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Canopy management to support disease control:

what we learned from INNOVINE

contributors

***INRA; ForceA; UCSC; HORTA; IGA; ITQB; ISA;
GRC; Schloss Vollrads; JKI***

challenges of today's wine production

1. produce the highest possible yields
2. while meeting the demanded grape quality requirements
3. and at the same time, maintaining healthy vines.

(King et al. 2012; Chalfant 2012)

Concept of vine balance:

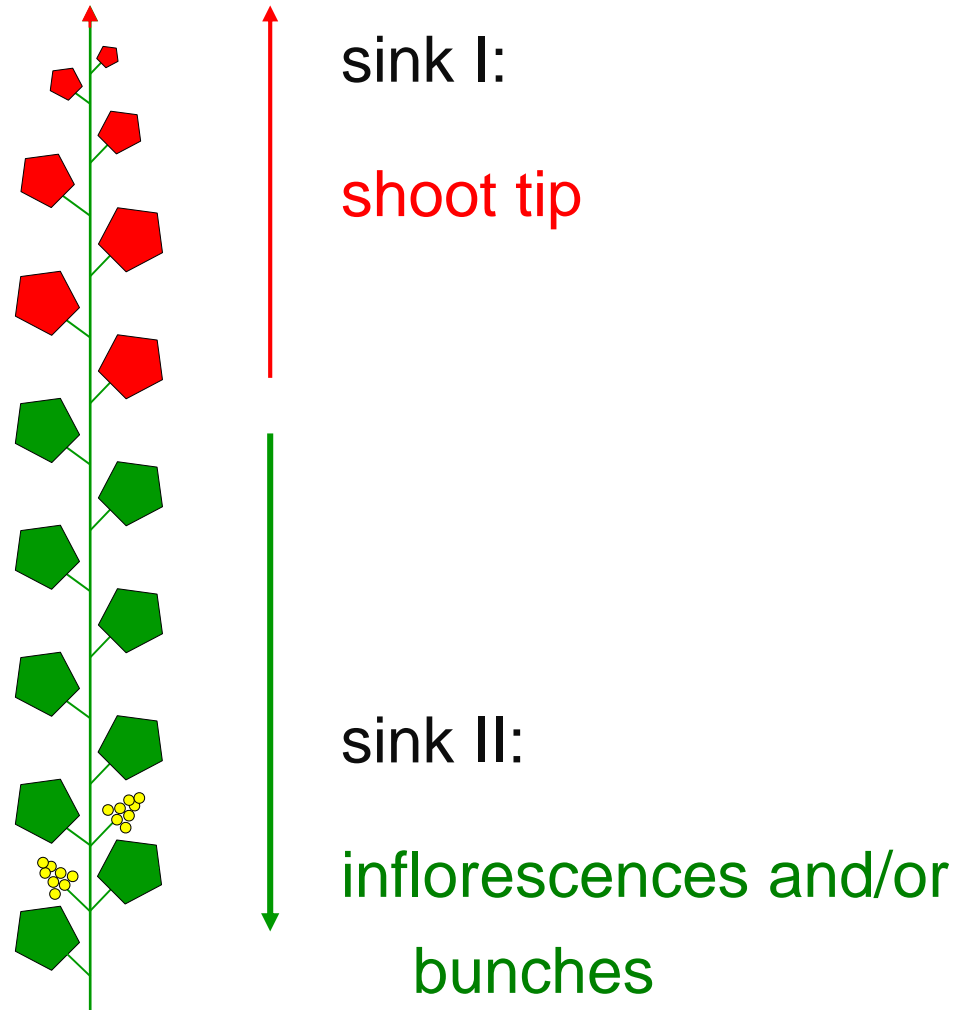
“.... (vine) balance is achieved when vegetative vigour and fruit load are in **equilibrium** and **consistent** with high fruit quality.”

