Duravitis opens breeding strategies for grapevine facing T° rises

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Bodies

Research units

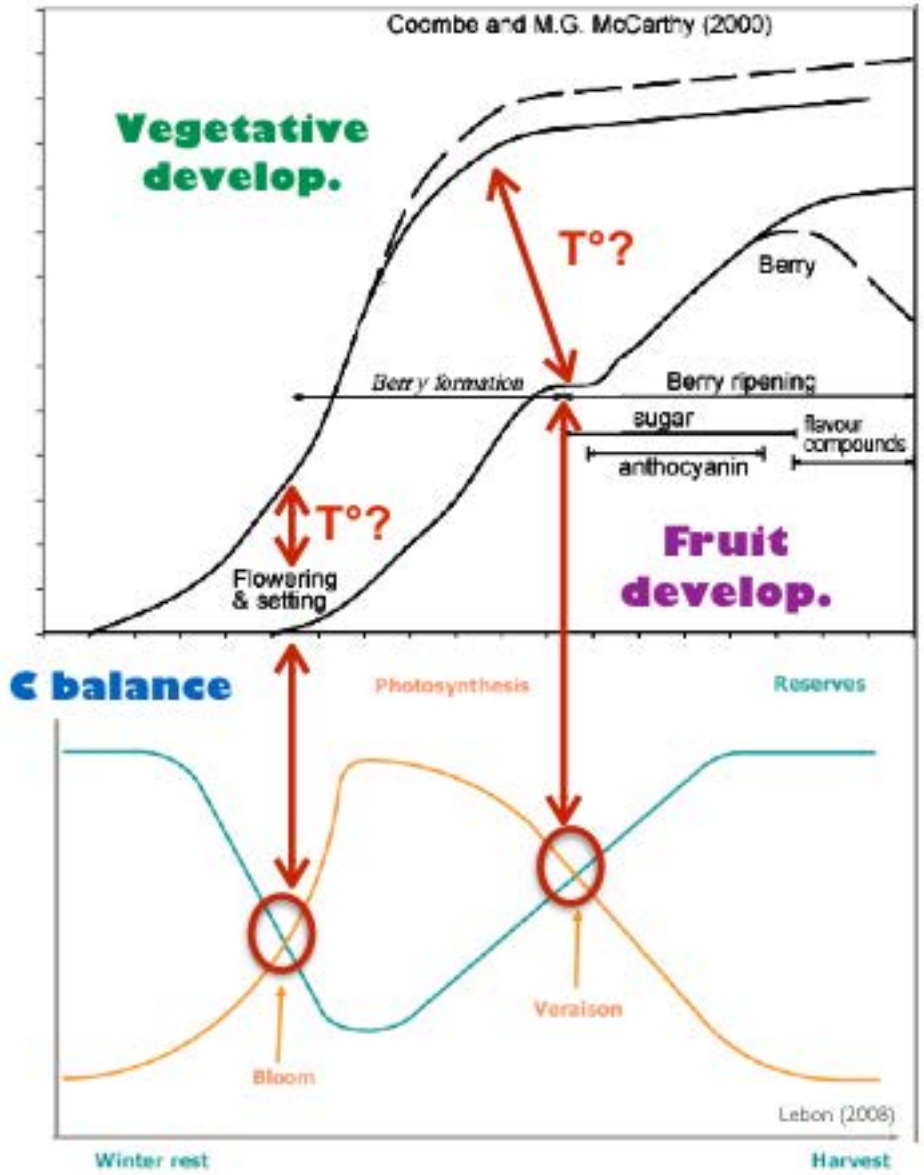
Supports

Studies on vine response to T°

With the macrovine it is difficult to

> Control uniform T° treatments
> Avoid external interactions
> Compare regional experiments

Complexity of the grapevine system



Grapevine a complex system

Interactions / physical fact. / cycles
Veget x Reprod. functions
Critical stages for C balance

To perform more efficient approaches

New biological **models**
New experimental **designs**
New working **hypotheses**

New biological models & designs

Fruiting cutting

Forcing inflorescences of Cab Sauv.

