There are several scientific explanations for abscission processes, including:

1 - A plant will abscise a part either to discard a member that is no longer necessary, such as a leaf during autumn, or a flower following fertilization, or for the purposes of reproduction. Most deciduous plants drop their leaves by abscission before winter, whereas evergreen plants continuously abscise their leaves.

2 - If a leaf is damaged, a plant may also abscise it to conserve water or photosynthetic efficiency, depending on the 'costs' to the plant as a whole. The abscission layer is a greenish-grayish color.

3 - Abscission can also occur in premature leaves as a means of plant defense. Premature leaf abscission has been shown to occur in response to infestation by aphids. By abscising leaves that have been made host to aphid, plants have been shown to massively diminish the pest population, as 98% of aphids in abscised died.

4 - The abscission is selective, and the chance of dropping leaves increases as the number of infection increase. A leaf with three or more infections was four times more likely to abscise than a leaf with one.

5 - 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.

The Structural Mechanisms of abscission, including:

1 - Abscission zone:

In deciduous trees, also called a separation zone is formed at the base of the petiole. 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.

2 - Lack of chlorophyll as a trigger:

The reduction of chlorophyll production in leaves due to decreased sunlight in the autumn 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.

3 - Chemically:

A variety of reactive oxygen species (ROS) are generated by plants during times of stress (biotic and abiotic) including UV light, cool temperatures, excessive light, pathogens, parasites, and high salinity. The presence and continuous production of these ROS causes disruption in the homeostasis of the cellular components, leading to metabolic dysfunction and expression of cell wall-degrading enzymes (WDEs).

4 - Hormonally:

Cell wall changes increasingly inhibit auxin transport and accelerate 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.

While researchers originally believed abscisic acid (ABA) to be the hormone that stimulates abscission, it was later proven that it does not play a primary role. In fact, auxin, a plant hormone, and ethylene have been implicated as prominent regulators of abscission signaling. The two compounds work in a (interactive) synergistic fashion:

As the auxin levels decrease, the flux of auxin to the abscission zone is reduced. Auxin depletion 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** 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. Decreasing auxin levels have also been implicated in autumn-leaf color change.

Role of GA and cytokinins in abscission both gibberellic acid and cytokinins will influence abscission, although they are thought to be less important than the other plant hormones. Cytokinins can delay abscission, probably by indirectly delaying senescence. Gibberellic acid will accelerate abscission.

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 by (enzymatic degradation) in Leaf abscission zone.

5 – The role of Fatty acids:

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 unsaturated fatty acids was mediated by the production of fatty acid hydro peroxides.

6 – The Theory of Mechanism of Abscission:

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.

The 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.

The fruit drop actually takes part in distinct stages:

The First drop stage: Presetting 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

The Second drop stage: 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 fruit set.

The Third Fruit drop stage: which happens towards end of June - dependent upon seasonal fluctuations 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. The probability is, that 'correct' any deficiency, and then the June Drop will not be as hurtful - for the tree.

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 supposed 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 presetting, post setting and June drop rare is a another drop i.e. pre - harvest drop, which causes financial 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.