VERNALIZATION

→ Definition:- Vernalization, the artificial exposure of plants (or seeds) to low temperatures in order to stimulate flowering or to enhance seed production.

- For some plants, vernalization is an absolute requirement or in some cases it simply assists in flowering.

- The duration of low temperature treatments required varies from four days to three months.

→ Types of Vernalization:-

1.) Facultative Vernalization.

Flowering will appear earlier once exposed to low temperature.

eg: Winter annual Triticale

2.) Obligate Vernalization :-

Must expose to low temperature to a desired period of time

eg: Biennial plants (cabbage).

→ Site of Vernalization :-

- Metabolic active apical Meristem is the site of temperature perception for flower initiation.
- Younger leaves are more susceptible to vernalization.
- The low temperature stimulus is received by the shoot apex of a mature stem or embryo of the seed.

⇒ Mechanism of Vernalization :-

Mechanism of Vernalization can be explained by two theories :-

1) Phasic development theory.
2) Hormonal Theory.

1)→ Phasic development theory :-

- This theory was proposed by Lysenko in 1934

- According to this theory there is a series of phases in the development of a plant.

- Each phase is stimulated by an environmental factors such as temperature, light etc.

- Commencement of one phase will take place only after the completion of the proceeding phase.

There are two phases:-

a) Thermophase
b) Photophase

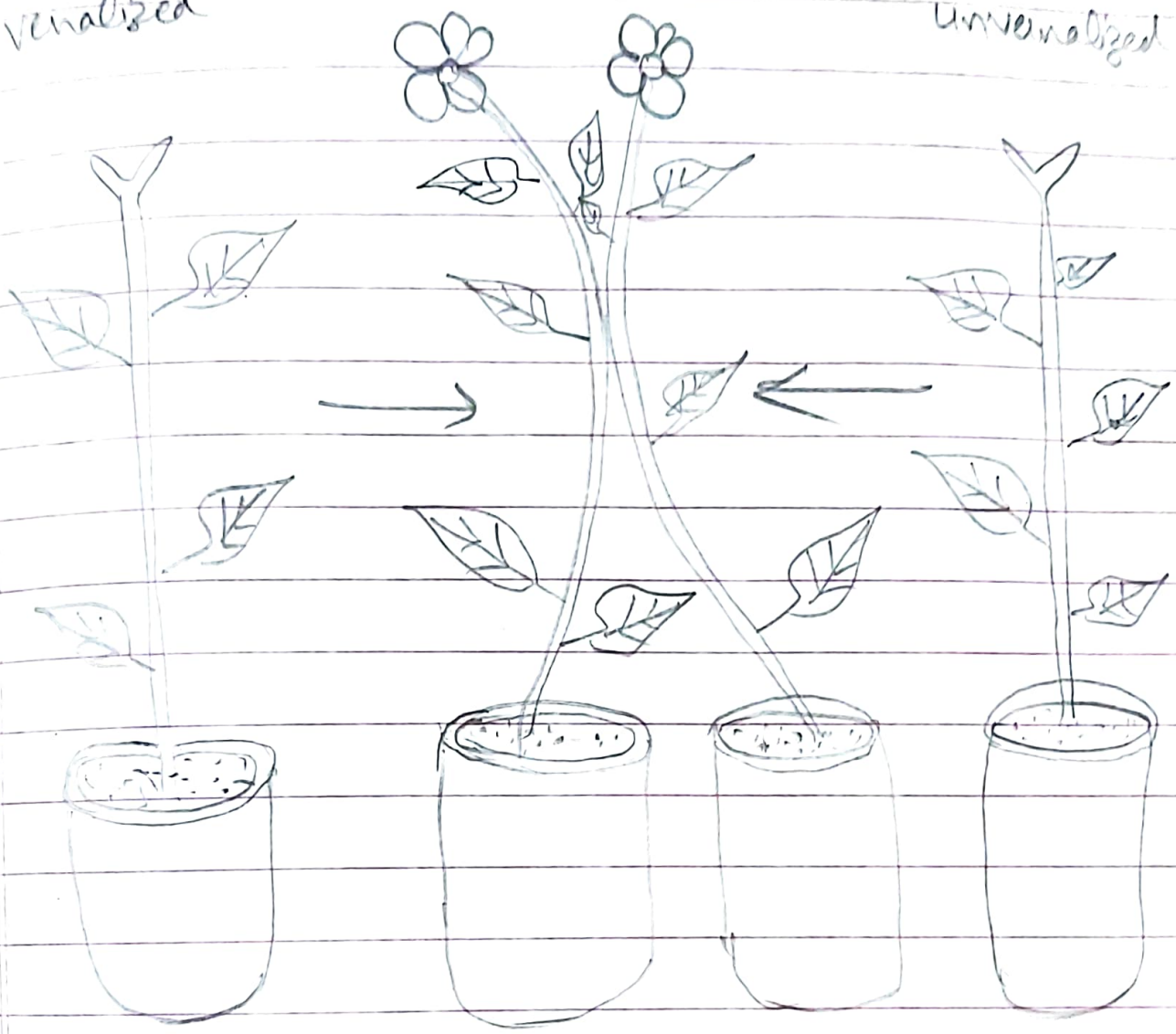
a) Thermophase:- Thermophase depends on temperature, vernalization accelerates thermophase.

b) Photophase:- It requires light. Thermophase should be followed by photophase which requires light.

2.) Hormonal Theories:-

- This theory was purposed by Melchar (1939)
- He proposed that chilling treatment induced the formation of new floral hormone called vernalin.
- This hormone is transmitted to other parts of the plant.
- He grafted a vernalized plant with an unvernalized plant.
- The unvernalized plant also initiates flowering.
- The hormone, vernalin diffuses from the vernalized plant to the unvernalized plant and induces flowering.
- So, he demonstrated that the product of vernalization could be transmitted from a vernalized to an unvernalized Hyoscyamus plant through a graft union.

Grafting Union



⇒ Experiment to demonstrate that flowering stimulus can translocate from vernalized plant to unvernalized plant through graft union.

⇒ Technique of Vernalization :-

The seeds are first soaked in water and allowed to germinate in processing chamber at 10-12°C temperature.

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Then seeds are transferred to low temperature (3-5)°C and kept for correct period of time.
(which varies among different varieties, from few days to 30 days)

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Seeds are dried and sown in the field in proper oxygen and water supply condition.

→ Devernalization :-

- The reversion of vernalization by high temperature treatment is called devernalization.

- Devernalization is affected by treating the vernalized seeds or buds with high temperature.
- Lang et al (1957) demonstrated that application of gibberlins can replace the cold treatment for vernalization in certain biennial plants.

⇒ Practical Applications :-

- Vernalization increases the resistance of plants to fungal diseases.
- It increases the cold resistance of plants
- It increases the resistance of plants to fungal diseases.
- It the biennials, vernalization induces early flowering and early fruit setting.
- It also helps in crop improvement.
- Flowering can be induced by grafting.