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# Pruning and Training Table Grapes on Trellises



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# Pruning and Training Table Grapes on Trellises



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## **DISCLAIMER**

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# Trellis Systems

The basic purpose of a grape trellis system is to;

- Support the vines and distribute the fruiting canes and clusters
- Spread the foliage out to maximize the interception of sunlight for photosynthesis
- Support the vine to enhance the microclimate by allowing better air circulation
- Facilitate mechanical cultural operations such as vineyard floor management, spray and dust applications and harvest
- Drip irrigation systems frequently are hung from the trellis system

The basic table grape trellis system design has evolved over the years with the addition of cross arms and more supporting wire. The system most commonly used consists of a stake, one or more cross arms, and multiple wires. The cross arm may be straight and parallel to the soil line or it may be a V shaped configuration. A stake and cross arm is located at each vine and the wires link all the stakes and cross arms in a row of grapes. The stakes usually are made from wood or metal, although concrete and plastic are also used in some places. High tinsel wire should be used for maximum strength.

The exact design will be affected by the pruning system selected. There are two basic pruning systems used in table grapes, which may slightly change the wire arrangement. The details of the two systems, cane pruning and spur pruning, will be covered later in this manual. The only seedless grape variety introduced to Iraq by USAID-*Inma* which requires cane pruning is the Thompson Seedless variety. The other varieties introduced can be pruned using either method. Cane-pruned varieties, such as Thompson Seedless, are always more difficult and expensive to prune because great care must be taken in selecting wood. Spur pruning is recommended for the other introduced varieties of seedless grapes.

The choice of pruning method is primarily influenced by the fruitfulness of the variety. Thompson Seedless and a few other varieties are cane pruned because of low fruitfulness at the basal node positions. Thus spur pruning, which leaves only two or three nodes, will not produce adequately fruitful buds when applied to Thompson Seedless grapes.

The simple trellis system recommended for Iraq is a stake with a T cross arm at the top.



## Trellis Materials

Determining which type of stake to purchase will depend on cost and availability of the various alternative materials. In Iraq there has been difficulty locating either metal or wood stakes at a reasonable cost. Concrete posts could be fabricated, but they are more expensive to install and it is more difficult to attach cross arms and wires to them. More and more growers are turning to metal stakes in other grape growing areas of the world. Metal stakes and cross arms can be imported from Turkey or China. With orders of sufficient quantities, discounted prices may be possible. Hardwood stakes, such as Kempas from the tropics or Redwood from California

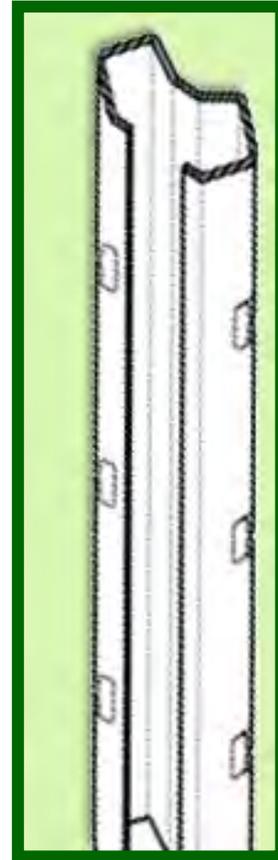
used to be the standard for grapes, but these have become very expensive. The wire used should be high tensile wire of #13 gauge or stronger. End posts, used at the end of each row to anchor and stabilize the system, should be either large wood posts such as used rail road ties or heavy iron pipe, 8 cm or larger, set in concrete.

## Recommended Materials

USAID-*Inma* horticulture specialists recommend metal stakes and cross arms if available at a reasonable price.

- Stakes: 2.25 to 2.5 meter, 1 per vine (Approximately 285 per donum)
- Cross arms: 0.6 to 0.75 meter, 1 per vine (Approximately 285 per donum)
- Wire: #13 High Tensile, 2 wires per row, **cane pruned** (Approximately 1,425 m/donum)
- Wire: #13 High Tensile, 3 wires per row, **spur pruned** (Approximately 2150 m/donum)
- End posts: 2 to 2.5 meter, assuming 200 m row length 14 per donum

- Anchors: 0.75 inch screw type, one per end post
- Dependent on the type of post, staples or retainers sufficient to attach wires and cross arms



## Installation

Trellis installation may take place anytime from prior to planting the vines to the early fall of the year of planting. Later installation will delay training and eventually the first harvest.

## Stakes

The first step in the trellis installation process is pushing the stakes. It is important to plant the vines in a line as straight as possible. It is equally as important to make the line of stakes as straight as possible. This is for more than esthetic reasons, a vine or a stake that is out of line is more likely to be hit and broken by tractor drawn equipment and will make mechanical operations more difficult.

