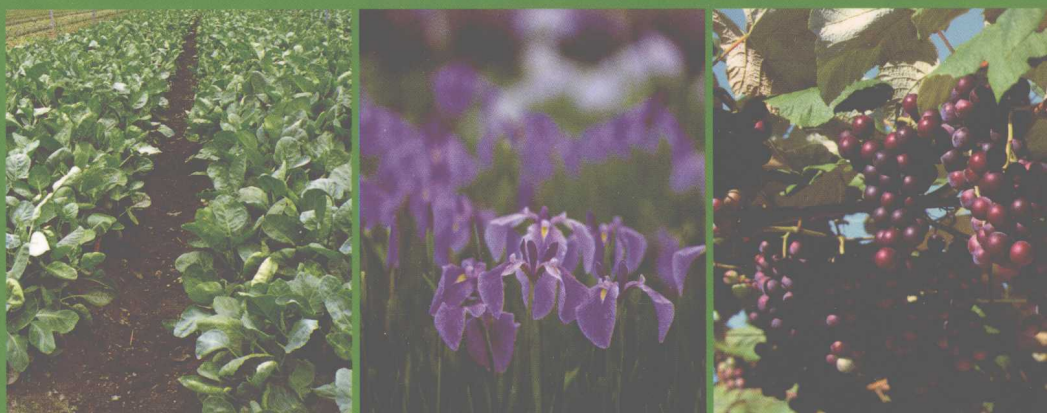


# 园艺英语

王永清 主编



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# 前 言

自我国加入 WTO 以来,中国园艺与世界园艺日益一体化。我国园艺专业的学生不仅需要从汉语课本中获得园艺专业知识,也需要从其他途径获得相关的园艺专业知识。为了帮助园艺专业学生成长为有一定国际水准的高素质人才,我们特组织一批具有留学经历、从事园艺专业英语教学的作者编写了这本园艺英语教材,希望能有助于我国高等农林院校园艺专业教学和人才的培养。

本教材内容包括园艺学基础、果树、蔬菜、观赏园艺等四个方面,分别选定若干主题,从国外图书、期刊、杂志和网站上精选素材,反映了园艺专业的基础知识和最新动态。

本书由王永清老师编写 lesson1 ~ lesson4,马翠兰老师编写 lesson5 ~ lesson12,于喜艳老师编写 lesson13 ~ lesson19,郭先锋老师编写 lesson20 ~ lesson21。每课内容包括英语短文、专业词汇解释、重点疑难句解释、英文阅读理解材料及理解题,另外还有英语短文的中文翻译和阅读理解题的参考答案。

本教材编写过程中,参考了国内外一些园艺相关方面的图书以及网络上的资料。在此,对提供这些资料的集体和个人表示衷心的感谢。

希望同学们通过学习本教材后,能够了解和掌握园艺专业领域内的常用英语词汇、短语、句法和语法,具有自学英文版专业图书的能力和翻译园艺专业英文文献及撰写园艺专业英语文章的能力。

本教材可作为大专院校园艺及其相关专业大学生、研究生英语教材,也可供上述相关专业的教师、科研人员参考。

限于编写人员的水平,本教材的缺点和错误一定还不少,我们恳切地希望广大老师和学生多多提出宝贵意见,以便我们在再版时修订,提高教材质量。

编者

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## Lesson 1

# CULTIVATION OF FRUITS

### Planting

Dry-rooted trees are best planted during November or December. If they are in their permanent sites by the beginning of winter they get off to a better start than those planted later.

Container-grown trees are more expensive but can be planted at any time of the year. Dig a hole twice the size of the rootball and add an organic fertilizer. Fill in the hole and firm into position by applying an even, steady pressure with the heel of the foot. When planting container-grown trees during the summer months the rootball should be teased out and soaked in a bucket of water overnight. Plant as described above and water regularly throughout the summer if there are dry spells.

All trees growing in the open should be supported, at least whilst they are still relatively small. Place a stake 3 in (7.5cm) from the tree on the windward side and secure with an adjustable tie.

