

College of Agriculture and Life Sciences Extension Publications

The Extension Publications collections in the UA Campus Repository are comprised of both current and historical agricultural extension documents from the College of Agriculture and Life Sciences at the University of Arizona.

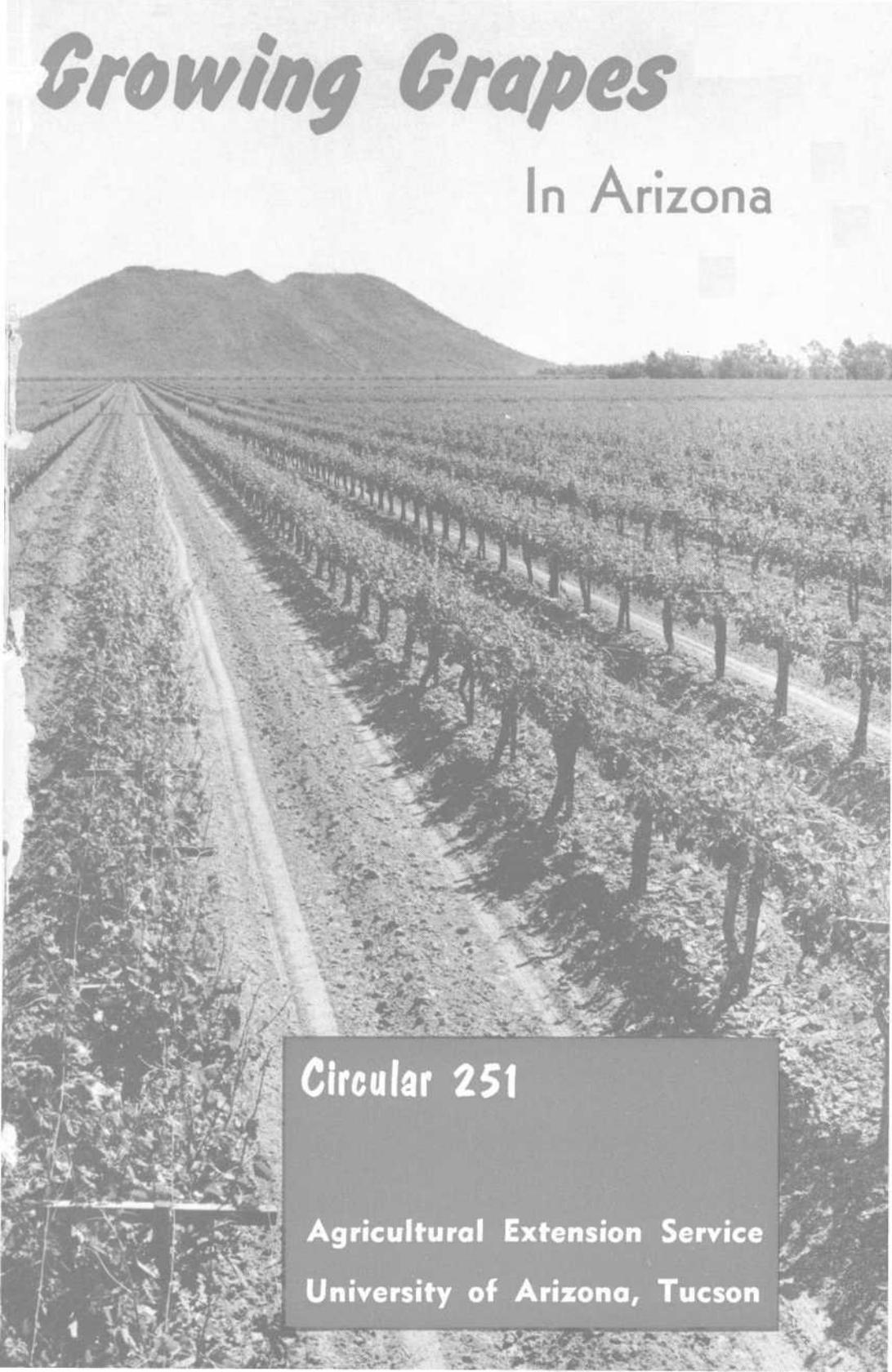
This item is archived to preserve the historical record. This item may contain outdated information and is not intended to be used as current best practice.

Current extension publications can be found in both the UA Campus Repository, and on the CALS Publications website, <http://cals.arizona.edu/pubs/>

If you have questions about any materials from the College of Agriculture and Life Sciences collections, please contact CALS Publications by sending an email to: pubs@cals.arizona.edu

Growing Grapes

In Arizona



Circular 251

**Agricultural Extension Service
University of Arizona, Tucson**

Contents

	<i>Page</i>
Varieties Adapted to Arizona	4
Propagation	6
Spacing	8
Planting and Soil Types	9
Training the Vines	10
Pruning	12
Thinning	15
Girdling	16
Irrigation	17
Fertilization	19
Cultivation	19
Grape Insects	19
Grape Diseases	21

Acknowledgment

The authors express their thanks to Robert H. Hulgeman, George C. Sharples, and Steve Fazio of the Horticulture Department, University of Arizona, and John H. O'Dell, County Agricultural Agent in Charge, Maricopa County, for suggestions and assistance in preparing this circular.

*University of Arizona
College of Agriculture
Agricultural Extension Service
Chas. U. Pickrell, Director*

Cooperative extension work in agriculture and home economics, the University of Arizona College of Agriculture and the United States Department of Agriculture cooperating. Distributed in furtherance of the Acts of Congress of May 8 and June 30, 1914.

