

# Crack CSIR-NET 2021 Through Mind Maps (Mind Map on Plant Growth and Development)

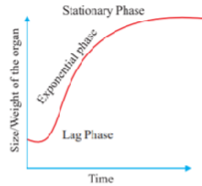


### Plant Growth and Development

Growth	Mathematical expression	Curve
<b>In Arithmetic growth :</b> Only one daughter cell continues to divide mitotically while other differentiate and matures.	$L_t = L_0 + rt$ $L_t$ = Length at time $t$ $L_0$ = Length at time zero $r$ = growth rate	Linear curve

#### Sigmoid Growth Curve

Geometrical growth	Formula	Shape of curve
The initial growth is slow (lag phase) and increase rapidly thereafter at an exponential rate (log phase). In both, the progeny cells divide mitotically and continue to do so. However, with limited nutrient supply, the growth slow down leading to stationary phase.	$W_t = W_0 e^{rt}$ $W_0$ = Initial size $W_t$ = Final Size $r$ = growth rate $t$ = time of growth $e$ = base of natural logarithms	Sigmoid or S-curve



### Hormones and its Function

Hormones	Functions
1. Auxins (Growth Promoters) e.g. Indole 3-Acetic Acid [2, 4-D and 2, 4, 5-T etc.]	1. Apical dominance, cell elongation, Promote flowering prevent premature leaf and fruit falling, initiate rooting in stem cutting, as weedicide, induce parthenocarpy.
2. Gibberellins eg. $GA_1, C_19H_{35}O_4$ , $GA_2$ , $GA_3$ , and $GA_4$ etc.	2. Delay senescence, speed up malting process, increase in length of axis (grape stalk), increase in length of stem (sugarcane), bolting in beets, cabbages and many plants with rosette habit.
3. Cytokinins (Growth Promoters) e.g. Zeatin (trans 6-purine DMAA-Dimethylallyl adenine and Isopentenyl adenine (IP) etc. [Ethylene ( $H_2C = CH$ ) A gaseous PGR which acts as Growth Promoters as well as growth inhibitor (mainly as growth inhibitor)	3. Promote cell division, induce cell enlargement, reduce apical dominance, induce growth in axillary bud, chlorophyll preservation, lateral shoot growth, adventitious root formation
4. Abscisic acid (ABA) eg. (Abscisin II Dormin)	4. Promotes senescence and abscission of leaf and fruits, promotes ripening of fruits, break seed and bud dormancy, initiate germination in peanut, sprouting of potato tuber, promotes root growth and root hair formation. 5. Inhibit seed germination, stimulate closure of stomata, increase tolerance to various stress, induce dormancy in seed and bud, promotes aging of leaf (senescence). Can delay the ripening of stored fruits as it absorbs the ethylene.

**1. Growth promoting hormones:** These are involved in growth promoting activities such as cell division, cell enlargement, flowering, fruiting and seed formation. E.g., Auxin, gibberellins, cytokinins.

**2. Growth inhibitor :** Involved in growth inhibiting activities such as dormancy and abscission. e.g., Abscisic acid and Ethylene.

#### Important Terms:

- Differentiation :** A biochemical or morphological change in meristematic cell (at root apex and shoot apex) to differentiate into permanent cell is called differentiation. e.g. loss of protoplasm by tracheary elements.
- Dedifferentiation :** The phenomenon of regeneration of permanent tissue to become meristematic is called dedifferentiation. eg. formation of interfascicular cambium and cork cambium from parenchymatous cells.
- Redifferentiation :** Meristems/tissue are able to produce new cells that once again lose the capacity to divide but nature to perform specific functions. eg secondary cortex, secondary xylem etc.

- Long Day Plants (LDP)**—Plants which need exposure to light for period exceeding critical duration e.g., wheat, rice, cucumber.
- Short Day Plants (SDP)**—Plants that need exposure to light for period less than the critical length e.g., Cabbage.
- Day Neutral Plants (DNP)**—There is no correlation between exposure to light duration & induction of flowering e.g., Tomato.

Seed Dormancy	Quiescence
It is the condition of seed when it is unable to germinate in spite of the availability of all environmental conditions suitable for germination.	The condition of a seed when it is unable to germinate because the conditions for germination are not available.

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