### Rootstocks

Most fruits do not breed true to form. If the seeds of fruit such as apples and pears are germinated, the resultant tree will probably yield fruit very similar to its wild ancestor and definitely far removed from the cultivar from which it originated. Very occasionally a different variety will result, but only a minute fraction of these will produce improved fruit. Instead, the method used to propagate fruit trees is grafting a shoot (scion) on to a rootstock of another variety, or in some cases even a different type of tree. Whilst the shoot will fix the variety of fruit which is obtained, it is the rootstock that will determine the vigour with which the tree grows and its ultimate size. Some stocks produce full-sized trees best suited to the larger garden or orchard whilst those termed 'dwarfing stocks' yield trees which can be grown and reach maturity in tubs. As well as reducing the size of the trees, these dwarfing stocks will increase the amount of fruit produced for the size of the bush. Virtually all urban gardens should grow only dwarfing rootstock as although a tree grown on any rootstock can be kept down to an acceptable size, with larger trees this will only be accomplished at the expense of yield.

### Types of Trees

Cordon fruit trees have only a single stem and are ideal for small gardens against walls or as part of a screen. They may be trained to grow upright or trained at an angle of 60 degrees and supported by a wire framework. Double cordons consist of two vertical stems with the fruiting spurs encouraged to grow outwards and are a particularly good method for growing gooseberries and similar types of fruit.

Espalier, also termed horizontal training, is a system of training which involves a main leader

growing vertically with a number of leaders growing at right angles to it. It is particularly useful for training against a wall or for training on wires to form a screen. Another advantage of this system is that the resulting effects are visually appealing and attractive. It is probably the best method of training for the small garden.

Fan is a system in which the leaders are trained to radiate from a central point to form a fan. This is especially suitable when growing trees such as plums against a wall.

Pyramid is a method used to obtain symmetry within the tree in which the leaders are trained to grow to a gradually diminishing size. It is essentially a trained version of the bush tree, the only advantage over the bush tree being cosmetic.

Standard tree possesses a trunk with no growths below the canopy. This style is developed by training the tree into a hemisphere and keeping the centre open. Winter and summer pruning are both essential for success with this method of cultivation.

Apples, and to a lesser extent pears, can be trained to grow in statuesque shapes forming living garden architecture. The variation of shapes is limitless, but for the inexperienced the simplest of designs are the most effective. The supple young growths can be trained into any shape and will form rigid structures over the years. One of the most effective is the tulip or wine-glass shape which has a completely open centre.

## Pruning

A tree will grow naturally as a main stem and will begin branching when it has reached a certain height - this height depends upon the rootstock. With any tree the single stem or trunk is referred to as the main leader and the branches growing from it are referred to as leaders. Growing from the leaders are the laterals.

If undisturbed, the main stem will form between five and seven leaders during the second year, and if the bush or pyramidal shape is desired, these should be reduced to one third of their original length during the winter. In subsequent years the general pattern of pruning is to cut out all weak leaders hard against the parent branch. Any branches which are growing inward should also be cut out as they would otherwise create a crowded canopy restricting the entry of light and the movement of air, both of which are necessary for reducing the danger of fungal infection. Strong leaders which you wish to retain should be cut back from a third to a half of their original length to an outward facing bud. Cuts should be made with sharp secateurs - a jagged cut will allow disease to enter, and any damage to the cambium layer just below the bark will result in the stem being very slow to form a callous. If the cut is some distance away from a bud, then die-back will occur which can gradually spread throughout the branch and the tree itself. If there is dead wood in the tree as a result of disease or wind damage, then it should be removed by cutting back to a live bud in the manner described for pruning. If large cuts have to be made then the wood should be cut flush with a main branch and painted over with a sealant to stop the entry of infection.