5M—July 1957—Circular 251

Growing Grapes

In Arizona

By

HARVEY F. TATE
Extension Horticulturist

And

RAY L. MILNE
Former Assistant County Agent, Maricopa County

The grape is one of the most useful fruits that can be grown commercially or cultivated in home gardens. The growing of table grapes is an important industry in Maricopa and Yuma counties.

In home gardens, grapes thrive over a wide range of soil and growing conditions in Arizona. The vines are ornamental and are often trained on an arbor for a shady retreat during the hot summer days.

The commercial grape varieties grown in Arizona are commonly known as the "European" grapes. They are derived from a native Western-Asia wild species—*Vitis Vinifera*. These grapes produce well in southern Arizona. The *Vinifera* grapes need long, warm to hot, dry summers and cool winters for best development.

In the elevations above 4500 feet, the "American" grapes (slip skin) are grown. These are derived from native American wild vines or crosses with other species. The American grapes thrive best where there are fairly short, humid summers and cold winters.

There is no one "best" grape for either commercial or home plantings. Use the varieties best adapted to your area, and those that have the desired qualities for home or commercial trade.

Grape Growing Zones In Arizona

- ZONE 1—0 to 4,000 ft. elevation
- ZONE 2—4,000 to 6,500 ft. elev.
- ZONE 3—Above 6,500 ft. elev.

Varieties Adapted to Arizona

I. European Grapes

There is a great difference in the production on vines of well adapted varieties and those not suited to Arizona conditions. For the home vineyard it is well to select several high-yielding varieties.

Choose those with a ripening period spread over a considerable length of time. Also, include some which have different uses, such as for jelly or eating out of hand. Different flavors and colors will give variety in eating.

THOMPSON SEEDLESS

Origin: Persia

Thompson Seedless vines are vigorous, very productive, and develop large, long cylindrical, heavily shouldered clusters. The grapes are greenish white to light golden in color; always seedless; firm and tender in texture; neutral in flavor and very sweet when fully ripe.

This variety ripens early in the season. It is adapted for commercial and home plantings.

Zones 1 and lower 2.

CARDINAL

Origin: USDA - Fresno, California

The Cardinal variety resulted from a cross of Flame Tokay x Ribier and was first introduced in 1946. The most outstanding characteristic of this variety is the early date of ripening. The Cardinal variety ripens about two weeks earlier than the Thompson Seedless, in Maricopa county.

The vigorous, productive vines have dark green foliage with leaves of medium size. The fruit color is rich, dark red, with grayish bloom. Although the berries vary in size,

they are large and have a slight muscat flavor, especially noticeable when fully mature.

The flavor is much better when berries are fully ripened. The seeds are rather soft, usually two per berry, but ranging from one to four. Cardinal grapes are adapted for commercial and home planting.

Zone 1.

PERLETTE

Origin: University of California

The Perlette variety was introduced as a hybrid by the University of California Experiment Station, Davis, California, in 1940. Vines develop slowly in early periods and increase in growth rate as the vines mature. New unfolding leaves are bronzed and shoots light, bright green in color. Leaves are dark green without luster when mature; thicker and more leathery than Thompson leaves.

Fruit clusters are very compact. Berries are pale green to amber. Fruit ripens a week ahead of Thompson Seedless. Perlette is adapted for commercial and home plantings.

Zone 1.

BLACK MONUKKA

Origin: India

The vine is very vigorous and productive. Clusters are large, very long, irregular to cylindrical. Berries are reddish black to black, below medium size and cylindrical. The skin is thin.

The berries are not high in sugar. They have neutral, but pleasing flavor. These grapes are seedless and early; a fine variety for home use. Black Monukka is well adapted

ed to warm and desert regions, for home planting only.

Zones 1 and lower 2.

PIERCE

Origin: San Jose, California

The Pierce grape has carried many names, such as the Isabella Regio, Royal Isabella, California Concord, Western Concord, etc. It is a bud sport of the Isabella grape found by J. P. Pierce, of Santa Clara Valley in 1882.

The vines are very vigorous with large, thick leaves, producing many clusters of medium size, with large berries of a Labrusca type. The berries vary from purplish black to black, with a light blue bloom.

The pulp slips from the skin as with all Concord or Labrusca type grapes. The flavor is similar to Concord, but does not rate quite as high as Concord. It is an excellent grape for home use and may be used as a table grape, or for unfermented grape juice. The Pierce grape ripens two or three weeks later than the Thompson Seedless. It is for home planting only.

Zone 1.

GOLDEN MUSCAT

Origin: Geneva, New York

Golden Muscat was introduced by the New York Agriculture Experiment Station in 1927. It is a cross of the Muscat of Hamburg and Diamond. The vine is vigorous with large leaves which tend to sunburn in western regions unless shade is provided. The berry is unusually large for an American type grape.

The skin slips from the pulp and the flavor more nearly resembles the Labrusca than the Vinifera Muscat. The outstanding feature of the grape for home use is the mus-

cat flavor. Fruit ripens in late July and August; later in northern Arizona. For home planting only.

Zone 1 and 2.

MUSCAT HAMBURG

Origin: Unknown

The Muscat Hamburg is medium in vine vigor. The clusters vary from loose to fairly well developed. The leaves are medium in size and dark in color. The berries are below medium size compared to other Vinifera table grapes.

Its delicate muscat flavor and special aroma have given the Muscat Hamburg a place in home gardens. For home planting only.

Zone 1.

OTHER

The Italis, Muscat and Ribier are also used in home plantings.