(Gladstone, 1992)

➡ **leaf area to fruit weight ratio**

Assimilate-Transport

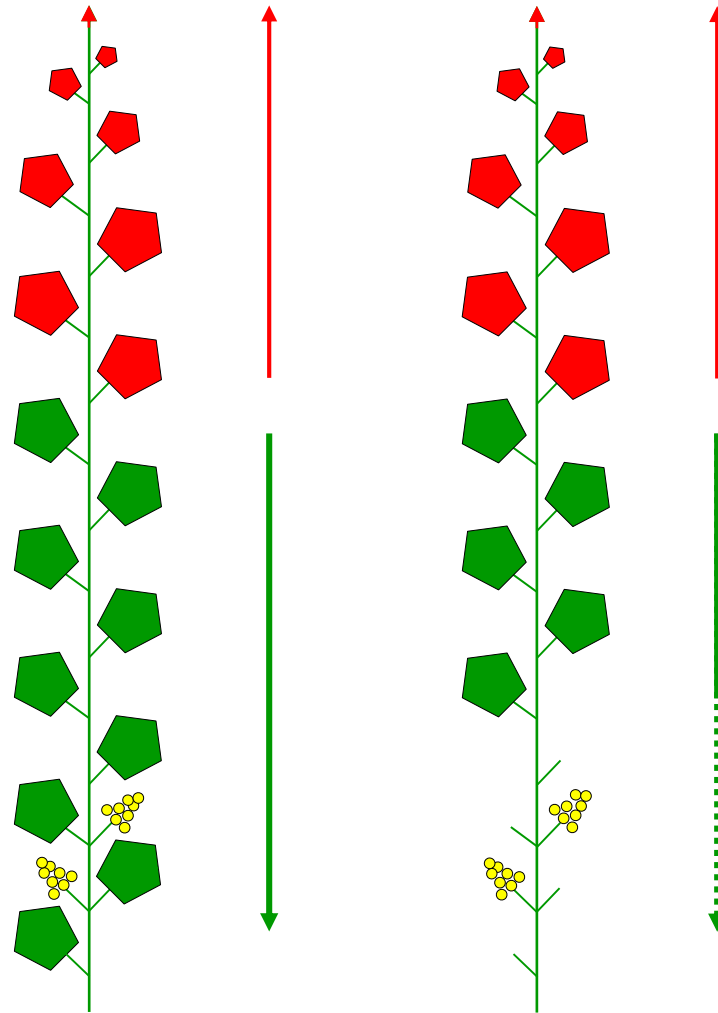
➔ leaf area to
fruit weight ratio



adapted from Koblet (1969)

