



Does oxidative stress metabolism play a role in *Zantedeschia aethiopica* spathe senescence?

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October 2004

Plant senescence

Particular type of programmed cell death (PCD)

Occurs at various levels of biological organization

- individual cell
- tissue
- organ
- entire plant

Nutrient mobilization and recycling process from senescing cells to other parts of the plant

Evolutionary acquired and highly regulated strategy

Plant senescence

Dramatic ultrastructural changes

- chloroplast disorganization
- leaf-like peroxisomes are converted into glyoxysomes
- alterations of vacuole ultrastructure

Dramatic metabolic changes

- decline of photosynthetic and photorespiratory activities
- increase of catabolic pathways
 - induction of glyoxylate cycle
- induction of other metabolic pathways
 - salvage and redistribution of metabolites
 - secondary metabolic pathways

Senescence may not proceed through a single common pathway...

Multiple signaling pathways leads to senescence induction

- Developmental signals
- Hormonal changes
- Cell energy status
- Free radical levels

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Senescence and oxidative stress

Decrease in the protective mechanisms against activated oxygen forms

Induction of cellular ROS generating mechanisms

ROS

Senescence and oxidative stress

Decrease in the protective mechanisms against activated oxygen forms

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ROS

Senescence triggering factor

Consequence of the senescence process itself

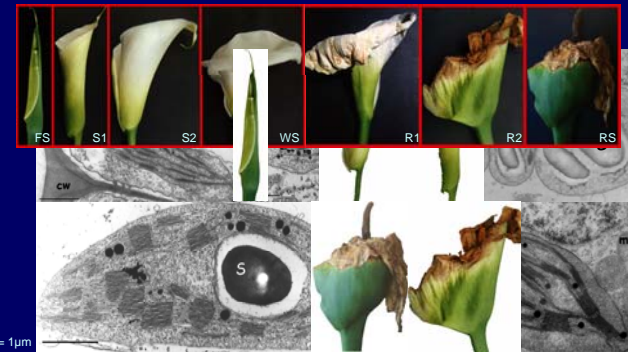
Zantedeschia aethiopica (L.) Spreng.



Development of *Zantedeschia aethiopica* spathe

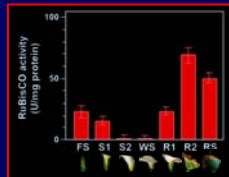
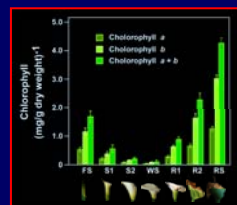
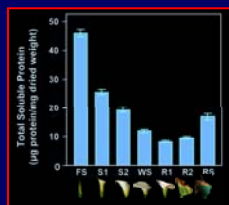


Morphological changes of *Z. aethiopica* spathe abaxial surface

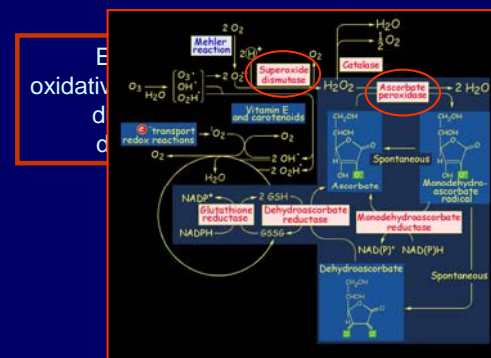


Spathe senescence occurs during spathe whitening...

Inhibition of spathe senescence occurs during spathe regreening.



Is oxidative stress causally related to spathe senescence?



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Evaluation of oxidative stress enzymes during spathe development

The results obtained from cytosolic CuZnSOD and cytosolic APX suggests....

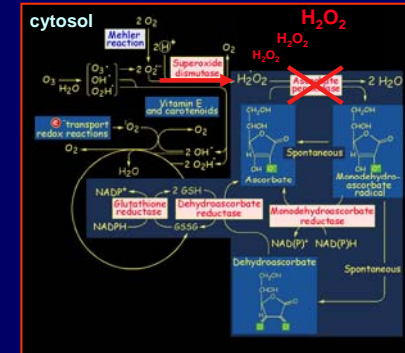
an initial H_2O_2 burst in leading to senescence



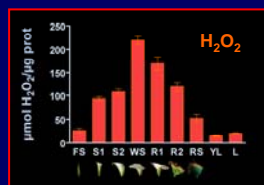
Is oxidative stress causally related to spathe senescence?

Evaluation of oxidative stress enzymes during spathe development

The accumulation of H_2O_2 could serve as a signal for the progression of senescence in *Z. aethiopica* spathe



H_2O_2 content and Lipid Peroxidation

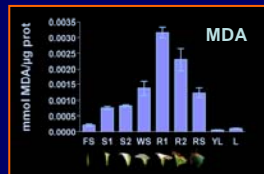


Significant increase in the levels of H_2O_2 during the initial stages of the whitening process....