II. American Grapes

CONCORD

Origin: Massachusetts

The Concord is the most popular and the most widely planted American type grape. The vines are vigorous and adapted to a wide range of soils and conditions. The berries are black with a heavy blue bloom. Skin is rather thick and tough. Flavor is "foxy" and very aromatic.

The Concord is excellent for table use, juice or jelly. Concord ripens in late August and early September. It is good for commercial or home plantings.

Zones 2 and lower 3.

CACO

Origin: New Jersey

The Caco grape vines are vigorous, hardy, but only medium in

productiveness. The clusters are tight and medium in size. Berries are light red, fairly large, with thin skins.

Caco is medium in sweetness and acidity; aromatic, and has a good dessert quality. It is a home or local market grape and ripens a week before Concord.

CATAWABA

Origin: Uncertain

Vines of Catawaba are vigorous, hardy and productive. Clusters are fairly large. They vary in shape and are rather loose. Berries are purplish red, with a lilac bloom. Skin is thick and tough. Sugar content is high, with a medium acidity.

Catawaba has a good flavor and eating quality. It ripens a week to two weeks later than Concord. A home or local market grape.

Zones 2 and 3.

NIAGARA

Origin: New York

Vines of the Niagara grape are vigorous, hardy and productive. Berries are amber colored with a thin gray bloom. Skin is thin and tender; sweet, juicy, and has a "foxy" flavor.

Niagara ripens about midseason. It is a good home garden grape.

Zones 2 and lower 3.

FREDONIA

Origin: New York

The Fredonia has strong growing vines. It ripens early in the season. Clusters are medium in size and fairly compact. Berries are black with a blue bloom; rather large in size. Skins are thick with tender flesh.

The flavor is "foxy" and aromatic. The fruit hangs well on the vine. It is a good home garden grape. Is also a good shipper. It ripens two weeks ahead of Concord.

Zones 2 and lower 3.

WORDEN

Origin: New York

Vines of Worden are vigorous, hardy and strong growing. Clusters are medium to large, with good shape. Berries are large, black, and with heavy blue bloom. Skins are rather tender and tend to crack. The flesh is tough and juicy; flavor somewhat "foxy."

Dessert quality is good. This grape ripens about the same season as Concord.

Zones 2 and lower 3.

Propagation

Grape vines may be propagated from seed, cuttings, layering or by grafting. New varieties are selections from seedling stock. (This method of propagation is used by the plant breeder to develop new varieties.)

Grape vines are generally grown from cuttings. During the dormant pruning season, cuttings should be selected from the pruning wood. Cuttings are 12 inches to 18 inches in length, (size of lead pencil or slightly larger) and contain 4 to



Plant cuttings with butt end up in the callus pit.

5 buds per cutting. The lower cut is made immediately below the bud, and the top cut, slanted at an angle, an inch or so above the top bud.

The cuttings are tied together in convenient size bundles, keeping the butt of the cuttings turned the same direction in the bundle. The bundle is then heeled in, or buried in trenches, butt end of cutting up, and well covered with 3 to 6 inches of sand or soil. (See photo).

Inverting the bundles causes the cutting to callus over on the butt end while the top portion of the cutting will remain dormant. Cuttings which have been properly callused will throw out rootlets as soon as planted. Callusing occurs in from 30 to 40 days.

A one-year-old plant is one which has grown one year in a nursery row and is ready for transplanting in the vineyard.

Grapes may also be budded or green grafted if a rootstock is required for a special situation. In nematode or Phylloxera infested soils resistant rootstocks are used to produce healthy vines. The green-graft method is generally used to propagate varieties on resistant rootstocks.

In the Salt River Valley, cuttings are generally used for propagation. On the Yuma Mesa most of the varieties are budded on the 1613 rootstock.

Layerage is a method used to re-establish a missing vine in the vineyard. A cane from a sister vine



“Layering” can be used to establish a missing vine. A cane from a sister vine is brought to the ground at the location of the new plant and covered with soil. The cane remains attached to the parent vine until the new cane establishes roots and top growth. The cane is cut away from the parent plant the following winter and trained to the stake to form the new vine.

is trailed on the ground to the desired location of the new plant and covered with two or three shovels of soil. The cane is allowed to remain attached to the parent vine until the cane establishes roots and top growth at the point covered

with soil. (See photo). In the spring or early summer, the cane is cut away from the parent vine and the new shoot trained up the stake to establish the new trunk system.

Spacing

The normal spacing for grape plants in commercial vineyards is 12 feet between rows and 8 feet between plants in the rows. How-

ever, 10 x 8 foot spacing is used for some varieties. The 12x8 foot spacing requires 452 plants per acre, the 10 x 8 foot spacing requires 540 vines per acre.

In commercial vineyards adequate space must be provided for roads at the ends and sides of the vineyard, as well as driveways through the center of the planting, to give ready access for harvesting operations. These cross driveways will also be found useful in irrigating, cultivating and pruning.

Grape plants may be established on any spacing in home plantings, provided there is adequate room to prune and thin the grapes and to control insects and disease with sprays and dusts. A two or three foot spacing is satisfactory when planting grapes for shade on an arbor or carport.

Planting and Soil Types

Grapes should be planted in fertile, well drained soils. The grape vine thrives better on light open soils than on heavy clay type soils. It is best to avoid very heavy clays, shallow soil, poorly drained soils, or soils high in alkaline salts. Be sure the soil contains a good quantity of organic matter and has a good supply of irrigation water.