Mullins (1966)
Mullins & Rajasekaran (1981)

Microvine

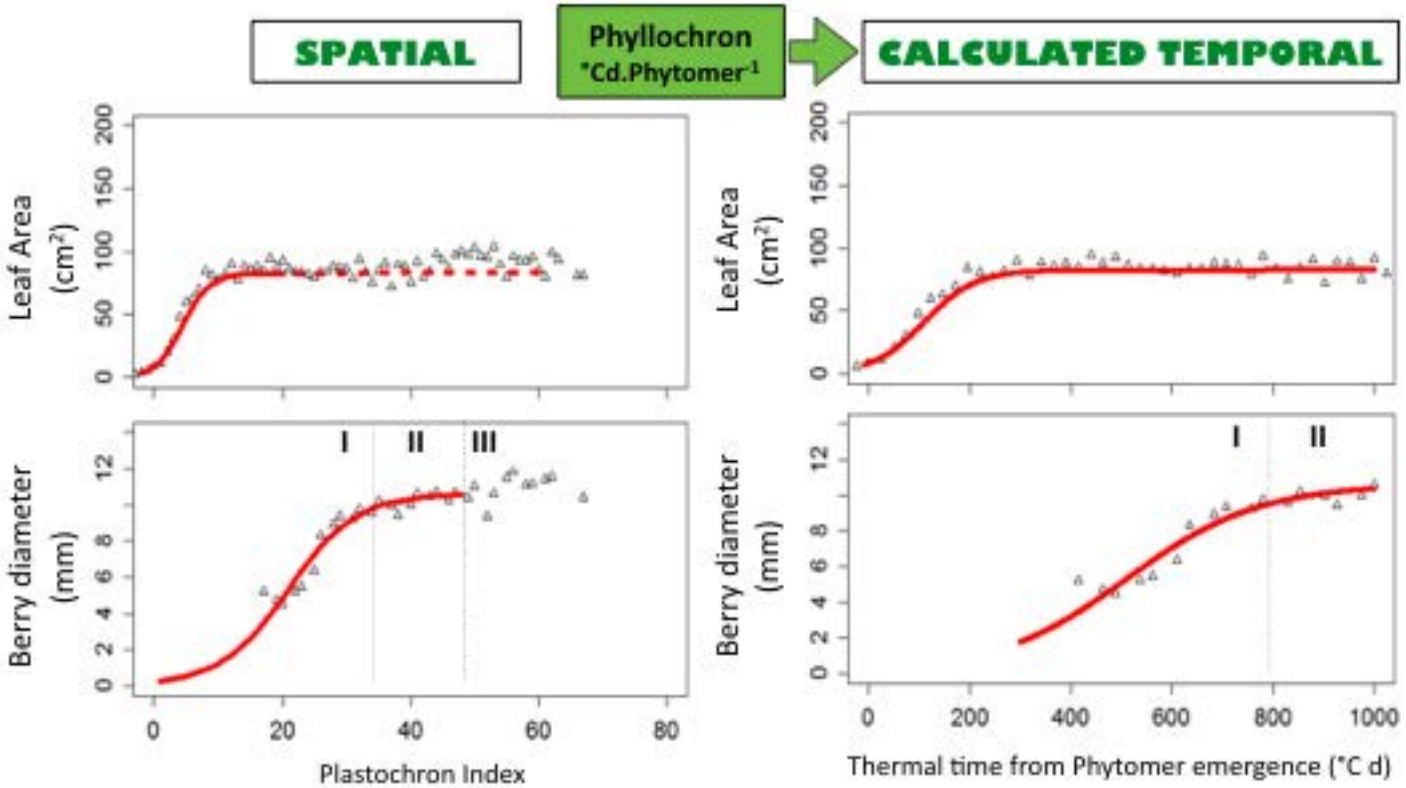
Dwarf, Rapid & Continuous Flowering Variant of Pinot N

Boss & Thomas (2002)
Chaïb et al. (2010)

Tight environ. control
Experimental throughput
Analyses accuracy

New biological models & designs

Spatio-temporal conversion for morphogenesis



Organ temporal development derived from spatial observations

(phenological models)

