




- Course – B.Sc. Botany
- Semester - V
- Paper code – BOT CC512
- Paper Name - Plant Physiology
- Topic - Vernalization in Plants
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VERNALIZATION

- Vernalization word derived (from Latin *vernus*, “ of the spring) .
 - Vernalization is bringing to spring condition.
 - Typical vernalization temperature are between 5° and 10° Fahrenheit.
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Vernalization

- The process of hastening the flowering and fruiting of plant by treating seeds, bulbs, or seedling so as to induce a shortening of the vegetative periods.





History of vernalization

- John Hancock experiment was first realised in 1857
- Lysenko 1928 , published his work on the effects of cold on cereal seeds.
- Chavard 1960 , defined vernalization as , acquisition or acceleration of the ability to flower by a chilling treatment.




**CHILLED FOR TWO MONTHS
AT 5°C. PLANTED AT
ORDINARY TEMPERATURE**


**SLIGHTLY
GERMINATED
SEED**

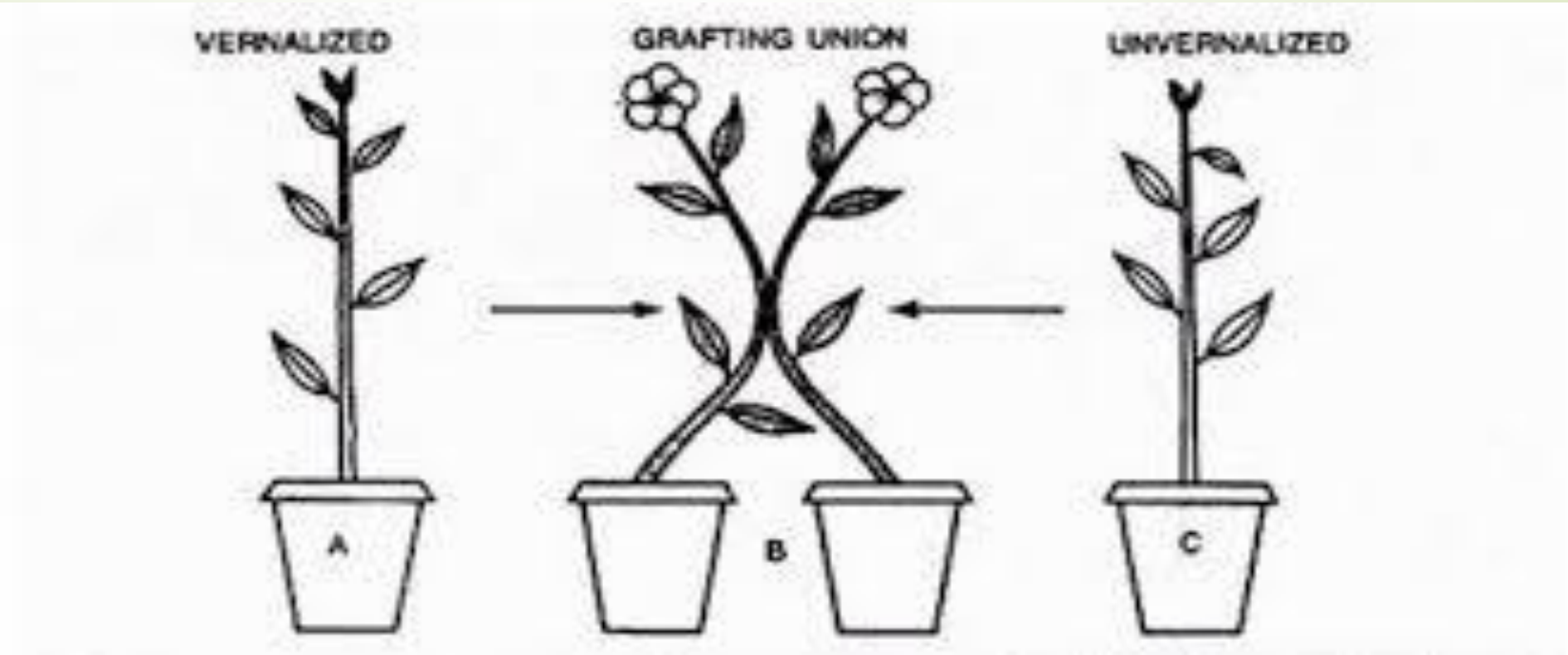
**NO CHILLING PLANTED
AT ORDINARY TEMPERATURE**



Sites of vernalization

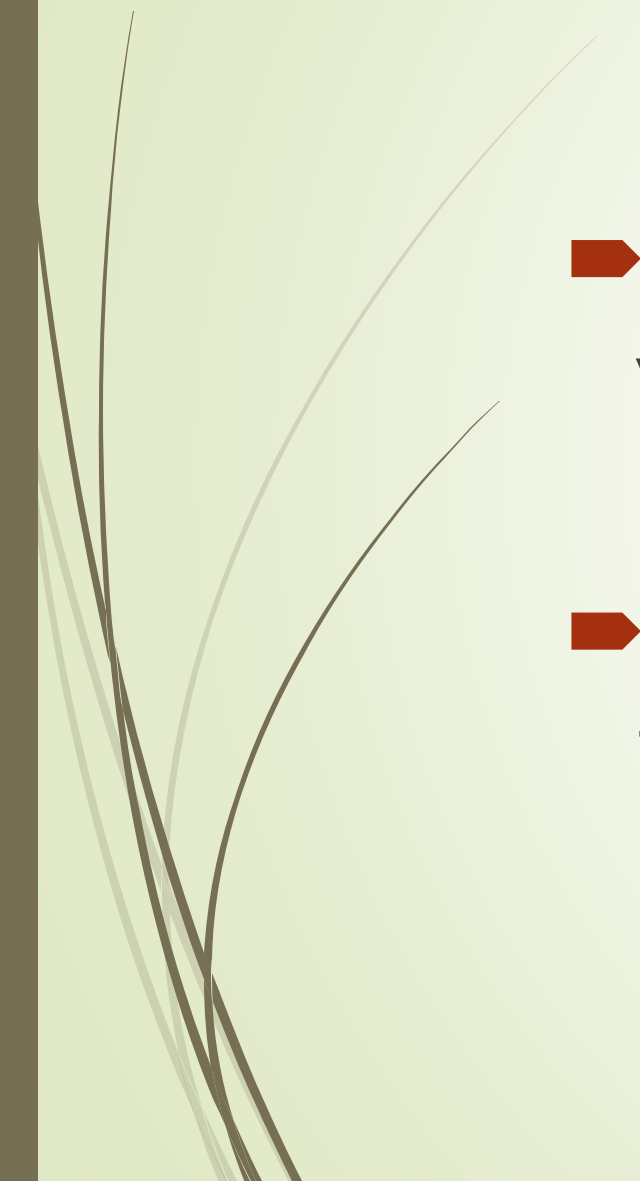
- Two sites of vernalization.
 - Stem tip : The localized cooling treatment was given to stem tip . It received the vernalization effect . The stem tip is chilled.
 - Seeds : Seeds are also vernalized before sowing . The embryo in seeds receives the vernalization stimulus .
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- The root tip and leaves of *Lunaira biennia* contain dividing cells .
 - Its roots tips and leaves can be vernalized. Thus dividing cell are necessary for vernalization.