Assimilate-Transport

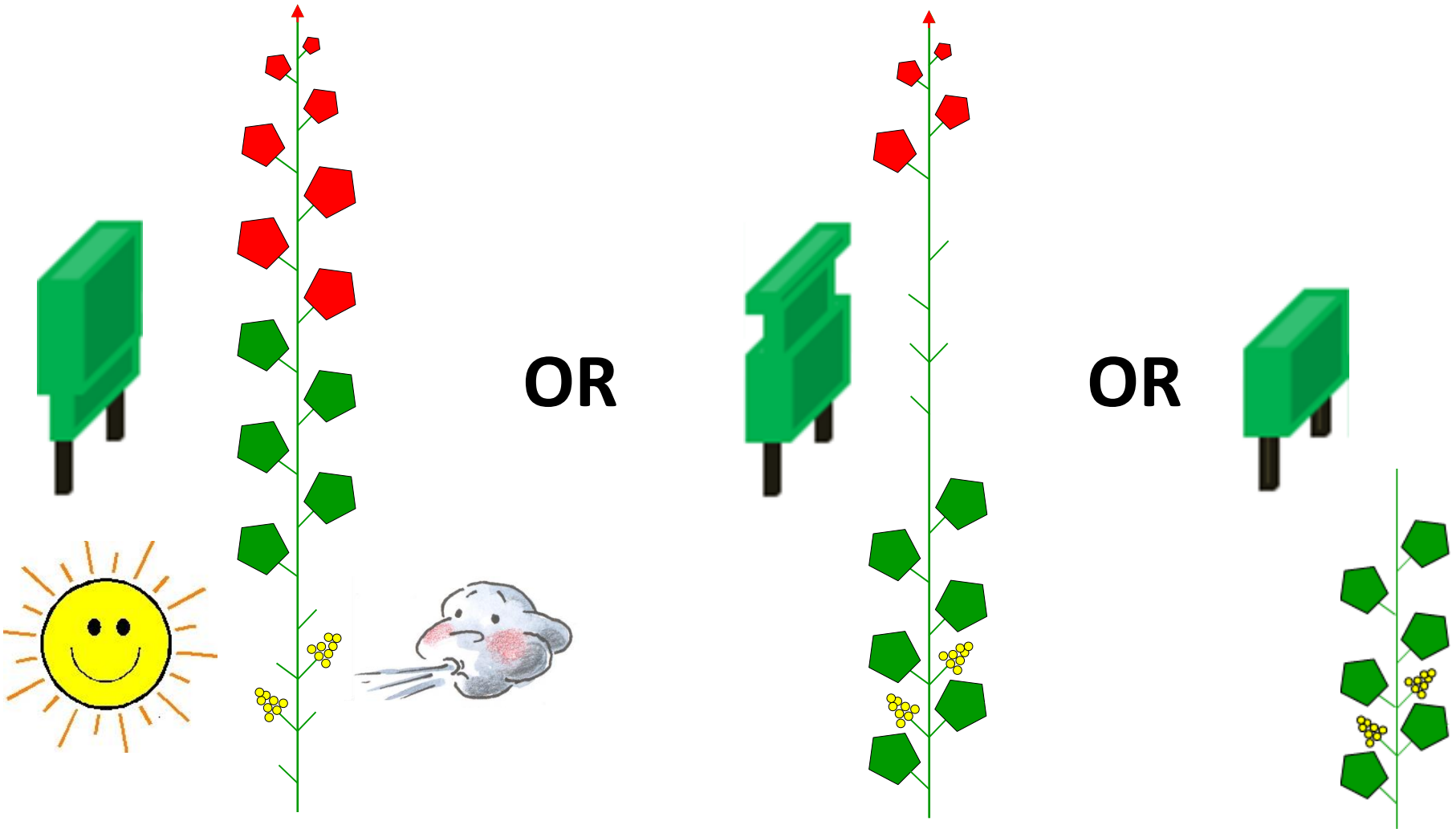
➔ leaf area to
fruit weight ratio



adapted from Koblet (1969)

Position of defoliation

⇒ **altering** leaf area to fruit weight ratio



Defoliation equipment



Clemens-
Binger Seilzug
(Germany)



ERO (Germany)



Siegwald (Germany)

- **Long term decisions**
 - Varieties [tested within the project: Tempranillo, Ortrugo, Riesling as well as fungus tolerant varieties]
 - Trellis systems [VSP, SMPH]

Trellis systems: Semi minimal pruned hedge (SMPH)

Initial aim: Reduce negative impact of the velocity of berry ripening maintaining the advantages of minimal pruning systems



Proposed benefit:

- app. 66 % labor saving [mainly pruning & shoot positioning]
- distribution of small clusters within entire canopy
- good distribution & exposure of the fruit [sun and pesticides]
- **However, production will need to suit the wine style and crop regulation will be a pre-requisite**

(Source: Ramos 2013)

(adapted from:
Intrieri *et al.* 2013)

Trellis systems: Semi minimal pruned hedge (SMPH)



- Spreading the bunch zone
- SMPH clusters were smaller and less compact than VSP clusters therefore showing less fungal infection in some years
- Reduction of fungal disease like bunch rot was observed in SMPH systems depending on the variety and year

Take home sms: type of trellis system used can be considered as one way to alter fruit distribution and canopy microclimate

- Long term decisions
 - Varieties [tested: Tempranillo, Ortrugo, Riesling fungus tolerant varieties]
 - Trellis systems [VSP, SMPH]
- Huge seasonal weather variability requires dynamic canopy adaptations strategies
 - Key factors
 - Timing
 - Position
 - Intensity

Early defoliation treatment carried out at Lisbon winegrowing region (39° 05' 40'' N, 9° 07' 56'' W) with the variety Aragonez (syn. Tempranillo).