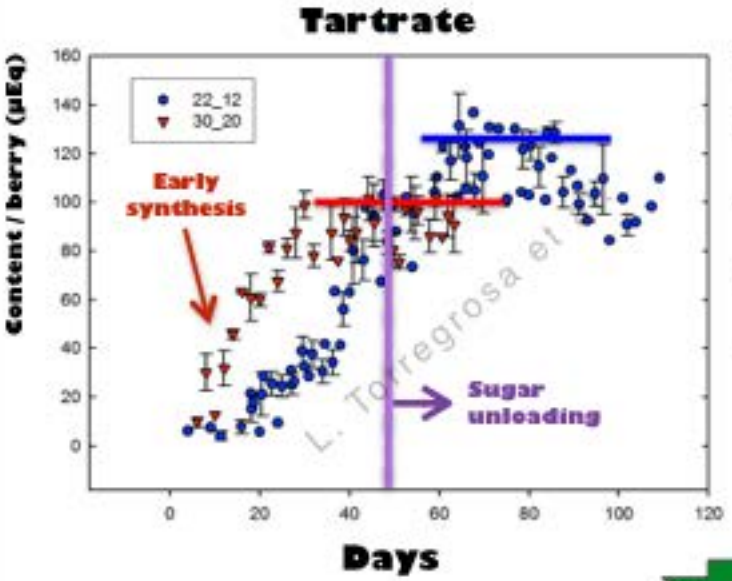
Grapevine response to T°

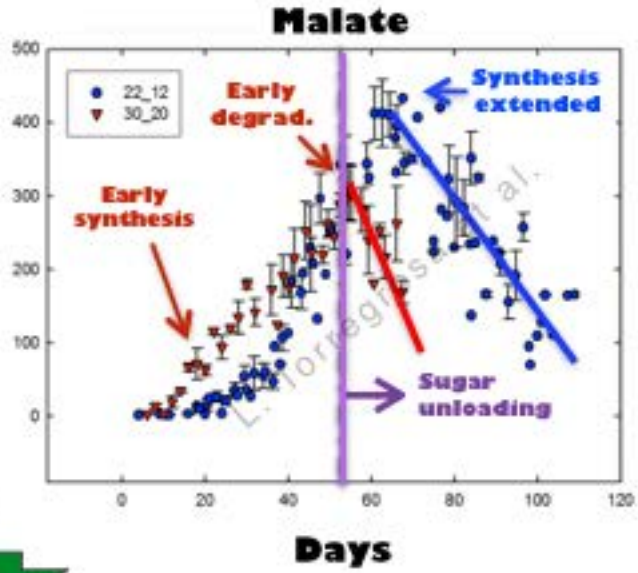
Plant level

T° impact of berry development *(plant level)*

Acid accumulation

22°C Day 12°C Night
30°C Day 20°C Night



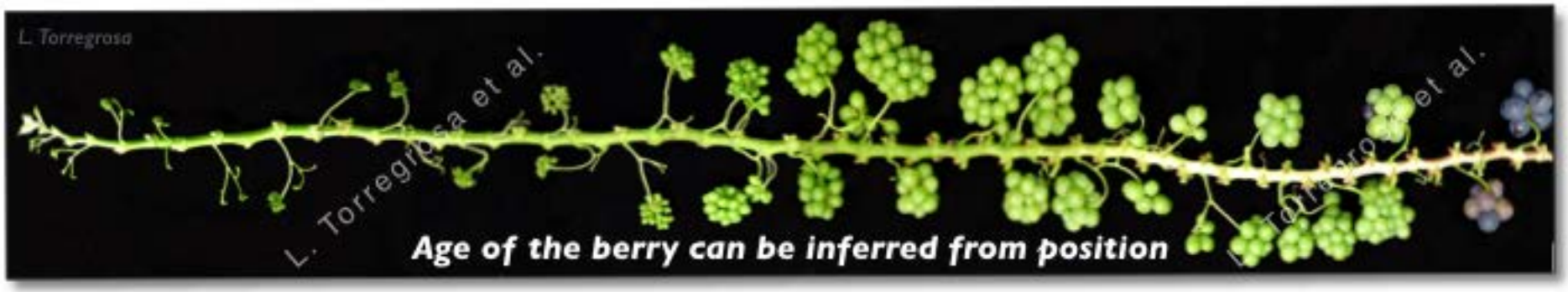


