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Plant Growth and Development

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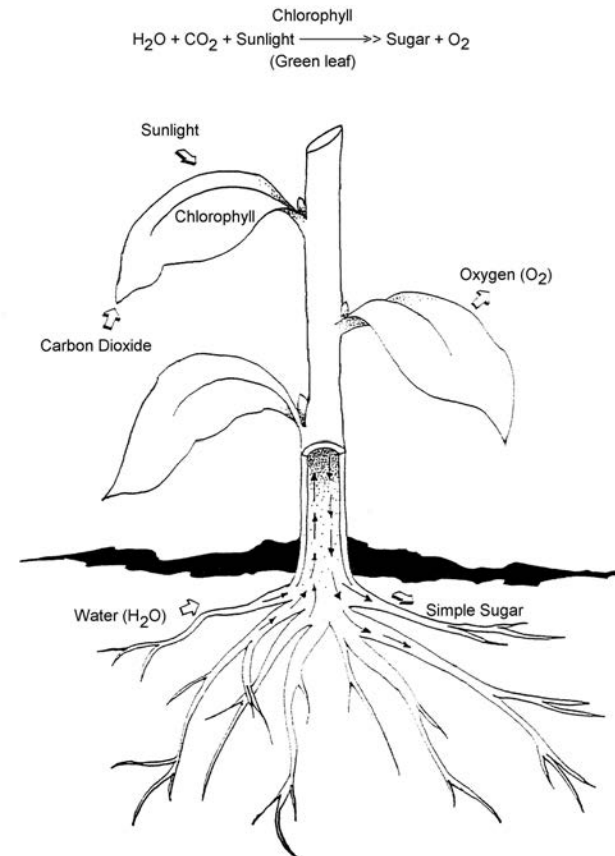


Plant Growth and Development

- Plant processes
 - Photosynthesis
 - Respiration
 - Transpiration
- Light
- Temperature

Photosynthesis

- Needs:
 - Light – natural, artificial
 - Water – roots
 - CO₂ – leaf stoma
 - Chlorophyll
 - Temperature, 65^o – 85^o F is best
- Produces:
 - Carbohydrates
 - Oxygen



Chlorophyll

- Pigment that makes cells green
- Found in chloroplasts in mesophyll cells
 - leaves
 - stems
 - between the lower and upper epidermis
- Traps light from sun
- Aligns perpendicular to sun for efficiency

Respiration

- Breaks down carbohydrates into energy, water, carbon dioxide
- Energy generated is used for plant growth
- Continuous but slows during photosynthesis

Photosynthesis and Respiration Comparison



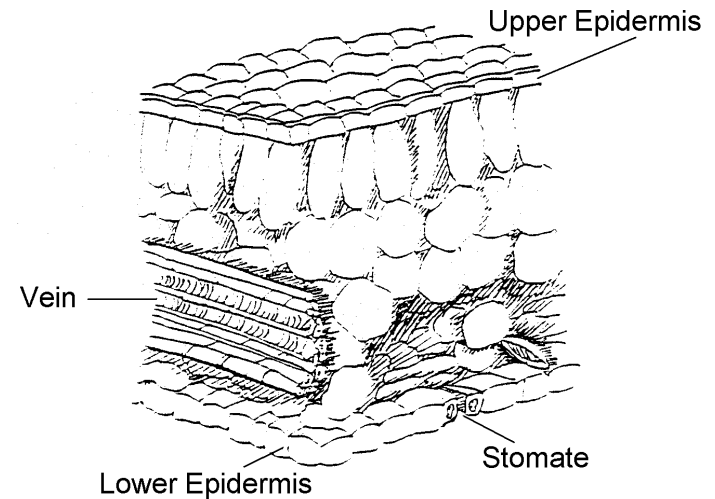
Photosynthesis	Respiration
Produces food	Consumes food
Stores energy	Releases energy
Requires chloroplasts	Occurs in all living cells
Releases Oxygen	Consumes Oxygen
Consumes water	Produces water
Consumes CO ₂	Produces CO ₂
Requires light	Requires no light

Plant Growth Balancing Act

Photosynthesis	=	Respiration	No growth
Photosynthesis	<	Respiration	Slow decline to death
Photosynthesis	>	Respiration	Growth, food storage, roots, flowers, fruit

Transpiration

- Movement of water through the plant
- Opening a closing of the stomata affect the rate
- Loss of water through evaporation mostly through stomata



Benefits of Transpiration

- Transporting minerals, chemicals, and nutrients – translocation
- Cooling through evaporation
- Maintaining turgor pressure – prevent wilting

Environmental Factors Affecting Transpiration

- Temperature
 - As temperature rises, transpiration increases
- Humidity
 - As humidity rises, transpiration decreases
- Wind
 - As wind increases, transpiration increases

Processes Are Related

- All three processes are interrelated.
- Plants balance the three functions.
 - Reduction of transpiration limits supply of water and oxygen to support respiration and photosynthesis.