Material and Methods

- ✓ site: Merceana, Lisbon wine region (39° 05' 40" N, 9° 07' 56" W).
- ✓ 11 years old grapevines cv. Aragonez (syn. Tempranillo) grafted to SO4 rootstock, spaced 1.0 m within and 2.5 m between rows;
 - **C** – control non-defoliated & unthinned;
 - **D&T** – Defoliated at pea size only on the east side of the canopy + bunch thinning at veraison (thinning of all second order clusters);
 - **ED** – Early defoliation: removal of 6 basal leaves and laterals from all shoots 1 week before flowering.



Early defoliation in Aragonez (syn. Tempranillo)

Season	Treat	Fruit set (%)	Bunch comp. (berries/cm)	Botrytis incidence (%)	Botrytis severity (%)
2013 low botrytis pressure	C	42.8 a	7.5 a	1.1 a	19.5 a
	D&T	44.1 a	7.2 a	0.0 b	0.0 b
	ED	24.2 b	4.5 b	0.0 b	0.0 b
	Sig.	***	*	*	*
2014 high botrytis pressure	C	52.1	10.8 a	85.1	47.4
	D&T	50.6	9.7 ab	84.7	43.7
	ED	42.7	8.5 b	77.2	36.4
	Sig.	ns	*	ns	ns
2015 low botrytis pressure	C	50.2 a	7.3 a	6.3 a	1.2 a
	D&T	46.2 a	7.1 a	4.1 a	0.8 a
	ED	32.1 b	5.1 b	0 b	0 b
	Sig.	**	**	*	*



Take home sms: ED induced a significant decrease on fruit set, bunch compactness and bunch rot incidence and severity (except for 2014) as compared to the control.

- **Material and Methods**
 - **Ortrugo (Std) / 420A**
 - **Guyot**
 - **Spacing: 2.5 x 1.0 m**
 - **Duration 2013-2014**
- **Treatments**
 - **ELR : defoliated pre-flowering**
 - **LLR : defoliated pre-veraison**
 - **BT : cluster thinned pre-veraison**
 - **C : control**

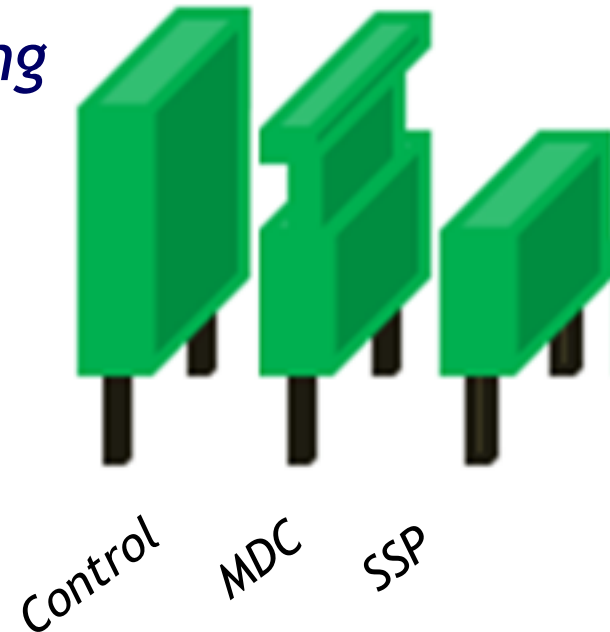
case study: timing [white: Ortrugo; Piacenza, Italy]

Treatment	Bunch compactness		Bunches/ node	Bunch rot (%)	
	(g/cm)	OIV rating		Incidence	Severity
ELR	23.2a	6.5b	1.05	22.8c	1.7b
LLR	28.9b	7.2a	1.15	29.2bc	1.9b
BT	29.7b	6.9ab	1.13	52.6a	7.6a
Control	29.0b	7.4a	1.18	46.6ab	5.5a
Significance	**	**	ns	**	**
T × Y	ns	ns	ns	—	—

