Plant hormones

Chapter 39

Signal Transduction

Etiolation and De-etiolation

Figure 39.4 An example of signal transduction in plants: the role of phytochrome in the de-etiolation (greening) response (layer 1)

Figure 39.4 An example of signal transduction in plants: the role of phytochrome in the de-etiolation (greening) response (layer 2)

Figure 39.4 An example of signal transduction in plants: the role of phytochrome in the de-etiolation (greening) response (layer 3)
Plants Raging Hormones

The discovery of phototropisms

Darwin and son found that the top of the plant played an important role

Confirmed by Boysen and Jensen

Went demonstrated that the chemical substance was transferable and named it AUXIN

Auxin

Produced in the embryo, apical meristems, young leaves

Is transported down the stem

Cell elongation, lateral root formation, herbicide, fruit development

Cytokinin

Produced in the roots (moves upwards)

Cell division and differentiation, apical dominance
Gibberellins
- Meristems, young leaves and embryos
- Stem elongation, fruit growth, break dormancy

Brassinosteroids
- Seeds, fruits, leaves, shoots, floral buds
- Elongation and xylem differentiation

Abscisic Acid (ABA)
- Leaves, stems, roots, green fruit
- Inhibits growth, stimulates seed dormancy and drought tolerance

Ethylene
- Ripening fruits, stem nodes, aging leaves and flowers
- Apoptosis, leaf abscission, fruit ripening, triple response
Plants will respond differently to changes in light, including wavelength, duration, intensity, and direction. There are two classes of photoreceptors:
- Blue-light photoreceptors
- Phytochromes

The structure of a phytochrome

How does a phytochrome work?

Biological Clocks and Circadian Rhythms
- Circadian Rhythms
- Biological clocks

Day length and Night length
- Short day plants
- Long day plants
- Neutral day plants
Other stimuli

Figure 39.25 Positive gravitropism in roots: the statolith hypothesis

Thigmomorphogenesis

Plant hormones will aid in dealing with environmental stresses
- Drought
- Flooding
- Salt
- Heat stress
- Cold stress
- Herbivores
- Pathogens
Coevolution of plants and their pathogens

- Signal molecule (ligand) from Avr gene product
- Receptor coded by R gene

- Avr allele
  - Antiviral pathogen
    - Plant cell is resistant
  - Avr allele in the pathogen corresponds to Avr allele in the host plant, the host plant will have resistance, making the pathogen avirulent

- Virulent pathogen
  - No Avr allele; plant cell becomes diseased

- Virulent pathogen
  - No Avr allele; plant cell becomes diseased

The control of plant resistance

1. Pathogen introduction
2. Signal recognition
3. Pathogenesis
4. Immunity
5. Resistance