If cuttings are used to establish the grape planting, they should be removed from the callus pit in late

February or early March and planted in the selected location. Cuttings are grown in the nursery row for one year before transplanting in the permanent location. The cuttings are planted on one side of the furrow, care being taken to place the slant cut end of the cutting up. (See photo).

Fill the hole and firm the soil around the cutting, leaving at least one bud above ground level.

Place callused cutting at the side of the stake.



The top bud of the cutting should be exposed above ground level. Firm the soil thoroughly around the cutting to prevent it from drying out. Place some loose, moist soil over the top of the cutting and

cover to a depth of 2 inches. If cuttings are placed in a nursery row they should be planted in the same way as in the permanent location. The cuttings should be placed 4 to 6 inches apart in the nursery row.

Training The Vines

This is one of the most important phases in establishing grape vines. If vines are properly trained they can be easily pruned and cared for with a minimum of effort. Cuttings planted in a permanent location are allowed to grow unhampered for the first season; then one cane is pruned back to two buds and all other canes are removed from the plant.

If one-year-old nursery stock is used in place of cuttings they should be pruned to a single cane containing two buds when planted in the permanent location.

When cuttings have grown one year and have been pruned to two buds, or the rooted plant pruned to two buds, it is ready to be trained on the trellis. (See Photos).

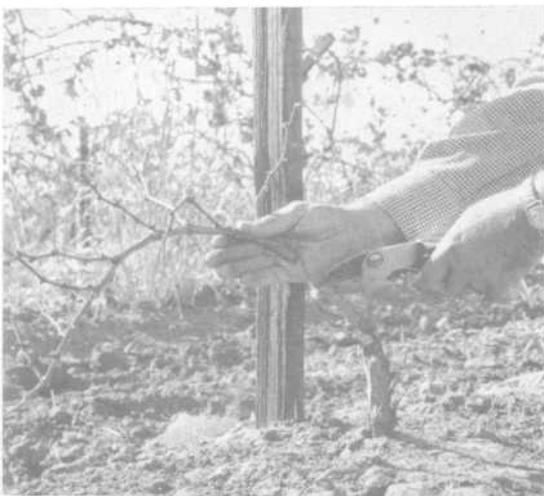
A permanent trellis with a post near the plant should be erected early in the spring to facilitate training the new grape vine. The first straight shoot which develops on the plant should be tied loosely to the stake or post.

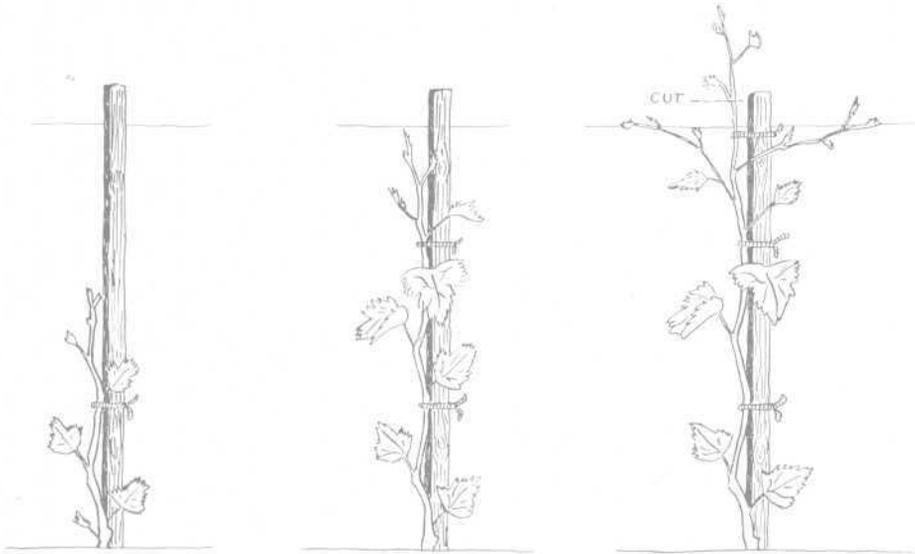
As the shoot develops it is tied at each six-inch level until it has grown to a height of 40 to 50 inches. It should then be pinched off at a point 30 to 40 inches above ground level to promote side shoot development. The leaves should not be removed for they provide shade for the tender shoots during the first year of development of the trunk. (See illustrations, pages 11 and 12.)



Vine at the end of the first growing season, before pruning.

Same vine as above with all side branches removed and the main cane cut back to two buds.





Training during the second season. Left: As shoot starts, disbud and train to stake. Center: Use two or more ties—keep straight. Right: In 6 to 8 weeks, when vine has grown above the wire or stake, pinch off or cut the tip just above the wire. Train at least two laterals on the wire as fruiting canes or cordons for the next season.

Vine at the end of the second season before training to vine system of pruning.



Same vine as in picture on page 11, after pruning.



The shoot which develops from the second bud is allowed to develop and is trained on the ground during the first season. This shoot will provide a second cane for training into a trunk if for any reason the first shoot breaks or becomes severed from the plant.

During the first growing season from rooted vines, or the second growing season from cuttings, lateral shoots are trained on wires to provide fruiting canes for the next season.



Pruning

Definitions of vine parts are outlined to give a clear picture of the plant structure:

SHOOTS are the current season's succulent top growth.

CANES are matured shoots which are more than one year old.

The **TRUNK** is the undivided body of the vine.