Early develop. is advanced in days
Less MA & TA at véraison and ripening

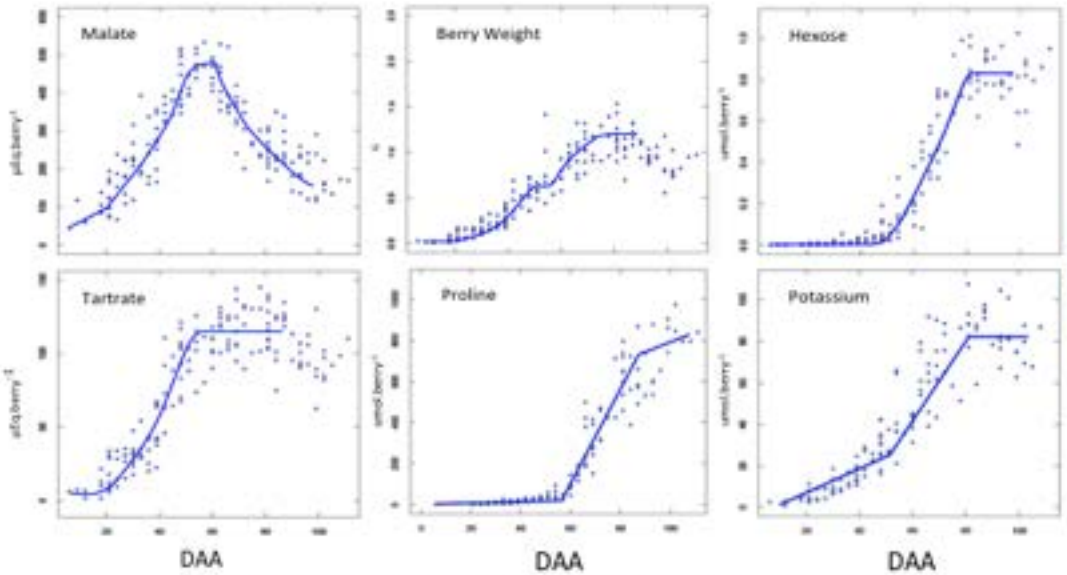
Co-synthesis of Ma/Sugar possible at cool ?

New biological models & designs

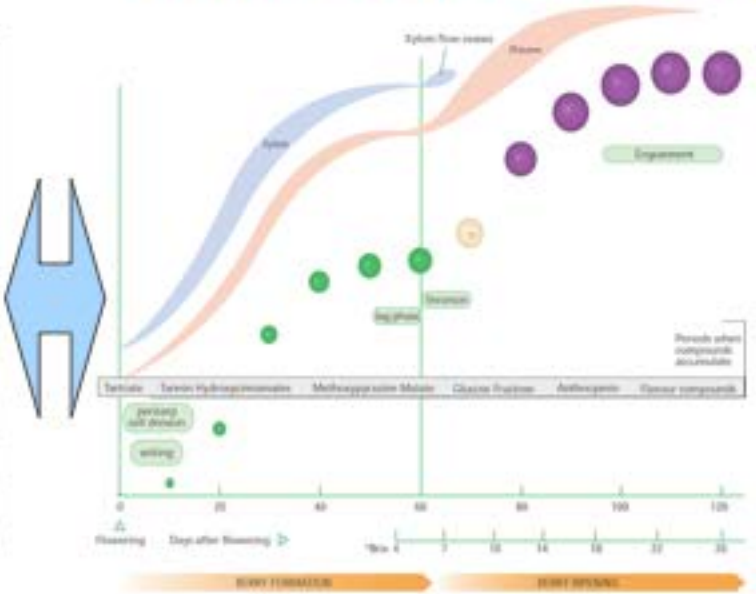
Spatio-temporal conversion for berry development



