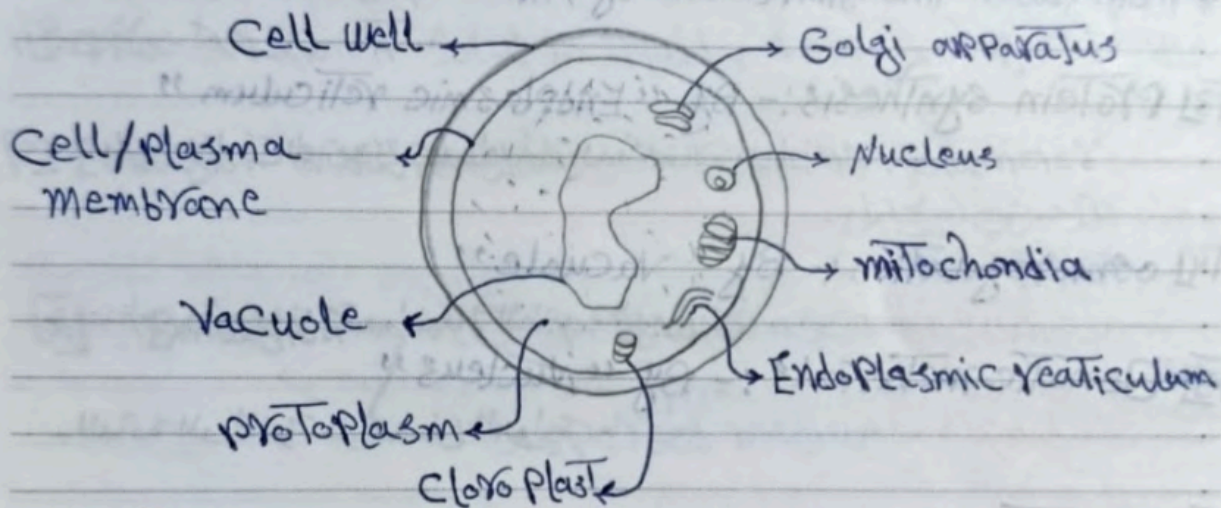


Lec 1:-

Plant Physiology

Plant Physiology:- study all vital process in side plant cell such "Nutrition, Respiration, Growth" → Growth
 دراسة جميع العمليات الحيوية داخل الخلايا النباتية مثل "التغذية، التنفس، النمو"

* Plant cell is a complete physiological unit.



1] Cell wall:- Rigidity and shape of the cell through cell wall
 الجدار الخلوي يتحكم في الصلابة وشكل الخلية

* Permeable

2] Cell membrane:- selective permeable → control on what go out and inside cell.

الغشاء البلازمي يتحكم في النفاذية الانتقائية وينظم ما يدخل ويخرج من الخلية.

3] Protoplasm:- Is the life physical basis of cell and consist of (cytoplasm + organelles)

الأنسجة

من سيتوبلازم + عضيات

Classification of Enzymes :-

according to the reaction they catalyzed.

① Oxidation-reduction-reaction :- "Oxidases"

وظيفتها هي إزاحة الأكسجين للتفاعل أو سحب هيدروجين من التفاعل إلى هيا تفاعلات الأكسدة والإختزال.

② Transferase . الناقل

بتشيل مجموعة وتنقل مجموعة ثانية.

Transfer active groups or particles between different molecules.

③ Hydrolases . التحلل المائي

Hydrolases of substrates by water.

④ Isomerases :-

arrangement of atom or groups or transfer active groups or particles in the same molecules.

⑤ Lyases :-

Cleavage in the absence of water.

⑥ Ligases or synthetase :-

They are the enzymes catalyzing the linking together of two compounds utilizing the energy.

تتضمن ربط مركبتين معاً باستخدام الطاقة الناتجة.