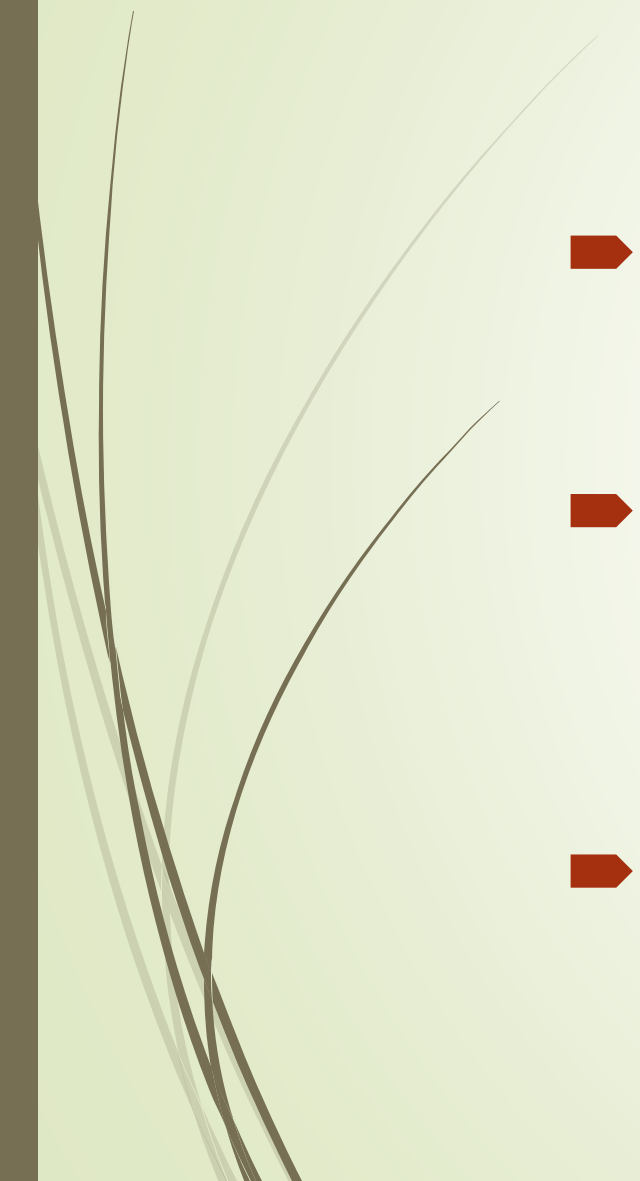


Type of vernalization

- Facultative vernalization: Flowering will appear earlier once exposed to low temperature
 - Obligate vernalization: must be exposed to low temperature for a desired period of time .
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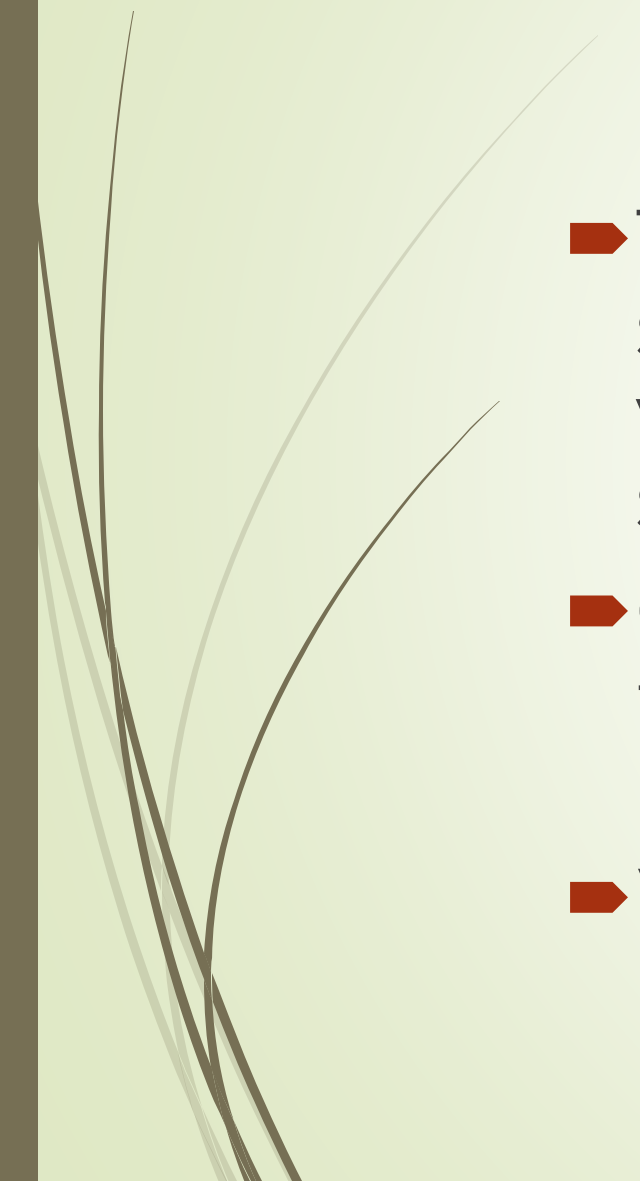