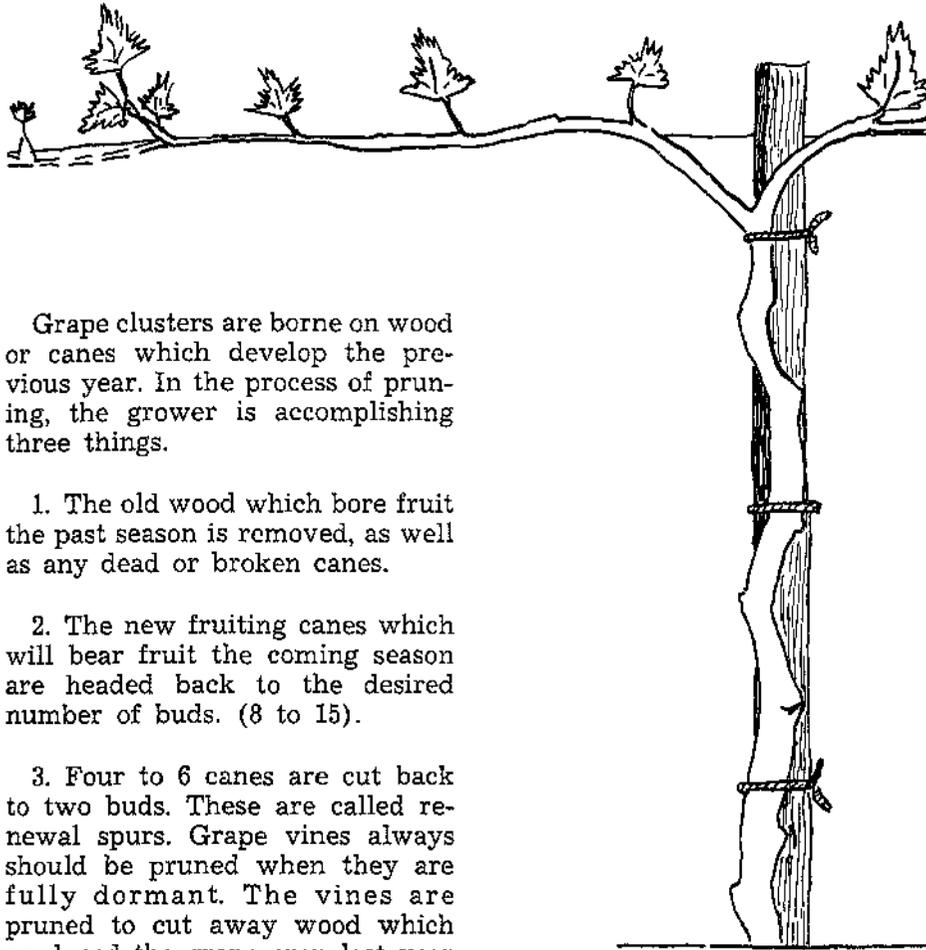
A **SPUR** is the basal portion of a cane which may be one, two, three or four buds, or nodes, in length.

A **RENEWAL SPUR** produces shoots that are used the next season for spurs or fruit canes.

A **WATERSPROUT** is any shoot that arises on parts of the vine older than one year.

A **SUCKER** is a watersprout that arises below ground.

A **FRUIT CANE** is a basal section of a cane, 8 to 15 buds long, which produces the next grape crop. It is always pruned off at the following pruning.



Grape clusters are borne on wood or canes which develop the previous year. In the process of pruning, the grower is accomplishing three things.

1. The old wood which bore fruit the past season is removed, as well as any dead or broken canes.

2. The new fruiting canes which will bear fruit the coming season are headed back to the desired number of buds. (8 to 15).

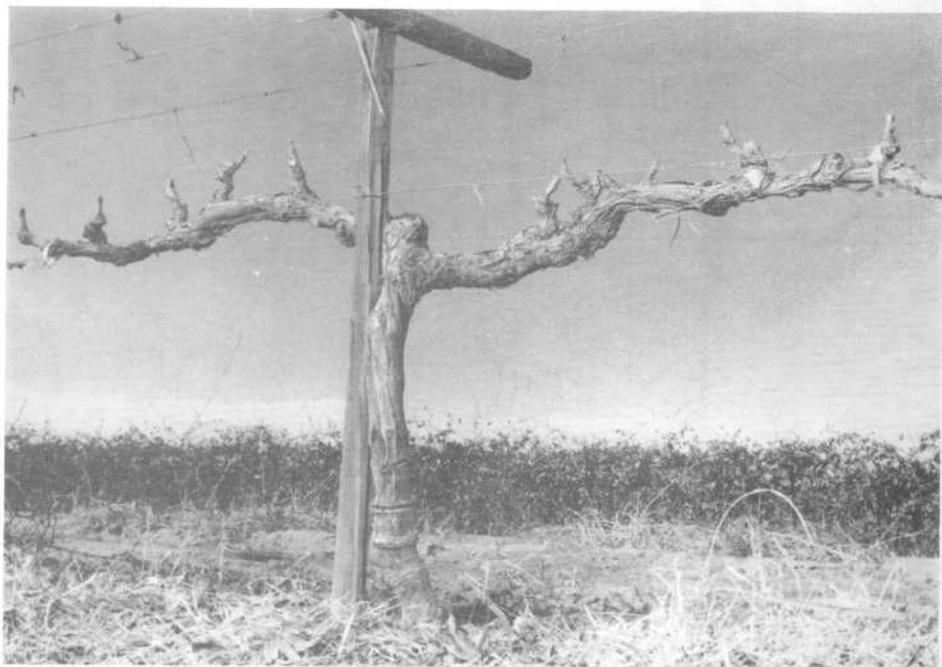
3. Four to 6 canes are cut back to two buds. These are called renewal spurs. Grape vines always should be pruned when they are fully dormant. The vines are pruned to cut away wood which produced the grape crop last year and to reduce the present productive wood to the desired number of fruit buds for the coming season.