Wherever possible trees should be bought part-trained as it is better to have the correct stock - not all varieties lend themselves to all methods of training. Cordons, for example, are only success-

ful with spur-fruiting cultivars and are a failure with tip-fruiting varieties. If spur-fruiting is to be encouraged, the laterals should be cut back to 1-2in (2.5-5cm) of the leaders; this will induce the formation of fruiting buds at the expense of growth buds.

The time of pruning depends upon the type of fruit. Apples and pears are best pruned during the dormant season from November to February, thus allowing sufficient time for the wounds to heal over before the sap rises. Plums and other stone fruit will bleed if pruned at this time of the year and should be left until the early summer. Soft fruits vary in their requirements depending upon the type.

Apple and pear trees grown in a confined space should have their laterals cut back to six leaves, while grape laterals carrying fruit should be cut back to three pairs of leaves. Do not reduce further, as sufficient leaves must be left to produce the sugars which form the fruits.

Plums on standard rootstocks will grow very vigorously, and to restrict this growth the tree should be root pruned. During the winter months cut a circle lyd (1m) in diameter around one half of the trunk of the tree, and with the spade cut through the roots (these will self-heal). Replace the soil and ensure that it is firmed in.

Pruning stimulates growth as it provides a balance between the roots below the ground and the growth above. As soon as pruning takes place vigorous new growth forms to restore the balance. Pruning can therefore be used to stimulate an old tree into fresh growth but should always be tried on an experimental basis in case you destroy a fruit tree! Cuts should be made with a special pruning saw and no more than a third of the main branches should be cut away in the first year because if more branches are removed the shock could kill the tree.

All along the main stems of fruit trees there will be buds. Many of these will remain dormant, but the ones which do develop are not always in the best position for training. Which buds develop will depend upon the growth chemicals they receive. Growth promoters are provided by the roots and travel upwards, and at the same time the tip of the shoots produce inhibitors to stop all of the tree's energy being diverted into shoot production. Shoot production is therefore regulated by stemming the flow of either of the control mechanisms. To promote shoot production make a 1/8in (3mm) deep cut, 1/2in (1cm) long and 1/2in (1cm) above the bud. Similarly, to stop the formation of the shoot make a similar cut the same distance below the bud.

Some trees, especially plums, develop suckers which are growths from the root of the tree. Such growths are related to the rootstock and not the scion, and although they will root themselves the quality of the fruit and the growth of the resultant tree will be unpredictable. Suckers should be removed as soon as they appear.

## Pollination

Fruit is formed when pollen from one flower is deposited upon another, but it will only form if the pollen of the donor is compatible with the acceptor. This presents no problem with most soft fruits, but many of the large fruit trees are more demanding in their requirements. Some fruits are self-fertilizing, that is pollen from one of the flowers on one tree will fertilize the ovaries of another on the same tree. Other trees are described as partially self-fertilizing and will produce crops without



the presence of another variety, but do require a fertilizing tree for the best results. Many trees need pollen from a different variety of the same fruit to bring about successful pollination. With some cultivars it is necessary to plant another variety nearby, and in general any tree that blooms at the same time will suffice although with cherries the demands are even more critical than this. As the number of varieties of fruit such as apples is so large it is not possible to include all fertility relationships, and if in doubt you should ask your local nurseryman for advice as to what, if any, pollinator is required.

Pollination of apple trees is often ignored. This is because it was seldom a problem in the past when large numbers of apple trees were grown in one district and pollinating insects would ensure fertilization of them all. Generally the amateur may ignore the question of pollination with apples unless he or she lives in an isolated area, but with pears, plums and more particularly cherries the lack of a suitable pollen source is a frequent cause of failure. Wherever possible and even where self-fertilizing varieties are grown, it is advisable to plant a second tree as far better crops will be produced through hybrid vigour. It is also possible to buy two mutually compatible varieties which are grafted on to the same rootstock. This ensures good crops of both, and when only one tree is to be grown the pollinating partner is extremely useful.