Wood or metal stakes may be pushed into the soil, either by hand with a tool or mechanically. It is important to push them to a uniform depth of at least 0.75 to 1 meter depth to give the stake the necessary stability. The top of the stakes should be uniformly set so that there is 1.35 to 1.65 meters of stake above the soil. Actual depth of pushing the stake and the length above ground will be influenced by the length of stake purchased and the ease of pushing the stakes. Should concrete posts be used, the installation will be slower and more expensive as each hole will have to be dug, the posts installed, the hole refilled and the posts lined up straight.

## Cross Arms

The second step will be the installation of the cross arms. The method of fixing the cross arms will vary with the type of stake and cross arm utilized. Metal cross arms are fixed to metal stakes with clamps or bolts. Wooden cross arms will be nailed or screwed to wood stakes. Concrete stakes should be fabricated with bolts set as studs, brackets, or metal eyes for attaching cross arms and wires.



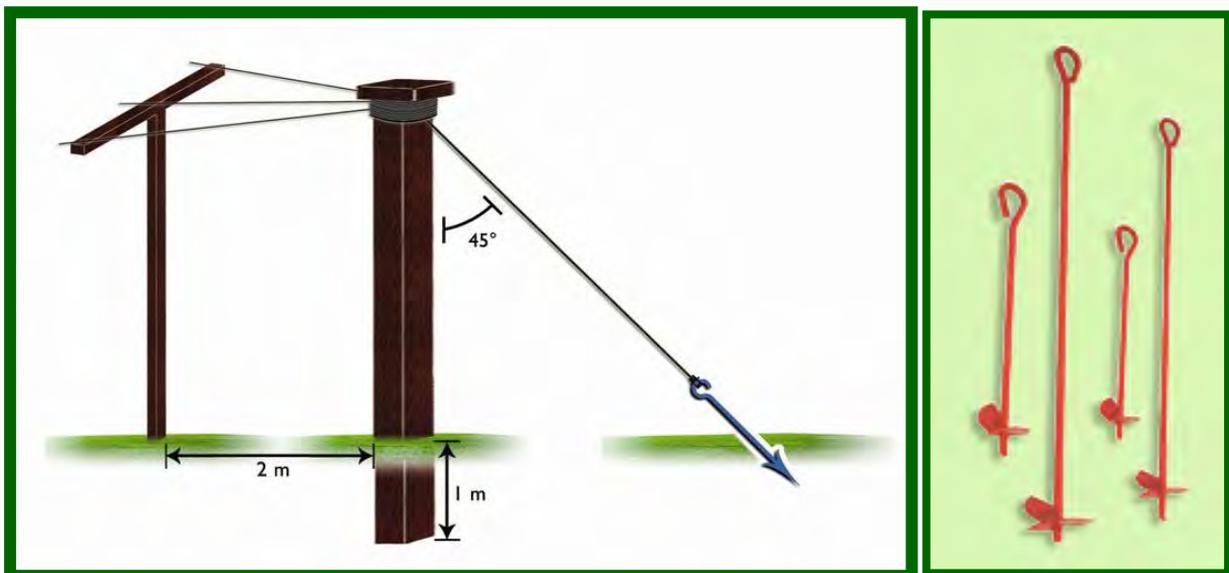
## End Posts and Anchors

The third step will be to install the end posts and anchors. The end posts should be set in the same line as the stakes, but several meters beyond the first and last vine in each row.

They should be set to a meter depth and may need to be set in concrete, depending on the type of stake and soil conditions. The anchor should be installed as in the diagram below. Some growers have tried partially burying old tires to use as an anchor, but unless buried completely they risk being pulled out under the load of a heavy crop.

## Wire

The fourth and final step is stringing the wire. The **cane pruned vines** will require 2 wires per row, placed over each end of the cross arm.



End Post and Anchor

Anchors for End Posts

They will be tied off to the end post at one end and then pulled tight and tied off at the other end post. There are various tools or turn buckles,

which should be used to put tension on the wire. The end posts should be tied to the anchors. (See diagram above).

### **Turn Buckles and Ratchet Wire Tighteners**



**Spur pruned vines** will have one additional wire strung from post to post at a height of about 1 meter above the soil. The cordon will be trained to that wire.



### **Cordon Wire on Posts**

## Potential Problems

Anything that threatens the structural integrity of the trellis system is a potential problem and could result in the collapse of the system, such as is shown in the picture to the right.



## Mistakes that can lead to such problems include:

- Using inferior quality materials
- Failure to push the stake in deep enough to ensure stability
- Failure to develop a trunk and train the vine to the trellis system
- Failure to anchor the end posts sufficiently to carry the load of a full crop
- Stakes being out of line and exposed to damage by farm machinery

# Training

## First Year

No training is attempted in the first year in most vineyards. The vines are allowed to grow unhindered for maximum leaf area and root system development. The vines are then pruned back at the end of the growing season, during dormancy. Remove all shoots except one that is strong and



well placed. Cut this shoot back to two buds. Vines are occasionally and successfully trained up the stake during the first year. Drip irrigated vineyards and those in the southern desert areas will have more success with first year training. The steady moisture supply of drip irrigation and a long growing season make this practice more feasible. This should only be done where extremely good, uniform growth can be anticipated

and where the training is well supervised.

