

# **Senescence and Aging**

**B. Sc III Sem V Sec-I**

**“Plant Biochemistry and Stress Physiology”**

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- Senescence has been defined as the deterioration that ends the functional life of an organism or an organ.
- Although meristems do not undergo senescence and can perhaps be considered potentially immortal, all of the cells produced from these undergoes aging, which eventually leads to death.
- Senescence occurs in **flowers , leaves, fruits, stems** and roots, but it commonly occurs at different times in these organs.
- In many perennial herbs , such as alfalfa, essentially the entire above ground system dies each year, but the crown and root system remain largely viable.

# Plant Senescence and Aging

- Senescence or biological aging - change in the biology of an organism as it ages after its maturity.
- Changes range from those affecting its cells and their function to that of the whole organism.
- Senescence - is derived from the **Latin word** meaning **old man, old age, or advanced in age.**
- Senescence – A program in which the function of organ or **whole plant naturally declines to death.** This is an essential phase of the growth and development.

# Retardation of Senescence

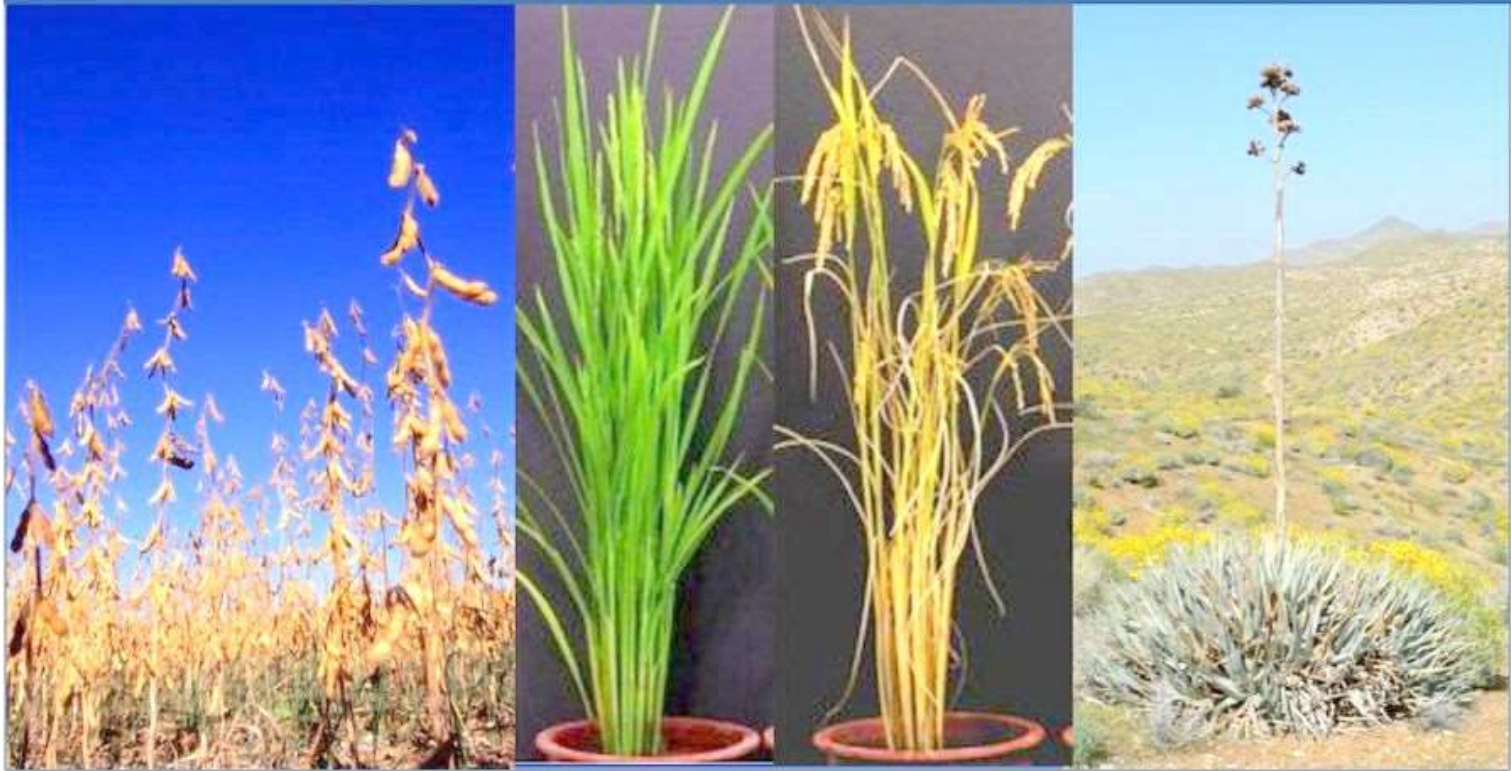
- Delay the degradation of plant. Also increase the life of plant and getting more and more yields.
- Delay the senescence of many plant parts that is flowers, leaves and fruits.
- The retardation of senescence with the help of many factor studied by many people these are as fallows.

