

BOUT 233 (SEM. 03)
PLANT PHYSIOLOGY
PHOTOSYNTHESIS (CREDIT II)
(M.Sc II)

Dr. Swapnil Dayaram Wagh

(M.Sc. B.Ed., CSIR NET JRF, ICAR NET, SET, GATE)

swapnildwagh@gmail.com

Mob: 8275586567

KKHA Arts, SMGL Commerce & SPHJ Science College
Chandwad. 423101



ULTRASTRUCTURE OF CHLOROPLAST

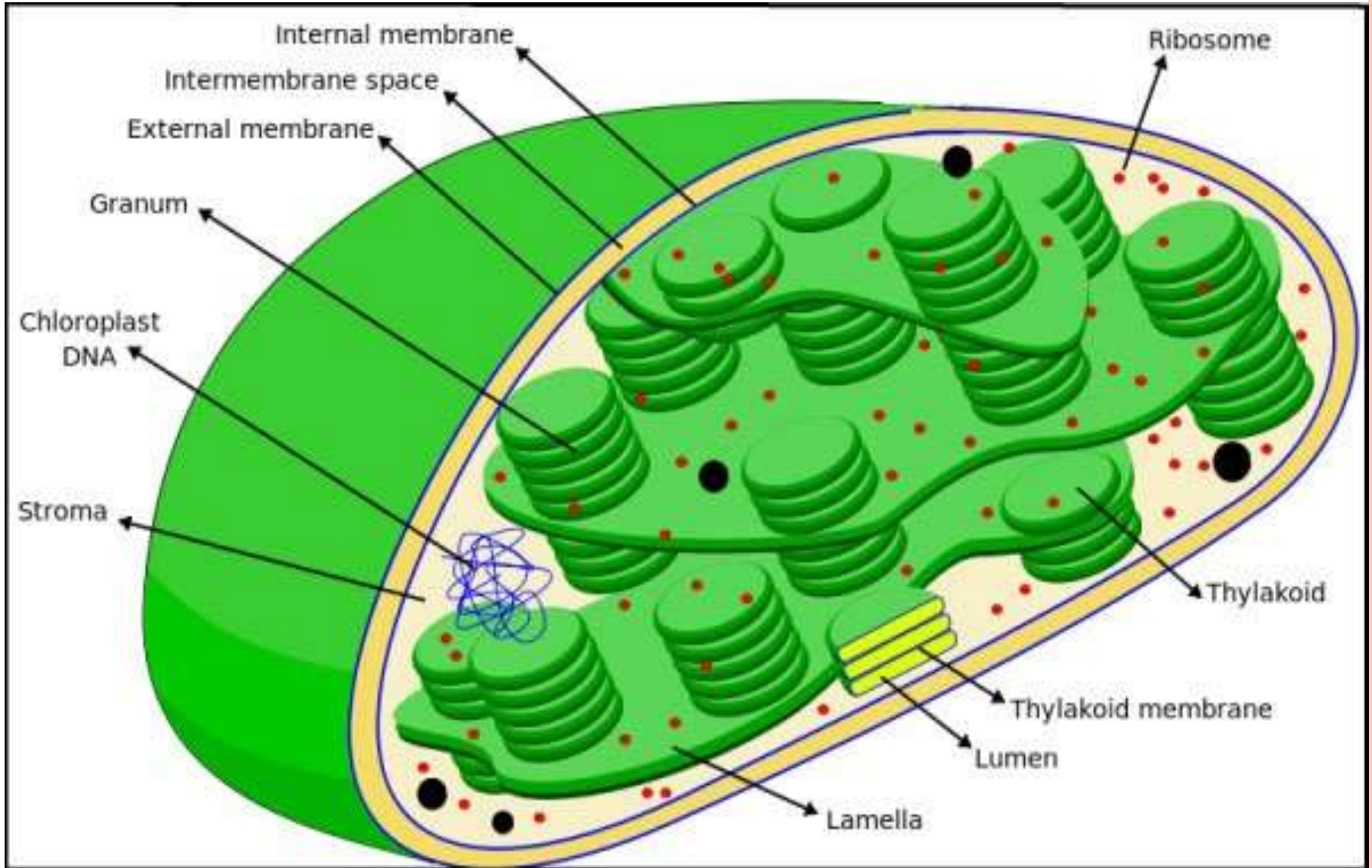


Image Source

https://www.google.com/search?q=chloroplast&sxsrf=ALeKk02YVaZaFj8b2JJ7uemFxMd2r23Xw:1594895034561&source=lnms&tbm=isch&sa=X&ved=2ahUKewikvPT_xtHqAhWYzDgGHfw3DYsQ_AUoAXoECBQQAaw&biw=1366&bih=608#imgrc=XIsiUWTKWi9BPM