* Factors that Affect enzyme activity :-

① Temperature

② pH

③ Toxic materials المواد السامة

solute $\rightarrow$ in

Dispersed phase

Solvent - میٹھ

tion

→ Types of solution according (Dispersed phase) :-

1) True solution: Solid in liquid, 1nm, sugar in H₂O

7] Emulsion or suspension:- 1000 nm diameter

[A] Emulsion $\rightarrow$ Dispersed phase: **Liquid**

Dispersed^{tion} medium:- liquid

BR suspension $\rightarrow$ Dispersed phase: **solid**

Transcription

Dispersed medium: liquid

= medium phase.

13] Colloidal soln:- $1: 1000 \text{ nm}$

→ Two types according to attraction and affinity between.

Dispersed phase, Dispers^{tion} medium

يتم تقسيم إلى نوعين حسب قوى الجاذب والإنتشار
الموجودة التالية

[A] Lyophilic

* Affinity is large

التقارب الكبير

EX:- starch in H₂O

* Stable → مستقر

* Reversible → قابل عكس

* Viscous → لزج

[B] Lyophobic

* Affinity is less, No.

التقارب أقل

EX:- $FeCl_3 + H_2O \xrightarrow{\Delta} Fe(OH)_3$

* Non stable → غير مستقر

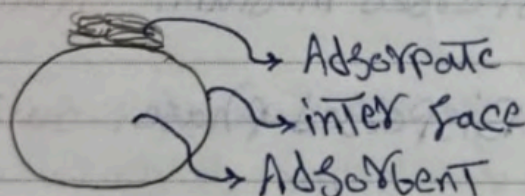
* Non Reversible → غير عكس

* Less viscous → أقل لزوجة

* Characters of protoplasm colloidal soln:-

[1] Adsorption:- The ability of colloidal substance to attract and accumulate other substance on its outer surface.

الامتزاز:- هو قدرة المواد الغروية على جذب وتجميع المواد الأخرى على سطحها الخارجي.



امتزاز

[2] Electro phoresis:- Movement colloidal substance (+ve/-ve) under the influence Electrical field.

حركة المواد الغروية تحت تأثير المجال الكهربائي.

[3] ultrafiltration:- filtration for colloidal substance using special filters called ultra filter.

الترشيح للمواد الغروية باستخدام مرشحات خاصة تسمى ورقة الترشيح.

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[14] Dialysis :- for True solution $\rightarrow$ separation between crystalloids and colloids through membrane called Dialyzer.

الغسل الدموي هو الفصل بين المواد البلورية والمواد الغروية من خلال أغشية

[15] Coagulation :- protoplasm lose electrical charge

التخثر :- يفقد البروتوبلازم شحنته الكهربائية

* Lead To death.
يقود إلى الموت

Lec 2:-

Diffusion:-

- movement of molecules of substances from high conc. to region of low conc. due to kinetic energy until equilibrium.

⇒ Types of Diffusion:-

I Simple Diffusion:-

- movement of Diffusion for small size oxygen, H_2O , CO_2 .

II Facilitated Diffusion:-

- movement large size particles such as glucose, starch.
- using protein channels.

⇒ Factors affecting Rate of Diffusion:-

- I Size and mass of diffused substance.

$$\left(\text{Rate of diffusion} \propto \frac{1}{\text{size or mass}} \right)$$

- II Temperature.

$$\left(\text{Rate} \propto \text{Temperature} \right)$$

Diffusion

[3] Pressure. الضغط

((Rate of Diffusion $\propto$ pressure))

[4] Solubility of diffused substances.

((Rate of Diffusion $\propto$ Solubility))

* Osmosis:-

movement of water from a region of high concentration of water to a region of low conc. of H_2O through membrane until equilibrium.

حركة انتقال جزيئات الماء من منطقة تركيز عالٍ من الماء إلى منطقة تركيز منخفض من الماء عبر الغشاء حتى يصل إلى حالة التوازن.

- Types of osmosis:-

[1] Endosmosis:-

- Entrance of water from outside cell into inside cell through cell membrane.

دخول الماء من الخلية الخارجية إلى داخل الخلية عبر غشاء الخلية

[2] Exosmosis:-

- loss of water from inside plant cell to outside cell

through plasma membrane. خسارة الماء من داخل الخلية النباتية إلى خارجها عبر الغشاء البلازمي

Endosmosis
size of plant cell

increase

Turgid

Hypotonic
solution

Exosmosis

decrease

Flaccid

Hypertonic
solution

physiology

[1] osmotic pressure:- is the pressure required to stop osmosis.