Take home sms: Ortrugo's fruit set does NOT respond to ELR; though bunch compactness and rot incidence is lower than control due to increased "chicken" berries

• *Treatments:*

- *control*
- *MDC: mechanically defoliated canopy*
- *SSP: severe summer pruning*
- *Riesling Vitis Vinifera cvs. Riesling*
- *Vine spacing 2.6 m²*



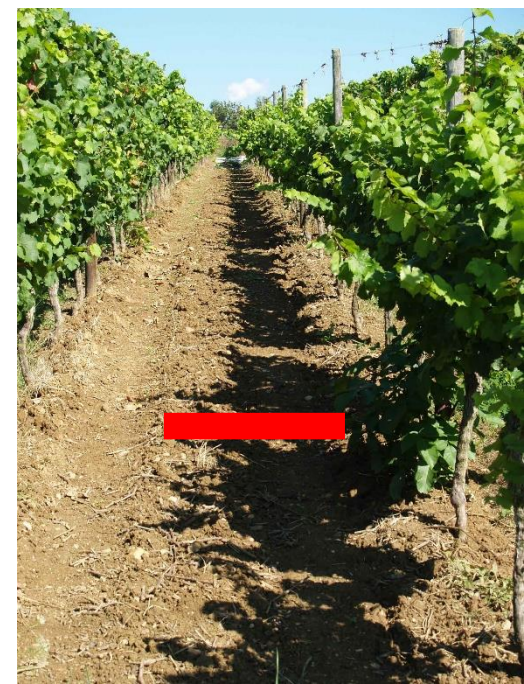
**control
[C]**



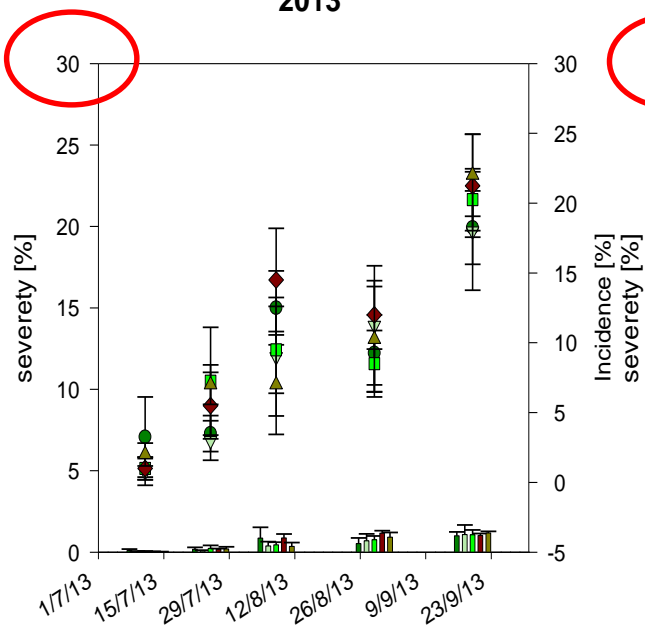
**mechanically defoliated
canopy [MDC]**