Pruning consists of removing canes, shoots, leaves and other vegetative parts of the vine. Summer pruning may be employed when it is necessary to remove one shoot where doubles occur. The removal of one shoot will force all of the growth at that point into the remaining shoot. The practice should give more vigorous fruit canes for the next fruiting year.

Many varieties of grapes which are produced commercially must

Vine at the end of the second season having been trained to form a cordon. (Cordon to be extended next season to at least six fruiting spurs.)

be cordon pruned. (See above). The cordon-trained vine can best be described as having one or more lateral extensions from the trunk which are developed 30 to 40 inches above ground level. From these lateral extensions, vertical spurs develop. The buds on these spurs produce the shoots on which fruit



An established vine pruned to a cordon with lateral fruiting spurs. (Note the four girdles on the main trunk.)

A Thompson Seedless vine being trained to the cane system before being cane pruned.





Same vine as in picture at left below (page 14).



clusters are borne. The Cardinal and Ribier varieties are normally cordon pruned, all others are normally pruned to canes.

The cane method of pruning is recommended for all home grape plantings. (See Photo). Each fruiting cane should be cut back to 8 to 15 buds per cane. Each vine should carry 4 to 6 canes and 4 to 6 renewal spurs. This is the correct number of canes and spurs for a properly pruned vine which is 4 or more years old.

Thinning

Thinning consists of the reduction of the total fruit load on the vine. Experimental work has generally demonstrated that partial removal of immature fruits from the vines causes the fruit which remains to be either larger or earlier ripening or both. The increase in size or earliness is more or less in proportion to the amount of fruit removed. It is presumed that the removal of fruit increases the supply of nourishment which is available to the remaining fruit.

Three types of fruit thinning are normally practiced: (1) Cluster thinning; (2) Berry thinning; and (3) Flower-cluster thinning.

Cluster Thinning

Cluster thinning consists of removing entire clusters of immature berries immediately after the blossoming cycle is complete and the fruit has set. This is the most

convenient and widely practiced method of thinning grapes. Since cluster thinning is performed after the fruit is set, it does not influence the number of berries that develop.

However, it makes possible a more critical selection of clusters for customer appeal. The poorer ones may be discarded during the thinning operation. For commercial purposes, mature vines of table grapes are normally thinned to 20 to 40 clusters, depending on the variety and market conditions. Grape vines in home plantings may carry somewhat more than this, according to individual desires.

Berry Thinning

Berry thinning consists of the removal of individual berries or portions of clusters. The use of this method is limited to varieties which set very large or very compact clusters. The quality of

Thompson Seedless clusters, which are typically large and elongated, is improved by removing the lower portion of the cluster and some of the branched stems of the upper portions.

Clusters of Perlette variety, which are extremely compact, must be berry thinned so that the remaining berries may develop normally. For maximum effect this type of thinning should also be performed immediately after fruit is set.

Flower-Cluster Thinning

This method of thinning consists in removing the rudimentary flowers which appear early in the grow-

ing season. The removal of flower clusters at this early stage of growth tends to increase the number of berries which set on the remaining clusters. For this reason, flower-cluster thinning is particularly useful for varieties which have loose or straggly clusters. In addition, it provides all the other advantages of ordinary cluster thinning methods.

One difficulty arises, however, in that the flowering cycle occurs over an extended period and the first berries have sometimes set before the last flower clusters have appeared. Therefore, more than one visit per vine by the crew is necessary to complete the thinning job. The cost is thus increased.

Girdling

Grape vines are girdled for the following purposes: (1) to improve fruit set; (2) to increase berry size; (3) to hasten fruit maturity. The particular response desired determines the time at which girdling is to be done.

Girdling, or ringing, consists in removing a continuous ring of bark $\frac{3}{16}$ inch to $\frac{1}{4}$ inch wide from the trunk, arm or cane *below* the fruit which is intended to be affected. The removal of such a band of tissue, provided it is done correctly, interrupts the normal flow of sugar from the leaves where it is produced, to the roots where it is stored, without interruption of the flow of water and minerals from the root system. The resulting increase in sugar concentration above the girdle greatly influences the

development of the fruit. Girdles on vigorous vines which receive proper care usually heal over in 3 to 4 weeks.

The berry size of seedless varieties, such as Thompson Seedless, is greatly increased by girdling immediately after the period of normal berry drop, at time of the most rapid fruit growth. Girdling to increase the size of seeded varieties is of doubtful value.

By girdling just before ripening begins, the rate of maturity of many seeded varieties of grapes can be increased by as much as 2 weeks, if other conditions are not limiting. For best results, Cardinal, Tokay, Red Malaga and Ribier varieties should be girdled when the first traces of color appear. The ripening rate of seedless varieties



These tools are used in the girdling operation. Left, pliers used for girdling canes. Right, (two views), double-bladed knife used in trunk girdling.

such as Thompson Seedless is affected little or none by girdling at this state of growth.

Girdling is *not* particularly recommended for home grape plant-

ings. Without the proper tools and a full understanding of the principles of plant structure and physiology involved, there is danger of fatal injury to the plant.

Irrigation

The fundamentals of irrigation of grapes are fairly simple. However, the individual needs of grape vines grown in different soil types vary considerably. Available soil moisture must always be present in the root zone during the growing season, and during the period

when the most rapid growth of the berries normally occurs.

