



Genetic and molecular control of Apple tree tolerance to soil water stress

AFEF-AGAP CIRAD-SupAgro Montpellier

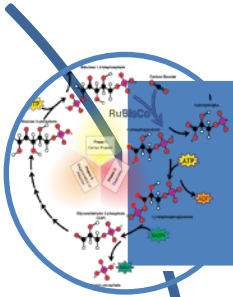
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Agreenskill incoming fellowship
(September 1st, 2014 - August 31th, 2015)





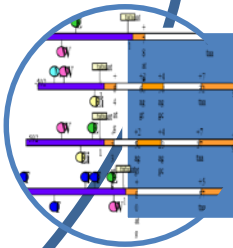
Objectives



Understand the mechanisms of response to water deprivation in apple tree (2 genotypes: GS and ST)



Detect the difference of behaviour for the two genotypes GS and ST and different organs from each genotype (apex, leaf, root)



Identify candidate genes for tolerance to water stress in apple tree

From transcriptome to candidate genes: How to proceed



1/Analyze the differentially expressed genes

2/Identify biological and molecular functions triggered under water stress

3/Identify key genes related to important biological function

4/Identify candidate genes

Experiment-sampling



Sampling

**Well watered conditions (T0,
T1, T2)**

**Moderate Water deficit
T1 = 50% FTSW**

**Severe Water deficit
T2 = 20% of FTSW**

apex →

leaf →

root →



Analyze of the differentially expressed transcripts

- AryANE micro-array apple chip (126,022 genes)
sense probes ⇒ 63,011 genes

UMR IRHS- INRA ANGERS (Celton et al., 2014)

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graph TD; A[Data filtering] --> B["12,901 genes differentially expressed transcripts (DET) (20.47% sense probes)"]; B --> C["1/ AryANE micro-array validation"]; B --> D["2/ Biological and molecular functions triggered under water stress conditions"];
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Data filtering

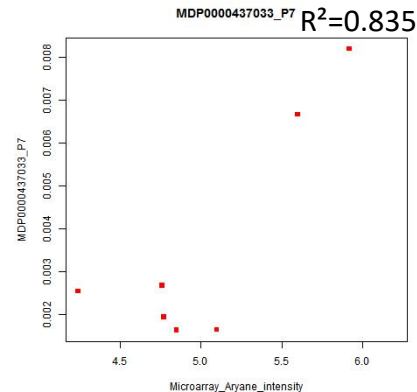
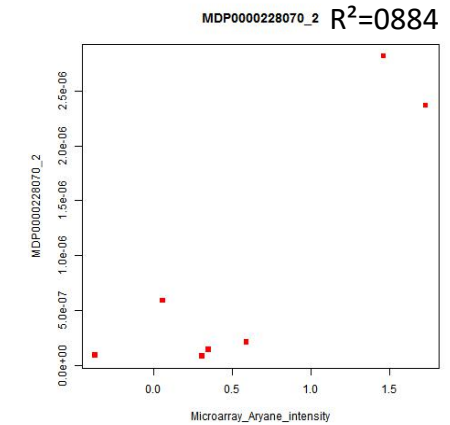
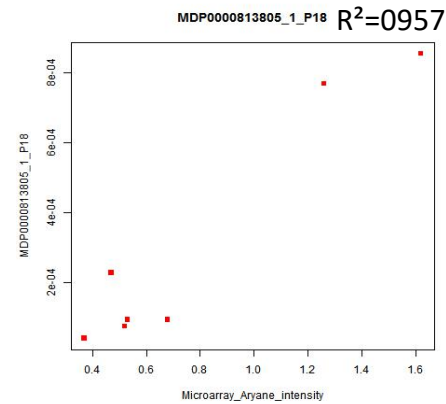
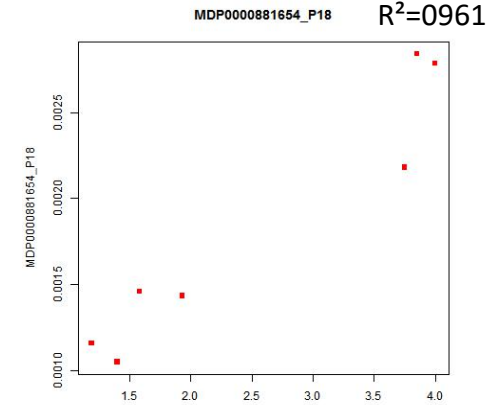
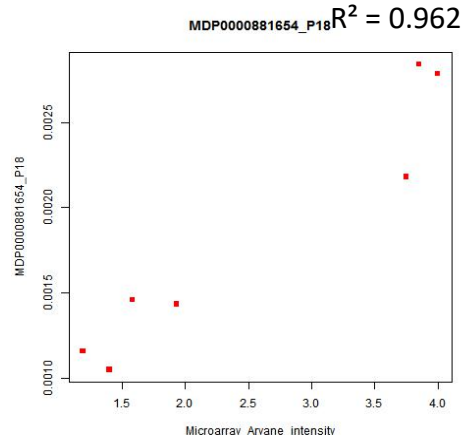
12,901 genes differentially expressed transcripts (DET) (20.47% sense probes)