# Senescence and Aging

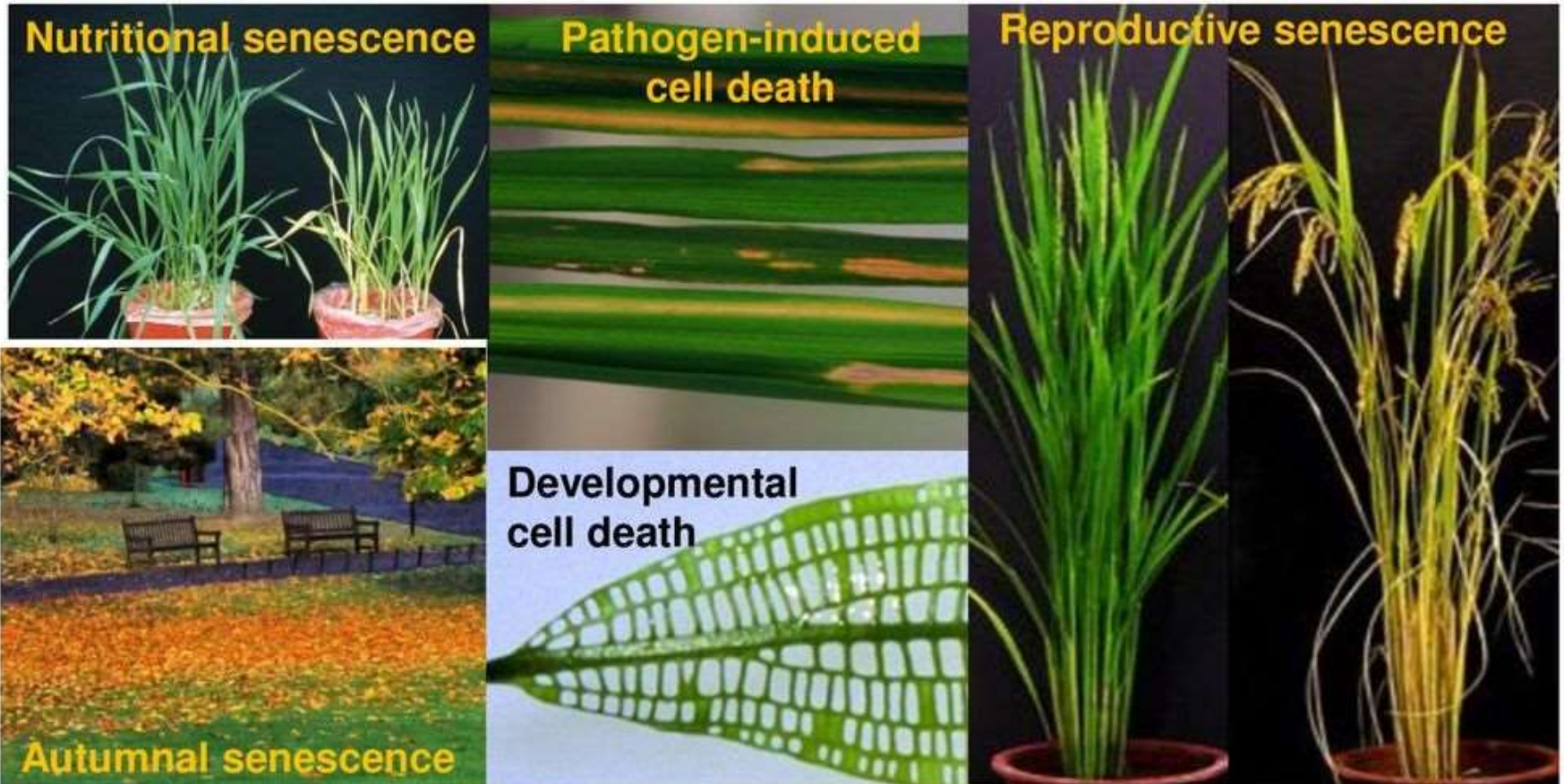
- All living organism have a definite lifespan.
- A plant, be it annual or perennial has a vegetative growth phase after germination.
- The formation of flowers or development of reproductive structures marks the arrival of reproductive phase. The plant becomes mature by this time.
- With further passage of time its metabolic activities retard.
- The functional activities slow down.
- The plant becomes old and it reaches the senescence phase ultimately the plant dies.