**severe summer
pruning [SSP]**

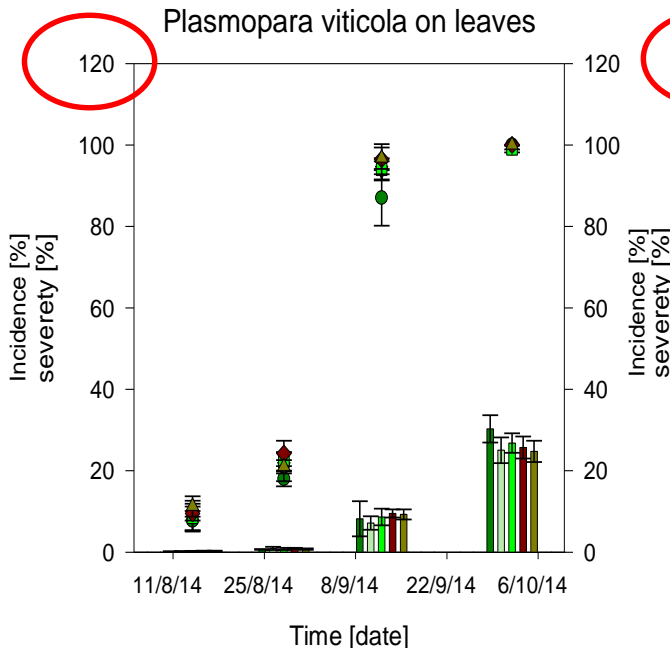


2013

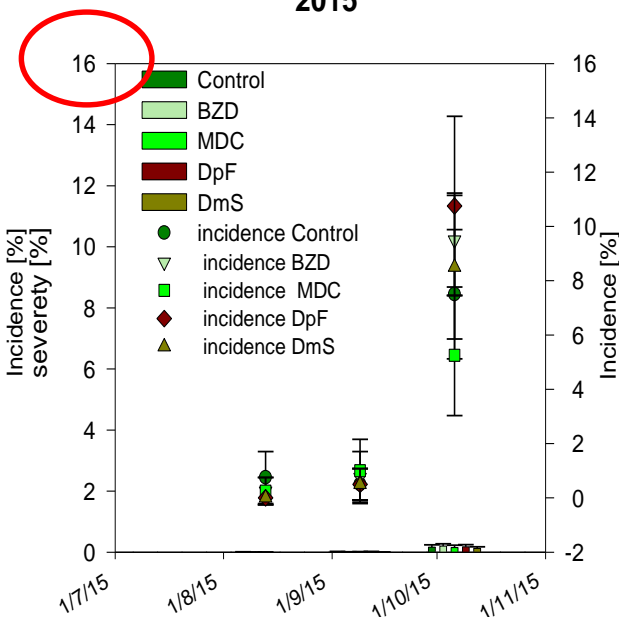


2014

Plasmopara viticola on leaves



2015

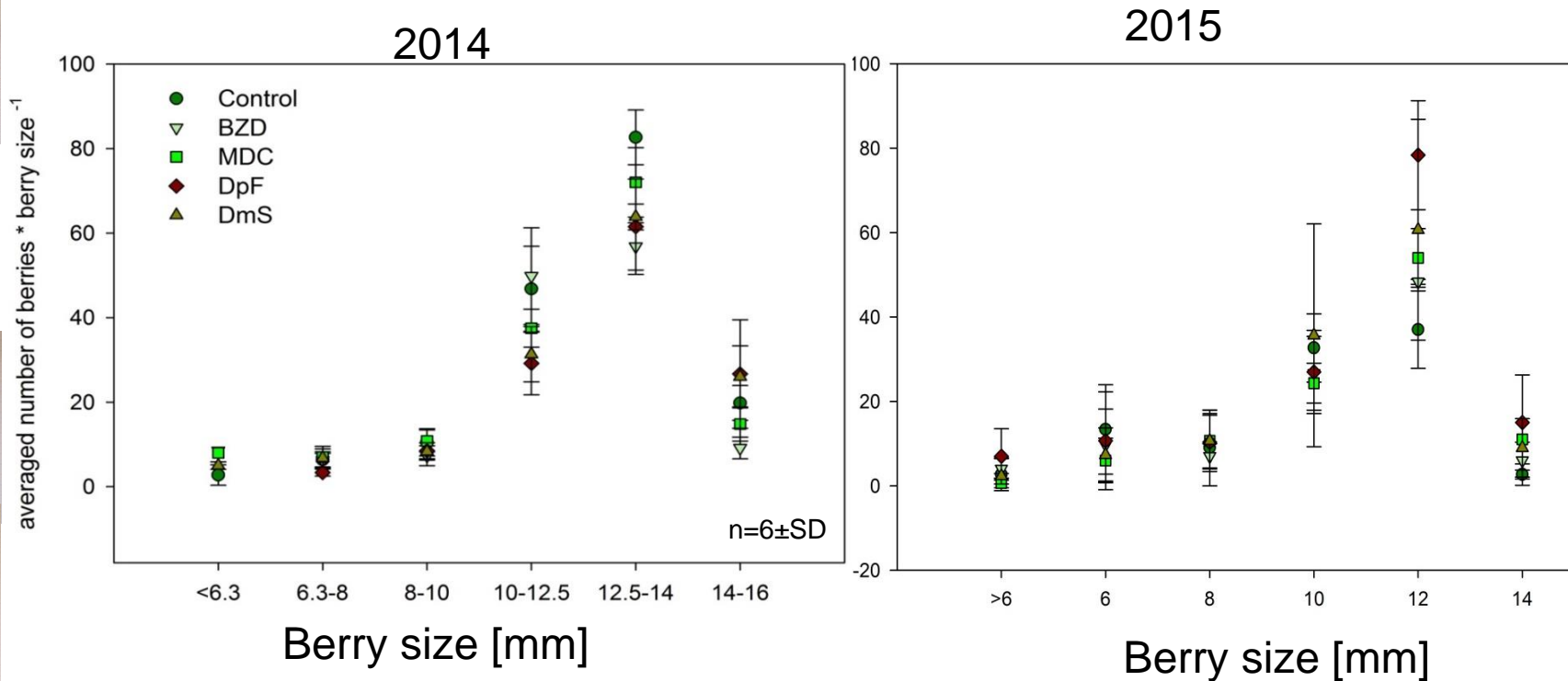


Highest severity and incidence *Plasmopara viticola* in 2014
NOT TO MENTION 2016!!!!!!



