PLANT DEV. RESPONSES TO SIGNALS

PLANT DEVELOPMENTAL RESPONSES TO EXTERNAL AND INTERNAL SIGNALS

SENSING ENVIRONMENTAL STIMULI

Among the environmental factors that are perceived and transduced and initiate adaptive responses are the following.	LIGHT
	GRAVITY
	TOUCH
	TEMPERATURE
	WATER

PLANT MOVEMENTS

- Tropic Movements
- Nastic Movements
- Turgor Movements

Tropic movements

Tropism	is the directional growth response to environmental stimuli such as light, gravity, and touch.
Phototropism	Induced by light e.g. bending of stems towards light.
Geotropism	Induced by gravity e.g. growth of roots towards gravity
Thigmotropism	Movement caused by contact e.g., twining stem and tendril and the drooping of leaves of sensitive plant by touch
Hydrotropism	Induced by water i.e., growth of roots towards source of water.

Nastic Movement

The nastic (nastein : bending) movements	are the growth movements resulting due to difference in the rate of growth on opposite sides of an organ
When the lower side grows more rapidly than upper side, it is called as	hyponasty
When upper side of an organ grows faster than the lower side, the movement is called	epinasty

Turgor Movements

Movements are due to change in the volume of water inside the cell.

Turgor pressure-	Pressure exerted by fluid in a cell that presses the cell membrane against the cell wall
Turgid-	When more water is present in the cell it is fully expanded and becomes rigid or hard.
Flaccid-	When less water is present inside the cell, it is not fully expanded and remains soft.
Turgor movements in the sensitive plant (Mimosa pudica).	A trigger hair must be touched more than once or two trigger hairs must be touched with in seconds of each other
	Seed pods of some plants open on maturity, vigorously expelling their seed.

Photoperiodism

Photoperiodism	is any response of a plant to the relative lengths of daylight and darkness.
Short-day Plants (SDP)	flower when the night length is equal to or greater than some critical period
	Chrysanthemum, Cosmos, Dahlia, poinsettias are short- day plants.
Long-day Plants (LDP)	They produce flowers when exposed to a light period longer than a fixed day-length
	Lettuce, spinach potatoes radish, are long-day.
Intermediate-day plants (IDP)	do not flower when day length is either too long or too short
	Sugarcane, onion, and coleus are intermediate-day plants.

Photoperiodism (cont)

Day-neutral Plants (DNP)	In these plants flowering is not affected by length of light period
	Cucumber, Tomato, Corn and Sunflower, are day-neutral plants.

FLORIGEN AND PHYTOCHROME

ROLE OF FLORIGEN AND PHYTOCHROME IN FLOWERING

Florigen	is responsible for initiation of flowering in plants.
Phytoc-hrome	known as light absorbing pigment and it makes the plants sensitive to light and participates in seed germination and flowering.
PR	absorbs red light
Pfr	absorbs far-red light

Circadian Rhythms

Latin circum,	“around,” and diurn, “daily”)
Circadian Rhythms	“daily”) help an organism respond to the time of day
	an internal timer, or biological clock
red light–	absorbing phytochrome
blue/ultra violet-	A light– absorbing
cryptochrome	implicated in resetting the biological clock

Vernalization

Vernal ization	is the process of accelerating the process of flowering by subjecting or exposing the plant to low temperature.
	Some examples include carrots, beets, onions, winter wheat, cabbage, and turnips. In order to produce flowers and seeds, these plants have to go through the process of vernalization.

RESPONSES TO HERBIVORES AND PATHOGENS

Each plant cells has an innate immune system to fight against local infection. When a molecule produced by a pathogen or herbivore binds to a receptor in a plant cell, it triggers a signal transduction pathway.

Hypersens-itive Response (HR)	found in all higher plants and is characterized by a rapid cell death at the point of pathogen ingress. It is usually associated with pathogen resistance.
Jasmonic Acid activates several plant defenses	This lipid derived plant hormone, triggers the production of enzymes that confer an increases resistance against herbivorous (plant-eating) insects.

Methyl Salicylate may induce systemic acquired resistance

Systemic acquired resistance (SAR) is a mechanism of induced defense that confers long-lasting protection against a broad spectrum of microorganisms.

Tobacco plants infected with tobacco mosaic virus release methyl salicylate into the air