### Thinning

Thinning in some circumstances will prevent biennial cropping. It allows the fruit to develop to its full size and should be done gradually. With apples much of the fruit is lost naturally in the 'July fall' when the tree disposes of much of its surplus. This usually still leaves more fruit than the tree can carry, so thin the fruit down until there are no more than two fruits per spur, with the spurs no closer than 6in (15cm) apart.

As soft fruit canes die after bearing the crop, and because thinning can have no effect on the following year's crop, there is nothing to be gained by using this method. Currants similarly do not require thinning. This is not necessary with cordon grown trees where far fewer fruits are encouraged to develop initially.

It is totally impractical to attempt the thinning of strawberries and little to be gained by it. Here, size will be determined mainly by variety and the amount of nutrient available for fruit production. Where thinning is performed it will only be effective if carried out in conjunction with all the other recommendations for good fruit production.

(摘自: B. Leverett. *Practical Fruit Growing*. The Crowood Press, 1992)

### New Words

bark *n.* 树皮  
biennial *n.* 二年生植物 *adj.* 二年生的, 二年一次的  
bloom *n.* 花 *v.* 开花

bud *n.* 芽  
bush *n.* 矮树丛  
callous *n.* 愈伤组织, 结痂  
cambium *n.* 形成层

cane *n.* 细长的茎, 蔓, 藤条  
 canopy *n.* 树冠  
 cherry *n.* 樱桃, 樱桃树  
 compatible *adj.* 亲和的  
 cordon *n.* 单干形  
 cultivar *n.* 品种  
 cultivation *n.* 培养, 栽培  
 currant *n.* 黑醋栗  
 decorative *adj.* 装饰的  
 die-back *v.* 回枯  
 dormant *adj.* 休眠状态的, 静止的  
 dry spells *n.* 干旱期  
 dwarfing stocks *n.* 矮化砧  
 espalier *n.* 篱形  
 fan *n.* 扇形  
 fertilize *v.* 施肥, 使受精  
 fungal *adj.* 真菌的  
 germinate *v.* 发芽  
 gooseberry *n.* 醋栗树, 醋栗  
 graft *n.* 嫁接, *v.* 嫁接  
 hard pruning *n.* 重剪  
 hybrid *n.* 杂种, *adj.* 杂种的  
 infection *n.* 传染, 感染  
 inhibitor *n.* 抑制剂  
 inward *adj.* 向内的, 内在的  
 jagged *adj.* 参差不齐的  
 July fall *n.* 7月落果  
 lateral *n.* 侧枝  
 leader *n.* 主枝  
 main leader *n.* 主干  
 maturity *n.* 成熟  
 nurseryman *n.* 种苗商  
 orchard *n.* 果园

planting *n.* 栽植, 定植  
 plum *n.* 李, 洋李  
 pollen *n.* 花粉  
 pollination *n.* 授粉  
 pollinator *n.* 授粉树  
 promoter *n.* 促进者, 助长者  
 propagate *v.* 繁殖  
 pruning *n.* 修枝, 剪枝, 修剪  
 pyramid *n.* 圆锥形  
 root pruning *n.* 根系修剪  
 rootstock *n.* 砧木  
 sap *n.* 树液  
 saw *n.* 锯, *v.* 锯  
 scion *n.* 接穗  
 sealant *n.* 密封剂  
 secateurs *n.* 修枝剪  
 self-fertilize *v.* 自花受精  
 shoot *n.* 新梢, 枝条  
 soft fruits *n.* 浆果, 浆果类果树  
 spade *n.* 铲, 铁锹, *v.* 铲  
 spur *n.* 短果枝  
 staking *n.* 支柱  
 stem *n.* 茎, 干, 茎干  
 stemming *n.* 起源, 发生  
 stimulate *v.* 刺激  
 strawberry *n.* 草莓  
 sucker *n.* 根蘖, *v.* 除萌  
 summer pruning *n.* 夏季修剪  
 supple *adj.* 柔软的,  
 thinning *n.* 疏果  
 tip *n.* 顶, 尖端  
 trunk *n.* 树干  
 tulip *n.* 郁金香

### Notes to the Text

1. Most fruits do not breed true to form.

大多数果树种子繁殖不能保持亲本性状。To breed true: 纯种传代

2. Whilst the shoot will fix the variety of fruit which is obtained, it is the rootstock that will de-

termine the vigour with which the tree grows and its ultimate size.