The shoots and clusters must be judiciously thinned the second year in order to produce a modest crop proportional to the vines' capacity. ***USAID-Inma horticulture specialists do not recommend this practice in Iraq unless it was well supervised by a knowledgeable grape specialist.***

The main purpose of first year training is to generate early income. However, other considerations include the less uniform training up the stake due to differences in individual vine vigor. Bud break and shoot development along the new cordon branches may be erratic due to the still limited root system and vine size. Usually the vines are fertilized quite heavily and irrigated late in the season to obtain maximum growth. This may result in an abundance of immature wood and poor reserves in the vine. Such vines may die-back during the winter and/or show poor bud break. A higher total labor input to complete the training can be expected because of more individual vine differences during first year training up the stake.

## **Second Year-Developing the trunk (The recommended method)**

Direct all the growth up the stake in a single shoot for the permanent trunk. The remainder of the framework will come from lateral branching near the top.

It may be necessary to hoe or shovel some soil away from each vine before growth begins. This fully exposes the crown to facilitate suckering of shoots at or below the normal soil surface.

Numerous shoots will emerge from each vine in the spring, providing an adequate selection for training and requiring "suckering" or removal of the extra shoots. Shoot selection and removal is best delayed until the longest shoots have grown to at least 20 to 30 cm. This operation can begin earlier with shoots 15 to 20 cm long, if a large number of donums must be covered. However, there is more risk in accidentally removing the best shoots at this more tender stage.

Some growers prefer to wait until the shoots are 30 to 45 cm long. This enables the farmer to select and tie the main shoot for training and to re-

move all others in one operation. However, this may be impractical in large plantings.

Shoots more than 45 cm in length become increasingly woody at their bases and more difficult to break out by hand. Thus, hand shears must be used to remove shoots if there is too much delay in training.



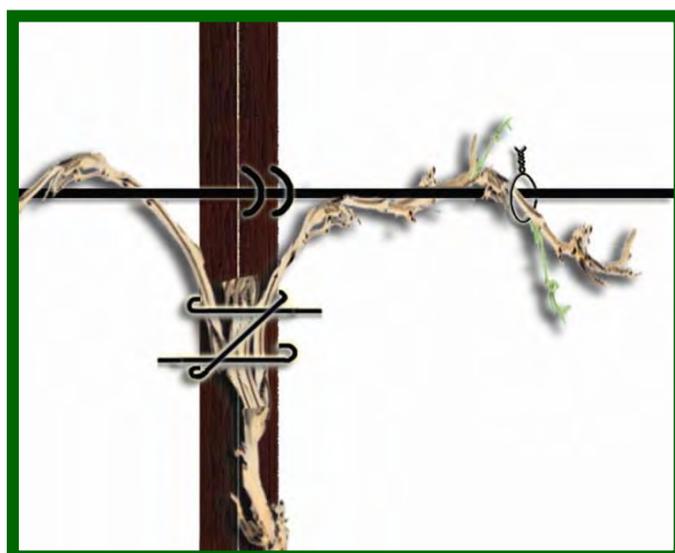
Two or three of the more vigorous, upright growing shoots are retained in this first task. Select shoots which are in position to be easily tied over to the stake.

The best positioned shoot can usually be tied to the stake without breaking it out once it is at least 30 cm long. The extra one or two shoots will remain as spare shoots in case the selected shoot is damaged or fails to thrive. Once the

main shoot is 30 to 45 cm long and is securely tied, cut off the spare shoots. Tie up the main shoot periodically -- about every 10 days -- to prevent breakage and to assure a straight trunk. Most growers prefer to tie the vines up the north or east side of the stakes. Lateral shoots arising from the bottom 60 to 75 cm of the main shoot should also be removed as they develop during the tying operation.



The top 1/3 of cordon-trained vines should always be brought over the wire attachment side of the stake. The cordons will then be in position to be attached directly to the wire and not bent around the stake over to the wire. (See diagram - right)



# Pruning Methods

The decision of which pruning method to utilize will need to be made by the second growing season. The choice of pruning method is largely influenced by the fruitfulness characteristics of the vine variety. The varieties introduced in Rashidayah can all be spur pruned.

## Cane Pruning

### ***Identify the Fruiting Canes***

The first step in cane pruning is to identify the fruiting canes for the next year. Select either one or two canes depending on the training system and vine spacing. Desirable fruiting canes develop under conditions of good sunlight exposure, which is a function of the training system, the previous season pruning level, and canopy management practices. Good sunlight exposure promotes bud fertility and wood maturity. Fruiting canes and renewal spurs should be selected from positions close to the trunk head to prevent the arms from becoming too long, which will cause a nonproductive gap in the canopy above the head.

The characteristics of desirable fruiting canes are:

1. Firm wood with brown periderm nearly to the tip;
2. A sufficient number of healthy, fruitful buds;
3. Without mechanical damage or visible disease infections;
4. Round in cross-section with relatively short internodes (7.5 to 10 cm) and moderate diameter (0.75 to 1.5 cm);
5. Well positioned on the arm (arising close to the trunk).

