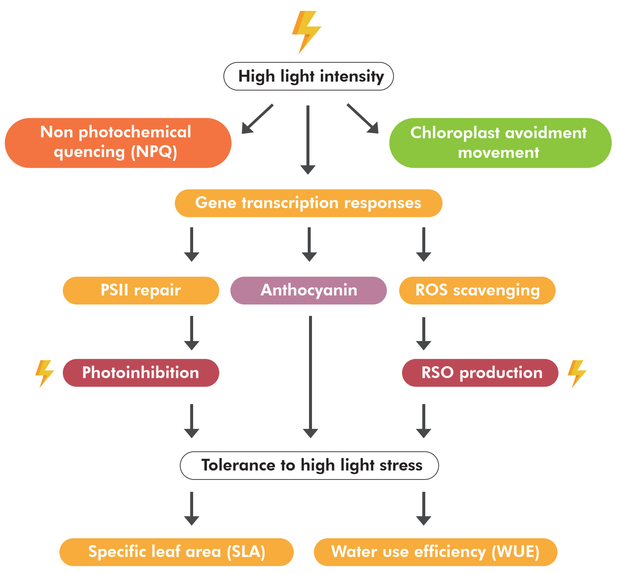
A plant-derived biostimulant based mitigates high light stress effects on *Lactuca sativa* L.

Chiara Agliassa[1], Alessandro Merlone[1], Valeria Contartese[1], Cinzia Margherita Bertea[2] & Francesca Secchi[3]

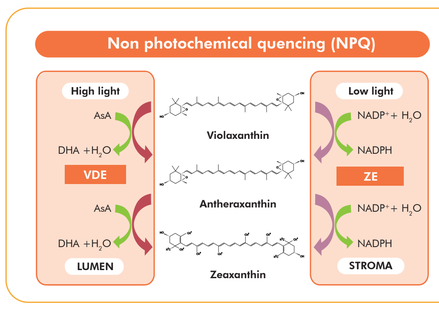
[1]Green Has Italia S.p.A., c.so Alba 85/89, 12043 Canale (CN), Italy
[2]Department of Life Sciences and Systems Biology - University of Torino, Via Quarello 15/A, 10100 Torino, Italy
[3]Department of Agriculture, Forest and Food Science - University of Torino, Largo P. Braccini 2, 10095 Grugliasco (TO), Italy
Email: c.agliassa@greenhasgroup.com

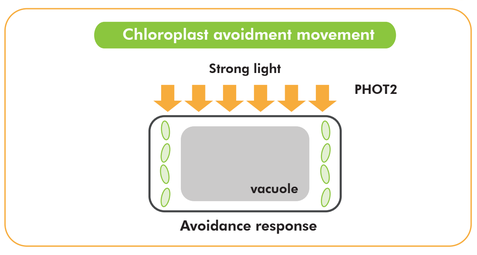
BACKGROUND

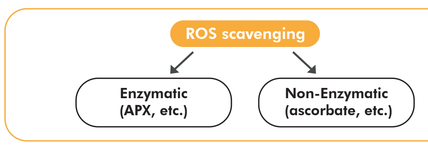
Amongst abiotic stressors, excess light intensity is one of the less studied, especially for biostimulant contribution in mitigating its adverse effects on crops. Light excess leads to oxidative stress and imbalance in photosynthesis redox reactions, thus compromising plant growth [(1)]. High light stress severity relies upon duration and intensity of light exposure.



Modified from Roeber et al., 2020 and Szymańska et al., 2017







EXPERIMENTAL DESIGN

PLANT

Lactuca sativa, Canasta variety

BIOSTIMOLANT

ERANTHIS, biostimulant based on Seaweed, Yeast Extracts and peptidic vegetal source.