Bearing vines develop very rapidly, resulting in a succulent type of growth in the spring and early summer. A gradual slowing of shoot growth occurs as the berries enlarge. The rate of growth slows

more and more and almost stops as the fruit begins to ripen.

A shortage of available water will greatly reduce the normal rate of growth of a grape vine. A restricted moisture supply may also be detected by the appearance of a soft, yellowish-green color in the growing tip leaves. As the plant becomes stressed this soft green color will turn to a grey-green color and growth of the plant will almost completely stop. A further reduction of moisture supply may cause the leaves to curl and the older leaves to desiccate and die.

Grapes grown in the Salt River Valley will require from 3 to 6 acre feet of irrigation water, depending on the soil type. In the lighter sandy soils grapes may require 5 to 6 acre feet of water to produce a satisfactory crop and to provide for normal vine growth.

During the dormant season, all, or portions of the root zone, should be filled with moisture to the field capacity of the soil. This is usually accomplished by surface irrigation unless winter rains are adequate to satisfy this condition. It may be necessary to use a soil tube or auger to determine the penetration of the water.

The grape is a deep-rooted plant, so a heavy irrigation should be applied in late winter before growth starts to wet the soil to a depth of 6 to 8 feet. The young developing shoots, leaves and fruit require little water in March and April. As the leaf area increases and the berries begin to enlarge, available water should be constantly maintained throughout the root system.

For the light to medium soils of the Salt River Valley the following schedule is presented as a

guide for the irrigation of grapes in commercial vineyards:

Feb. 15 to Mar. 1 (heavy)
April 10
May 5
May 25
June 8
June 25
July 10
Aug. 15
Sept. 15
Nov. 15 to Dec. 15 (light)

Results have shown that a very heavy irrigation between February 15 and March 1 is necessary to fill the sub-soil with moisture. After growth starts, the above schedule has proved satisfactory.

After the crop is harvested the rate of vine growth should be reduced. To accomplish this, the schedule should be lengthened to intervals of one month or more. When the vines become dormant they should be given an irrigation to carry them through the winter.

For areas with light sandy soil it may be necessary to apply an additional irrigation during the late summer and fall months. Home gardeners should follow these same general principles in irrigating their vines.

Irrigation may be a factor in the problem of shattering of grape clusters during the blooming period. Shattering or shedding of the flowers usually occurs when the vines have not been irrigated in the spring before the blossoms appear. The first irrigation in the spring should be applied a month or more before the blooming period. Shattering, or shedding of the cluster, is reduced to a minimum when planned irrigation schedules are followed.

Fertilization

In the Salt River Valley grape vines respond chiefly to nitrogen applications. Test applications of phosphorus and potassium have not given visible response in grape vines. In the deep soils of the valleys and mesas the addition of nitrogen is not usually required for a number of years to maintain vine vigor and produce satisfactory crops.

The annual vine growth is a very good index to the fertilizer needs of the plant. Too much nitrogen

fertilizer results in extremely vegetative vines which produce little fruit and of poor quality. On the lighter sandy soils tests should be conducted on several rows to determine whether or not the vines will respond to the different kinds and amounts of fertilizers.

Barnyard manure can be used to advantage in home plantings to maintain vigor and production in getting the vineyard established in sandy or rocky soils.

Cultivation

Cultivation in the grape vineyard is done principally to eliminate weeds and grasses from the areas around the plants. Cultivation also facilitates irrigation, provides for better water penetration and aera-

tion of the soil, and to help to incorporate cover crops and manures.

Cultivation does not reduce the rate of evaporation from the soil, but does reduce the water loss by destroying weeds which rob the soil of moisture.

GRAPE INSECTS

By J. N. Roney

Extension Entomologist

Grape growers in Arizona, both the backyard and commercial producer, find very few insects attacking grape plantings.

Leafhopper

The most important insect to contend with is the grape leafhopper. This small leafhopper is scarcely more than one-eighth of an inch in length, pale yellow, with red or black markings on its front

wings. The eggs are laid in the leaves and hatch in about two weeks.

The pale wingless nymph (immature stage) feeds on the lower surface of the leaves, casting skins five times before becoming an adult. It takes about three to four weeks for the young to reach the adult stage.

The leafhopper injury on leaves appears in a speckling of the leaves, caused by the feeding of the leaf-

hoppers with their small beaks. The leafhopper sucks out the plant juices and leaves a pale greenish-yellow spot that is easily noticed. Usually a closer observation will show the young leafhopper to be present. Some seasons the 'hoppers cause injury during the spring and again late in the fall.

Growers formerly used Pyrethrum sprays for control. Then DDT sprays were used. However, in some cases the 'hoppers became resistant to DDT.

Recent research has shown that best results may be secured with a 5 percent Malathion dust or a spray. Apply about one pound of technical Malathion per acre. This means about 1½ teaspoonsful of 50 percent Malathion emulsion concentrate per one gallon of water. Malathion dust is used at the rate of 20 pounds per acre per application. Some growers still use DDT, but when this fails, they use Malathion.

Skeletonizer

In the small backyard vineyards, the western grape-leaf skeletonizer gives about as much trouble as the leafhopper. In certain parts of the state it causes more damage than other grape insects.

The larva, or worm stage, of this insect is black and yellow (six-banded), and feeds only on the underside of the leaves.

A 50 percent Cryolite dust or a 5 percent Malathion dust will give good control of this insect. When applying an insecticide be certain to get the material on that portion of the plant where the insect is feeding. Quite often poor controls are secured because of poor application.

