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Comportamento ecofisiologico di piante affette da Flavescenza Dorata (FD)

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(Article begins on next page)

Claudio Lovisolo – (UNITO – DISAFA)
Comportamento ecofisiologico di piante
di vite affette da FD

**Flavescence dorée phytoplasma
deregulates stomatal control of
photosynthesis in *Vitis vinifera***

Annals of Applied Biology 162: 335–346 (2013)

Marco Vitali, Walter Chitarra, Luciana Galetto, Domenico Bosco,
Christina Marzachì, Maria Lodovica Gullino, Federico Spanna and
Claudio Lovisolo

Finanziamento Masgrape, Regione Piemonte

Introduction

Aim: To highlight which mechanism controls leaf to atmosphere gas exchange during FD infection and recovery

Introduction:

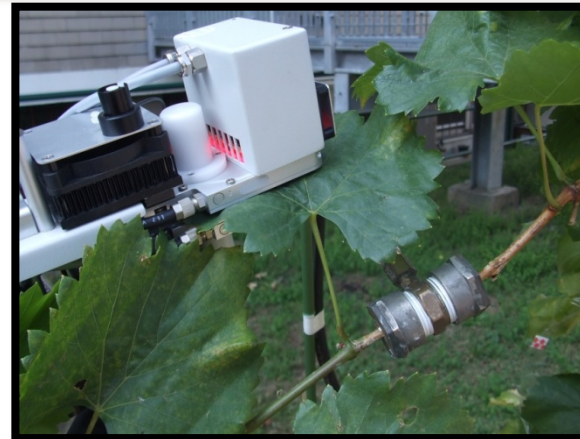
- Flavescence dorée (FD) is caused by the 16SrV-C, -D, '*Candidatus Phytoplasma vitis*' (non-culturable plant-pathogenic prokaryotes)
- Phytoplasmas are transmitted by a vector (*Scaphoideus titanus* B.)
- Symptoms: yellowing or reddening of the leaves (no photosynthesis), stunting, downward leaf rolling, shortening of internodes, bunch shriveling, and general decline that may result in plant death. Do symptoms take place after the block of phloem transport?

Note that:

- FD-infected vines may show a spontaneous remission of symptoms (Recovery, REC)
- Different susceptibility among cultivars

Materials and Methods

- Measurements performed on 2 vineyards: Barbera and Nebbiolo
- Plant physiology monitored by a portable gas exchange and fluorescence system.
- Four groups of plants were monitored (diagnosis were performed by Entomologists at University and CNR):
 - Healthy (PCR negative)
 - FD–infected (FD) (PCR positive)
 - Recovery (REC1) plants infected in the previous year (PCR negative)
 - Recovery 2 (REC2) plants infected two years before (PCR negative)



Population of plants used for eco-physiological measurement

| | | 2008 | 2009 | 2010 |
|------------|---------|------|------|-------|
| 'Barbera' | healthy | 12 | 12 | 12+3* |
| | FD | 12 | 7 | 5+3* |
| | REC1 | | 5 | 2 |
| | REC2 | | | 5 |
| | Tot | 24 | 24 | 30 |
| 'Nebbiolo' | healthy | 10 | 10 | 10 |
| | FD | 10 | 9 | 7 |
| | REC1 | | 1 | 2 |
| | REC2 | | | 1 |
| | Tot | 20 | 20 | 20 |