Microvine *(Spatial)*



Macrovine *(Temporal)*



DAA is inferred from position

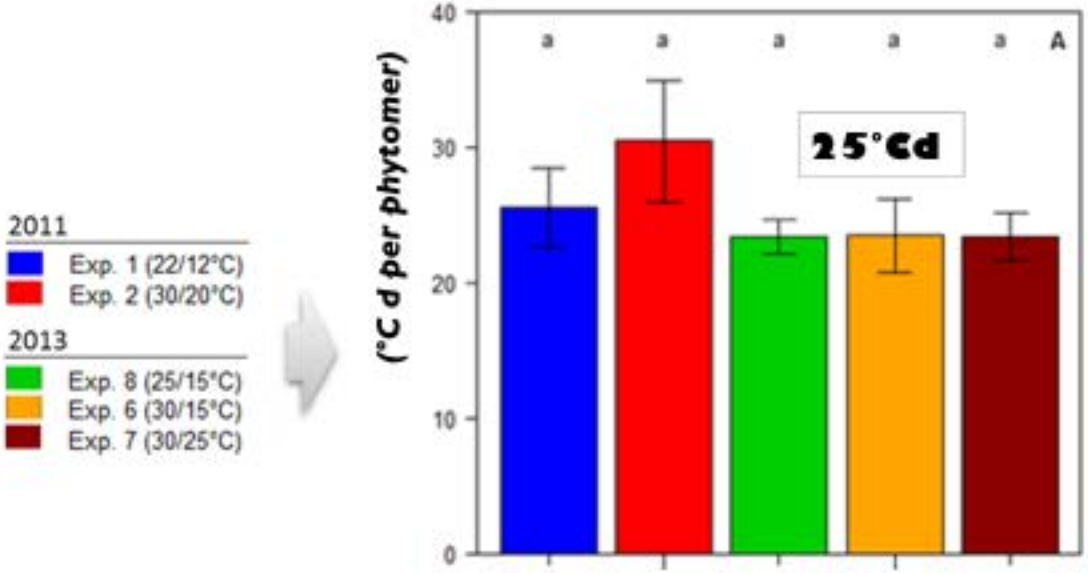
Coombe, 2001

Grapevine response to T°

Plant level

T° impact of organ initiation

Phyllochron



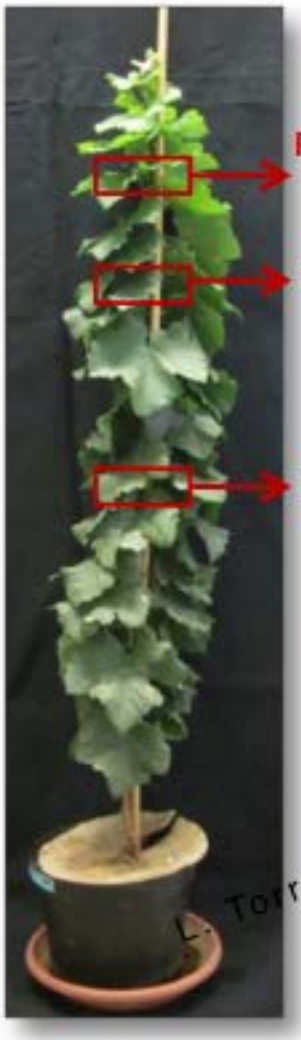
Linear response of vegetative organogenesis to T°

(in the range of T° experimented)

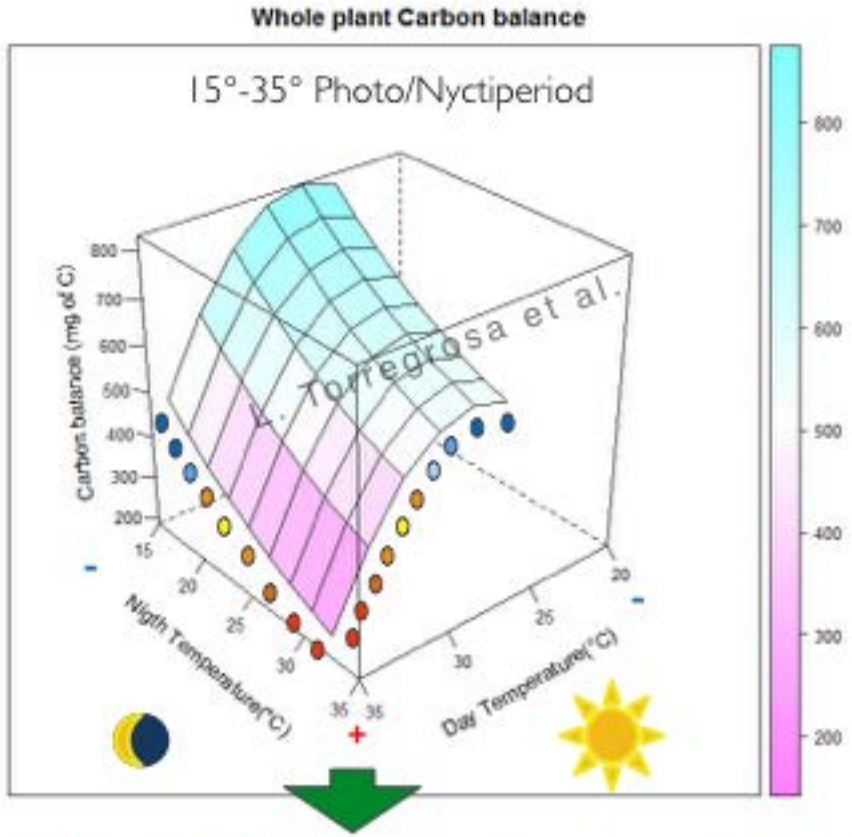
Grapevine response to T°

Plant level

T° impact of energy supply (C balance)