### ***Identify the Renewal Spur***

Following selection of good fruiting canes, another good, well-positioned cane is selected as a renewal spur and pruned back to one or two buds. Periodically, it may be useful to retain a water sprout during shoot thinning if the water sprout is closer to the trunk than the current renewal spur. At the next dormant pruning, the water sprout cane will become the renewal spur. This practice keeps arm length from becoming excessively long.

An alternate method does not retain a separate renewal spur. Instead, in the next dormant season, a good basal cane from the previous season's

fruiting cane can be selected as the new fruiting cane.

### ***Prune***

The remainder of the previous year's fruiting wood and all other extraneous canes, including suckers and water sprouts, are removed. Suckers should be traced back to their source and cut back completely to remove all their basal buds. Fruiting canes are trimmed to a length that retains the desired number of dormant buds. The pruning cut is made through the next node (bud) beyond the retained buds, so that the enlarged portion of the node prevents the tie from slipping off.

Next, all tendrils and laterals are removed; the cane is bent up onto the fruiting wire, wound once around it, and tied at the end.

# Head Training for Cane Pruning

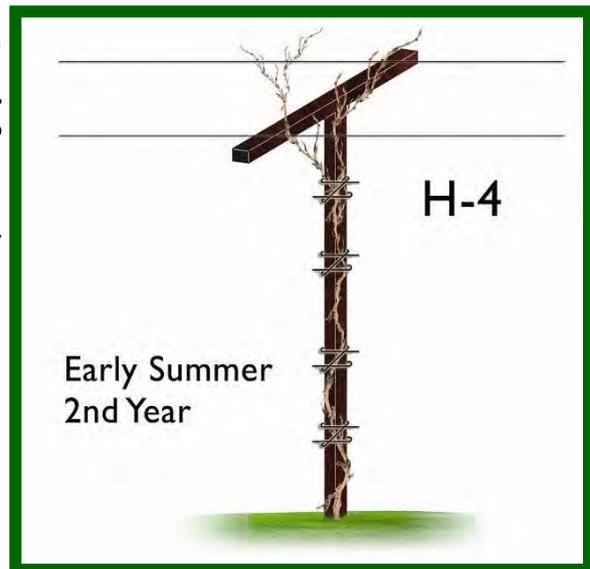
**Year one (Year of planting)**      No pruning

## **Winter after Year 1**

Prune back to two to three buds

## **Year two (Figure H-4)**

Tie and train the straightest shoot developing from the retained buds to the stake, when securely tied and with about 45 to 60 cm growth, remove all other shoots.



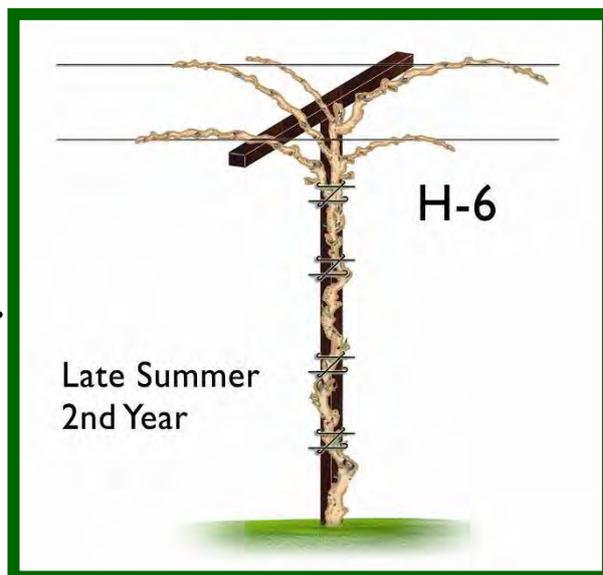
Continue to tie growing shoot to stake at a minimum of every 30 cm. Remove all lateral growth on the lowest 75 to 90 cm.

When the trunk has grown about 20 to 30 cm above the cross arm and wire, cut it off to form the head about 20 to 30 cm below the cross arm and wire. (Figure H-5)



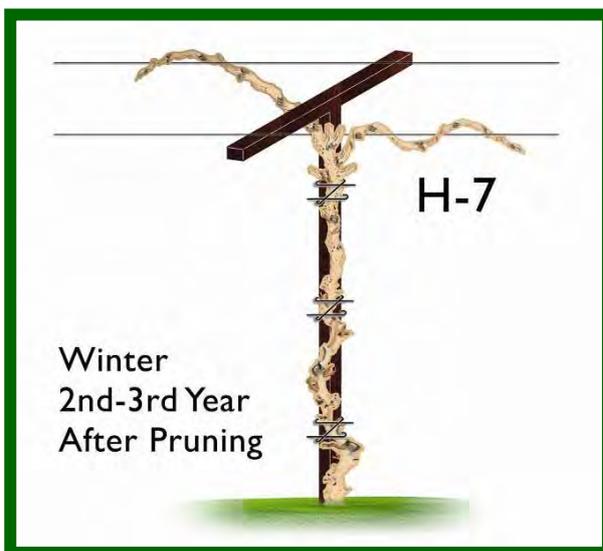
This allows the trunk, where cut, to have time to harden and become woody before it is cut.

