**Drops**

Abscission of the [hypanthium](http://en.wikipedia.org/wiki/Hypanthium) during development of a [nectarine](http://en.wikipedia.org/wiki/Nectarine) fruit

A plant will abscise a part either to discard a member that is no longer necessary, such as a leaf during [autumn](http://en.wikipedia.org/wiki/Autumn), or a flower following [fertilisation](http://en.wikipedia.org/wiki/Fertilisation), or for the purposes of [reproduction](http://en.wikipedia.org/wiki/Reproduction). Most [deciduous](http://en.wikipedia.org/wiki/Deciduous) plants drop their leaves by abscission before [winter](http://en.wikipedia.org/wiki/Winter), whereas [evergreen](http://en.wikipedia.org/wiki/Evergreen) plants continuously abscise their leaves. Another form of abscission is fruit drop, when a plant abscises fruit while still immature, in order to conserve resources needed to bring the remaining fruit to maturity. If a leaf is damaged, a plant may also abscise it to conserve [water](http://en.wikipedia.org/wiki/Water) or [photosynthetic](http://en.wikipedia.org/wiki/Photosynthetic) efficiency, depending on the 'costs' to the plant as a whole. The abscission layer is a greenish-grayish color.

Abscission can also occur in premature leaves as a means of [plant defense](http://en.wikipedia.org/wiki/Plant_defense). Premature leaf abscission has been shown to occur in response to infestation by gall [aphids](http://en.wikipedia.org/wiki/Aphids). By abscising leaves that have been made host to aphid galls, plants have been shown to massively diminish the pest population, as 98% of aphids in abscised [galls](http://en.wikipedia.org/wiki/Galls) died.

The abscission is selective, and the chance of dropping leaves increases as the number of galls increase. A leaf with three or more galls was four times more likely to abscise than a leaf with one, and 20 times as likely to be dropped as a leaf without any galls.

**Mechanisms**

**Structural**

In [deciduous](http://en.wikipedia.org/wiki/Deciduous) trees, an abscission zone, also called a separation zone, is formed at the base of the [petiole](http://en.wikipedia.org/wiki/Petiole_%28botany%29). It is composed of a top layer that has cells with weak walls, and a bottom layer that expands in the autumn, breaking the weak walls of the cells in the top layer. This allows the leaf to be shed.

**Lack of chlorophyll as a trigger**

The reduction of [chlorophyll](http://en.wikipedia.org/wiki/Chlorophyll) production in leaves due to decreased sunlight in the autumn explains why some leaves turn yellow. However, the yellow color can attract [aphids](http://en.wikipedia.org/wiki/Aphid), so some trees turn the leaves red instead by injecting a bright pigment. The loss of chlorophyll may also contribute to the abscission process.

**Chemical**

A variety of [reactive oxygen species](http://en.wikipedia.org/wiki/Reactive_oxygen_species) (ROS) are generated by plants during times of stress ([biotic](http://en.wikipedia.org/wiki/Biotic_component) and [abiotic](http://en.wikipedia.org/wiki/Abiotic)) including [UV light](http://en.wikipedia.org/wiki/UV_light), cool temperatures, excessive light, pathogens, parasites, and high [salinity](http://en.wikipedia.org/wiki/Salinity). The presence and continuous production of these ROS causes disruption in the [homeostasis](http://en.wikipedia.org/wiki/Homeostasis) of the cellular components, leading to [metabolic](http://en.wikipedia.org/wiki/Metabolic) dysfunction خلل التمثيل الغذائيand expression of cell wall-degrading enzymes (WDEs).

**Hormonal**

While researchers originally believed [abscisic acid](http://en.wikipedia.org/wiki/Abscisic_acid) to be the hormone that stimulates abscission (for which the hormone was named), it was later proven that it does not play a primary role. In fact, [auxin](http://en.wikipedia.org/wiki/Auxin), a plant hormone, and [ethylene](http://en.wikipedia.org/wiki/Ethylene) have been implicated as prominent regulators of abscission signaling.