接穗保持果实的特性,砧木则决定树的生长势和树体最终的大小。

it is... that... 是强调句型。

3. As well as reducing the size of the trees, these dwarfing stocks will increase the amount of fruit produced for the size of the bush.

虽然矮化砧树变小了,但结实能力却相对增大了。

the amount of fruit produced for the size of the bush:按树的大小而论的果实产量。

4. Virtually all urban gardens should grow only dwarfing rootstock as although a tree grown on any rootstock can be kept down to an acceptable size, with larger trees this will only be accomplished at the expense of yield.

实际上所有的城市果园都应该种植矮化砧的树,因为尽管在任何砧木上的树体都能控制在适当的大小,但把大树控制成小树是以牺牲产量为代价的。

at the expense of yield:以牺牲产量为代价

5. Any branches which are growing inward should also be cut out as they would otherwise create a crowded canopy restricting the entry of light and the movement of air, both of which are necessary for reducing the danger of fungal infection.

任何向内生长的枝条都应该剪去,否则它们可能引起树冠拥挤,影响透光和通风,增加真菌感染的危险。

both of which are necessary for reducing the danger of fungal infection:透光和通风是减少真菌感染所必需的。

6. Apple and pear trees grown in a confined space should have their laterals cut back to six leaves, while grape laterals carrying fruit should be cut back to three pairs of leaves.

密植的苹果和梨应该在侧枝第六片叶后剪枝;而葡萄的结果侧蔓应该留三对叶。

grown in a confined space:在限制空间中栽培的

## Reading Material

### Pruning

Pruning is a very important operation in the orchard, its object being two fold (1) to give form to the tree, and (2) to induce the free production of flower buds as the precursors(先驱) of a plentiful crop of fruit. To form a standard tree, either the stock is allowed to grow up with a straight stem, by cutting away all side branches up to the height required, say about 6 ft., the scion or bud being worked at that point, and the head developed therefrom; or the stock is worked close to the ground, and the young shoot obtained therefrom is allowed to grow up in the same way, being pruned in its progress to keep it single and straight, and the top being cut off when the desired height is reached, so as to cause the growth of lateral shoots. The tips of unripened wood should be cut back about one-third their length at an outwardly placed bud, and the chief pruning thereafter required will be to cut away inwardly directed shoots which cross or crowd each other and tend to con-

fuse(扰乱) the center of the tree. If the shoots produced are not sufficient in number, or are badly placed, or very unequal in vigor, the head should be cut back moderately close, leaving a few inches only of the young shoots, which should be pruned back to buds so placed as to furnish shoots in the positions desired. Three or four leading shoots should be selected to pass ere long(不久) into boughs and form a well-balanced framework for the tree; these boughs, however, will soon grow beyond any artificial system the pruner may adopt.

To form a dwarf or bush fruit tree the stock must be worked near the ground, and the young shoot produced from the scion or bud must be cut back to whatever height it is desired the dwarf stem should be, say 11/8 to 2 ft. The young shoots produced from the portion of the new wood retained are to form the framework of the bush tree, and must be dealt with as in the case of standard trees.