Near the end of the summer, select three to five of the upper retained shoots and secure them to the wires. (Figure H-6)



### ***Winter after year 2***

Select two of the retained canes, one on each side, and remove the others back to 2 nodes for renewal spurs, provided that they are in a suitable position for future cane selection. Cut the retained canes back to 10 to 12 nodes in length, rather than the normal 15, which will be retained in all following years. This will limit the third year crop. (Figure H-7)



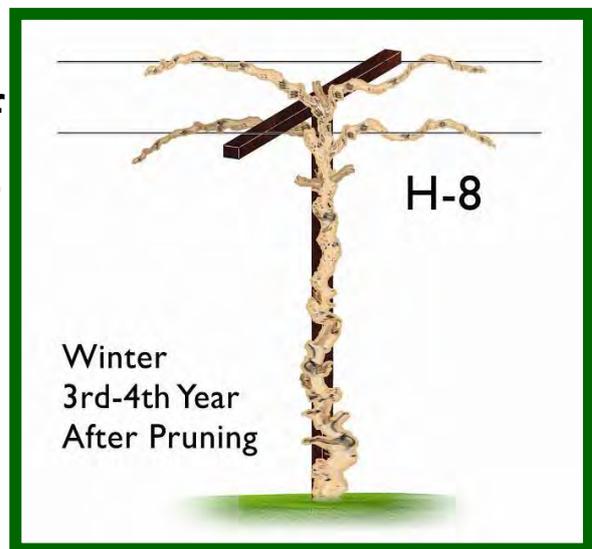
The third year canes originating from lateral shoots are more fruitful than canes originating from primary shoots on mature vines.

### ***Summer year 3***

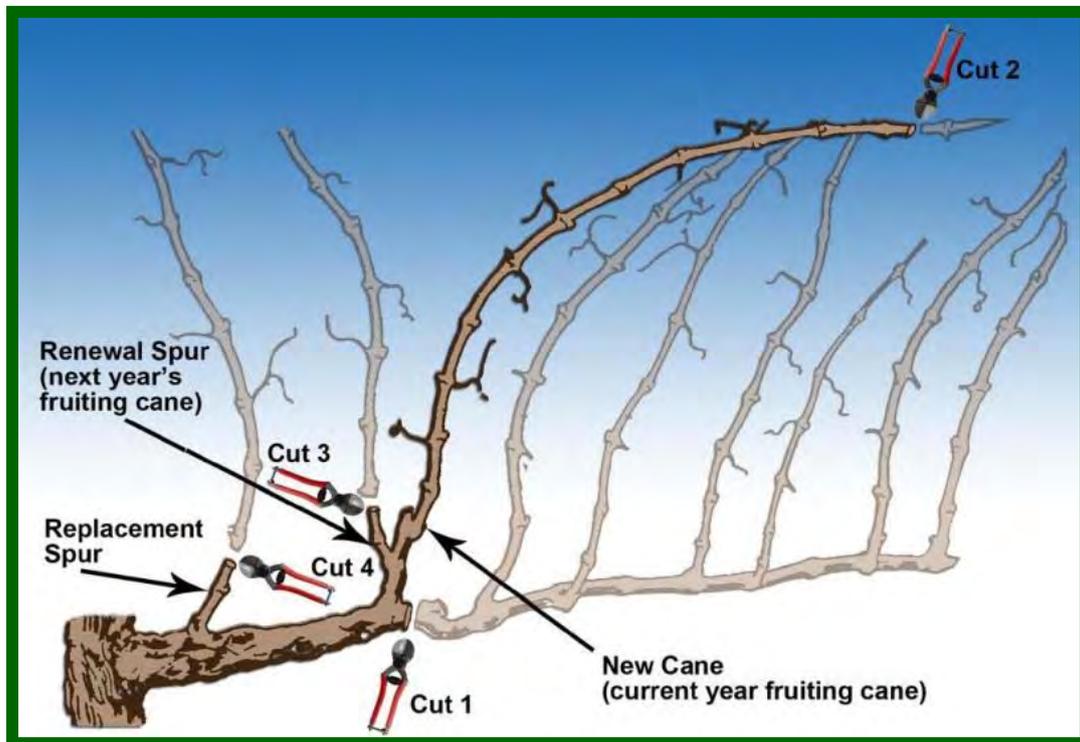
The farmer will produce a crop on the two retained canes.