PHOTO OXIDATION OF WATER

- At Photo System II (P 680) reaction centre photolysis of water takes place i.e splitting of H₂O in presence of light to form 2H, 2e, ½ O₂.
- For splitting of water molecule water splitting enzyme is present in PS II. It require Mn⁺⁺, Ca⁺ and Cl as co factors.
- Electron release during photolysis of water accepted by PS II reaction centre and H⁺ temporarily stay in thylakoid lumen.
- The high energy electron then transfer to the next acceptor in stepwise manner (Every time electron passes from donor to acceptor to reduce donor & oxidised acceptor)

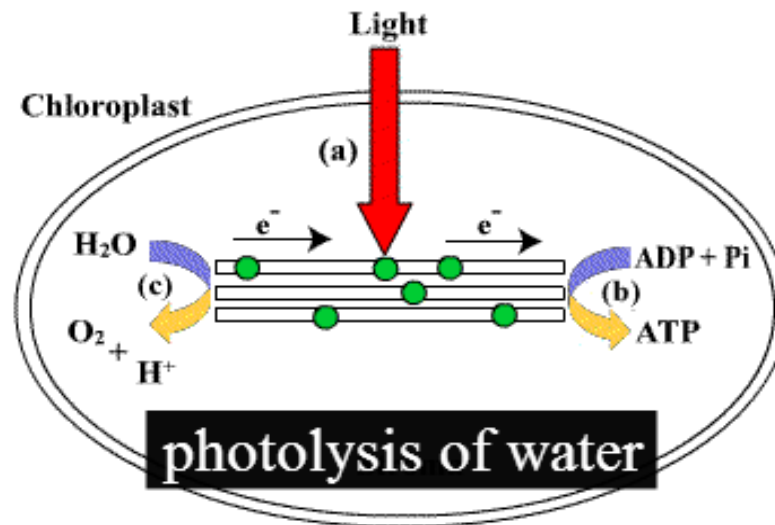


Image Source

https://www.google.com/search?q=photolysis+of+water&tbm=isch&ved=2ahUKEwiI9ILWYNHqAhVJcn0KHfsXCY8Q2cCegQIABAA&oeq=photolysis+of+water&gs_lcp=CgNpbWcQARgAMgQIIxAnMgIIADICCAAyAggAMgIIADICCAAyAggAMgIIADICCAAyAggAOgYIABAHEB46BAGAEEM6CggAELEDEIMBEENQ8KsBWNnUAWCQ6AFoAnAAeAGAAYUBiAHUEJIBBDIuMTiYAQCgAQGqAQQtnd3Mtd2l6LWltZw&scient=img&ei=siwQX4jTBsnk9QP7r6T4CA&bih=608&biw=1366&hl=en#imgrc=GXWG9P24sjrRAM

MECHANISM OF ESTABLISHMENT OF PROTON GRADIENT ACROSS THYLAKOID MEMBRANE

❖ Non Cyclic Photophosphorylation:

chloroplast stroma

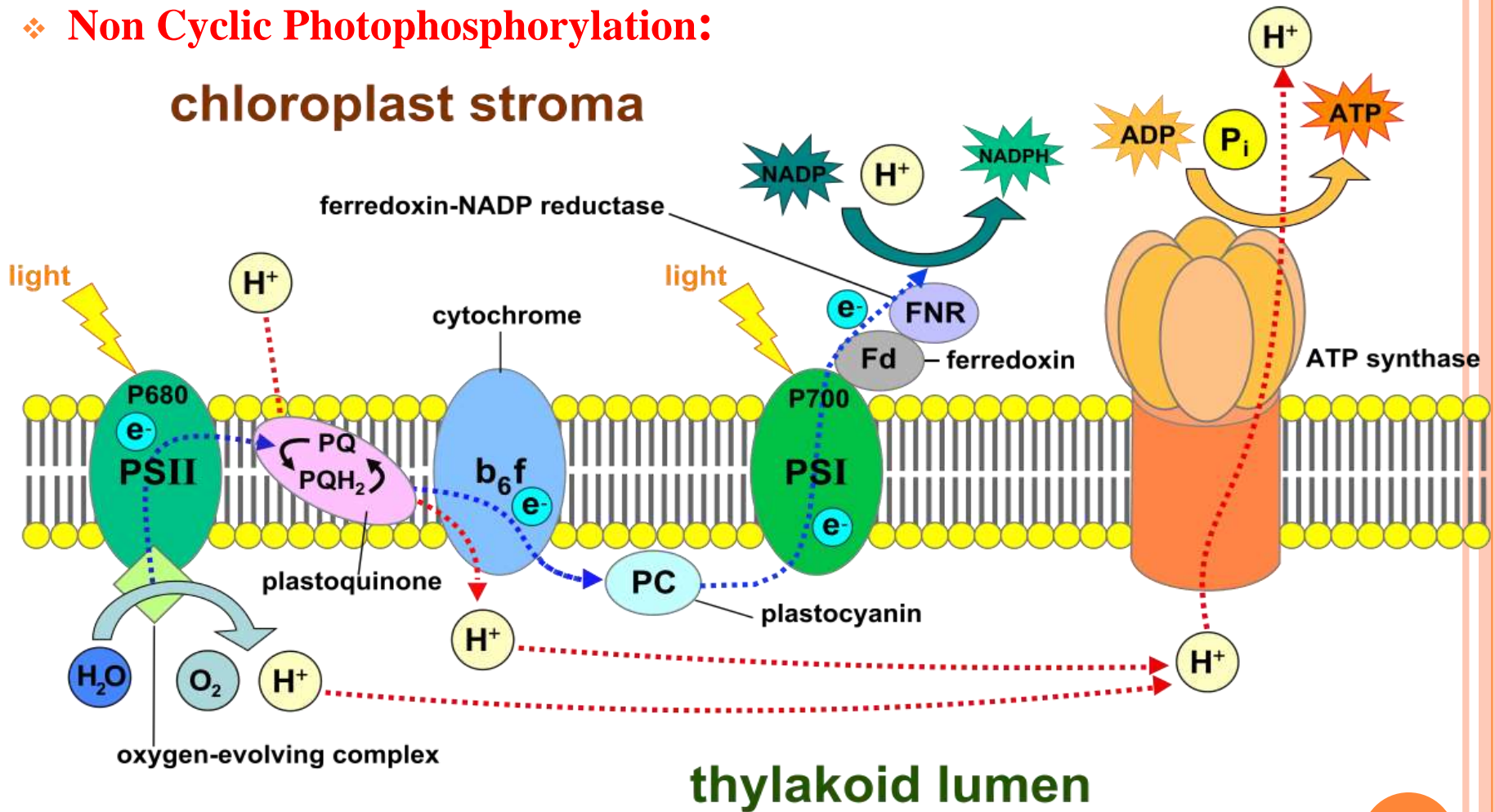