# Developmental senescence

In *monocarpic* plants, reproduction triggers senescence.  
Monocarpic plants flower once, set seed and die.  
*Most crop plants are monocarpic*



# Senescence and cell death are normal, actively controlled processes





# Senescence is a slow process of nutrient reassimilation followed by death

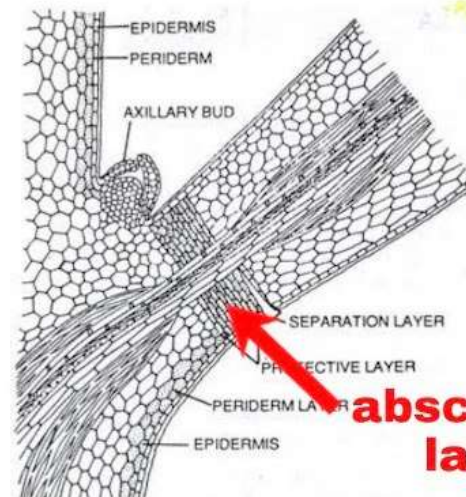
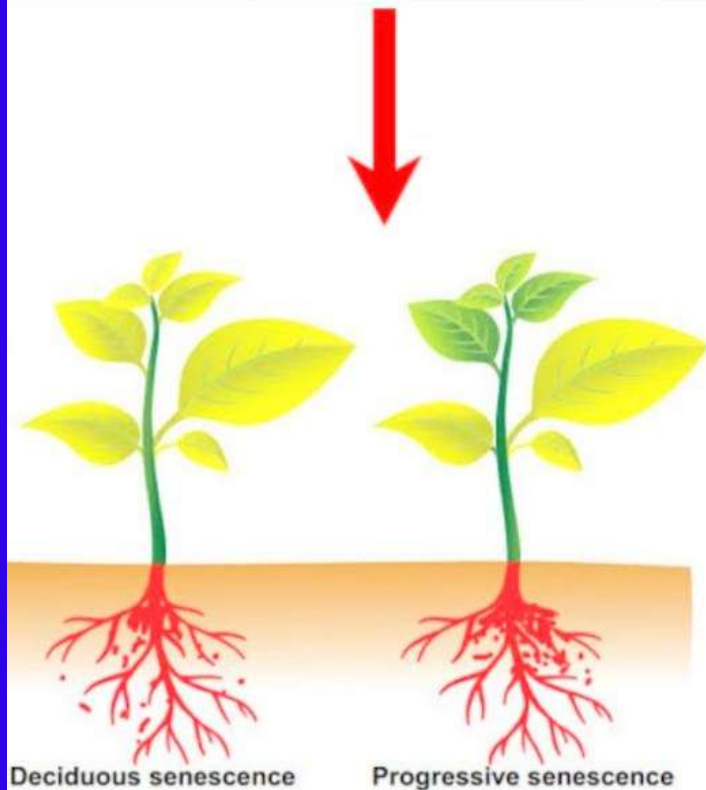
Senescence is a process by which nutrients are remobilized into seeds (annual plants) or bark and other tissues of long-lived plants