LIGHT CONDITIONS

12 h day/12 h night

150 μmol m^2 sec^{-1}

450 μmol m^2 sec^{-1}

DOSAGE

water spray

2 ml/l **ERANTHIS**

PHYSIOLOGHY

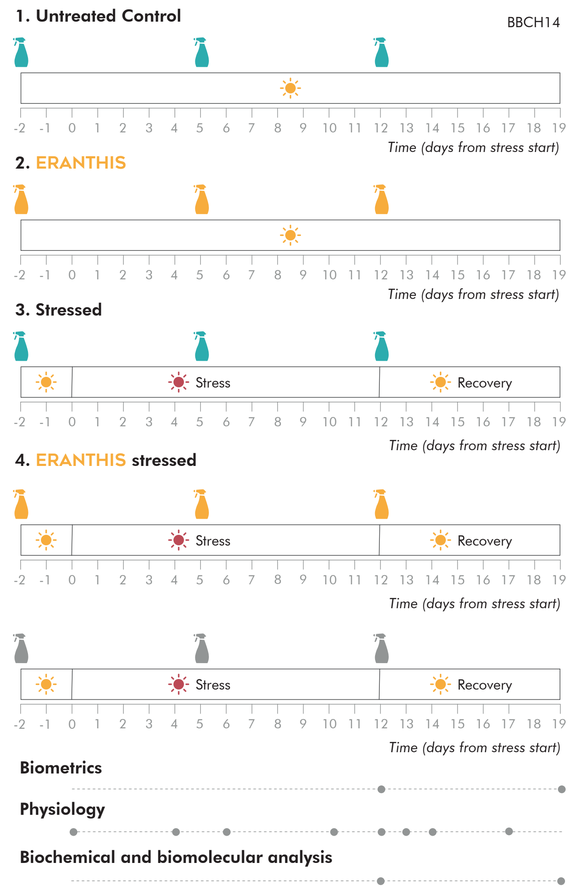
Leaf gas exchanges and fluorimetry

BIOMOLECULAR ANALYSIS

qPCR on light stress induced genes

BIOCHEMICAL ANALYSIS

Spectrophotometric assays on light stress target molecules



AIM OF THE WORK

In order to understand **ERANTHIS** potential role in mitigating light stress, a multidisciplinary approach was adopted to monitor whether **ERANTHIS** treatment modified lettuce stress and recovery responses to chronical moderate high light stress.

BIOMETRIC, BIOCHEMICAL AND BIOMOLECULAR PARAMETERS CONFIRMED HIGH LIGHT STRESSOCCURRENCE, DESPITE ITS MODERATE INTENSITY

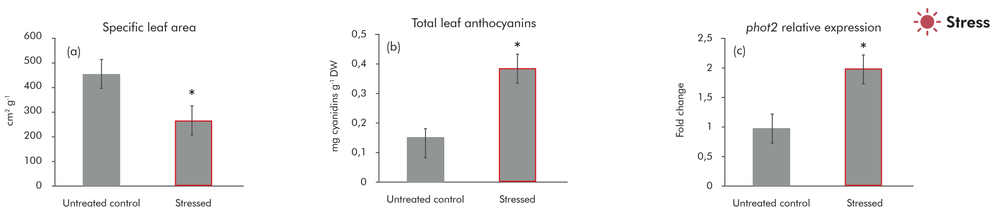


Figure 1: Specific leaf area (a), leaf antochyanin level (b) and *phot2* relative expression (c) at the end of the stress phasE. Data are expressed as means ± SD. Asterisks denote statistically ($P < 0.05$) differences according to t-test.

ERANTHIS REDUCES LEAF OXIDATIVE STRESS UNDER HIGH LIGHT STRESS AND ITS RELIEF

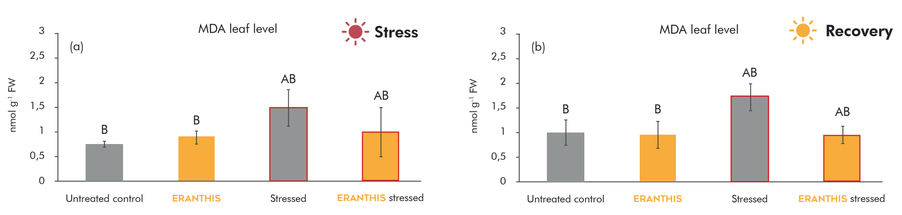


Figure 4: MDA leaf level at the end of high light stress (a) and its relief (b). Data are expressed as means ± SD. Different letters refers to two way ANOVA followed by Tukey's test($P < 0.05$).

ERANTHIS APPLICATION REDUCES NON PHOTOCHEMICAL-QUENCING AFTER 12 DAYS OF HIGH LIGHT STRESS

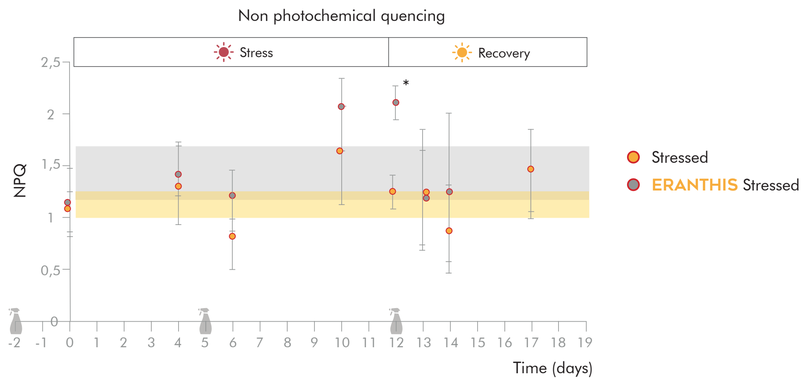


Figure 2: Non potochemical quencing (NPQ) during high light stress and its relief. Data are expressed as means ± SD. Rectangular squares refers to Untreated control (grey) and ERANTHIS (yellow) values.*= significant statistical difference between the stress treatment and its relative control at the same time point ($P < 0.05$, t test).