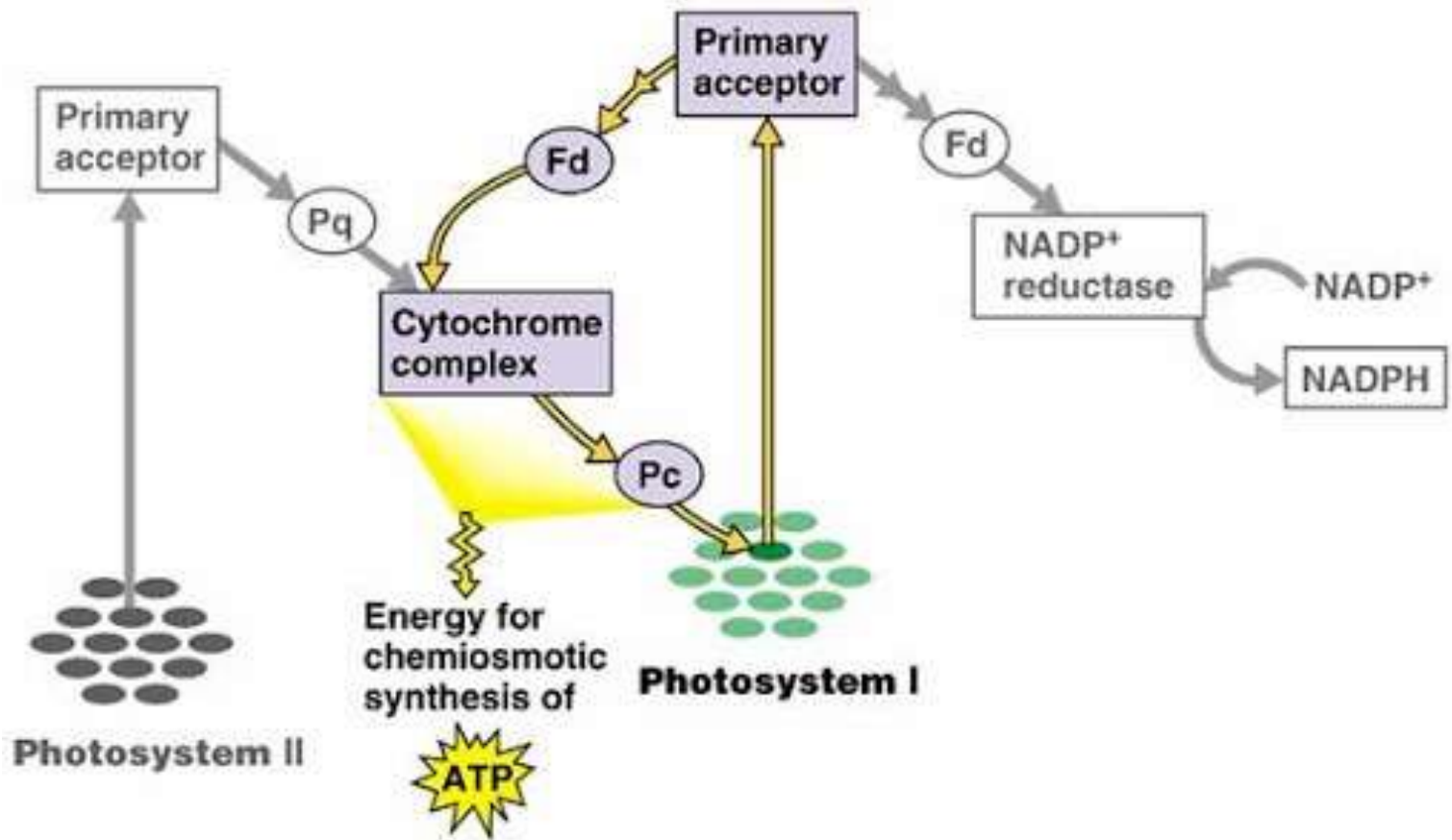