*=three plants were added in 2010

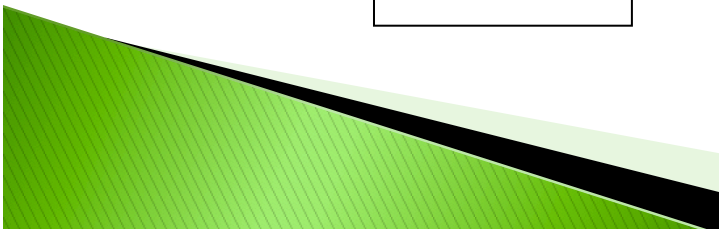
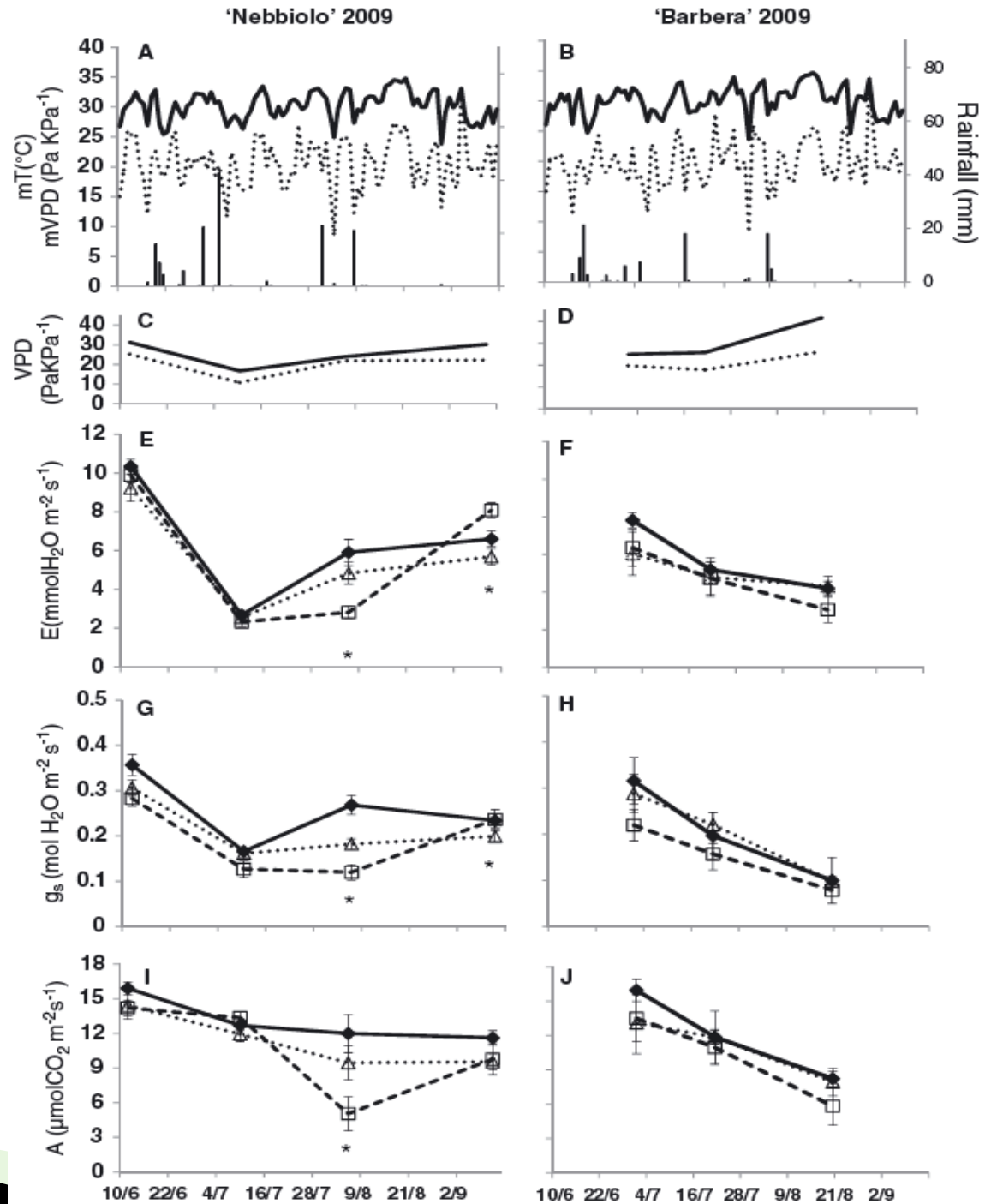
Recovery percentage in the four experimental years in the two vineyards

| 'Barbera' | 2008 | 2009 | 2010 | 2011 | |
|-----------|----------------|-----------------|----------------|-----------------|-----|
| FD | 100% (n=13) | 100% (n=11) | 100% (n=70) | | |
| REC1 | | 61.5 % (n=8) | 54.5% (n=6) | 51.4% (n=36) | 53% |
| REC2 | | | 75 % (n=6) | 83.3% (n=5) | 46% |