Leaf Beetle

Leaf beetles are sometimes a problem. This small brown beetle sometimes feeds on the leaves, leaving small holes. Some species in the higher elevations are of a metallic blue or green color. Leaf beetles may be controlled with a 5 percent Malathion dust or a spray of 1 to 1½ teaspoons of a 50 percent emulsion concentrate in one gallon of water.

Spider Mite

Spider mites have become a problem at times, and an application of dusting sulfur usually controls them. At times they may be present in such numbers that two applications of 5 percent Malathion spray may be necessary for control.

Sphinx Moth Larva And Cabbage Looper

Occasionally the sphinx moth larvae and cabbage loopers feed on the foliage of grape plants. Usually a 10 percent DDT dust will give the desired control.

GRAPE DISEASES

By Ivan J. Shields
Extension Plant Pathologist

In general, diseases of grapes are a minor problem if some preventive measures are taken. *In new plantings* use certified or disease-free wood. Several virus diseases can be spread through propagation wood.

If you are to take cuttings from your own vines, check parent vines for disease symptoms for at least two previous growing seasons before taking wood for propagation. Remove weak and low producing vines regularly. Make at least two disease inspections in the nursery row before transplanting the grape plants in the vineyard.

Grapes should be planted in soil free of Texas root rot, Bacterial Crown Gall, and Root-knot Nematodes.

Texas Root Rot

Grapes that are attacked by Texas root rot will wilt suddenly. The leaves hang limp for a few days and then turn yellow and die. An examination of the roots will show a browning and rotting of the outer cortex. The disease is most active in July and August.

An application of one pound of ammonium sulfate per ten square feet of soil around the base of infected grape vines recently affected by root rot may save the vine if applied soon enough. The ammonium sulfate should be flooded in and the vine growth pruned back to 50 percent.

The application of steer manure or other organic materials to the

root-rot spots will help prevent the infection, although it is too slow acting to check the disease in plants already infected.

Bacterial Crown Gall

A warty growth may occur on grape roots or vines near the soil surface. This growth, which is usually about the size of a golf ball, or larger, will weaken the vine and cause it to be unproductive. These vines should be removed as this crown gall can spread to other vines.

This disease can also attack roses, pyracantha, fruit trees, and many other plants. It remains in Arizona soils for several years and usually infects plants through injured roots or bark.

Powdery Mildew

This fungus often becomes active as soon as spring growth starts and may continue to some extent throughout the growing season. It is the period from spring to harvest that controls are most necessary.

Symptoms

The disease forms whitish spots on leaves, on canes and on fruits, giving them the appearance of having been dusted with flour. These spots often enlarge and may cover the entire surface. The affected leaves are retarded in growth and odd shaped.

The canes will soon exhibit rusty red spots, which become dark in

the affected areas. The mildewed fruit may split, and fall, or in some cases, dry up in the cluster.

Control

Dust or spray applications should begin before symptoms appear. Sulfur will protect the vines from infection, but has little effect on established infection, except at high temperatures. If eradication is desired, apply sulfur as a spray.

Sulfur dusts give excellent protection against grape mildew, providing the material is applied, thoroughly and at regular intervals.

A suggested dusting schedule is as follows:

1. Apply first dusting when vine shoots are 6 inches to 8 inches long at the rate of 10 to 15 pounds per acre.

2. Apply a second dusting before blossoming, usually when vine shoots are 2 to 3 feet long, at the rate of 15 to 20 pounds per acre.

3. Apply a third dusting in late June or July when berries are one-half size. Use 25 pounds of dusting sulfur per acre by ground rig or 50 pounds by plane. *Heavy sulfur-ing during hot weather may cause a burn.* During seasons when mildew is prevalent, a total of five dustings may be necessary.

In sulfur sprays, applications of 5 pounds of wettable sulfur and a suitable spreader to 100 gallons of water should be used. The first two applications will take about 100 gallons to the acre, but a third application may take 150 gallons per acre for adequate coverage. Sulfur is compatible with Malathion and DDT and the two materials may be used together when necessary.

Evening applications just before an irrigation should lessen chances of burning later in the season and still give maximum control.

Root Knot

In sandy and sandy loam soils, nematode infestations often build up rapidly and soon reduce yields in grapes. In planting new vineyards, nematode-resistant rootstocks should be used in these soil types. In loam and clay loam soils, root knot is usually not a problem.

In establishing vineyards where root-knot infestations often occur, some increase in yield may be effected with more frequent irrigations. The use of certain soil fumigants is being investigated to note if practical control can be obtained.

Little Leaf—Zinc Deficiency

Grape vines affected with little-leaf disease have stunted leaves. In zinc deficiency, the first leaf formed on the shoot is usually normal or only slightly yellow. The yellowing condition becomes more severe as the shoot develops.

Thus the leaves at the base of the canes are green and the farther out on the shoot the smaller and more chlorotic the leaves become. The tissue close to the vein is the greenest and the areas between the veins are whitish or yellowish green.

The yields may be reduced on vines that are only slightly affected and badly affected vines may produce very low yields.

The most economical way to supply needed zinc to the vine is to daub the pruning cuts with a zinc sulfate solution. One pound of zinc sulfate, dissolved in a gallon of

water, should be applied to pruning cuts within two hours after pruning.

The foliage can be sprayed with zinc materials for additional response. However, these foliage sprays should *supplement* the dormant season application.



Daub the pruning cuts with a solution of zinc sulfate.



* This is a
publication of the
Agricultural Extension
Service, University of
Arizona. See your local
County Agricultural Agent or
County Home Agent for other
farm and home
information.