→ due to presence of salt.

- osmotic pressure $\propto$ concentration of salt.
- osmotic pressure increase by increasing salt conc.
- Pure H₂O "Hypotonic" → osmotic pressure → zero

[2] Turgor pressure:- From Time To Time

↳ Endosmosis (Hypotonic salt)

↳ stretching wall cells to avoid exsuzes.

[3] Wall pressure:-

- resistance to Turgor pressure.
- avoid cutting cells.

*** Water Potential:-**

is a measure of Energy State of water.

→ maximum in pure H₂O ((water)) = zero.

- water potential for any solution -ve value.

*** Solute Potential:-**

- due to presence of salt.

Notes:-

osmotic pressure

Solute Potential

Salt Concentration

جسوا بجز

→ osmosis → Movement of H_2O from low to high
Till equilibrium.

*Plasmolysis:-

1) plasmolyzed cell:-

Hypertonic soln.

↓
Exosmosis

Take place shrinkage cells:

2) Deplasmolysis cell:-

→ according to the concentration of hypertonic soln.

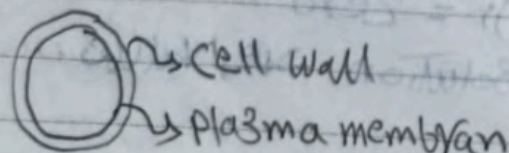
Low concentration

→ Temporary plasmolysis
→ may occur recovery

High concentration

→ Permanent plasmolysis.

- using Hypotonic soln → Endosmosis → Turgid



Deplasmolyzed cell

* Plant growth :-

is irreversible increase in plant size accompanied by increase in plant weight due to growth stages.

زيادة وزن غير قابلة للعكس في جميع النبات مع زيادة في وزن النبات بسبب مراحل النمو

1] cell division 2] cell enlargement

3] cell differentiation → plant organs

→ At growth meristematic cells have ability to divide continuously and regularly.

* plant growth regulators " plant hormones "

" الهرمونات النباتية "

→ organic substance produced by plants " Apical buds "

To regulate physiological processes.

مادة عضوية تنتجها النباتات " البراعم القمية " لتنظيم العمليات الفسيولوجية

إضافة الهرمونات
Adding by two methods

Endogenous → priming seeds
in hormone solution

داخلية المنشأ :- تحفيز البذور في محلول هرموني

Exogenous → spraying with
hormones soln.

خارجي :- الرش بمحلول هرموني

→ low or moderate conc.

→ high conc → decrease growth

ارتفاع التركيز يقلل النمو

Plant hormones

Growth promoters

increase growth

Growth inhibitors

Decrease growth

⇒ Transpiration: التبخر

* Definition: Water loss from the aerial parts of the plant « leaves, stem » in the form of water vapor.

* plants loose alot of water by Transpiration.

* Importance of Transpiration:-

1) Heat loss « latent heat of vaporization »

2) Carry nutrients from soil to the plant.

↳ ascent of cell sap صعود السائل الخلوي

* The minimum of Transpiration found in « xerophytes plants »

* No Transpiration in « submerged hydrophytes »

