A young vine being established on a trellis is shown before and after pruning in Fig. 6.

The arms should be tied firmly to the wires at the time of pruning. A single tying toward the end of the cane is usually sufficient for young vines trained to the Kniffin system; with older, more vigorous vines the canes should be tied twice or more (Fig. 7). If vertical systems, such as the fan, are used, tying at several points will always be required.

Several materials are used for tying vines, twine being the most common. In some regions willow is used almost exclusively, bushes being planted and maintained near the vineyard especially for this purpose.
A young vine before pruning is shown in the upper photograph. The same vine after being pruned and permanently established on the trellis is shown below. The cane with the best laterals was selected for the trunk. All other canes arising from the ground were cut off. Six lateral canes originating near the trunk were selected for arms and were tied to the three-wire trellis. The arms were then cut back leaving the desired number of buds.

The four-arm Kniffin system with a two-wire trellis is the one most commonly used in Illinois, altho six arms are recommended for vines growing on soil that is especially rich, for vigorous varieties, or for close planting distances.
Prune Annually After Establishment on Trellis

The grape must be pruned every year to maintain sufficient bearing wood for best fruit production. With the exception of the trunk, which may be many years old, and the short stubby bases of arms of older wood, the wood left after pruning is all one-year-old.

The arms are renewed each year by selecting canes of medium vigor which originate as near the trunk as possible. A single spur with two buds should be left near the base of each arm to furnish canes for renewal the following year (Fig. 7). Prune off all other canes. Then cut back the selected arms, leaving about the same number of buds on each to make up the total of 40 to 60 buds per vine. If in the selection of the arms it becomes necessary to choose canes varying considerably in vigor, a larger number of buds may be left on the more vigorous canes and fewer on the weaker canes.

Do not leave laterals on the arms except when it is necessary to select a bull cane, in which case shorten the central stem and leave part of the buds on the laterals.

Determine Bud Number by Vine Performance

The number of buds to leave on a vine in order to induce the best fruit production will depend upon the variety, upon the fertility of the soil, and upon any climatic or cultural factors which influence vigor. The more vigorous the growth, the larger the number of buds that should be left.

Concord, Niagara, and Agawam are strong-growing varieties and Delaware, Moore Early, and Catawba are less vigorous. When training a vigorous variety such as the Concord to the Kniffin system, 40 to 60 buds per vine should be left after pruning, according to Illinois experiments. For less vigorous varieties, 30 to 45 buds ordinarily give the best results.

The best bud number for a particular vineyard as a whole can be determined by leaving varying numbers of buds and noting the effect upon vigor and yield, but the ideal procedure is to go further and regard each vine as an individual, adjusting the number of buds to individual vine performance. To illustrate:

If in a certain vineyard 50 buds per vine usually gives the moderate type of vigor necessary for best production,—that is, canes slightly larger than a lead pencil and with few laterals,—a total of about 50 buds should be left on all vines producing this size of cane. If, however, under this treatment a vine has produced large bull canes (Fig. 3, page 5), or if a considerable number of its canes are much larger...
Six medium-sized one-year-old canes as near the trunk as possible were selected for arms in pruning the above vine. A spur with two buds near the base of each arm was left for renewal whenever available (see arrows), and all other canes were cut out. The arms were headed back, leaving the correct number of buds.

in diameter than a pencil and have several laterals, the pruning of the previous year was too severe and the number of buds left might profitably be increased to 60. Other vines will be found that have produced weak, spindly canes \( \frac{1}{4} \) inch or less in diameter. These vines were
not pruned severely enough the previous year and fewer buds, perhaps only 40, should be left.

By treating the vines according to their individual performance, the efficiency of the vineyard will be increased above that possible to attain when the vineyard rather than the vine is the basis for bud determination.

**Renew Neglected Vines Gradually**

It is easy to prune a vine which has been trained to a definite system and pruned annually, but a vine neglected for several years presents a more difficult problem. Very severe cutting would be required to renew completely in one season a vine that has been long neglected. Furthermore such heavy pruning would result in shoot growth so vigorous that little or no fruit would be borne. For this reason it is best to renew neglected vines gradually, so that at least some fruit may be obtained during the process of rejuvenation.

To prune neglected vines trained to the four-arm Kniffin system, renew two arms on opposite sides the first year and prune the other two arms considerably lighter, completing the renewal the following year. If there is no one-year-old wood for renewal, cut back the old arms near to the trunk in order to force out new growths to be used as arms the following season (Fig. 8).