Characteristics of Light

- Quantity
- Quality
- Duration

Quantity of Light

- Plant growth depends on light intensity.
- Intensity is seasonal due to the angle of the sun.
- Green houses must manipulate the light intensity.
 - Supplemental lighting
 - Shade cloth

Quality of Light

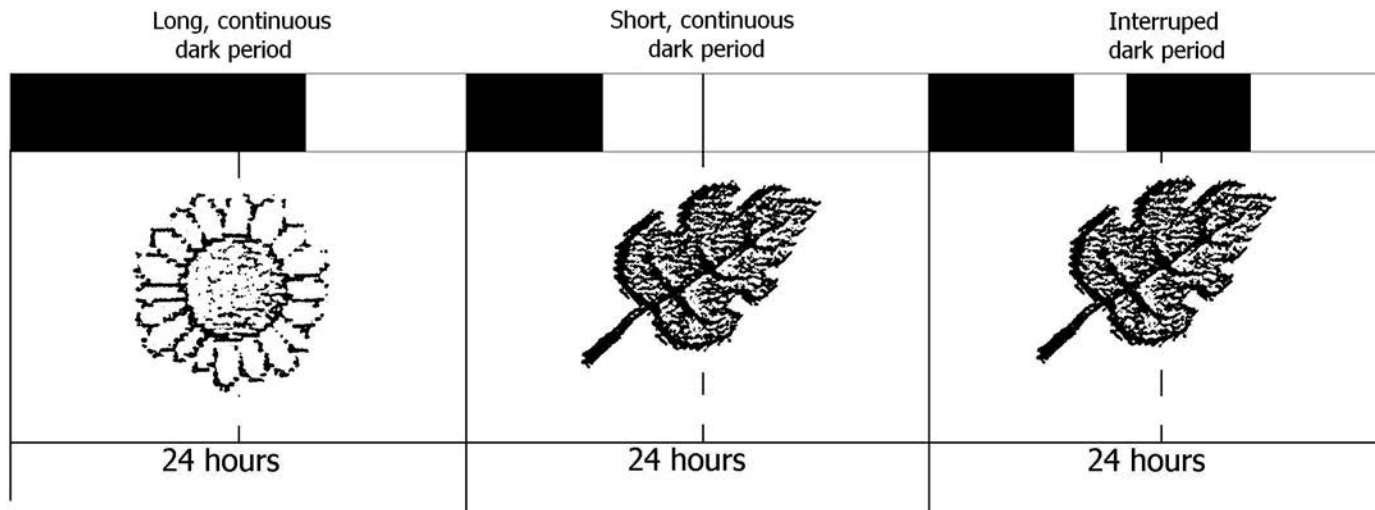
- The color of light, or wave length, affects plant growth.
- Sunlight is full spectrum.
- The blue end of the spectrum enhances vegetative growth (fluorescent).
- The red end if the spectrum enhances flowering (incandescent).

Duration of Light

- Photoperiod influences flowering
 - Short day, less than 12 hours, triggers spring and fall blooming plants - mums, poinsettias, Christmas cactus
 - Long day, more than 12 hours, triggers summer blooming and cool season vegetables - radishes, spinach, lettuce
 - Day neutral, not affected by photoperiod - many tropical plants (evolved near equator)
- Manipulate duration with shade or lighting

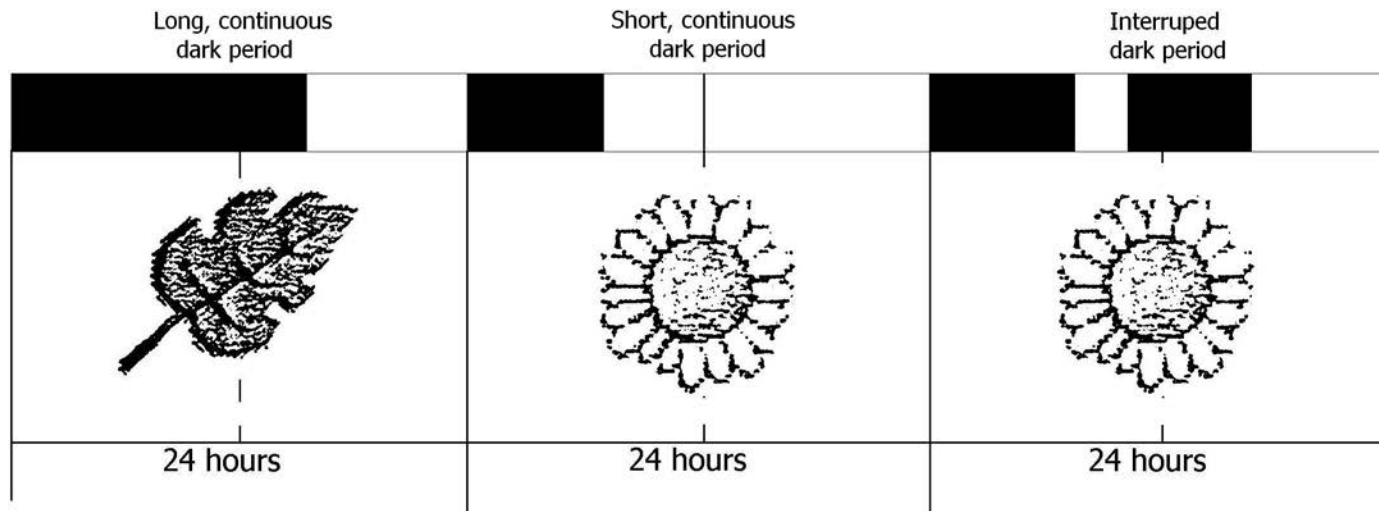
Short-day Plants

Short-day (long-night) plants



Long-day Plants

Long-day (short-night) plants



How Temperature Affects Plants

- Plant processes – increases or decreases
- Flowering
 - Christmas cactus requires 50-55°F, short day
 - Vegetables require high temperatures and long day.
- Germination – cool vs. warm seasons
- Dormancy and flowering requiring low temps.
 - Peaches – 700 to 1000 hours 32-45°F
 - Bulbs – below 33°F for 6 weeks