### ***Winter after year 3***

Prune to retain 4 canes of 15 nodes and leave replacement spurs to produce the following year's canes. ([Figure H-8](#))

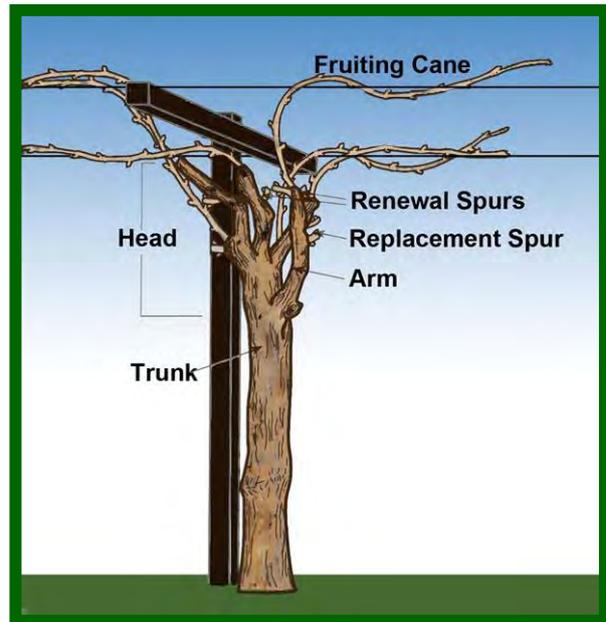


# Thompson Seedless - Cane Pruning Close -Up Views



***Thompson Seedless variety must be cane pruned of low fruitfulness of the three basal nodes.*** The three basal nodes are the nodes normally used for fruit production in spur pruning, but are too low in fruitfulness in Thompson Seedless to be useful. Instead, 12 to 15 node canes are retained because of the higher fruitfulness through the remaining node positions. Thompson Seedless is the only variety introduced by USAID-Inma, which requires cane pruning. The other varieties may be either cane or spur pruned. Features of an ideal

## Thompson Seedless vine after pruning.



## Spur Pruning

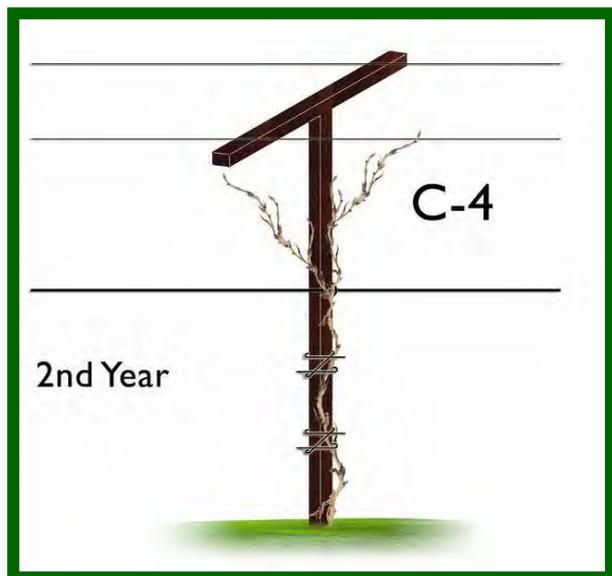
Cordon-trained vines are typically spur-pruned. Just as with cane-pruning, the arm positions of cordons are established by the training process and all fruiting and renewal spurs arise from this area. The arms should be evenly spaced along the cordon, and oriented in the proper direction (up or down depending on the training system). Select suitable canes for the new fruiting spur and renewal spur using the same criteria described for cane pruning. Remove the old fruiting wood from the previous season. The selected fruiting cane is shortened to create a fruiting spur containing 2-4 buds, depending on the fruitfulness of basal buds and the desired cropping level. The renewal spur cane is cut back to one bud. Similar

to cane-pruning, selection of canes for spurs should take into consideration the position of the cane on the arm. Select canes to maintain as compact an arm as possible and to maintain the desired spacing between arms.

## Bilateral Cordon Training

This system is used for spur-pruned varieties. The cordon branches are trained on a wire about 50 cm below the cross-arm -- approximately 1 M above ground level using 2.1 M stakes with 50 cm pushed into the ground.

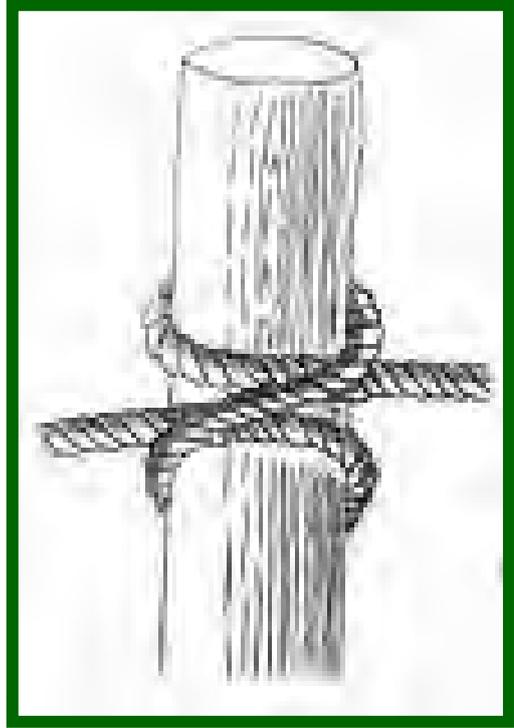
Cordons are formed from 2 lateral shoots at the top of the main shoot. The main shoot (trunk) is topped when it has grown 45 cm beyond the lower (cordon) wire (Figure C-4)



Normally, the space between nodes has reached its full potential at this distance behind the shoot tip. However, **topping should be delayed with vigorous Flame Seedless variety vines until there is at least 60 cm of growth beyond the cordon wire.**

The exceptionally long internodes can still be elongating within this distance from the shoot tip.

