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IMPORTANCE OF VERNALIZATION IN FLOWERING PLANTS

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Introduction

The word "vernalization" comes from the Latin word "vernus," which meaning "of spring". It signifies to make "spring-like." It is the induction of the plant's blooming process brought on by extended exposure to long cold winter weather or other circumstances. Plants then acquire the ability to blossom after this procedure. But before they blossom, they could need a few more weeks of extra seasonal growth.

When a well hydrated seed or a developing plant receives a cold treatment during the vernalization process, it promotes flowering. The plant's vegetative phase is shortened as a result of the vernalization process, which causes early flowering. When vernalization is not applied, plants that require it either bloom later or remain in a vegetative state.

It permits the plant to attain vegetative maturity prior to the initiation of reproduction. Certain annual food plants (like wheat, barley, and rye), some biennial plants (like cabbage, sugar beet, and carrot), and some perennial plants (like chrysanthemum) have this characteristic in their winter varieties.

Russian researcher Lysenko (1928) discovered that by subjecting immature plants or wet seeds to low temperatures,

it is possible to get cold-tolerant annual and biennial plants to blossom in a single growing season.

Vernalization can be of the following types –

- **Obligate vernalization**

Lower temperatures must be applied to plants for a predetermined amount of time. Cabbage is an example of a biennial plant.

- **Facultative vernalization**

Plants begin to blossom earlier when exposed to lower temperatures. A good example is winter annual triticale.

Mechanism of Vernalization

The progress of flowering due to a postponed time of low temperatures, such as those seen during winter, is known as vernalization. The vernalization mechanism can be explained by two main theories.

1) Phasic development Theory

2) Hormonal theories

1) Phasic Development Theory

This hypothesis was created by Lysenko in 1934. This theory states that there are sequences for the phases in a plant's development. Environmental elements, such as light and temperature, influence each phase. Only once the previous stage has concluded, another scenario begin. There are two main phases, which are as follows:

a) Thermostage:

- Temperature is a factor.
- The thermostat accelerates or quickens during vernalization.
- Thermostage, or the vegetative stage, needs air movement (aeration), moderate moisture content, and low heat (0-14°C).
- The length of this phase varies depending on the type of plant and environmental factors.
- When winter wheat is given a short day and a low thermostat tempera-

ture, they complete their life cycle quickly.

b) Photostage

- Required high temperature.
- At this phase, vernalin aids in the synthesis of florigen.
- When winter wheat is exposed to longer days and greater temperatures during the photo stage, their life cycle is completed the quickest.

2) Hormonal theory

This hypothesis was proposed by Melcher in 1939. This theory suggests that the freezing treatment triggers the production of the flower hormone vernalin. Various parts of the plant receive various amounts of this hormone. Melcher combined a plant that had been vernalized with one that had not. The unvernalized plant also begins to flower. Blooming is triggered by the hormone vernalin, which spreads from the vernalized plant to the unvernalized plant.

Requirement of vernalization

1. Low temperature

Vernalization typically requires a cold temperature of 0 to 4 degrees Celsius. It is not advisable to use a high-temperature (about 40 degrees Celsius) therapy right after the cooling treatment. The vernalization property is lost if the chilling treatment is applied right after the high-temperature treatment.

2. Duration of chilling treatment

The length of the freezing process for vernalization is not fixed. Treatment at low temperatures might last anywhere from a few hours to many days, depending on the species.

3. Actively Dividing Cells

As is previously known, meristematic cell division is the sole way that vernalization stimuli is received. Consequently, we must apply a vernalization therapy to the entire plant with meristematic tissues and other circumstances, or to the seeds that are germinating.

4. Water

Life exists because of water. Therefore, enough hydration is essential for detecting the vernalization stimulus, which is produced by actively proliferating meristematic tissue cells.

5. Oxygen

Adequate aerobic respiration was also necessary for vernalization.

Importance of Vernalization

- Gibberellins, a kind of growth hormone, are synthesized when vernalization occurs.
- During development and flowering, several inhibitors can be overcome by vernalization, which also lessens their effects.
- Flowering can be induced by grafting vernalized shoot apex of horticultural plants
- A plant's phase of vegetative growth is shortened by vernalization.
- The plant is ready to flower after the vernalization treatment.
- Plants become more resistant to illnesses and the cold as a result of vernalization.
- Crop yields are increased with vernalization.
- In wheat plants, vernalization can eliminate wrinkles in the kernels.

Flowering can be induced by grafting • The time interval between germination and blooming is shortened by vernalization. This makes it possible to harvest many crops in the same field in a given year.

Conclusion

To conclude, we can say that Vernalization is the process of pre-treating seeds at a low temperature in order to induce early flowering in plants by virtue of which the plants growth cycle is reduced which increases crop yield. Thus, vernalization treatment is ultimately used to increase the plant productivity.