Mechanism of vernalization

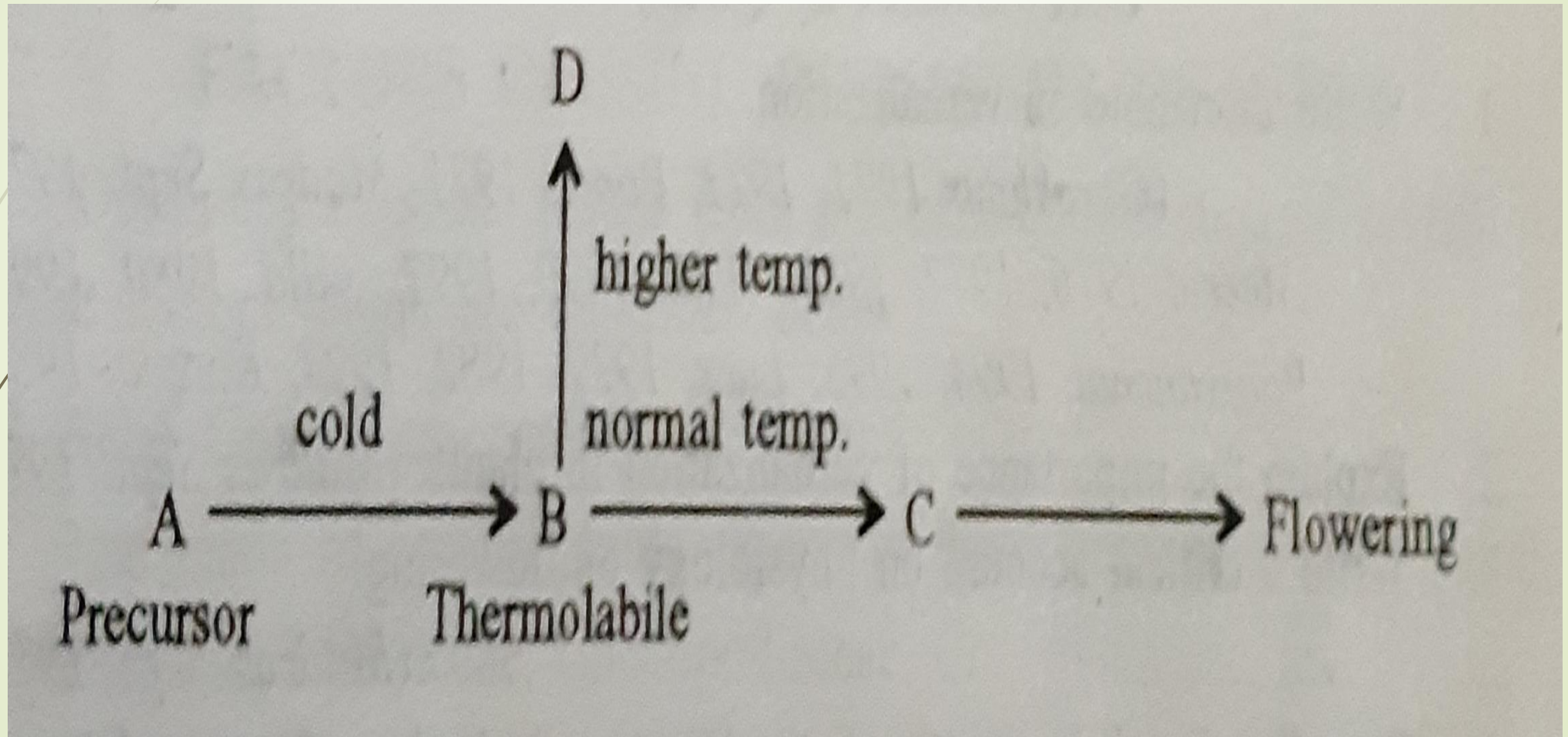
- Two main hypothetical theories are :
 - Phase Development Theory: Lysenko, (1934)
 - Hormonal Theory. (Lang and Melchers)
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Phase Development Theory

