VERNALISATION

In some plants flowering is either quantitatively or qualitatively dependent on exposure to low temperature. This phenomenon is termed as vemalisation.
"Vernalisation refers specially to the promotion of flowering by a period of low temperature".

Requirements for success of vernalisation :

(1) Actively dividing cells (2) Period of low temperature treatment
(3) Aerobic respiration (4) Optimum hydration
(5) Optimum nutrition

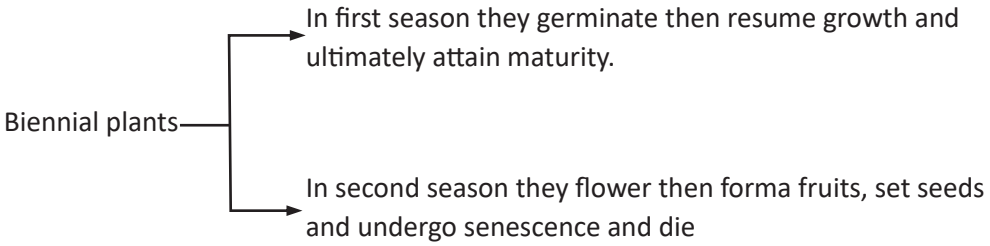
Mechanism : After perception of suitable low temperature period, a hypothetical hormonal substance (vernalin) is produced.

Examples : Some important food plants, wheat, barley, rye have two kinds of varieties :

(i) Spring varieties (ii) Winter varieties

Spring varieties	Winter varieties
They are normally planted in the spring and come to flower and produce mature grain before the end of growing season.	They are planted in late autumn. They germinate and over winter come out as small seedlings, resume growth in spring and usually harvested around mid-summer.

- Winter varieties however, if planted in spring would normally fail to flower or produce mature grains within a span of flowering season.
- Another example of vernalisation is seen in biennial plants (e.g. sugar beet, cabbages, carrots etc,). Biennials are monocarpic plants.



Significance : Vernalisatien prevents precocious reproductive, development late in the growing season and enables the plant to have sufficient time to reach maturity.

SEED DORMANCY:

- There are certain seeds which fail to germinate even when external conditions are favourable. Such seeds are understood to be undergoing a period of dormancy
- Quiescence–Viable seed fails to germinate due to absence of favourble external environmental conditions.

Causes of Seed Dormancy:

1. Tough seed coat e.g. Capsella.
2. Seed coat is impermeable to water (e.g. Legumes) or gases (e.g. Apple) or chemicals (e.g. Xanthium)
3. Immature embryo at the time of shedding of seed
4. Presence of inhibitors e.g. ferulic acid in tomato juice; ABA, phenolic acids, para-ascorbic acid, coumarins.
5. Absence of growth hormones
6. Requirement of chilling treatment

Breaking of Dormancy

This dormancy however can be overcome through

(a) Man-made – For example, the seed coat barrier in some seeds can be broken by
(i) Mechanical abrasions (Scarification) using knives, sandpaper, etc. or
(ii) Vigorous shaking.
(iii) Effect of inhibitory substances can be removed by subjecting the seeds to chilling conditions or
(iv) by application of certain chemicals like gibberellic acid and nitrates (NEET-2019).
(b) Natural means – In nature, these abrasions are caused by microbial action, and passage through digestive tract of animals.
Changing the environmental conditions, such as light and temperature are other methods to overcome seed dormancy.

Some special points

- Agent orange :
  It is a mixture of equal parts of two herbicides, 2, 4-D and 2,4,5-T. Agent orange is a herbicide and defoliant chemical.
  It is widely known for its use by the U.S. military during the vietnam war from 1961 to 1971. The chemical eroded forest cover of 31,000 km^2
- Optimum concentration of auxin for shoot growth is 10-100 ppm while for root growth it is very low i.e. 0.0001 ppm. (at high concentration auxin inhibit root growth.)
- Gibberellins induce flowering in long day plants (LDPs) under non inductive photoperiods.
- Gibberellins is a substitute of vernalisation.
- Gibberellins is a substitute of red light requirement for seed germination in tobacco and lettuce (salad).
- Gibberellin is a male hormone (promote formation of male flowers)
- Auxin, gibberellins and ABA are acidic in nature while cytokinin is a basic hormone.
- The discovery of each of five major groups of PGR have been accidental.
- The role of PGR is of one kind of intrinsic control. Along with genomic control and extrinsic factors, they play an important role in plant growth and development.
- Delay of senescence mainly caused by cytokinin.
- Low level of auxin in a leaf as compare to stem is an indication that very soon leaf will shed.

- For every phase of growth, differentiation and development of plants, one or the other PGR has some role to play such roles could be complimentary or antagonistic. These could be individualistic or synergistic.