VPD (2 kPa) PAR (500/0 µmol.m⁻².s⁻¹

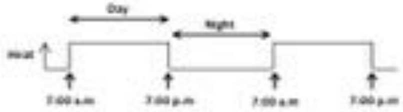


High T° at night or day degrades energy supply

Grapevine response to T°

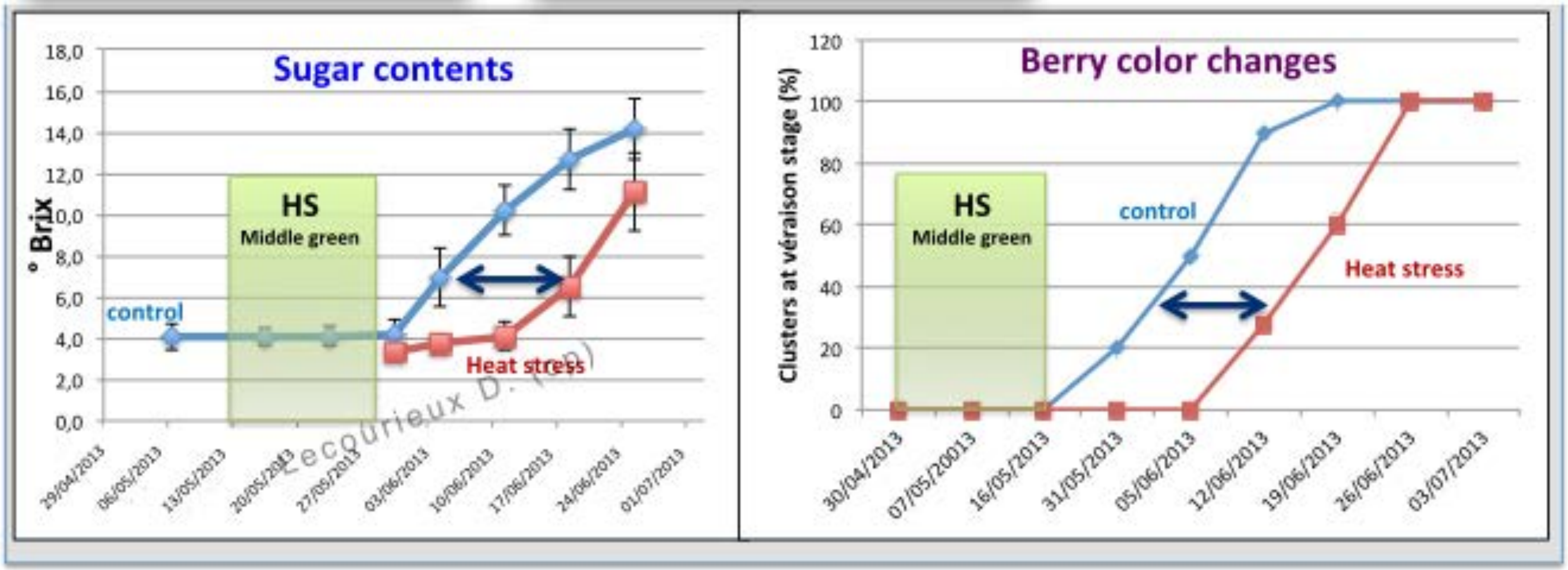
Micro-climate

T° impact of berry development



HS (+8°) 12 h. / 1 to 14 days
3 developmental stages
- Green berry development
- Véraison stage
- Ripening

9 combinations (stage x duration)

