Michigan Grape & Wine Industry Council
2015 Report of Research Activities

Leaf removal: a tool to improve crop control and fruit quality in vinifera grapes

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Research Report 2015

- **Leaf removal: a tool to improve crop control and fruit quality in vinifera grapes**
- **2015: Impact of Early leaf removal on Riesling**

- 2012: Timing and intensity of early leaf removal on Chardonnay and Pinot noir
- 2013: Timing and intensity of early leaf removal on Chardonnay and Pinot noir and potential carry over effects
- 2014: Physiology of early leaf removal, impact on carbon partitioning and effect of pruning and training strategies on Pinot noir
- 2016: Mechanization of early leaf removal, impact on bunch cluster rot (sour rot) on Merlot and Chardonnay
- 2017: Mechanization of early leaf removal, impact on bunch cluster rot (sour rot) on Merlot and Chardonnay
- 2017-18: Physiological Impact of cluster zone early leaf removal on vine carbon allocation and fruit secondary metabolites (metabolomics) on Pinot noir

Project: Leaf removal: a tool to improve crop control and fruit quality in vinifera grapes

Report 2015: Impact of Early leaf removal on Riesling

- This work was partially financially supported by AgBioResearch at Michigan State University (Project GREEEN), the Michigan Grape and Wine Industry Council and the MSU Southwest Michigan Research and Extension Center.

- This information is given in summary form of a **research in progress** and does not purport to be complete and **should not be considered as final advice or a final recommendation to grape growers** unless extensively tested by MSU field extension specialists, farm advisors and industry members.

Project: Leaf removal: a tool to improve crop control and fruit quality in vinifera grapes

Report 2015: Impact of Early leaf removal on Riesling

- **Research Component**: research trial at MSU Southwest Michigan Research and Extension Center (Benton Harbor)
- **Extension Component**: demonstration trial at 12 Corners Vineyards & Winery (1201 N Benton Center Rd, Benton Harbor, MI 49022) on Cabernet franc and Pinot noir

Aim of Leaf Removal (classical approach)

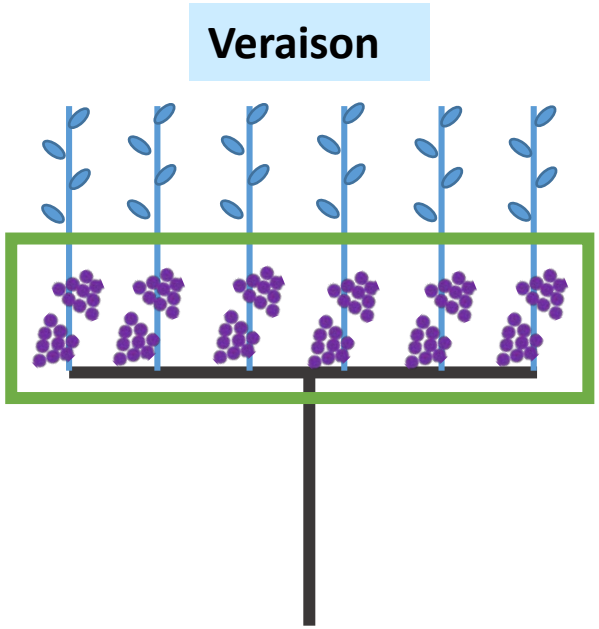
Cool climate

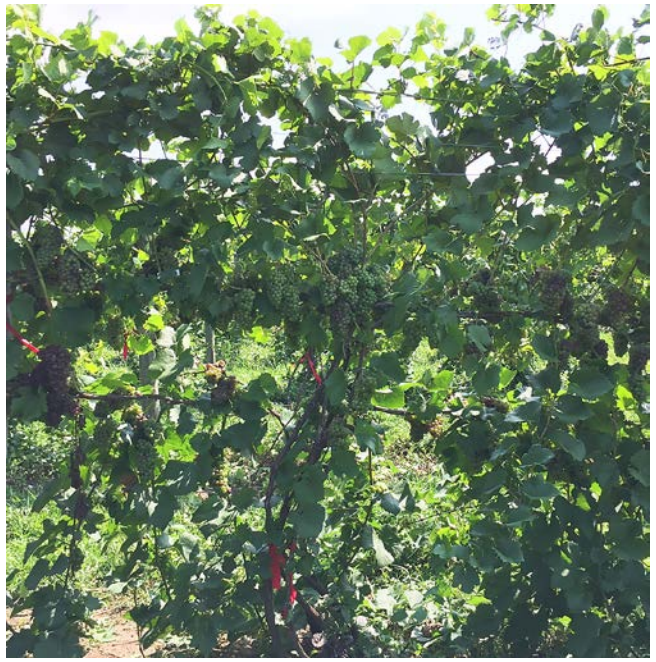
Disease control

(Palliotti *et al.*, 2012; Hed *et al.*, 2015)