The two compounds work in a (interactive)[synergistic](http://en.wikipedia.org/wiki/Synergistic) fashion:

**As the auxin levels** decrease, the flux of auxin to the abscission zone is reduced. Exhaustion of auxin makes the abscission zone sensitive to ethylene. When the plant is then exposed to **ethylene**, gene expression of cell wall-degrading enzymes such as **cellulase and** [**polygalacturonase**](http://en.wikipedia.org/wiki/Polygalacturonase) are activated. However, this is not to say that ethylene directly activates WDE(cell wall-degrading enzymes) gene expression, because the elements responsible for detecting ethylene have not been found in the gene’s promoter region. Dwindling auxin levels have also been implicated in autumn-leaf color change.

Fruit Drop and Pre-harvest Fruit Drop

**Fruit Drop:**

Fruit trees usually bear a large number of flowers and only small percentage of which are enough to give a normal yield. When the fruit set is much more than the tree can normally carry to maturity, there will be drop of fruits at various stages of fruit development as an adjustment Change) of tree to its resources. Such drop is natural and beneficial to the trees and it will prevent exhaustion of the resources and breaking of branches by over bearing.

The flower or fruit drop are preceded by the formation of layer or several layers of cells at the base of petiole pedicle or punend and at the right angles to this axis. These cells are more or less rectangular مستطيلة الشكل in shape and are not cemented ملتصقة together strongly and not crossed by fibrous or vascular tissues consequently وبالتالي breakage or abscission is at that point. The formation of this abscission layer of cells is a natural phenomenon ordinarily taking place as natural maturity is reached. It may be hastened by certain environmental conditions.

**The fruit drop usually takes place in definite, waves or at .definite stage and those are**

**1)** **Pre setting

2) Post setting

3) June drop

4) Pre-harvest drop.**



**The fruit drop actually takes part in distinct stages.**

 **The first stage**: - pre setting occurs shortly after flower opening. Usually flowers with aborted pistil(Female) drop off at' this stage is with the natural dropping or shedding those fruitiest that were not pollinated well, and would therefore never make it to the proper seed-bearing fruit stage. This first stage of fruit drop - for apples, plums and pears, takes place as soon as the flowers have faded

 **Second drop** : post setting occurs a fortnight later than the first, drop. This drop includes unfertilized flowers and some fertilized flowers also drop off at this stage as a result of alteration in the trees between nutritional factors arid قاحلfruit set.

The dropped fruit are usually the size of a pea, and accepted as natural loss by gardeners.

**The Third Fruit Drop stage**, which happens towards end of June - dependent upon seasonal fluctuations التقلبات - is the one that causes consternation for gardeners, as they see potential 'fruit' dropping off the tree for some reason. This second 'real fruit' drop is where the tree is deciding upon how much fruit it can take forward in life. Fruit trees realize their limitation, and will 'adjust' the crop by discarding fruit that they are unable to support with the current nutrition situation! For everything depends upon the trees' ability to crop a heavy load.

If you have regular and substantial June Fruit drop each year, then it is time to act in relation to providing nourishment (nutrition) to the tree by way of  [Fertilization fruit trees.](http://www.gardenseeker.com/fruit/apples/feeding-apple-trees.htm) The probability are, that 'correct' any deficiency, and then the June Drop will not be as hurtful - for the tree!

There is a tendency for trees to grow out of June Fruit Drop. Quite simply, the younger trees need to grow into large trees, and they will ensure that the available food resources will be allocated to growth rather than fruit production. Fruit drop normally abates تخف - unless there are environmental causes in any given year. - As the trees get older, more established, and more concerned about their potential off spring (fruit) than they are with their own growth.

June drop occurs when the fruits are marble (Glass ball) size due to the formation of abscission layers in the young fruit stalks (stems). This drop usually occurs in most deciduous fruits in the month of June.

These three drops are suppose to be natural one and thinning of fruits hopes the trees to produce remaining fruits with good size.

Pre-harvest Drop:

In addition to the fruit drop like pre setting post setting and June drop rare is a another drop i.e. pre - harvest drop which causes financial مالية loss to grower as it takes place just before the harvest of fruits. At this stage 1/2 developed and 3/4 developed fruits are shed drops to many causes.