... new, remote technologies will provide information for future vineyard management

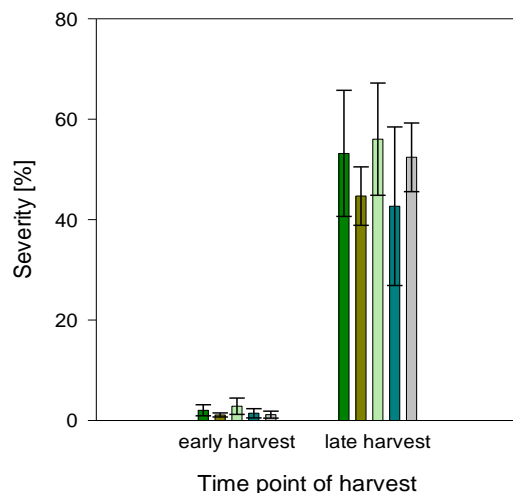
Bunch architecture



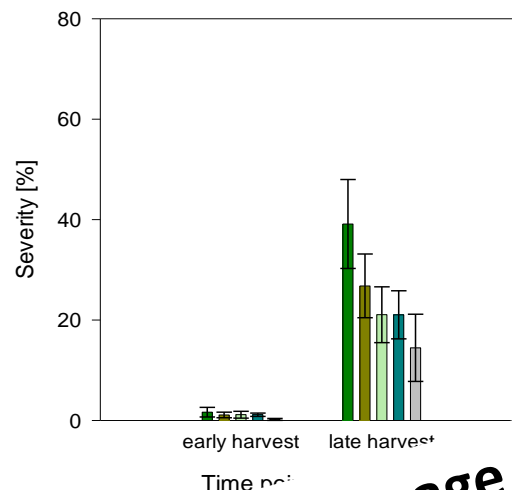
control showed the **highest amount** of berries size class **>12.5 mm**. **MDC** treated vines had the highest amount of **small berries** in **2014**