Differential expression of *Apx* and *cytoCuZn-Sod* genes in those stages

...the increase in H_2O_2 level continues until the white spathe

The main source is probably the senescence process itself



Lipid peroxidation that measures the level of oxidative damage follows the same pattern as H_2O_2 levels suggesting a cause/effect relationship

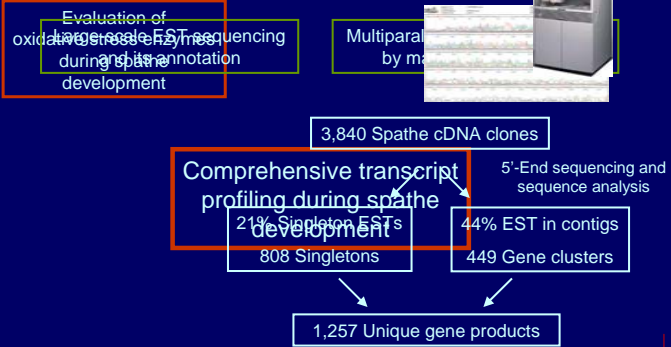
Is oxidative stress causally related to spathe senescence?

H_2O_2 seems to have a dual function in *Z. aethiopica* spathe senescence ...

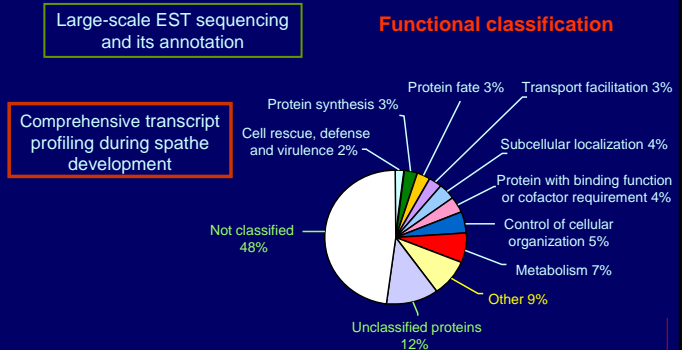
as a **signalling molecule** involved in the activation of cellular mechanisms that ultimately leads to the senescence process during spathe whitening.

as a **deleterious agent** to cellular functions.

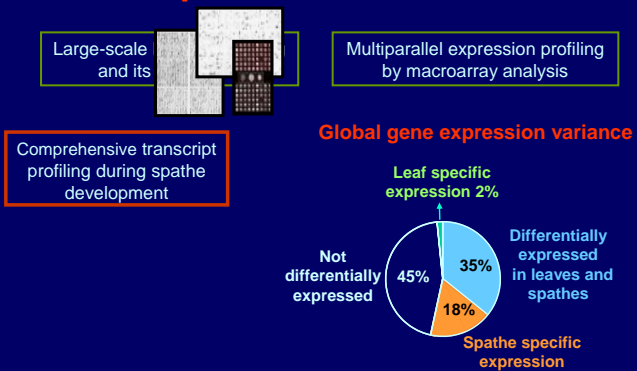
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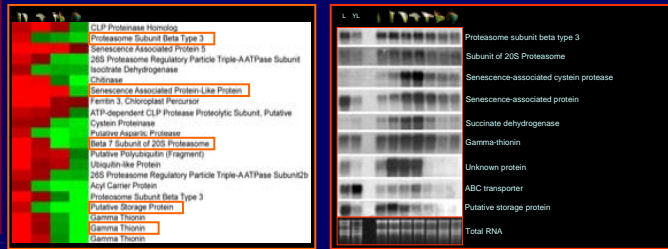
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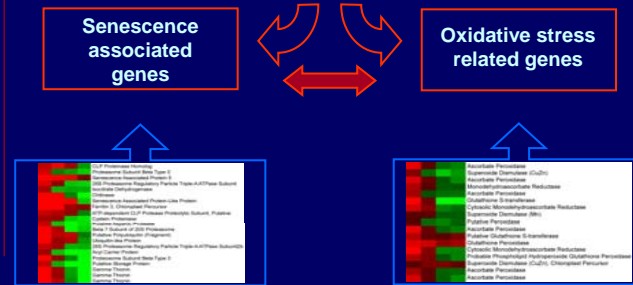
Combining the analyzed EST dataset and the macroarray data



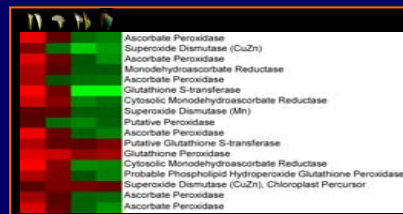
Combining the analyzed EST dataset and the macroarray data



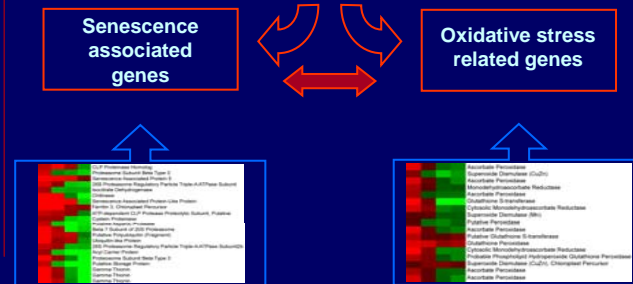
Combining the analyzed EST dataset and the macroarray data



Combining the analyzed EST dataset and the macroarray data



Combining the analyzed EST dataset and the macroarray data



Is oxidative stress causally related to spathe senescence?

ROS seems to play a dual role in *Z. aethiopica* spathe senescence in **signalling** and in **degradative processes**.

Expression profile of oxidative stress related genes is similar to that of senescence associated genes

Acknowledgments

Prof. Dr. Bernd Weisshaar and Dr. Martin Werber
Max-Planck-Institut für Züchtungsforschung, Köln, Germany

Dr. Rui Fernandes
IBMC, Porto, Portugal

Cátia Barbeta is supported by Fundação para a Ciência e Tecnologia, grant ref. SFRH/BD/12081/2003