PHYSIOLOGICAL AND MOLECULAR TESTS OF THE SUGARS EFFECTS IN PHOTOSYNTHESIS OF A NON-VASCULAR PLANT.

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Introduction. For years the principal model to study sugars role in plants has been *Arabidopsis thaliana*. Now days it is known that sugars are signal molecule that modulate different processes like photosynthesis, seedling development and stress responses (1). Moreover, sugars like Glucose (Glc) can regulate expression of photosynthetic genes like ribulose 1,5-bisphosphate carboxylase/oxygenase small subunit (*RCBS*) and chlorophyll a/b-binding protein (*CAB*) (2). The signaling role of sugars in non-vascular plants is essentially unknown. The moss *Physcomitrella patens* has recently been proposed as a new plant model because of its genetic and morphologic characteristics (3).
In this work we evaluated sugar impact in photosynthetic efficiency and gene expression of two photosynthetic genes of the non-vascular plant *P. patens.*

Methods. Moss tissues grown *in vitro* for 30 days in PpNH4 medium supplemented with different concentrations of Glc (100-1000 mM) and sorbitol (Stl) as an iso-osmotic control. Photosynthetic efficiency was monitored every 5 days and determined by the parameter Quantum Yield (QY). Gene expression was analyzed in protonemal tissue of 10 days under inductions with 300 and 500 mM Glc. RT-PCR was performed using specific oligonucleotides. Additionally phenotypic response was monitored

Results. Tissues subject to low Glc concentrations (100 mM) sowed a high photosynthetic efficiency compared to control treatments. Intermediate Glc concentrations (300 and 500 mM) also showed high QY values, but only at 300 mM this effect is differentiable of the osmotic effect (Fig 1). Further at intermediate Glc concentrations, mosses looked phenotypically dark green compared to the osmotic control.

At high Glc concentrations (700 and 1000 mM) photosynthetic efficiency and protonemal pigment and development were severely affected, but only on 700 mM Glc treatment, it is possible to observe a clearly differentiable Glc effect from the osmotic response (Fig 1).

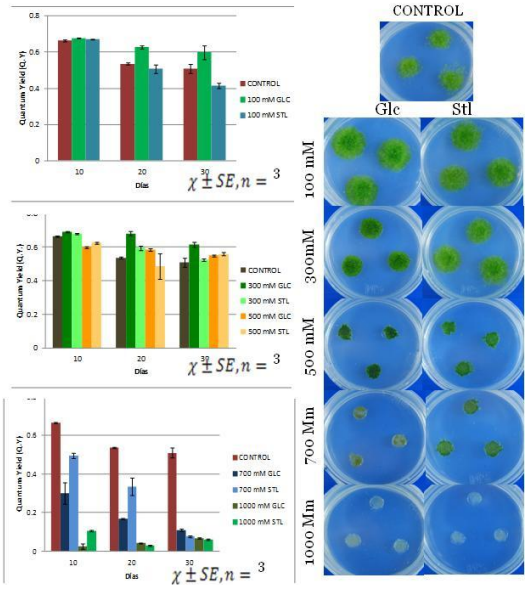

Fig.1 Left: Photosynthetic efficiency of moss *P. patens* subject to different concentrations of Glc (Stl as a iso-osmotic control). Right: Phenotype of moss *P. patens* 30 day under Glc or Stl treatments.

RT-PCR analysis showed that gene expression of two genes related with photosynthesis (*CAB1* and *RBCS*) was repressed in presence of 300 mM Glc concentrations Showing that glucose has a direct impact on the photosynthetic activity and gene expression.

Conclusions. The moss *P.patens* can be perceive and respond to different Glc concentrations and this has an impact on the phenotype, photosynthetic efficiency and gene control of genes related with photosynthesis in this non-vascular plant strongly suggesting that sugar responses are evolutionary conserved in plants.

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