## Senescence:

- is an **active** developmental program that requires upregulation of many genes
- is **not** simply necrosis or death by neglect

# Senescence and abscission



**abscission  
layer**

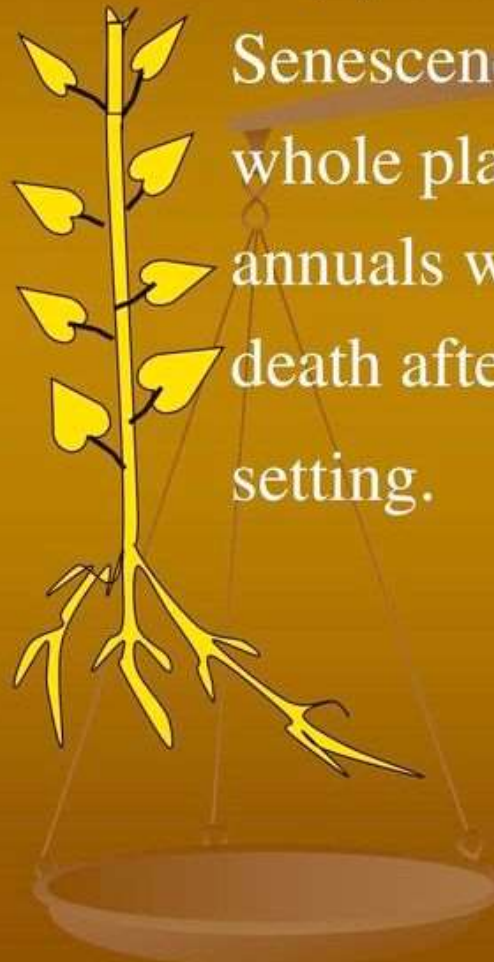


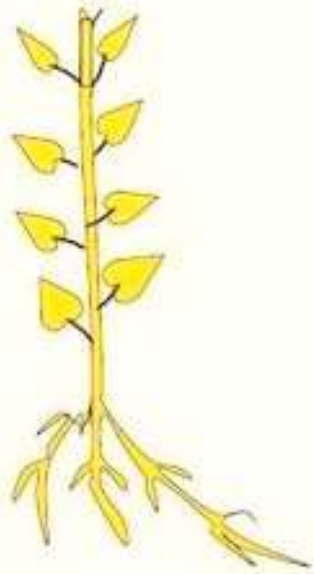
## 4.1.2 types of plant senescence



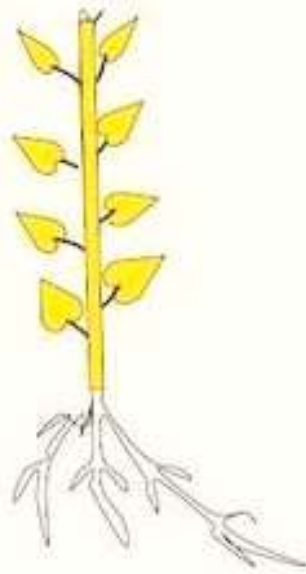
- **(1) Overall Senescence**

Senescence occurs in whole plant body, such as annuals which senesces to death after flower and setting.