In forming a pyramidal tree, the lateral growths, instead of being removed, as in the standard tree, are encouraged to the utmost; and in order to strengthen them the upper part of the leading shoot is removed annually, the side branches being also shortened somewhat as the tree advances in size. A shows a young tree with its second years growth, the upright shoot of the maiden(童期的) tree having been moderately headed back, being left longer if the buds near the base promise to break freely, or cut shorter if they are weak and wanting in vigor. The winter pruning, carried out with the view to shape the tree into a well-grown pyramid, would be effected at the places marked by a cross line. The lowest branch would have four buds retained, the end one being on the lower side of the branch. The fourth is not cut at all owing to its shortness and weakness, its terminal bud being allowed to grow to draw strength into it. The fifth is an example where the bud to which the shoot should be cut back is badly placed; a shoot resulting from a bud left on the upper side is apt instead of growing outwards to grow erect, and lead to confusion in the form of the tree; to avoid this it is tied down in its proper place during the summer by a small twig(小枝、细枝). The upper shoots are cut closer in. Near the base of the stem are two prominent buds, which would produce two vigorous shoots, but these would be too near the ground, and the buds should therefore be suppressed; but, to strengthen the lower part, the weaker buds just above and below the lowest branch should be forced into growth, by making a transverse incision(环割) close above each.

In order to bring a young tree into the cordon shape, all its side branches are shortened back, either to form permanent spurs, as in the case of pears, or to yield annual young shoots, as in peaches and nectarines. If a double cordon is required, the original young stem must be headed back, and the two best shoots produced must be selected, trained right and left, and treated as for the single cordon.

The forms chiefly adopted for trees trained to walls and espalier rails are the fan-shaped, the half-fan and the horizontal, with their various modifications.

The maiden tree is headed down, and two shoots led away right and left, two laterals should be allowed to grow from the upper side of them. The tree will thus consist of six shoots, probably 3 ft. to 4 ft. long, which are not to be pruned unless they are unequal in strength, a defect which is rather to be remedied by summer pinching than by winter pruning.

The method of pruning formerly adopted for the formation of a fan-shaped tree was to head down

the maiden plant to about two eyes, so placed as to yield a young shoot on each side, the supernumerary(多余的、额外的) shoots being rubbed off while quite young, and the reserved shoots trained against the wall.

The next year they were cut back again often nearly to the base, in order that the lower pair of these shoots might each produce two well-placed young shoots, and the upper pair three young shoots. The tree would thus consist of ten shoots, to be laid out at regular distances, and then if closely cut the frame-work of the tree. These main shoots were not again to be shortened back, but from each of them three young shoots were to be selected and trained in two, on the upper side, one near the base, and the other halfway up, and one on the lower side placed about midway between these two; these with the leading shoot, which was also to be nailed in, made four branches of the current year from each of the ten main branches. The other young shoots, produced were pinched off while quite young, to throw all the strength of abundant light and air.

In pruning for a horizontal tree the young maiden tree has to be headed back nearly to its base, and from the young shoots three are to be selected, the two best-placed lower ones to form an opposite or nearly opposite pair of main branches, and the best-placed upper one to continue the erect stem. This upper shoot is at the next winter pruning to be cut down to within about a foot of the point whence it sprung, and its buds rubbed off except the upper one for a leader, and one on each side just below it to furnish another pair of side shoots; these being trained in position, the tree would appear as in third year.

Sometimes in very favorable soils and with vigorous trees two pairs of branches may be obtained in one season by summer stopping the erect shoots and selecting others from the young growths thus induced, but more commonly the trees have to be built up by forming one pair of branches annually. The shoots are not at first lowered to the horizontal line, but are brought down gradually and tied to thin stakes; and while the tree is being formed weak shoots may be allowed to grow in a more erect position than it is ultimately intended they should occupy.

In all the various forms of cordons, in horizontal training, and in fan and half-fan training, the pruning of the main branches when the form of the tree is worked out will vary in accordance with the kind of fruit under treatment. Thus in the peach, nectarine, apricot, plum and cherry, which are commonly trained fan-fashion, the first three (and also the morello cherry if grown) will have to be pruned so as to keep a succession of young annual shoots, these being their fruit-bearing wood. The others are generally pruned so as to combine a moderate supply of young wood with a greater or less number of fruit spurs. In the pear and apple the fruit is borne principally on spurs, and hence what is known as spur-pruning has to be adopted, the young shoots being all cut back nearly to their base, so as to cause fruit buds to evolve from the remaining eyes or buds. Cordons of apples and pears have to be similarly treated, but cordons of peaches and nectarines are pruned so as to provide the necessary annual succession of young bearing wood.