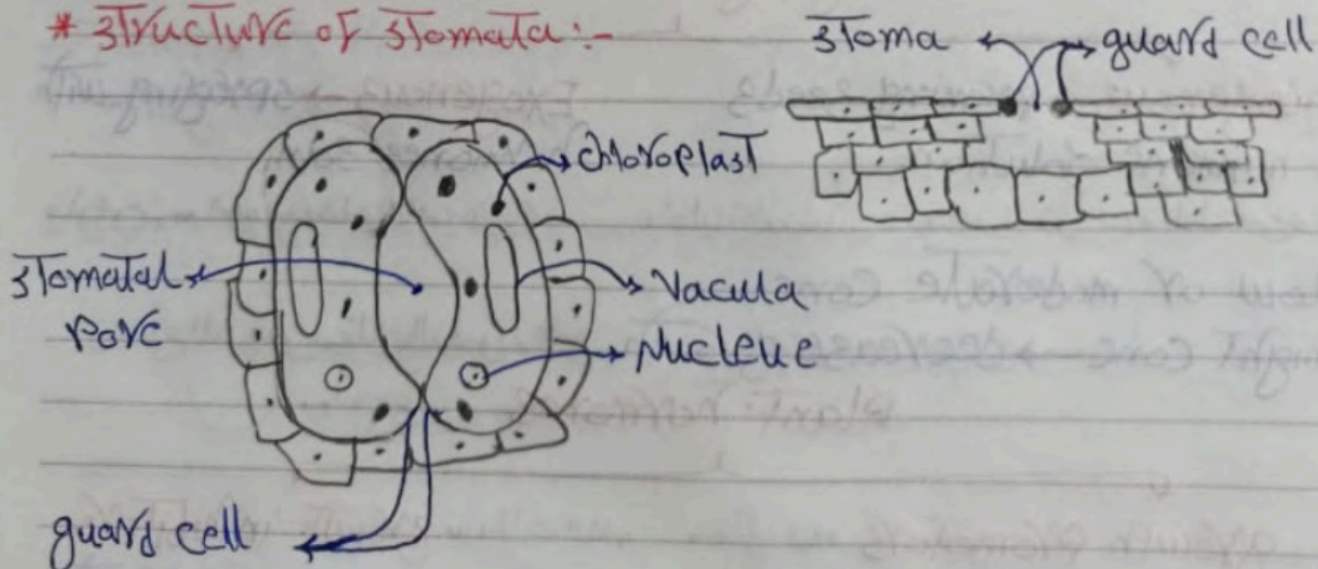
النباتات - المائية الغامرة

⇒ Stomatal Transpiration: التبخر الشجري

- Stomata: are minute openings on the epidermis of leaves / stem.

* Most of water loss about 95% Take place through the stomata

* Structure of Stomata:-



- Each stomata is surrounded by a pair of kidney shaped guard cell.
- The cell wall of guard cell has a different thickness.
- inner wall of guard cell have a concave structure and thick, rigid.
- outer wall of guard cell have a convex structure and thin, elastic.

* opening and closing of stomata:

- opening and closing of stomata take place due to changes in turgor pressure of guard cell.
- water diffuses into guard cells which causes turgid of cell and make it to open.
- on hot / dry days, the guard cells have less water and the stomata tend to closed.

* Mechanism of opening and closing of stomata.

- light $\rightarrow$ make photosynthesis $\rightarrow$ formation of sugar $\rightarrow$ increase the osmotic pressure $\rightarrow$ increase the turgor pressure in guard cell $\rightarrow$ stomata open.
- photosynthesis $\rightarrow \downarrow \text{CO}_2 \rightarrow \uparrow \text{pH} \rightarrow$ hydrolysis of starch to sugar by enzymes $\rightarrow \text{O.P.} \uparrow \rightarrow$ turgor pressure $\uparrow \rightarrow$ stomata open.
- night $\rightarrow$ no photosynthesis $\rightarrow \text{O.P.} \downarrow \rightarrow$ stomata closed.

$\Rightarrow$ Factors Affecting the rate of Transpiration.

* External Factor:-

- (1) Temperature :- $\text{Temperature} \propto \text{rate of Transpiration}$
- (2) Relative humidity :- $\text{Relative humidity} \propto \text{rate of Transpiration}$
- (3) light :- $\text{light} \propto \text{rate of Transpiration}$
- (4) Wind :- $\text{Wind} \propto \text{rate of Transpiration}$

* Internal factor :-

11] stomatal number :- $\propto$ rate of Transpiration

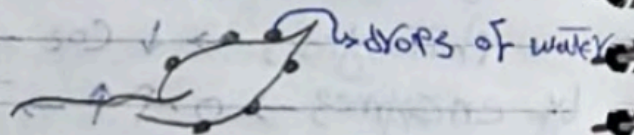
12] Diameter of stoma :- $\propto$ rate of Transpiration

