

Cyclic electron flow in C3 plants

PRINCIPLE:

This application notes figures out as a first approach on how cyclic electron flow can be followed using JTS-10 (Joliot Type Spectrometer) on a spinach leave, in absorbance mode.

Photosynthetic process involves in electron transfer. The electron flow operates through two ways: cyclic and linear:

In linear electron flow, the electrons are transferred from PSI to NADP and then to the Benson and Calvin cycle. In cyclic electron flow mode, the electron flow occurs between PSI and Cyt b₆f complex (figure 1).

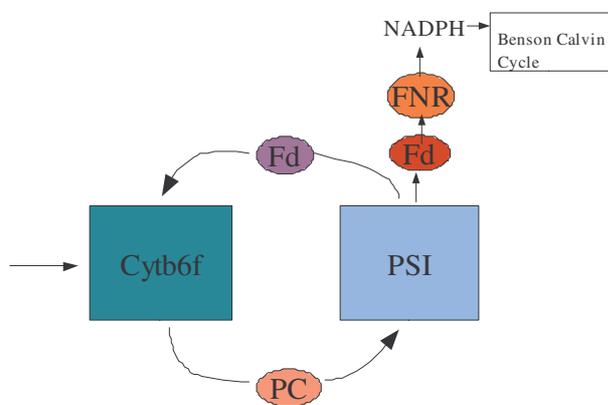


Figure 1: Simplified modelisation of linear and cyclic electron flows in a photosynthetic membrane

All experiments were realized using a **JTS-10** (photo 1) from Bio-Logic (Claix, France)



Photo 1: JTS-10 spectrometer

Experiments are performed with market spinach leaves. Absorption changes are sampled at 810 nm using a 10 μ s detecting flash LED. Excitation is induced by an actinic far red Led peaking at 720 nm. The photodiodes are protected from the actinic light using appropriate cut-off filters.

Figure 2 displays the kinetics of P700 oxidation induced by a far red illumination under different conditions:

In curve 1, the sample is light adapted and is preilluminated with an orange actinic light during 10 minutes. The Benson Calvin cycle is activated. Oxidation of P700 is fast and reaches a steady state around 8 s. The kinetic could be compared with an experiment made under the same condition but with the addition of Methylviologen (MV), an electron acceptor, to confirm that electron flow mainly occurs through the linear way.

In curve 2, the sample is dark adapted and preilluminated with a saturated pulse of 200 ms. The oxidation of P700 is much lower, and reflects mainly a cyclic electron flow. The preillumination of the leaf with the 200 ms saturated pulses reduces most of the PQ molecules inducing a slow oxidation of P700 during the illumination with the far red.

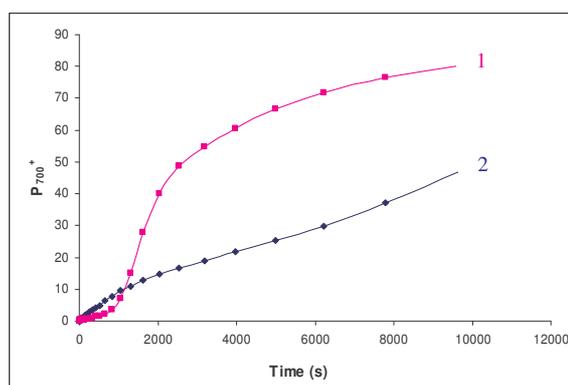


Figure 2: Kinetics of P700 under far red illumination for a light adapted leaf (1) and a dark adapted leaf preilluminated by 200 ms saturated pulse.

Reference:

- P.Joliot, A. Joliot, Cyclic electron flow in C3 plants, BBA 1757 (2006) 362-368

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[Http://www.bio-logic.info](http://www.bio-logic.info)

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TEL: +33 476 986 831