Make the cut so that the top lateral shoot is about 5 to 8 cm below the wire. This assures that the cordons will branch about 5 cm below and into a gradual bend up to the wire. Some growers prefer to cut through a node at or just below the cordon wire. This kills the bud, but leaves a dead internode at the top to tie firmly to the stake, using twine with a clove hitch tie.



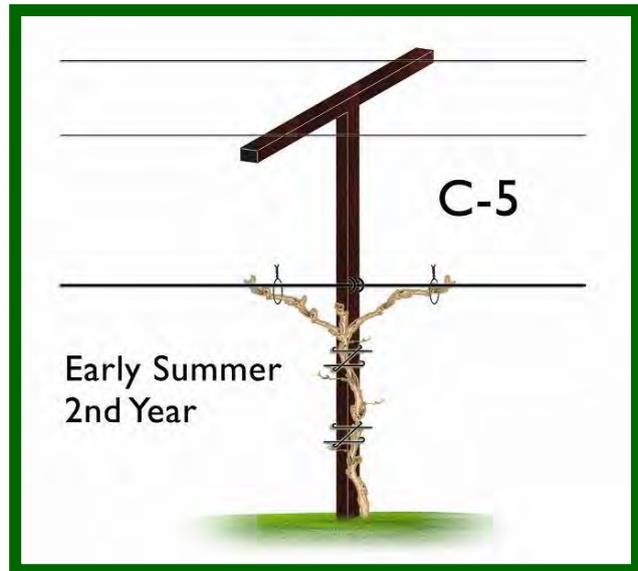
**Clove Hitch Tie**

Always make sure that the top of the vine is tied to the same side of the stake as the wire attachment.

***Always top the vine to produce the lateral shoots*** for uniform cordons. If the main shoot growing up the stake is merely tied down to one side for a cordon, the opposite cordon must come from a smaller lateral shoot. This results in a permanently stronger side and weaker side on cordon trained vines.

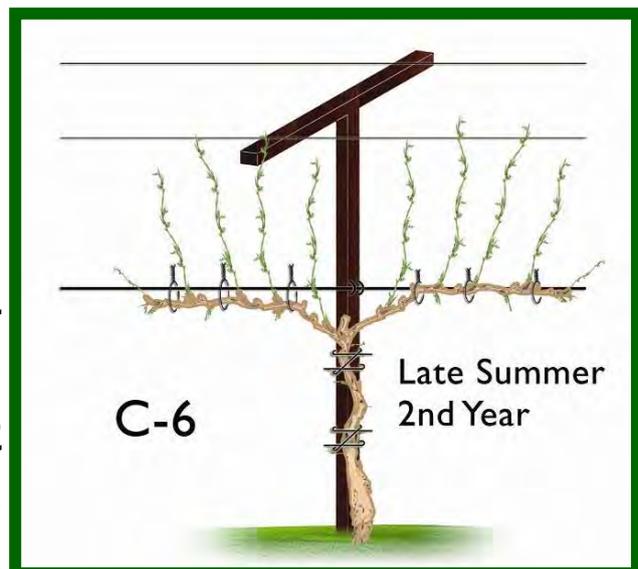
## Summer second year

Once the two top lateral shoots are selected for the cordons and tied to the wire, all the remaining lateral shoots down the trunk are removed (Figure C-5).



Continue to tie the two remaining lateral shoots as they develop along the wire to keep them straight (Figure C-6).

If the lateral shoots are vigorous enough to grow past midway to the next vine by July 1, they can be tipped at this point. This stimulates more lateral shoot growth along the permanent portion of the branch canes. Weaker vines can be left to grow along the wire without tipping. No further training is then necessary for the remainder of the growing season except keeping loose growth