Fruit trees trained as espaliers, fans or cordons against walls, trellises or fences, are not only pruned carefully in the winter but must be also pruned during the early summer months. Shoots of peaches, nectarines and morello cherries are laid in, that is, placed in between fruiting shoots where

there is the space to be ripened for next years crop.

Summer Pruning should be performed while the shoots are yet young and succulent, so that they may in most cases be nipped off with the thumb-nail. In some cases, as, for example, with peaches, the superfluous(过剩的) shoots are wholly removed, and certain selected shoots reserved to supply bearing wood for next year. In others, as pears, the tops of the young shoots are removed, leaving three or four leaves and their buds at the base, to be developed into fruit buds by the additional nourishment thus thrown into them

Orchard-house trees, and also pyramidal and bush trees of apples, pears and plums, are mainly fashioned by summer pruning; in fact, the less the knife is used upon them, except in the necessary cutting of the roots in potted trees, the better. In the case of orchard-house plants no shoots are suffered to lengthen out, except as occasionally wanted to fill up a gap in the outline of the tree.

The nature of the cut itself in pruning is of more consequence, especially in the case of fruit trees, than at first sight may appear. The branches should be separated by a clean cut at an angle of about 45°, just at the back of a bud, the cut entering on a level with the base of the bud and passing out on a level with its top, for when cut in this way the wound becomes rapidly covered with new wood, as soon as growth recommences, whereas if the cut is too close the bud is starved, or if less close an ugly and awkward snag is left.

The pruning of bearing flowering plants is generally a much lighter matter than the pruning of fruit trees. If a young seedling or cutting of any soft-wooded plant is to be bushy, it must have its top nipped outly the thumb-nail or pruning-scissors(枝剪) at a very early stage, and this stopping must be repeated frequently. Then generally the plant is allowed to grow away till bloom or blooming shoots are developed. To form a pyramidal plant, which is a very elegant and useful shape to give to a decorative pot plant, the main stem should be encouraged to grow upright, for a length perhaps of 6 or 8 in. before it is topped; this induces the formation of laterals, and favors their development. With all the difficult and slow-growing plants of the hard-wooded section, all the pruning must be done in this gradual way in the young wood as the plant progresses.

Root-pruning is most commonly practiced in fruit-tree cultivation. The effect of root-pruning in the first case is to reduce the supply of crude sap to the branches, and consequently to cause a check in their development. The operation is best performed early in autumn, and may be safely resorted to in the case of fruit trees of moderate age, and even of old trees if due care be exercised. In transplanting trees all the roots which may have become bruised or broken in the process of lifting should be cut clean away behind the broken part, as they then more readily strike out new roots from the cut parts.

After the close pruning of the branches to which they are annually subjected, and when the young shoots have shot forth an inch or two in length, they are turned out of their pots and have the old soil shaken away from their roots, the longest of which, to the extent of about half the existing quantity, are then cut clean away, and the plants repotted into small pots.