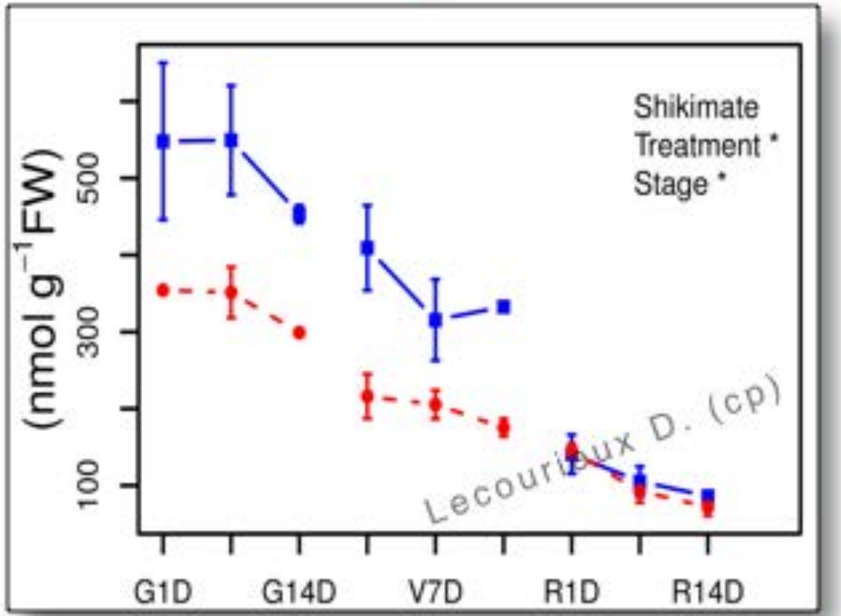

Sugar contents
° Brix
18,0
16,0
14,0
12,0
10,0
8,0
6,0
4,0
2,0
0,0
HS
Middle green
control
Heat stress
29/04/2013
06/05/2013
13/05/2013
20/05/2013
27/05/2013
03/06/2013
10/06/2013
17/06/2013
24/06/2013
01/07/2013
Lecourieux D. (cp)
Berry color changes
Clusters at véraison stage (%)
120
100
80
60
40
20
0
HS
Middle green
control
Heat stress
30/04/2013
07/05/20013
16/05/2013
31/05/2013
05/06/2013
12/06/2013
19/06/2013
26/06/2013
03/07/2013