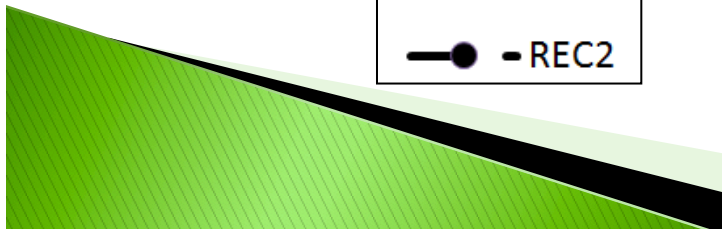
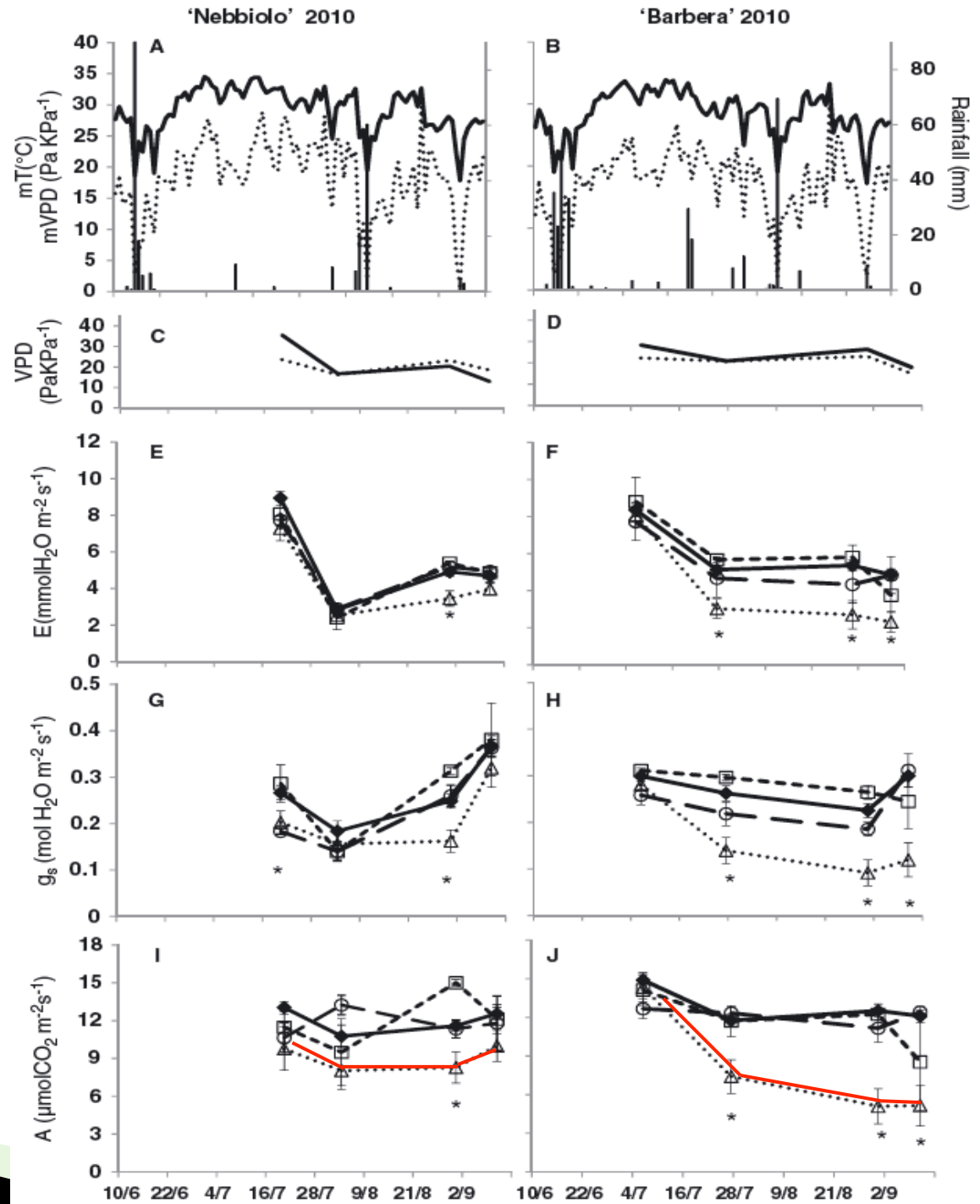
| 'Nebbiolo' | 2008 | 2009 | 2010 | 2011 | |
|------------|----------------|----------------|----------------|----------------|-----|
| FD | 100% (n=13) | 100% (n=11) | 100% (n=13) | | |
| REC1 | | 23.1% (n=3) | 9% (n=1) | 30.7% (n=4) | 22% |
| REC2 | | | 33.3% (n=1) | 100% (n=1) | 8% |