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**Fig. 8.—A Neglected Vine Is Difficult to Prune**

Rejuvenation of long-neglected vines should be gradual, so that some fruit may be obtained during the process. On the vine above, extra trunks and arms should be cut off at the points indicated by the arrows and white lines. The arms to be left should be pruned moderately leaving the best one-year-old canes for fruiting. These arms should be cut out the second year, at which time sufficient new growth will have developed to replace all the old arms.
FIG. 9.—NEGLECTED VINE BEFORE AND AFTER PRUNING

This vine had enough one-year-old canes so that it could be trained to a six-cane Kniffin system. It is not often possible to renew a vine completely in this manner in a single year. The dead wood, weak canes, and superfluous trunks were cut out.
Two vines growing very close together are shown in the upper photograph. The weaker vine on the left was removed. On the other vine a portion of a second trunk about 2 feet long was left in order to lessen the severity of pruning; this trunk may be removed at the next year's pruning or new growth arising from it may be utilized for a permanent trunk. A selection of the best young wood for fruiting was made from the remaining trunk. Most of the older, crowding, unproductive wood, the result of neglect, was pruned out. The young cane indicated by the arrow can be used for a new trunk if desired.
Neglected vines also frequently have several trunks. These should be gradually cut out until only one remains (Fig. 9). When such severe cutting back causes vigorous shoots to come up from the crown, it is sometimes advisable to use one of these new growths to form a new trunk, and to prune the old vine moderately for fruit until the new one becomes established (Fig. 10).

**FIG. 11.—VINE TRAINED ON AN ARBOR SHOWN BEFORE AND AFTER PRUNING**

In training vines on an arbor the simplest way is to extend the central trunk along the top of the arbor and select one-year-old laterals on either side at intervals of 3 to 4 feet. The vine in the above photographs was winter-injured, so that much of the old trunk which would ordinarily be carried along the top had to be cut out and more new canes left.

**Arbor Training a Compromise Between Fruit and Shade**

When grapes are trained on an arbor the primary purpose is to provide shade, and fruit production is sacrificed to a certain extent. It should be clearly understood, however, that even in arbor training more and better quality fruit may be grown by a system which permits
the grower to regulate vigor as nearly as possible in accordance with production.

In arbor training the same principles should be observed as are used in the Kniffin system on an upright trellis, altho variations will have to be made in details. Annual pruning is necessary with either arbor or trellis because only the one-year-old canes produce fruit (Fig. 11). The permanent trunk should be carried along the top of the arbor. Arms of one-year-old wood should then be distributed at intervals of 3 or 4 feet along this permanent trunk. The shoots from these arms will cover the intervening spaces and provide shade.

Pruning of the above character is not severe enough for best results in fruit production, but, as already indicated, on an arbor fruit production is of secondary importance.

Long-Cane System Superior to Spur Method

The Kniffin system recommended in this circular is a long-cane system and is superior to the old “spur” method of pruning. In the spur method all the one-year canes are cut back to two or three buds each. This practice means that in a variety such as Concord, in which the 4th to the 12th buds are much better for fruit production than are the buds near the base, the best-producing buds will be cut off and the weak basal buds, which always bear inferior fruit, left for production. In the long-cane method one long cane is left on each wire and so the best-producing buds are retained.

A single lateral from a vine pruned to the long-cane system is shown in the cover photograph. Poor fruit borne on the shoots arising from the basal buds may be seen at the top of the picture.

Very Early Spring Is Best Time to Prune

Grapes should be pruned in very early spring, but not until after the period of extreme cold is past. Very low temperatures usually kill a portion of the terminal growth, and such killing is in effect the same as pruning, since it reduces the number of buds. If a vine has been pruned to the correct number of buds, and then winter temperatures cause further reduction, the balance is upset. The whole plan of pruning may need to be changed following very severe killing of buds by cold.

Furthermore, pruning should not be done when the wood is frozen, for the frozen canes cannot be handled without being broken. The more comfortable working conditions in mild weather are also conducive to a better job of pruning.

When pruning is done in very early spring, as recommended, it is
completed before the sap flow becomes so rapid as to reduce the loss of sap by "bleeding" at the pruning wounds. Altho experiments have shown that bleeding is not nearly so harmful as was once supposed, because the food concentration of the early sap is very low, there is no good reason for so delaying pruning that severe bleeding will result. It is better, however, to prune rather late than not to prune at all.

Other Phases of Vineyard Management

Altho proper pruning is essential for high yields of good-quality grapes, attention to some other phases of vineyard management is also necessary to profitable returns.

Good cultural treatment is highly important. It is a mistake to attempt to raise grapes in a permanent sod without cultivation, for certain insects and diseases which attack them thrive in uncultivated ground. For the same reason mulches, which can be used with other home-grown fruits in order to save time and labor, are not satisfactory for grapes. Vineyards should be cultivated from early spring to late summer, at which time a cover crop should be sown to occupy the land during the winter, to reduce erosion, and to build up the humus. On soils lacking in fertility grapes respond to fertilization with barnyard manure or nitrogen-carrying commercial fertilizers.

Insects and diseases, when present in a vineyard, reduce the efficiency of the vine, may seriously retard ripening, and always lower the amount and quality of the crop. Most of this damage can be controlled by proper cultivation, vineyard sanitation, and by spraying. For spraying instructions see Illinois Circular 447, "Directions for Spraying Fruits in Illinois."

ACKNOWLEDGMENT

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