**Function**

A plant will abscise a part either to discard a member that is no longer necessary, such as a leaf during [autumn](http://en.wikipedia.org/wiki/Autumn), or a flower following [fertilisation](http://en.wikipedia.org/wiki/Fertilisation), or for the purposes of [reproduction](http://en.wikipedia.org/wiki/Reproduction). Most [deciduous](http://en.wikipedia.org/wiki/Deciduous) plants drop their leaves by abscission before [winter](http://en.wikipedia.org/wiki/Winter), whereas [evergreen](http://en.wikipedia.org/wiki/Evergreen) plants continuously abscise their leaves. Another form of abscission is fruit drop, when a plant abscises fruit while still immature, in order to conserve resources needed to bring the remaining fruit to maturity. If a leaf is damaged, a plant may also abscise it to conserve [water](http://en.wikipedia.org/wiki/Water) or [photosynthetic](http://en.wikipedia.org/wiki/Photosynthetic) efficiency, depending on the 'costs' to the plant as a whole. The abscission layer is a greenish-grayish color.

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[1-](http://image.slidesharecdn.com/abscission-140318023637-phpapp01/95/abscission-2-638.jpg?cb=1395111222) Abscission. abscission the separation of leaves, flowers, and fruits from plants after the formation of an abscission zone at the base of their petioles, peduncles سويقة, and pedicels. Abscission, a physiologically determined program of cell separation, provides a mechanism whereby every separate, multi cellular plant organ, such as leaves, flowers, or fruits, becomes detached from the plant body in a controlled manner

2-Abscission can be initiated in response to environmental events such as disease or pathogens, or it can be a programmed shedding of organs that no longer provide essential function to the plant, exemplified by the flower after aiding in pollination. The process requires the formation of an anatomically distinct structure, the abscission zone (AZ), which constitutes the region where organs are detached from the plant body. Very little is known about which developmental signals and how cell–cell interactions inform primordial AZ cells to differentiate.

 3-Abscission zone between pedicel and stem

4- Structural mechanism In deciduous trees, an abscission zone, also called a separation zone, is formed at the base of the petiole. It is composed of a top layer which has cells with weak walls, and a bottom layer which expands in the autumn, breaking the weak walls of the cells in the top layer. This allows the leaf to be shed.

4-Lack of chlorophyll as a trigger the reduction of chlorophylls production in leaves due to decreased sunlight in the fall explains why some leaves turn yellow. However, the yellow color can attract aphids, so some trees turn the leaves red instead by injecting a bright pigment. The loss of chlorophyll may also contribute to the abscission process.

5- Abscission of the hypanthia during development of a nectarine fruit.

6- Abscission zone the abscission zone is a layer of weak, thin-walled cells that form across the base of the plant part where the break eventually occurs. A corky فليني layer containing suberin forms below the abscission zone to protect the plant. The process occurs at precise sites and involves coordinated cell wall breakdown. Associated with cell separation is an increase in the activity of several hydrolytic enzymes including -1,4-glucanase (cellulase, EC and polygalacturonase.

(hypanthia **a cuplike or tubular enlargement of the receptacle of a flower, loosely surrounding the gynoecium(**the female part of a flower, consisting of one or more carpels) **or united with it.The hypanthium is usually glabrous, with narrowly triangular sepals that are pubescent adaxially and are deciduous in fruit).**

7- The process of leaf loss is called abscission, and is controlled by hormones. The abscission zone is located at the base of the petiole in a region of undifferentiated, small parenchyma cells. Their walls contain no lignin, and the vascular cells in the abscission zone are also reduced in size. The process of abscission is initiated and proceeds as follows: The parenchyma cells start dividing rapidly. They secrete a layer of suberin in the walls nearest the stem The middle lamella, cell walls and cells of the abscission zone dissolve (enzymatic degradation) Leaf abscises.

8- Leaf Abscission. The abscission of leaves is a highly coordinated phenomenon involving multiple changes in cell structure, metabolism, and gene expression.

9- Leaf Abscission. The abscission of leaves is a highly coordinated phenomenon involving multiple changes in cell structure, metabolism, and gene expression.

10- Induction of abscission There are a variety of environmental factors accelerate abscission Mineral deficiency, draught .low light as being responsible for the shedding of flowers and fruit . Pollination accelerated تسارع petal abscission and failure of embryonic development seemed associated with the shedding of young fruit. Both environmental and natural factors influence the rate of natural abscission.

11-Role of phytohormones in abscission causes the abscission of leaves and fruits, abscisic acid (ABA) was found to be an inducing factor and was named accordingly. Later it turned out that the formation of the abscission layer for leaves and fruits are induced primarily by ethylene.