Bunch rot

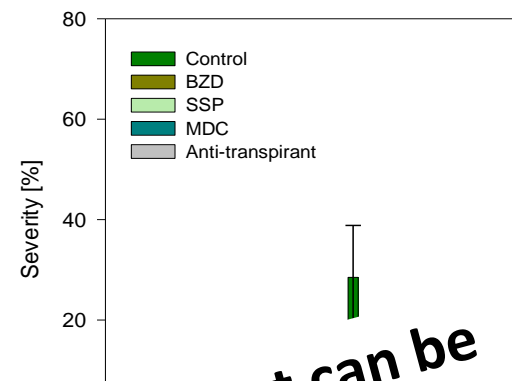
2013



2014

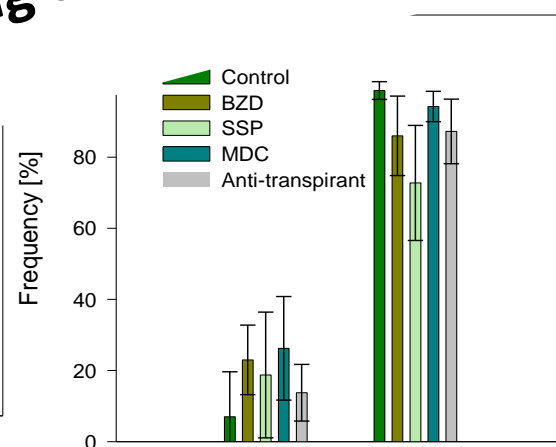
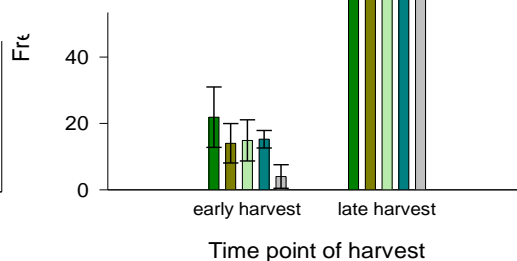
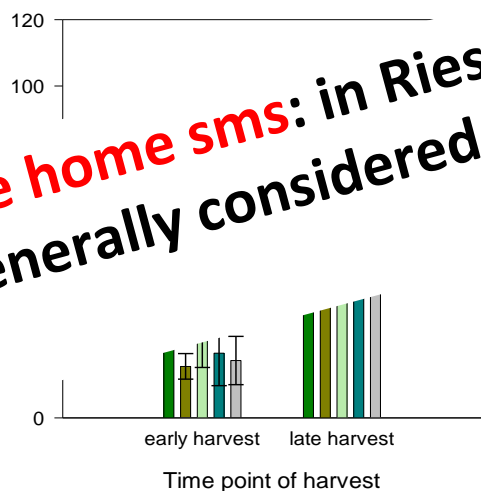


2015



Take home sms: in Riesling risk and damage of bunch rot can be generally considered as very high reducing crop yield prior to harvest drastically

2013



conclusion

- **Under various environmental conditions common varieties have been tested by the partners following different viticultural canopy management strategies.**
- **Pruning systems with high bud load adjusted through thinning can be considered as a long term strategy to increase indirectly the tolerance to bunch rots.**
- **The choice of variety (rootstock as well as scion) will become of major importance to reply to climate change.**
- **With all varieties tested, the risk of bunch rot was mainly reduced by decreasing cluster compactness.**

- **Timing, position and intensity altering leaf area to fruit weight ratio led to reduced fruit-set, loosening cluster compactness, reduced cluster weight (crop load!) and the susceptibility to bunch rot as well as impacting on the ripening process.**
- **HOWEVER, the canopy manipulation strategies trialed were not able to reduce *P. viticola* infection significantly.**
Instead, mildew resistant varieties have been shown to be the most promising strategy to produce healthy grapes with less fungicide input.
- **Most important for you: wines of the trials will be available at the tasting tomorrow!**

acknowledgement

Contributors: *INRA; ForceA; UCSC; HORTA; IGA; ITQB; ISA; GRC; Schloss Vollrads; JKI –
with support through many students*



**THANK YOU FOR
YOUR
ATTENTION**



**MERCI POUR
VOTRE
ECOUTE**



**DANKE FÜR
IHRE
AUFMERKSAMKEIT**

Apitz : Triptik