13] Plant structure :- xerophytes, hydrophytes
 $\searrow$ rate of Transpiration $\uparrow$

Transpiration التبخر

Guttation الغش

- | | |
|--|---|
| <ul style="list-style-type: none"> • occur through stomata, cuticle and lenticels. • loss of water in the form of vapour. • occur at day time only. • lose water from pore (stomata) • have a relation with temperature • root pressure is not involved. | <ul style="list-style-type: none"> • occur through hydathodes in the leaf. • loss of water in the form of liquid • occur at morning or night • no pore to lose water. • no relation with temperature • occur due to development of root pressure. |
|--|---|



Lec: 5 :-

«Plant metabolism»

* Plant metabolism :- is a biochemical reaction occur inside the plant cell, and expresses most of the physiological processes that occur within a living organism.

* Type of metabolism :-

① Anabolism - بناء - تجميع

② Catabolism - تحليل - تكسير

* Reaction that require energy

↳ = absorption of energy

* Energy-producing reaction

↳ = release of energy

* It works to assemble monomers to form polymers.

* It works by breaking down polymers into monomers

ex:- photosynthesis

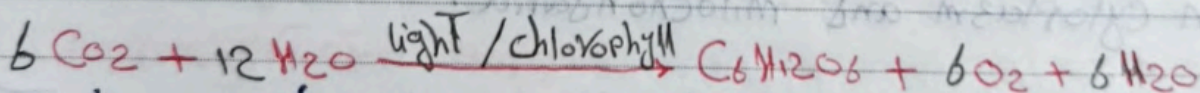
ex:- Respiration

• Photosynthesis :- البناء الضوئي

- All plants are autotrophic = can make their own food.

- photosynthesis :- The process which occurs in the chloroplasts of green plant.

- In which simple sugars " $C_6H_{12}O_6$ " are formed from CO_2 & H_2O in the presence of light and chlorophyll.

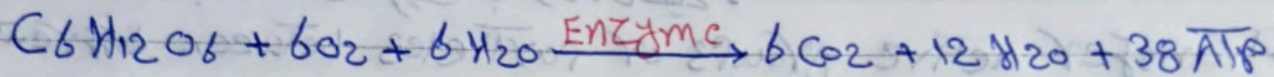


↳ From soil through leaves
↳ absorbed from air by stomata

* Type of respiration :-

① Aerobic Respiration :- التنفس الهوائي

Make complete oxidation of organic substance in the presence of oxygen and release CO_2 , It is the most common in higher organism.



② Anaerobic Respiration :- التنفس اللاهوائي

Called « fermentation التخفير », incomplete oxidation. يتم فيها تحويل حمض البيروفيك إلى ثاني أكسيد الكربون والإيثانول، كما تنتج بعض الكائنات الحية الأخرى حمض اللاكتيك من حمض البيروفيك. - تنتج 2 ATP

* Enzymes - الإنزيمات :-

- are complex protein molecules called biocatalysts.
- Enzymes has a highly specific.
- Can defined as soluble colloidal and organic catalysts.
- Decrease the energy of reaction.

* Character of Enzyme :-

Classification of Enzymes :-

according to the reaction they catalyzed.

① Oxidation - reduction - reaction :- "Oxidases"

وظيفته نقل إلكترونات الأكسجين للتفاعل أو سحب إلكترونات من التفاعل إلى هيا تفاعلات الأكسدة والإختزال.

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* There are Two Type of photosynthesis :-

① light dependent :-

Is called light reactions, depend on the light energy and produces "ATP"

② light Independent :-

Is called dark reaction, not use light directly but use ATP.

* What is the Important of photosynthesis?

- ① main biosynthetic pathway by which carbon and energy enter the web life.
- ② Nearly the only source of O_2 .
- ③ Reduce the CO_2 conc. in the atmosphere.

* sun light $\rightarrow$ is the main source of energy.

* Chloroplast $\rightarrow$ absorbed the light energy.

* فتد على النبات الفوتوسنتز يتم تحويل الطاقة الضوئية إلى طاقة كيميائية

* Respiration :-

break down of complex molecules to yield energy occurs in cytoplasm and mitochondria.