BIOSTIMULANT APPLICATION REDUCES STOMATAL CLOSURE AFTER 12 DAYS OF HIGH LIGHT STRESS

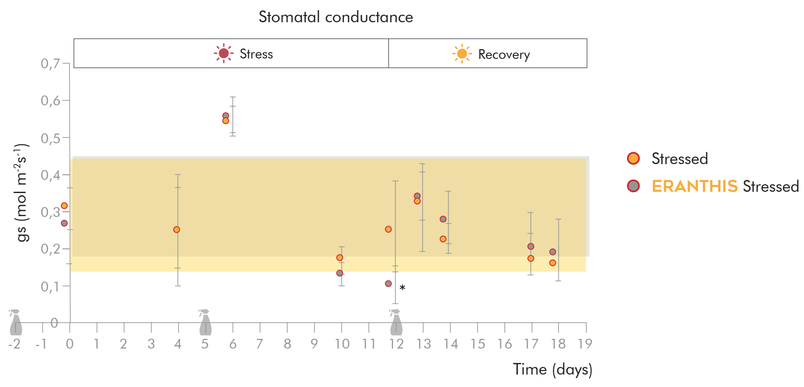


Figure 3: Stomatal conductance during high light stress and its relief. Data are expressed as means ± SD . Rectangular squares refers to Untreated control (grey) and ERANTHIS (yellow) values.*= significant statistical difference between the stress treatment and its relative control at the same time point ($P < 0.05$, t test).

BIOSTIMULANT APPLICATION DIFFERENTLY MODULATE ASCORBATE ACCUMULATION AND *apx* TRASCRIPTION UNDER HIGH LIGHT STRESS

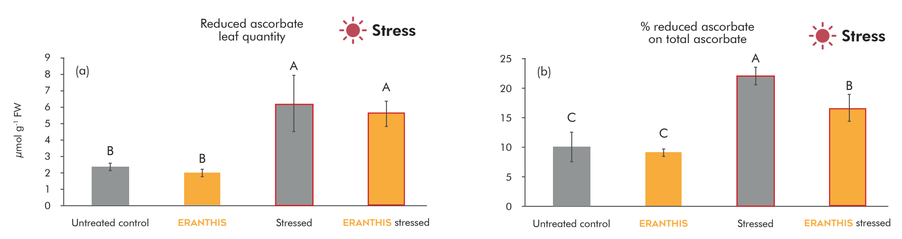


Figure 5: Reduced ascorbate quantitity and percentage in leaf at the end of the stress phase. Data are expressed as means ± SD. Different letters refers to two way ANOVA followed by Tukey's test ($P < 0.05$).

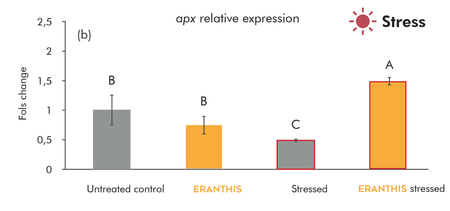


Figure 6: *Apx* expression at the end of the stress phase. Asterisks denote statistically ($P < 0.05$) differences according to two-way ANOVA followed by Tukey's test ($P < 0.05$).

ERANTHIS MANTAINS HIGHER ANTHOCYANIN LEAF CONTENT AT STRESS RELIEF

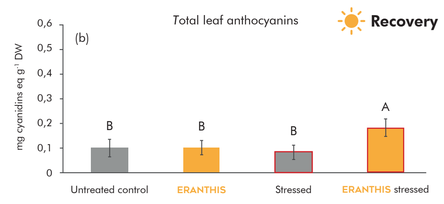


Figure 7: Leaf antochyanin level at high light stress relief. Data are expressed as means ± SD. Different letters denote statistically ($P < 0.05$) differences according to two way ANOVA, followed by Tukey's test.

CONCLUSION

ERANTHIS seems to mitigate high light effects on lettuce :

- It reduces high light stress damages by preventing oxidative damage by non-enzymatic scavenging
- It enhances high light stress prevention by inducing an higher anthocyanin accumulation