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13- Auxin (Indol-3-acetic acid or IAA, a plant hormone) and ethylene have been implicated as prominent regulators of abscission signaling. The two compounds work in a synergistic (interactive) fashion. As the IAA levels decrease, the flux of IAA to the abscission zone is reduced. Exhaustion of IAA makes the abscission zone sensitive to ethylene. When the plant is then exposed to ethylene, gene expression of cell wall degrading enzymes such as cellulase and polygalacturonate are activated. However, this is not to say that ethylene directly activates WDE gene expression, because the elements responsible for detecting ethylene have not been found in the gene’s promoter region.

 While researchers originally believed abscisic acid to be the hormone that stimulated abscission (for which the hormone was named), it was later proven that it does not play a primary role. Dwindling auxin levels have also been implicated in autumn-leaf color change. Auxins have often been reported either to delay or to induce fruit abscission and hence may operate as growth hormones or as abscising agents.

 14- Progressive leaf senescence. A- leaf at fully expanded stage characterized by high auxin levels in equilibrium with ethylene production. B- Initiation of leaf senescence, auxin content decreases and ethylene production increases. Leaf cells in the abscission zone become sensitive to ethylene action. c - Leaf abscission.

15- Role of ABA in abscission ABA also promotes abscission of leaves and fruits (in contrast to auxin, which inhibits abscission). It is, in fact, this action that gave rise to the name abscisic acid. The dropping of leaves in the autumn is a vital response to the onset of winter when ground water is frozen — and thus cannot support transpiration — and snow load would threaten to break any branches still in leaf.

16- Role of GA & cytokinin in abscission Both gibberellic acid and cytokinin will influence abscission, although they are thought to be less important than the other plant hormones . Cytokinin can delay abscission, probably by indirectly delaying senescence . Gibberellic acid will accelerate abscission.

17-Other Potential Regulators Long-chain unsaturated fatty acids such as linolenic acid also enhance abscission. Experiments on bean abscission zones showed that the accelerating effect of the C18 unsaturated fatty acids was mediated by the production of fatty acid hydro peroxides and that ethylene was not involved. It is not clear whether these compounds are involved in the regulation of natural abscission, but they do accumulate in some senescent tissues.

18-Mechanism of Abscission: Early Theories The turgor theory:proposed that the solute concentration in the separation zone cells increased as a result of starch degradation. The increased turgor pressure generated in the cells caused them to round up, tearing the wall along the line of the middle lamella. Second theory belief that abscission involve the induction of wall-degrading enzymes. It has also been shown that protein synthesis inhibitors will stop rapid abscission of petals, removing one of the last objections to the involvement of wall hydrolases.

[19-](http://image.slidesharecdn.com/abscission-140318023637-phpapp01/95/abscission-19-638.jpg?cb=1395111222) Inductive Stimuli Normally, the induction of abscission appears to be an integral part of the senescence program accompanying the yellowing of leaves and ripening of fruit. In most abscission systems the process can be accelerated and will take place prematurely in the absence of senescence. For instance, pollination can dramatically accelerate petal abscission. In cyclamen, all pollinated flowers shed their corollas in 5 days, whereas un pollinated flowers retained theirs even after 23 days .

 Accelerated floral abscission is thought to have evolved to prevent wasted visits of scarce pollinators to fertilized flowers. Leaf loss in temperate species accompanies senescence, which in turn is induced by environmental factors such as photoperiod changes, low temperatures, and drought. Factors that affect the leaf blade adversely can cause premature shedding. These include frost damage, drought , bacterial or fungal attack , damage by herbivores , mineral deficiencies, toxins, excessive shading, darkness , and competition with younger leaves. Leaf fall is not invariably linked to lamina senescence, and water stressed ivy plants will shed leaves with the same chlorophyll content as those still attached to normal healthy plants.

[20-](http://image.slidesharecdn.com/abscission-140318023637-phpapp01/95/abscission-20-638.jpg?cb=1395111222) Mechanical Forces and Separation Although the walls of living cells in the abscission zone- (AZ) are enzymically degraded, mechanical forces are necessary both to facilitate(help) cell separation-and to rupture the xylem . External forces such as the wind and gravity may be involved, although they are usually not sufficient by themselves. Weisner in 1871 showed that if all the living tissues in a petiole are severed, leaves will often remain attached by the xylem for long periods, despite these external agencies.