- The process of development of an annual seed plant consists of a series of phases which must occur in some predetermined sequence.
 - Commencement of any of these phases will take place only when the preceding phase has been completed
 - Vernalization accelerates the thermophase
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Hormonal Theories







Hormonal Theories

- A. the precursor is converted into a thermolabile compound
- B. during cold treatment under normal conditions.
- C. ultimately causes flowering but at high temperatures
- D. Flowering does not take place (devernalization)



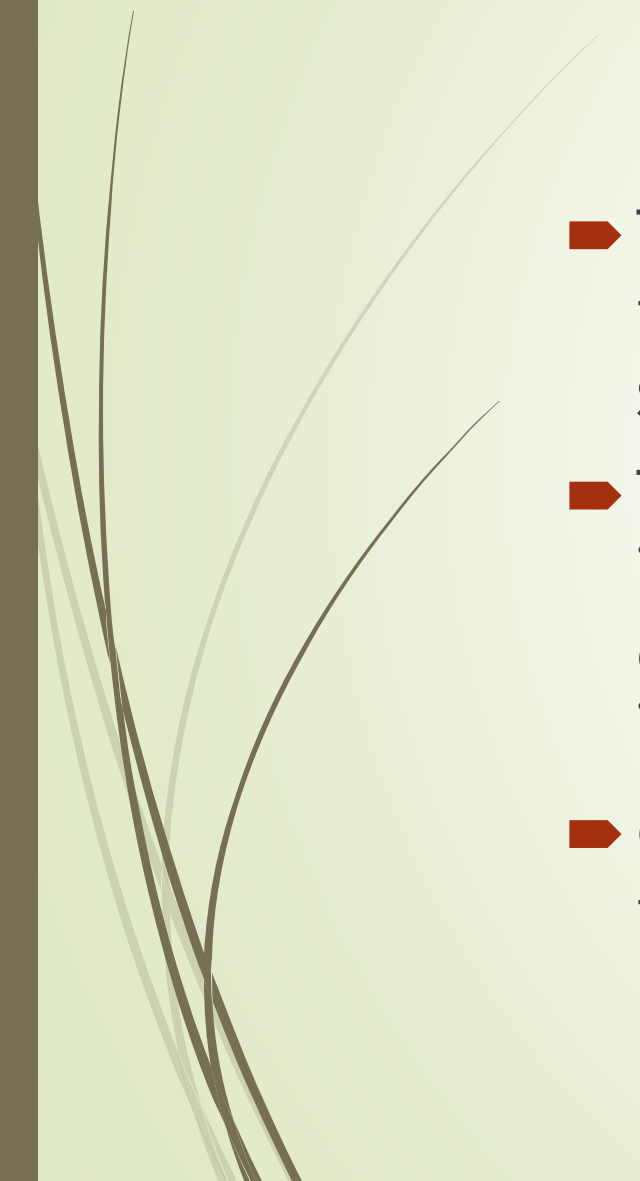
Factor affecting vernalization

- Water and oxygen: Oxygen is also necessary for vernalization. Oxygen is used during respiration.
 - Temperature: The seeds are exposed to low temperature during vernalization.
 - Temperature lower than 4°C is not effective. Similarly, temperature above 12°C does not cause vernalization.
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- Devernalization: The exposing of vernalized seed to high temperatures (30-35°C) ,lose the effect of vernalization called devernalization.
 - Effect of light: The seeds of a plant can be vernalized in the presence or absence of light .
 - Many plants like carrot require both vern5and photoperiodic stimulus.




Effects of Hormone

- ▶ The gibberellins are known to replace the low temperature requirement in certain biennial plants such as henbane .
 - ▶ The plant normally remains vegetative and retains its rosette habit during the first growing season and after passing through the winter period flowers in the next season .
 - ▶ Gibberellins probably through stem elongation trigger some reaction leading to flowering.
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Application of vernalization

- Vernalization shortens the vegetative period of the plants .
 - Vernalization increases the cold resistance of the plants .
 - Vernalization increases the resistance of plants to fungal disease.
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Thank - you