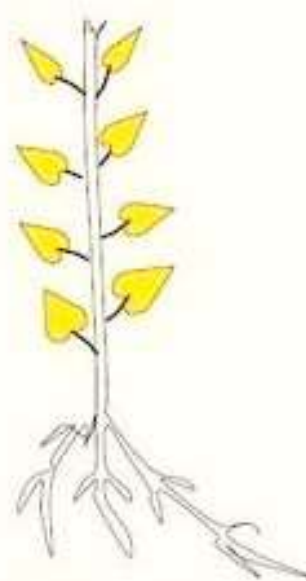




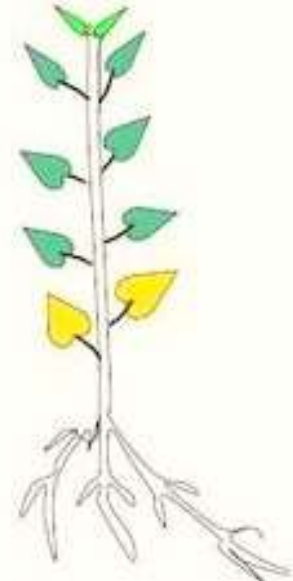
Whole plant senescence



Top Senescence



Deciduous  
senescence



Progressive  
senescence

## 1. Whole plant senescence

It is found in **monocarpic** plants which produce flower and fruit only once in their life cycle. The plants may be annual(e.g. **rice, wheat, gram, mustard** etc.), biennials(e.g.**cabbage, henbane**) or perennials (e.g. certain **bamboos**). **The plant dies soon after ripening of seeds.**

## 2. Shoot senescence

This type of senescence is found in certain perennial plants which possess underground penetrating structures like **rhizomes, bulbs, corm** etc. The above ground part of the shoot dies each year after flowering and fruiting, but the underground part (stem and root) survives and puts out new shoots again next year. e.g. **banana, gladiolus, ginger** etc.

## 3. Sequential Senescence

This is found in many perennial plants in which the tips of main shoot and branches remaining a meristematic state and continue to produce new buds and leaves. **The older leaves and lateral organs like branches show senescence and die.** Sequential senescence is apparent in evergreen plants. e.g. *Eucalyptus, Pinus* etc.

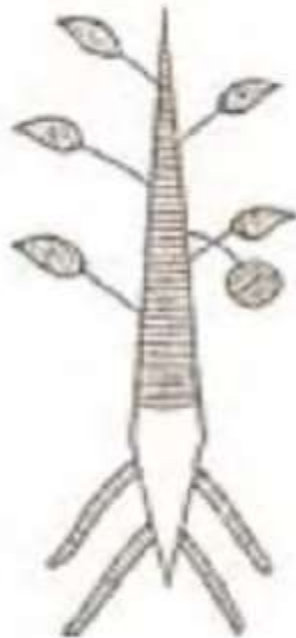
#### 4. Simultaneous or Synchronous senescence

It is found in temperate **deciduous trees** such as **elm** and **maple**. These plants shed all their leaves in **autumn** and develop new leaves in spring. Because of this shedding of leaves, autumn season is also called fall. Such a senescence of leaves or plant organs is called synchronous.

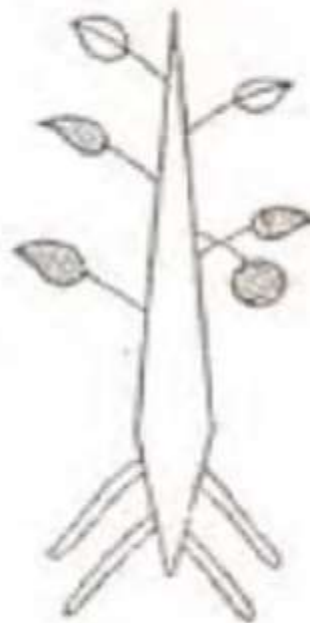
Whole plant senescence



Shoot senescence



Sequential senescence



Simultaneous senescence



**Fig. Types of senescence**


## Physiology of Senescence

The following physiological changes occur during senescence:

1. Photosynthesis stops.
2. Chlorophyll degradation: The colour of leaf changes
3. Anthocyanin pigments accumulation in the leaves



# Physiological and Biochemical changes

1. Loss of membrane compartmentation
2. Ultra structural changes in chloroplast
3. Chloroplasts are converted into Chromoplasts
4. Loss of Chlorophyll content 
5. Reduction of Soluble protein content