1/ AryANE micro-array validation

2/ Biological and molecular functions triggered under water stress conditions

1/ AryANE micro-array validation

- 20 candidate gènes selected
- Specific primers designed
- Quantitative RT-PCR performed
- Specific RT-PCR product analysed (LightCycler 480)



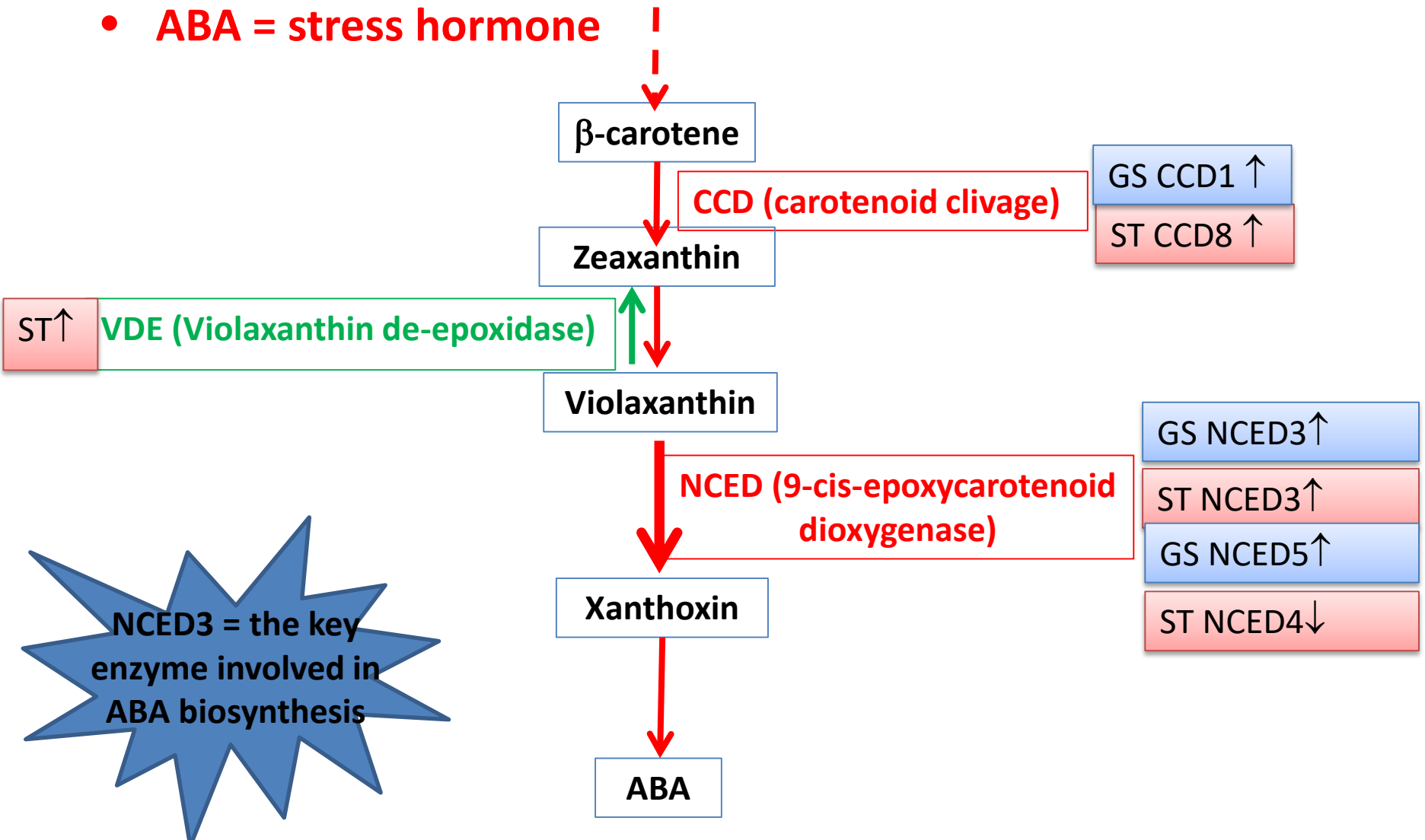
2/Biological and molecular functions

Genes ontologies involved in water stress for GS and ST genotypes in roots (AgriGO & Mapman softwares)

- 1. Hormones**
- 2. Sucrose-starch synthesis and degradation**
- 3. Glycolysis**
- 4. Cell wall**
- 5. Ions and water transport**
- 6. Signaling**
- 7. Regulation of transcript**
- 8. Abiotic stress**

ABA biosynthesis

- DET related to Mechanism of ABA biosynthesis under moderate water deficit in roots
- **ABA = stress hormone**



Thanks to



**Architecture et fonctionnement des
espèces fruitières (AFEF)
UMR amélioration génétique et
adaptation des plantes
méditerranéennes et tropicales (AGAP)**