Senescence-associated proteolysis induced by abiotic and biotic stresses in barley leaves

Velasco-Arroyo B[1], Diaz-Mendoza M[1], González-Melendi P[1], Santamaria ME[1], Arnaiz A[1], Dominguez-Figueroa J[1], Hensel G[2], Kumlehn J[2], Martinez M[1], Diaz I[1]

[1]Centro de Biología y Genómica de Plantas (CBGP-UPM-INIA), Campus de Montegancedo, Autovía M-40 (km 38), 28223 Pozuelo de Alarcón, Madrid, Spain.

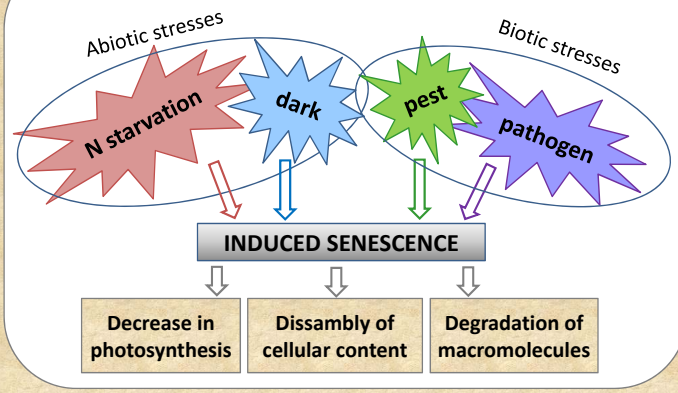
[2]Plant Reproductive Biology, Leibniz Institute of Plant Genetics and Crop Plant Research (IPK) Gatersleben, Corrensstr. 3, 06466 Gatersleben, Germany.

GOALS

Leaf senescence is a recycling process characterized by a massive degradation of macromolecules to relocalize nutrients from leaves to growing or storage tissues.

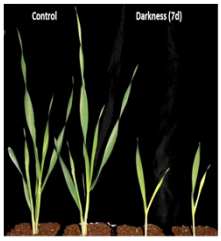
Our aim is to identify and analyze the C1A Cysteine- Protease (CysProt) family members from barley (35 cathepsin L-, 3 B-, 1 H and 3 F-like) involved in leaf senescence, to study their modulation by their specific inhibitors (cystatins) and to determine their roles mediated by abiotic (darkness and N starvation) and biotic (pathogens and pest) stresses.

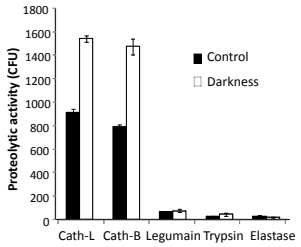
LEAF SENESCENCE

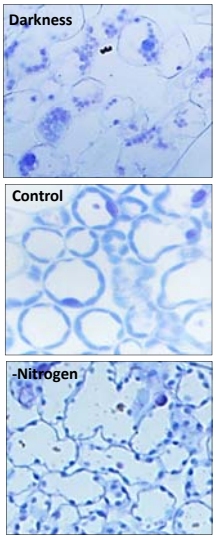


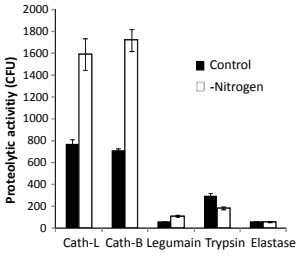
RESULTS

Barley plant responses to abiotic treatments. *Phenotype of barley plants 7 days after darkness or N starvation. Proteolytic activities and dissambly of chloroplast content after different treatments.*

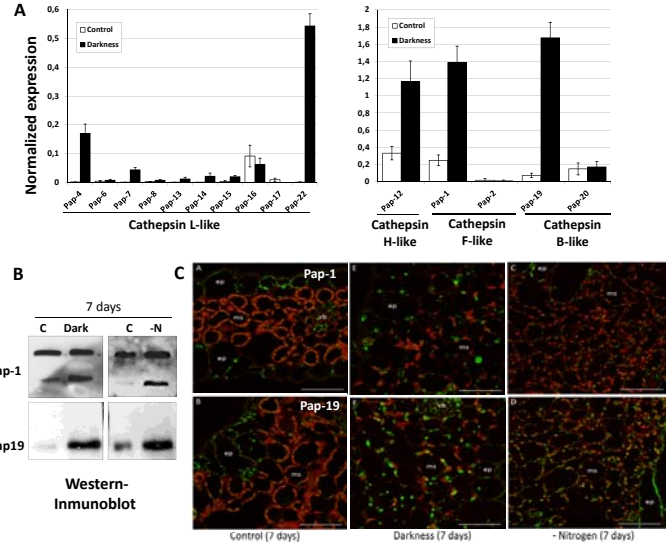




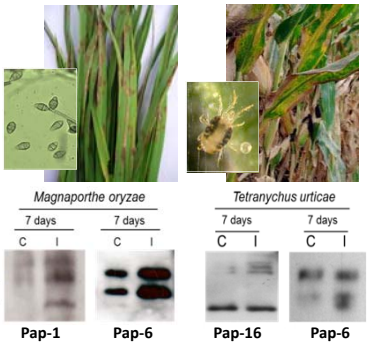


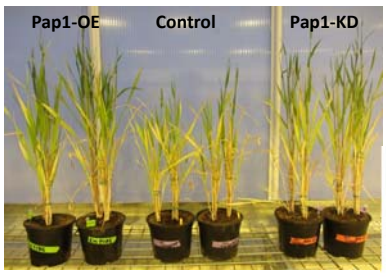


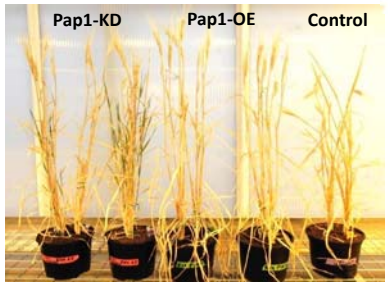
Barley CysProt expression patterns after abiotic stresses. *Levels of mRNAs (A) and proteins (B) and location (C) of barley CysProt 7 days after darkness or N startvation.*



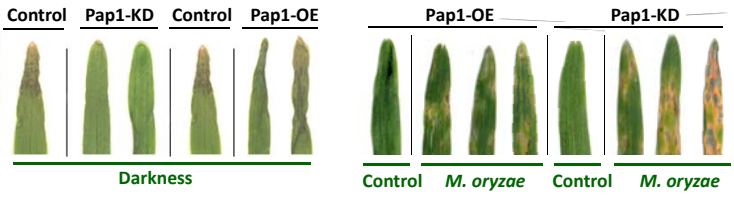
***Western immuno-blot of CysProt* from barley after biotic stresses.** *Barley CysProt protein expression 7 days after* Magnaporthe oryzae *Infection or* Tetranychus urticae *infectation.*







Phenotype and responses of Pap-1 barley transgenic lines. *Barley transgenic lines overexpressing (OE) and silencing (knock-down KD) the Pap-1 gene after 14 days of incubation under darkness and 5 days after* M. oryzae *infection.*



CONCLUSIONS

- ✓ **C1A CysProt barley members are involved in leaf senescence modulated by abiotic and biotic stresses.**
- ✓ **There is a confluence between biotic stress responses and an accelerated senescence in barley and C1ACys proteases are differentially involved in both processes.**