Nutrition in Plants ☺

↳ autotroph, ~~heterotroph~~

Photosynthesis (P.S.)

↳ Light energy trapped by chlorophyll is transformed into chem. E, to make glucose from H_2O, releasing CO_2 & H_2O.

- Req.: Light + Chlorophyll + suitable temp. + right pH (by enzymes)

① Light-dependent stage

[1st step]: Light E $\xrightarrow{\text{chloro.}}$ Chem. E (to form ATP, to give E to photolyse H_2O)

[2nd step]: $12\,H_2O \xrightarrow{\text{Photolysis}} 6\,O_2 + 24$ H atoms ~~molecules~~ (to red. $CO_2 \rightarrow$ Carbo)

② Light-independent stg (calvin's cycle)

[3rd]: ATP (from ①) + 24 H atoms + $6\,CO_2 \xrightarrow{\text{enzymes}} C_6H_{12}O_6 + 6\,H_2O$

⇒ OVERALL: $6\,CO_2 + 12\,H_2O \xrightarrow[\text{chloro.}]{\text{sunlight}} C_6H_{12}O_6 + 6O_2 + 6\,H_2O$ → don't cancel as H_2O is a prd. of p.s.

Wavelength absorpⁿ by chloro.

- absorpⁿ spectrum
- action spectrum

⇒ Plants like bluish-purple & red light

FATE of glucose

① Glu. → Prd. energy for tissue resp. & form cellulose cell wall

② Glu. + nitrates → a-a. & protein for protoplasm (stored as protein)

③ Glu. → Fats for storage / cell resp. / synthesize protoplasm

④ DAY: Glu → starch

NIGHT: starch → Glu

⑤ Sucrose → in storage organs

Importance of P.S.

① Provide food & E. to animals in/directly

② Formation of coal (fossil fuel)

↳ combusⁿ releases E derived from sun

③ Purify air: $CO_2 \rightarrow O_2$ ☺

FUN ENZYMES!

Starch	Proteins	Fats
↓ diastase	× polypep.	↓ lipase
Maltose	↓ Protase	glycerol & fatty acid
↓ maltase	a-a.	
glu.		

FUN P.S. EXP!

- Boil leaf to denature enzymes
- Boil leaf in ethanol to remove chlorophyll

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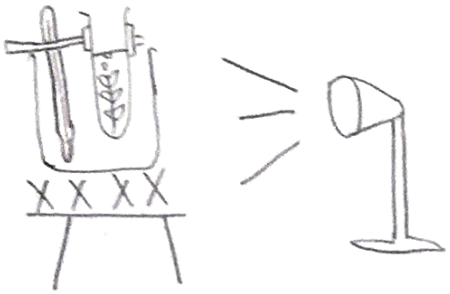
LIMITING FACTORS (L.F)

① Temperature
② Light intensity
③ Conc. of carbon dioxide
④ Water } not covered
⑤ pH



+ graphs ::

STRUCTURES of leaf

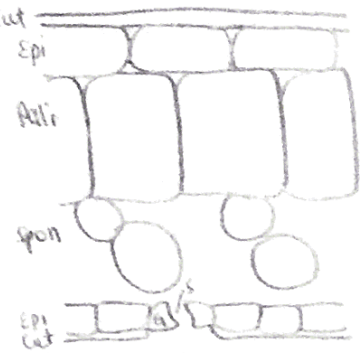
External

→ Lamina (leaf body)
- large to provide large S.A. for absorp. of CO_2
- Flat & thin to allow rapid gaseous diffusion

→ Veins (midrib & lateral vein)
- Contain vascular bundles for rapid transport of materials (sugar & H_2O) thru leaf

→ Petiole
- Holds lamina away to absorb max. sunlight & air

Internal



→ Cuticle & epidermis
- Covered by ~~thin~~ layer of wax to prevent excessive evap. of H_2O & protects inner leaf tissue

→ Palisade meso (rectangular) | Spongy meso

Palisade meso	Spongy meso
* no chloroplasts	
- Thin walled, long cells	More irregular, oval/round
- Tightly packed	Loosely arranged (due to)
- NO int-cell air spaces	Has int-cell. air spaces
- more chloroplasts ↳ main site of p.s.	Less chloroplasts than pali.
- Absence of transport tissue	- Present!
- Usually absence of t.f.om.	- Present!

→ Vascular tissue (in main & lateral veins, ends among meso cells)
- Extensive vascular n/w thru out leaf
- W transports δ & min-salts & support leaf
  P transports sucrose & a-a.

→ Stomata (s: stoma)
- Bordered by 2 guard cells, controlling opening & closing of stoma
- Contain chloroplast (for p.s. to prd. ATp. for)

→ Lower epidermis: Guard cell & Cuticle
- Many stomata to regulate diff. of gases in & out of leaf

① Chloroplasts in guard cells p.s. → chem. E to pump K^+ ions into g.c. from surr. cells
② Water pot. ↓, δ enters g.c. by osmo.
③ G.c. swell & turgid, more curved, stoma open

DAY

① No p.s., K^+ diffuse out of g.c.,
② δ pot. ↑, δ leaves g.c. by osmo.
③ G.c. flaccid, stoma closes (tightly sealed)

NIGHT

CO_2 → Atm. → Leaf's int.-cell air spaces → T-F-O-M- (double diffuse) → meso cells → cell to cell (for p.s. to take)

O_2 ← p.s.-ing cells ← T-F-O-M- ← int.-air spaces ← stomata ← out of leaf (the opposite!)

stomata thru ↓ to cell layer

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