[21.](http://image.slidesharecdn.com/abscission-140318023637-phpapp01/95/abscission-21-638.jpg?cb=1395111222) Physiological changes during abscission One of the first detectable changes during the lag phase is the accumulation of cytoplasm and organells in the abscission zone cells, associated with the change in the rate of respiration and incorporation of precursors in to both RNA and protiens ,respiratory inhabitors or inhabitors of RNA and protein synthesis added during this period markedly inhibit the weaking process.

[22.](http://image.slidesharecdn.com/abscission-140318023637-phpapp01/95/abscission-22-638.jpg?cb=1395111222) Control of abscission is controlled by the hormones auxin and ethylene, and that it is also closely correlated with environmental factors such as photoperiod, ozone, wounding and/or attack by pathogens, water stress, and senescence.

[23.](http://image.slidesharecdn.com/abscission-140318023637-phpapp01/95/abscission-23-638.jpg?cb=1395111222) Control Mechanism Auxin is a primary growth regulator produced in the leaf and slowly transported toward the stem base through living cells. As long as auxin is effectively being transported across the abscission zone, abscission zone cells remain unrea ctive.

 As auxin production begins to wane in fall and auxin transport rates begin to decline due to less auxin availability, damage to living cells transporting auxin, and/or accelerating infection of living tissues by pests, cell wall changes are initiated.

 Cell wall changes increasingly inhibit auxin transport and accelerate (increase speeds) ethylene production. Small amounts of ethylene hasten(speed) abscission zone development. ABA (abscisic acid), responsible (in part) for dormancy on-set in the leaf, stimulates ethylene production and inhibits auxin transport.

WHY FRUIT TREES FAIL TO BEAR

Fruit trees will normally begin to bear fruit between two and five years after planting, depending mainly on the species and method of training and pruning. Most stone fruits begin to bear in year two or three.

However, cherries may not begin bearing for up to five years, apples often begin to bear in about two to four years but pears can take one to two years longer than apples. fruiting in many species requires pollination, as well as adequate irrigation, drainage, and fertilization.

 **Observe Flowering and Fruiting Characteristics**.

 It is important to note whether your trees did not bloom at all, bloomed but did not set fruit, or bloomed and set, but most or all the fruit fell off at some point before harvest. If your trees have never bloomed and they are older than the bearing ages listed above, you may be pruning too severely.

 Most fruit trees require the development of spurs or short shoots on which flowers form, although peaches and nectarines bloom on longer shoots. It is important, therefore, not to cut off all the one-year-old spurs and shoots. It is also important to provide adequate light to these fruiting shoots by thinning out crowded growth and/or opening the center, especially by summer pruning.

 Lack of sunlight can also prevent flowering and fruit set; trees should have at least six hours of direct sun per day. If you are pruning appropriately and your tree is healthy, but still no flowers form after several years, consider grafting to a different variety or replacing the tree.

Trees that consistently (time after time) flower but set little or no fruit probably lack a pollinizer variety .However; the problem could be cold and/or wet weather during bloom, which reduces the activity of pollinator in revenging the transfer of pollen. Such weather conditions also prevent pollen tube growth in the female parts of the flower. Inclement weather is often more of a factor on early flowering species such as almond and plum.

Lack of nitrogen can also lead to poor fruit set. If nitrogen deficiency is suspected, fertilize in the summer to incrase the nitrogen storage in the tree over the winter; this stored nitrogen is utilized for flowering a fruit set the following spring. If your trees bloomed and set fruit normally, but the fruit dropped off prematurely, any of several factors could have contributed. Sometimes fruit appears to set, but drops in April;this could still be a lack of pollination.

Any factors that cause poor tree health can affect fruit set and retention. For example, excess or insufficient water during the summer can cause fruit to drop, but you would also seed roping or yellowing leaves. Other contributing stresses include root constrictions caused by hardpan or compacted soil, sunburn or borer insects on the trunk or branches, and pests such as soil nematodes, root rot, bacterial canker, brown rot of twigs, powdery mildew, and spider mites.

**Encouraging Precocity**

Trees with vigorous, upright growth, such as cherry and pear, tend to begin bearing later than those with spreading habit, such as peach and apricot. However, these trees can be encouraged to bear earlier by bending upright branches outward during the growing season, before they become too stiff to bend. Branches can be held in place by tying them to a stake ( column ), a string attached to the ground, or a trellis تعريشة (espalier). Also, avoid excessive heading cuts, especially during the dormant season, since heading encourages vigorous growth and reduces flower development. Bending unheeded, upright branches outward is a proven method for developing spurs and flowers quickly.