In brackets the number of plants

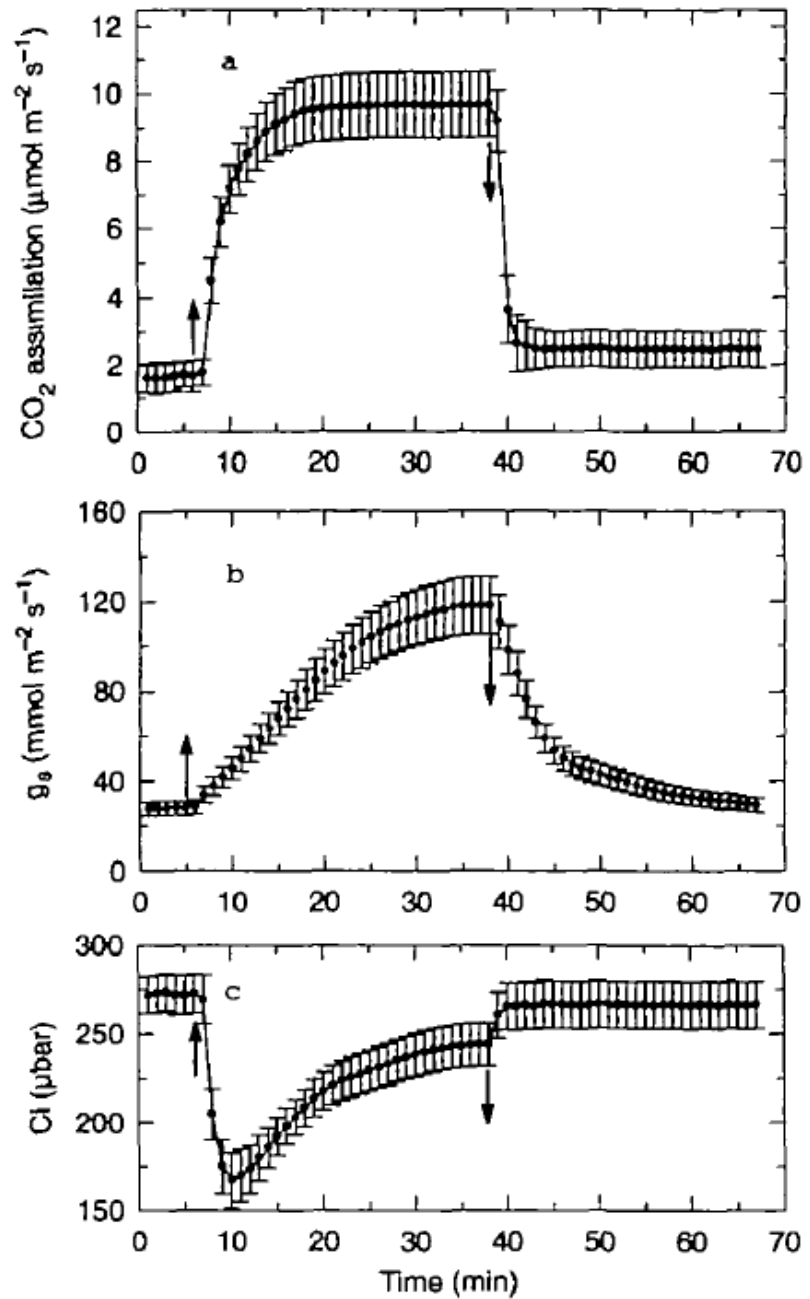
Results



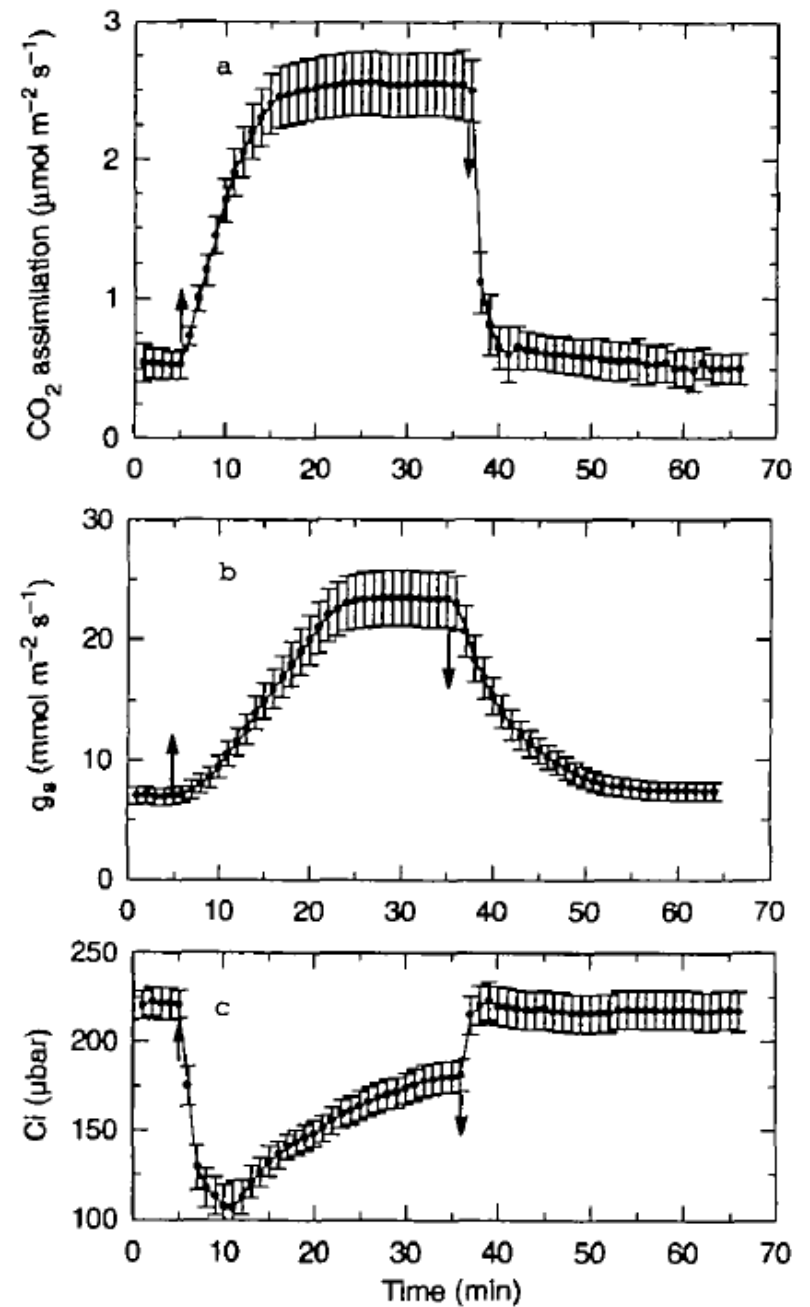
Results



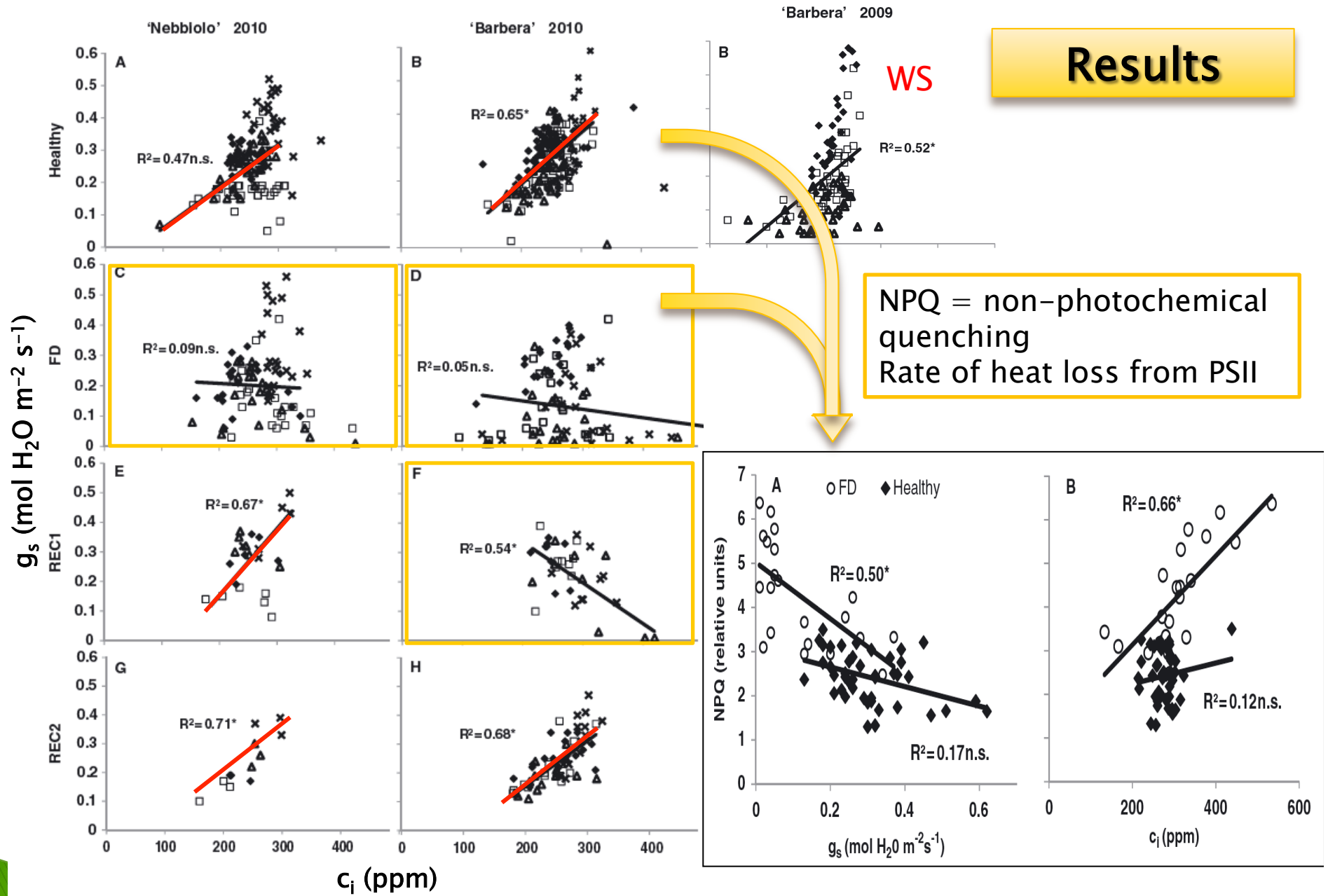
Well watered



Water stress



Results



- ◆ 20/07/2010
- 03/08/2010
- ▲ 31/08/2010
- × 10/09/2010
- ◆ 06/07/2010
- 27/07/2010
- ▲ 31/08/2010
- × 11/09/2010

Conclusions

- ✓ Disease slows down Calvin cycle with a consequent rise in c_i → metabolic leaf gas exchange limitation and photo-damages;
- ✓ Barbera shows higher susceptibility to FD than Nebbiolo plants, associated with a detrimental effect on physiological performances recorded;
- ✓ Different attitudes to recovery from FD between the cultivars
- ✓ The REC2 *status* corresponded to a stable remission of symptoms