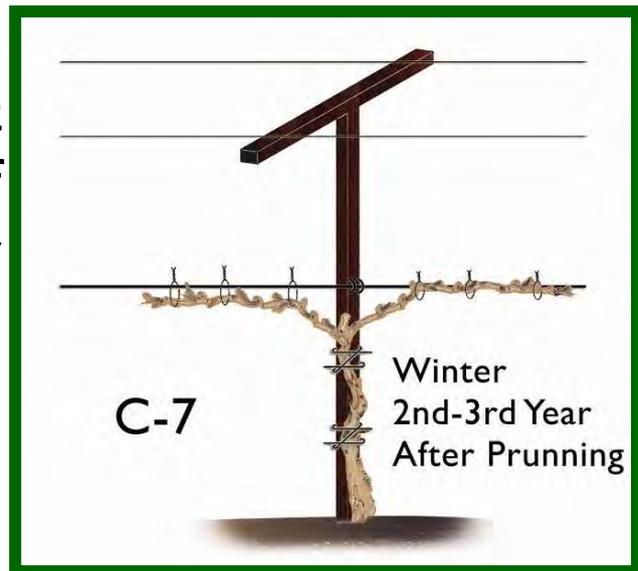


supported on the wire. Excessive vine vigor and late fall growth can be a problem at this stage of vine development, especially with cordon training. **It contributes to excessively long internodes and erratic bud break-a common problem in Flame Seedless Grapes. Poor wood maturity and winter kill can cause vine die-back and poor bud break-a characteristic of Ruby Seedless Grapes.** Avoiding nitrogen fertilization and late fall irrigation in fertile soils will help minimize these problems in susceptible varieties.

### ***Winter between second and third year***

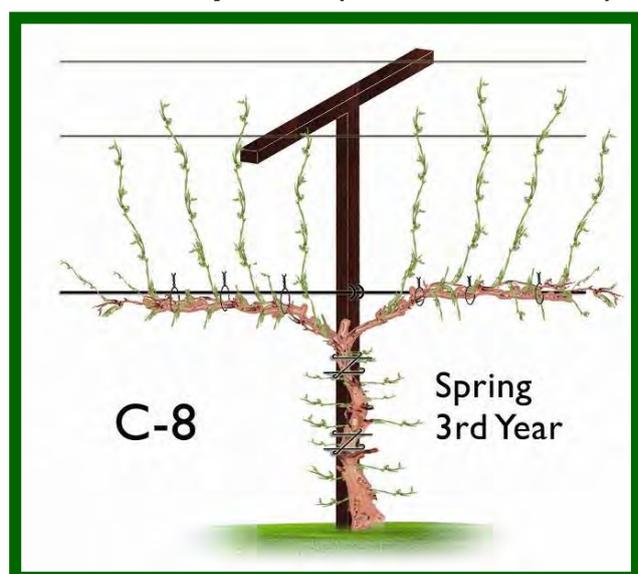
Cut the developing cordons off at the point where they are about 3 mm in thickness. Less vigorous varieties may require two seasons to reach their full length, otherwise the vines can be over-cropped and never develop strong, full length cordons. Spurs (laterals) are not normally left on first year cordons. Cutting off all of the laterals limits the number of buds that can grow the following spring. This reduces the number of shoots and clusters. (Very vigorous vines are the exception to this) Leave one node spurs where the cordon is very thick (1.6 cm or larger). This

helps prevent blank areas, where buds get buried in the growth of large diameter wood. (Figure C-7)



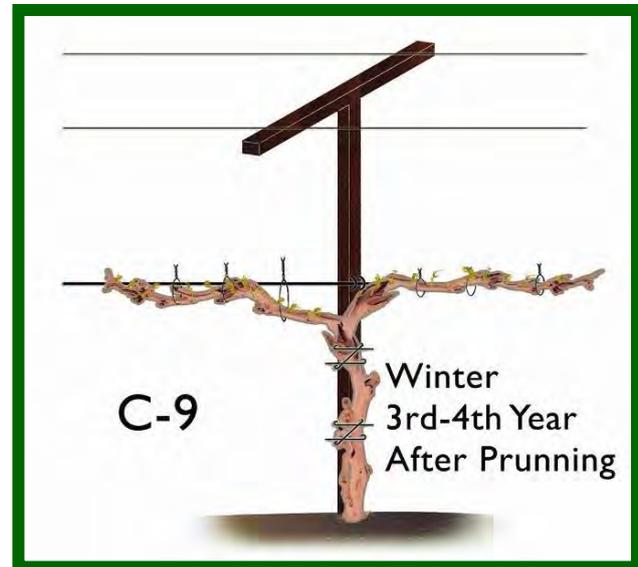
### ***Spring of the third year***

Shoot thinning is appropriate for the following spring. This removes excess crop, provides for permanent spacing of the spur positions, and eliminates unwanted growing points for the following years. Remove all shoots on the trunk up to just above the branching of the cordons. Leave about 20 cm of open (shoot free) space where the cordons divide. Retain shoots only where you wish to have permanent spur positions, approximately every 10 to 13 cm along the cordon. (Figure C-8)



## ***Winter pruning of mature vines***

Prune to retain the 2 cordons. Prune laterals to 3 nodes. (Figure C-9)



## ***Disposal of Prunings***

A typical two wire trellis of seedless grapes will produce about 1,240kg/ donum for prunings. The dry weight would be about 560 kg/ donum. These prunings are approximately 0.305 % nitrogen, 0.252% potassium on a fresh weight basis. If incorporated into the soil they will return approximately 4 kg N and 3 kg of K per donum. This nutrient content along with the organic matter the prunings provide, are incentives for shredding and incorporating any prunings that are not used for future propagation into the field, rather than removing them.

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