**Climate and Weather**

Most fruit trees need a substantial amount of cold winter weather to end their dormancy and to promote spring growth. After mild winters, spring growth and flowering are delayed and irregular, the flowering period is extended, and fruit set is reduced. The extended bloom increases the chance that inclement weather will cause blossom diseases, such as brown rot or fire blight.

The chilling requirement is the number of hours below 7C0 from November 1 through February 15. Fruit tree species and varieties differ greatly in the number of hours required to fully break dormancy. The label on a purchased fruit tree will often state the chilling requirement.

The Sacramento area usually receives adequate chilling, averaging about 900 to 1,000 hours. When possible, select varieties with a chilling requirement below about 700 to 800 hours, since there are some years in which we receive less than 800 hours.

Varieties requiring 1,000 hours or more may set poorly in some years. Low-chill varieties are available for most fruit tree species, and the chilling requirement is usually stated on the label. Sometimes, frost during or shortly after blossoming can cause young fruitlets to abort, even though no frost damage is seen.

When a heavy frost is expected, covering the trees with plastic or bed sheets will sometimes prevent injury to the expanding buds or blossoms, providing temperatures do not fall too low and the cold weather is of short duration.

**Pollination**

Most fruit trees need to be pollinated. Without sufficient pollination, they may blossom abundantly, but will not bear fruit. A pollinizer is a tree or branch of a different variety with a similar bloom period. Pollinators (usually bees) carry pollen from the flower of one variety to the flower of another variety. Most species of fruit trees have “perfect” flowers: both the anthers, which contain pollen, and the pistil, which

develops into fruit, are located in the same blossom. Trees that bear fruit through self-pollination, or set fruit without pollination, are called.

“**Self-fruitful**.” However, there are many fruit species with perfect flowers that cannot produce fruit from their own pollen. These require pollen from another variety and are called “self-unfruitful.”

Some species do not fit into either category. Pistachio and kiwifruit have male trees that produce pollen and female trees that produce fruit. To grow them successfully, it is necessary to plant at least one tree of each gender near each other.

**Self-Fruitful Types**

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Almost all citrus species are “self-fruitful.”Other self-fruitful species include quince, sour cherry, most apricots, fig (except the Smyrna type), peach (except ‘J.H. Hale’ and some others), and European-type plums and prunes. Some European pears are also self-fruitful. ‘**Bartlett’ pear** is parthenocarpic, which means that no pollination is required to set fruit . Some cherries are self-fruitful, such as ‘Lapins,’ ‘Stella,’ and ‘Sunburst.’

Many apple varieties are self-fruitful, including ‘Braeburn,’ ‘Empire,’ ‘Fuji,’ ‘Gala,’ ‘Granny Smith,’ and ‘Pippin.’

Self-Unfruitful Types

. “Self-unfruitful” species include many apple, Asian pear, sweet cherry, and Japanese plum varieties. The label usually indicates varieties that will pollinate your tree. To pollinate adequately, plant two or more varieties no further than 10 to 15 m. apart – the closer, the better.

 Alternatively, can graft a pollinizer variety onto the tree. The use of bees can improve pollination. In the interim before a pollinizer variety is grafted or planted nearby, you can place flowering branches of a pollinizer variety in a jar filled with water, and set the jar and flowers in the tree canopy.

 Bees will visit these flowers and will pollinate the tree’s flowers. Some cherries have fairly specific pollinizer requirements. ‘Bing,’ ‘Lambert,’ and ‘Royal Ann’ cherry trees do not pollinate one another.

Plant a pollinating variety such as ‘Black Tartarian’ or ‘Van,’ or a sour cherry such as ‘Montmorency’ nearby.

**Biennial Bearing**

Occasionally, certain fruit trees such as apples bear heavily one year and sparsely the next. This is called “biennial bearing.” The spring-flowering buds of most deciduous fruit trees have actually been formed during the previous summer. Therefore, anespecially heavy crop one year may prevent adequate flower bud formation for the following year because the carbohydrates produced through photosynthesis are used preferentially for fruit production during the “on” year.

Biennial bearing of apples is difficult to alter or correct. However, you can induce a return to normal annual fruit production by heavily thinning during the year in which the trees are producing their large yield .