1. The purpose of pruning in orchard is \_\_\_\_\_.

A. to induce more flower buds

- B. to form a well-balanced framework for the tree  
C. to beautify the tree  
D. both A and B
2. The forms chiefly adopted for trees trained to walls and espalier rails don't include \_\_\_\_\_.
- A. the cordon shaped tree  
B. the half-fan shaped tree  
C. the fan-shaped tree  
D. the horizontal tree
3. The head should not be cut back moderately close, leaving a few inches only of the young shoots in the pruning for a standard tree, \_\_\_\_\_.
- A. if there are not sufficient shoots in number  
B. if the shoots are badly placed  
C. if the side branches are up to the desired length  
D. if the shoots are very unequally vigorous
4. In forming a pyramidal tree, the upper part of the leading shoot is removed \_\_\_\_\_ in order to strengthen the lateral growths.
- A. every two years  
B. every three years  
C. every year  
D. none of the above
5. In pruning for a horizontal tree, the best-placed upper shoot is \_\_\_\_\_.
- A. to be made a transverse incision  
B. to be cut down to within about a foot of the point where it sprung  
C. to be rubbed off all buds on it  
D. to be trained in position
6. The pruning of the main branches when the form of tree is worked out will vary in accordance with \_\_\_\_\_.
- A. the weather  
B. the kind of the tree  
C. the size of the tree  
D. the height of the tree
7. The spur-pruning has to be adopted to \_\_\_\_\_.
- A. peach and nectarine  
B. apricot and cherry  
C. apple and pear  
D. peach and pear
8. \_\_\_\_\_ are mainly fashioned by summer pruning in apple, pear and plum.
- A. Orchard-house trees

- B. Bush trees
  - C. Pyramidal trees
  - D. All of the above
9. The pruning of non-flowering plants is generally \_\_\_\_\_ than the pruning of fruit-bearing trees.
- A. better
  - B. worse
  - C. a much lighter matter
  - D. a much heavier matter
10. Root-pruning is best performed in \_\_\_\_\_.
- A. early autumn
  - B. winter
  - C. late spring
  - D. early summer

### Questions for Discussion

1. What purposes does pruning serve?
2. What types of tree are mentioned in this article?
3. What should be done to form a standard tree by pruning?
4. How is summer pruning performed?
5. What is the effect of root-pruning?



## Lesson 2

### UPTAKE OF FOLIAR-APPLIED NUTRIENTS

Mineral nutrient uptake by leaves involves three steps. After mineral nutrients are deposited on the leaf surface they (1) penetrate the cuticle and epidermal walls by means of diffusion; (2) are absorbed on a surface of the plasmatic membranes, and (3) pass through the plasma membranes and enter the cytoplasm.

#### Penetration through the Cuticle

##### Structure of the Cuticle

The first, and most limiting, barrier to foliar uptake of nutrients is the cuticle, which consists of two layers. The outer layer is made almost entirely of cutin covered by surface (epicuticular) waxes. The inner layer is composed of cellulose and pectic substances and is encrusted with cutin. Pockets of cuticular (embedded) waxes are also present in the second layer. The entire cuticular membrane is separated from the underlying epidermal cell wall by a pectic layer.

The epicuticular wax is the outermost and most hydrophobic component of the leaf surface on which foliar sprays are deposited. The cutin, consisting of polyesterified hydroxy fatty acids, is more hydrophilic due to the presence of polar groups attracting water through hydrogen bonds. Other components of the cuticle (pectinaceous substances and proteins) have a great ability to absorb water and thus may serve as polar pathways for water and solutes.

##### Pathways for Nutrient Penetration through the Cuticle

Views on possible conducting channels through the cuticle have changed with time. Roberts reported that in the leaves of 'McIntosh' apple pectinaceous substances form a continuum across the cuticle. Norris and Bukovac noted pectic substances in pear cuticles, although those substances did not appear to reach the outer cuticular surface. More recently Hoch showed that polysaccharide microfibrils in apple leaf cuticle form a continuum from the outer surface to the epidermal cell wall and serve as a pathway for polar transport. He concluded that due to the staining and microscopic techniques used by Roberts et al. and Norris and Bukovac, it is doubtful that the pectinaceous substances they found represented microfibrils in the cuticle. Instead, he proposed that these materials represented the pectinaceous substances of anticlinal epidermal cell walls. Reed and Tukey confirmed the existence of polysaccharide microfibrils in apple leaf cuticle, although the extension of these microfibrils to the outer surface of the cuticle was not confirmed. In addition to polysaccharides, cutin may also serve as a penetration pathway for water and solutes since it is not totally impermeable.

The existence of polar pathways in the cuticle may be demonstrated by the formation of black precipitates after leaf fixation in Gilson solution. Mercury precipitates are usually found under the