Image Source

https://www.google.com/search?q=photosynthetic+electron+transport&sxsrf=ALeKk03Rh5It_X2ES23IkJdTXfzh_ilvrg:1594895357678&source=lnms&tbn=isch&a=X&ved=2ahUKEwjKf2ZyNHqAhX2xzgGHXNEDzMQ_AUoAXoECBEQAw&biw=1366&bih=608#imgrc=brgGusya_zpbM

❖ Cyclic Photophosphorylation:



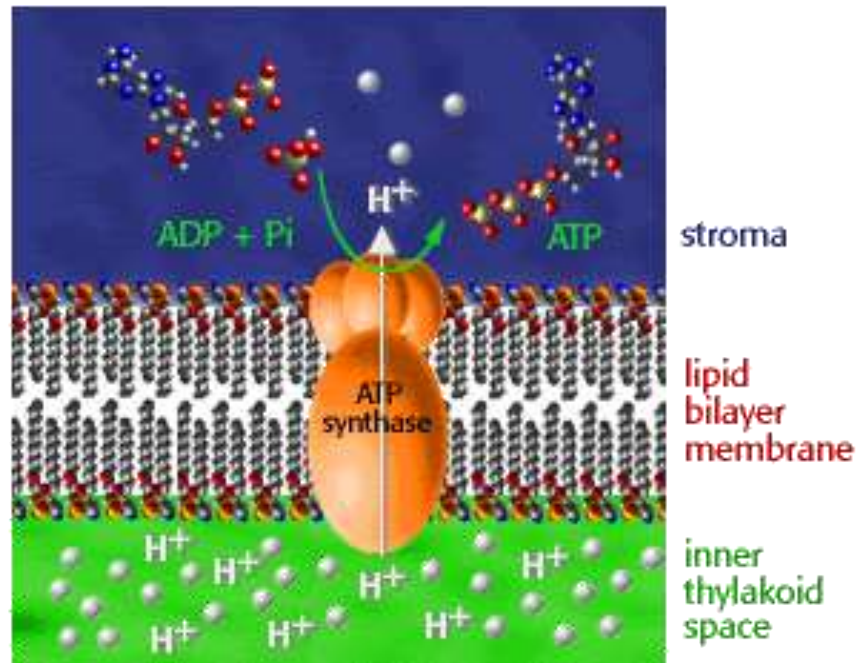
- ❖ In cyclic photophosphorylation only ATP are synthesized
- ❖ No synthesis of NADPH₂

Image Source

https://www.google.com/search?q=non+cyclic+photophosphorylation&tbm=isch&ved=2ahUKewitlY7_yNHqAhU66jgGHdSWDBoQ2cCegQIABAA&oeq=non&gs_lcp=CgNpbWcQARgAMgQIixAnMgQIABBDMgUIABCxAzIFCAAQsQMvBQgAELEDMgUIABCxAzIFCAAQsQM6AggAOgcIIXDqAhAnUL6nEFjPuhBguckQaAFwAHgDgAGsAYgBmhGSAQQwLjE4mAEAoAEBqgELZ3dzLXdpei1pbWewAQo&scient=img&ei=0SwOX-3oLbrU4-EP1K2y0AE&bih=608&biw=1366&hl=en#imgrc=UNShagkGfCWFnM

❖ ATP Synthase:

Hydrogen gradient drives ATP production



Chemiosmotic Hypothesis: In 1961 a British biochemist by the name of Peter Dennis Mitchell theorized the Chemiosmotic hypothesis, which explains how the energy molecule (ATP) are created during photosynthesis & awarded by Nobel Prize. In this process ATP produce as result of the proton gradient that exist across the thylakoid membrane. The enzyme required for ATP synthesis is ATP synthase. It is made up of two subunits i.e F0 & F1. F0 subunit is involved in the proton transportation across membrane which causes changes in F1 configuration leading to activation of enzyme. The enzyme phosphorylates ADP converts ADP into ATP.

Image Source

https://www.google.com/search?q=proton+gradient+in+photosynthesis&tbm=isch&ved=2ahUKEwio14n_ytHqAhXM6DgGHWI4C28Q2cCegQIABAA&oeq=proton++in+photosynthesis&gs_lcp=CgNpbWcQARgAMgYIABAHEB4yBggAEAcQHjoICAAQBxAFEb46AggAOgQIABBDOggIABAIEAcQHlChzgRYw48FYIufBWgDcAB4AIABhQGIAY8UkgEEMC4yMpgBAKABAaoBC2d3cy13aXotaW1n&scient=img&ei=6i4QX6iIczR4-EP4vCs-AY&bih=608&biw=1366#imgsrc=xfqM1cArRtvO3M

○ REFERENCES

1. Lincoln Taiz & Eduardo Zeiger (2010) Plant physiology. Fifth edition . Sinauer Associates, Inc. Publishers. Sunder Land, USA.
2. V. Verma (2011) Textbook of Plant Physiology. Ane books Pvt. Ltd. New Delhi.
3. V. K. Jain (2008) Fundamental of Plant Physiology. S. Chand & Compony Pvt. Ltd.
- 4.