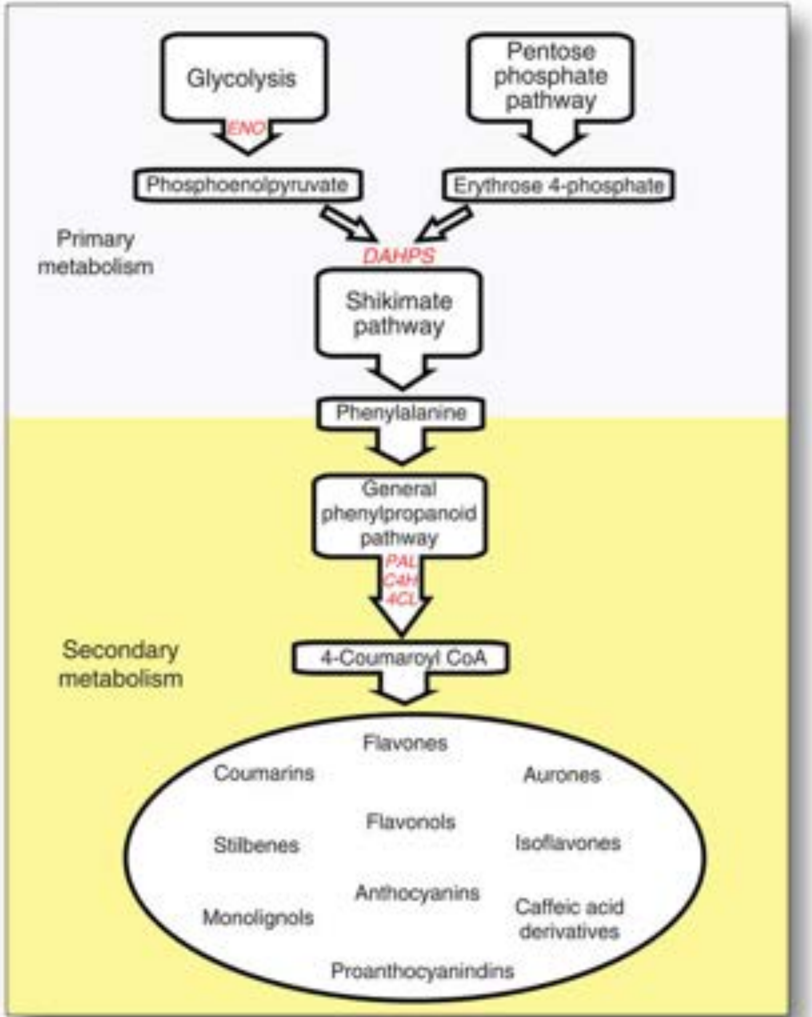
Grapevine response to T°

Micro-climate

T° impact of berry development

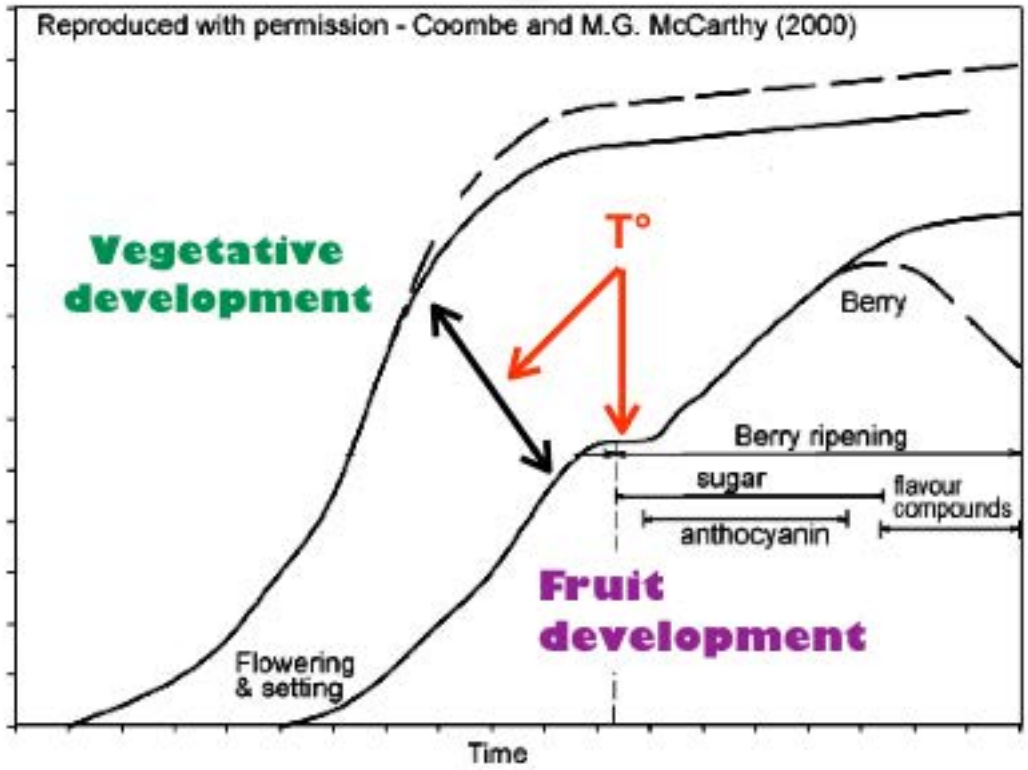
**Proteomic
Transcriptomic
analyses**





Main conclusions

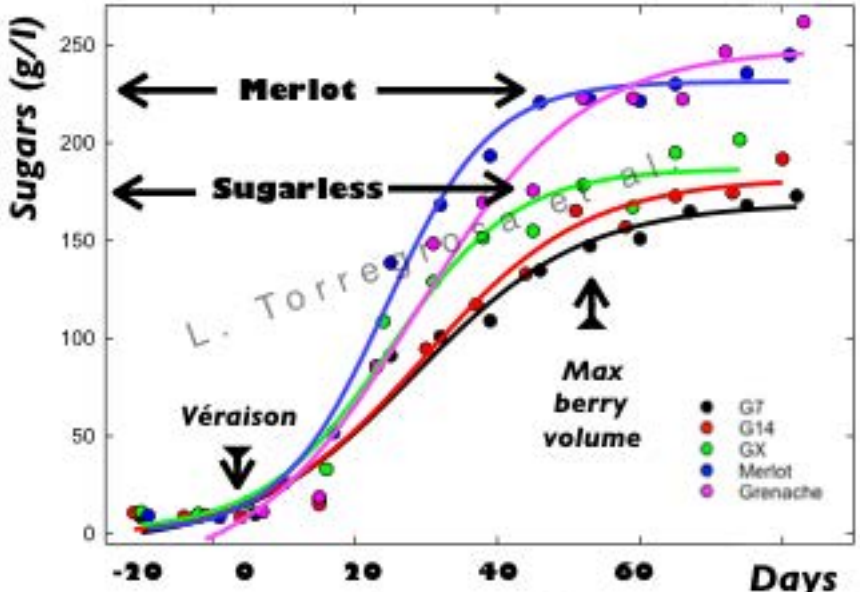
1. T° **differentially impacts** vegetative x reproductive systems
2. **Desynchronizing** growth/sugars/acid/flavonoids
3. This is due, at least in part, to changes **C balance** and biomass allocation
4. Also T° **directly impacts** on I^{ary} & II^{ary} metabolisms



Targets to support berry quality ?

Sugarless variants X **Microvines**

Physiology of the parental trait
(metab l, 2, growth, osmotica)



Sugarless QTLs

Extreme phenotypes Pre-breeding

2015

Sugarless Disease^R X HomoZ ren3/rpv3
run1/rpv1
(350 ind.)

2016

MicroVDQA X ***Cabernet Franc***
run1/rpv1
ren3/rpv3

2017
2018

2018
2020

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