DIFFERENTIAL PHOTOPERCEPTION AND GENE EXPRESSION FOR DIFFERENT PHYTOCHROMES

Masaki FURUYA

Hitachi Advanced Research Lab, Saitama 350-03, Japan

Photochrome (Phy)-dependent reactions have been classified into "induction" reaction and "high irradiance" reaction in terms of fluence and timing of irradiation. My talk centers arround the former. Recent our studies[1,2] using PhyA- and PhyB-null mutants of Arabidopsis thaliana revealed that PhyA perceives UV, visible and far-red light of very low fluence and induces photo-irreversibly seed germination and CAB gene expression, while PhyB photo-reversibly switches "on" or "off" of the response upon alternatively given red and far-red light of 4 order of magnitude higher fluences than PhyA. The availability of these Phy mutants has clarified that the light-responsive element of a CHS gene mediates UV-A / blue induced transcription in the absence of PhyA and PhyB, besides PhyA dependent induction[3].

To explain the different photoperception by PhyA and PhyB, Eberhard Schafer and I have proposed a model on the basis of phptochemical calculation, assuming that PhyA induces the signal as a monomer (or its heterodimer, $PhyA_rPhyA_{fr}$), while PhyB can switch "on" only by the homodimer form ($PhyB_{fr}PhyB_{fr}$) and "off" by $PhyB_rPhyB_r$, and the heterodimer of PhyB would be unable to switch "on" or "off" in terms of PhyB signaling. This kinetics-based model can be consistent with the experimental data, but there might be several other models as we do not have any crucial physicochemical data to proof this hypothesis yet.

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3) Batscauer, A., Roccholl, M., Kaiser, T., Nagatani, A., Furuya, M., Schafer, E. (1996) Plant J. 9 : 63-69;

4) Furuya M., Schafer, E. (1996) Trends in Plant Science., in press.