

External Factors and Plant Growth
Chapter 28

Tropisms

- definition
- phototropism
- gravitropism
 - auxin drives negative gravitropism in shoot
 - auxin drives positive gravitropism in root differently
 - calcium also important
 - How does the plant perceive gravity?
 - starch-statolith hypothesis
 - protoplast pressure hypothesis
 - tensegrity model
 - cytokinin
- thigmotropism
 - tendrils

Circadian Rhythms

- definition
- examples in plants
- biological clocks
 - synchronized by environment
 - need to be kept in check by daily cycles
 - flower may open according to circadian feeding pattern of pollinator
 - light-dark cycles and temperature cycles

Photoperiodism

- definition
 - biological response to change in proportions of light and day in a 24-hour daily cycle
- daylength
 - major determinant of flowering time
 - plants measure length of darkness
 - phytochrome
 - photoreceptor that absorbs red or far-red light
 - affects photoperiodism
 - P_r inactive; P_{fr} active
 - much smaller amounts than pigments like chlorophyll
 - involved in many plant responses

Hormonal Control of Flowering

- floral stimulus
- gibberellins important in some plants
 - some long-day plants and biennials
- inhibitors and promoters involved

Genetic Control of Flowering

- analyze mutations that affect flowering time
 - Tobacco (*Nicotiana*)
 - *Arabidopsis*

Dormancy

- definition
- environmental cues required to break seed dormancy
 - in temperate and colder habitats, seeds usually require period of cold
 - stratification
- seed bank
 - naturally occurring
 - government efforts
 - Svalbard seed vault
- bud dormant condition preceded by acclimation

Cold and the Flowering Response

- vernalization
- must still have suitable photoperiod

Nastic Movements and Solar Tracking

- nastic movements
 - nyctinastic movements
 - thigmonastic movements
- thigmomorphogenesis
- solar tracking

Summary

- plants detect and respond to changes in environment
- living organisms exhibit various rhythms
- photoperiodism
- flowering
- dormancy
- nastic movements