Better sun exposure

(Gatti *et al.*, 2015; Mosetti *et al.*, 2016)





Lemon Creek Winery, 2016

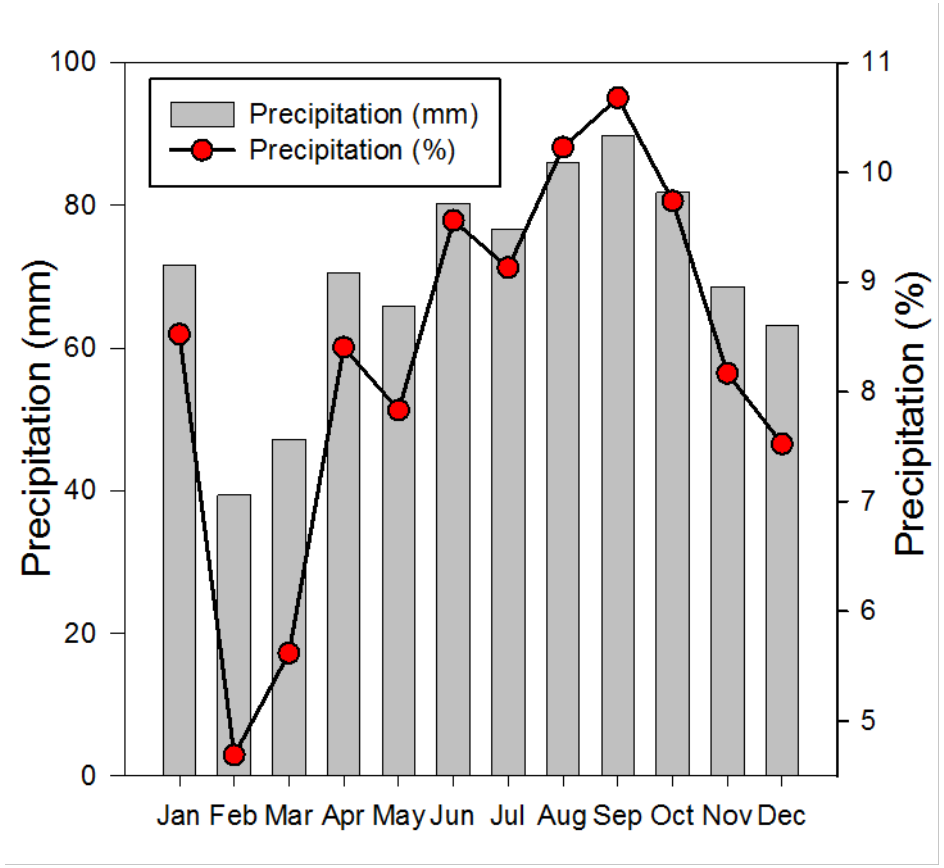
Aim of Leaf Removal

Leaf Removal

NO Leaf Removal

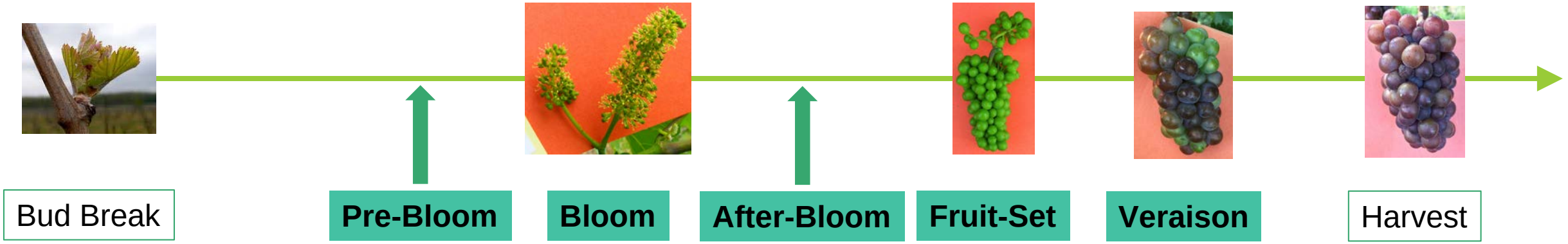
Improving Fruit Technological Maturity

The varieties that are cold resistant and early ripening for cool climate viticulture are highly sensitive to fruit rot



Data from SWMREC (2000-2015)

Research on Leaf Removal (literature review)



	PB	B	AB	FS	V
Yield Reduction					
Quality Increase					
Disease Reduction					
	0 ← Publication Frequency → 5				

Research on Mechanical Leaf Removal

Plucker, Tanesini Technology

Gregoire DX20 Leaf Remover

DF200 BMV Double model leaf remover

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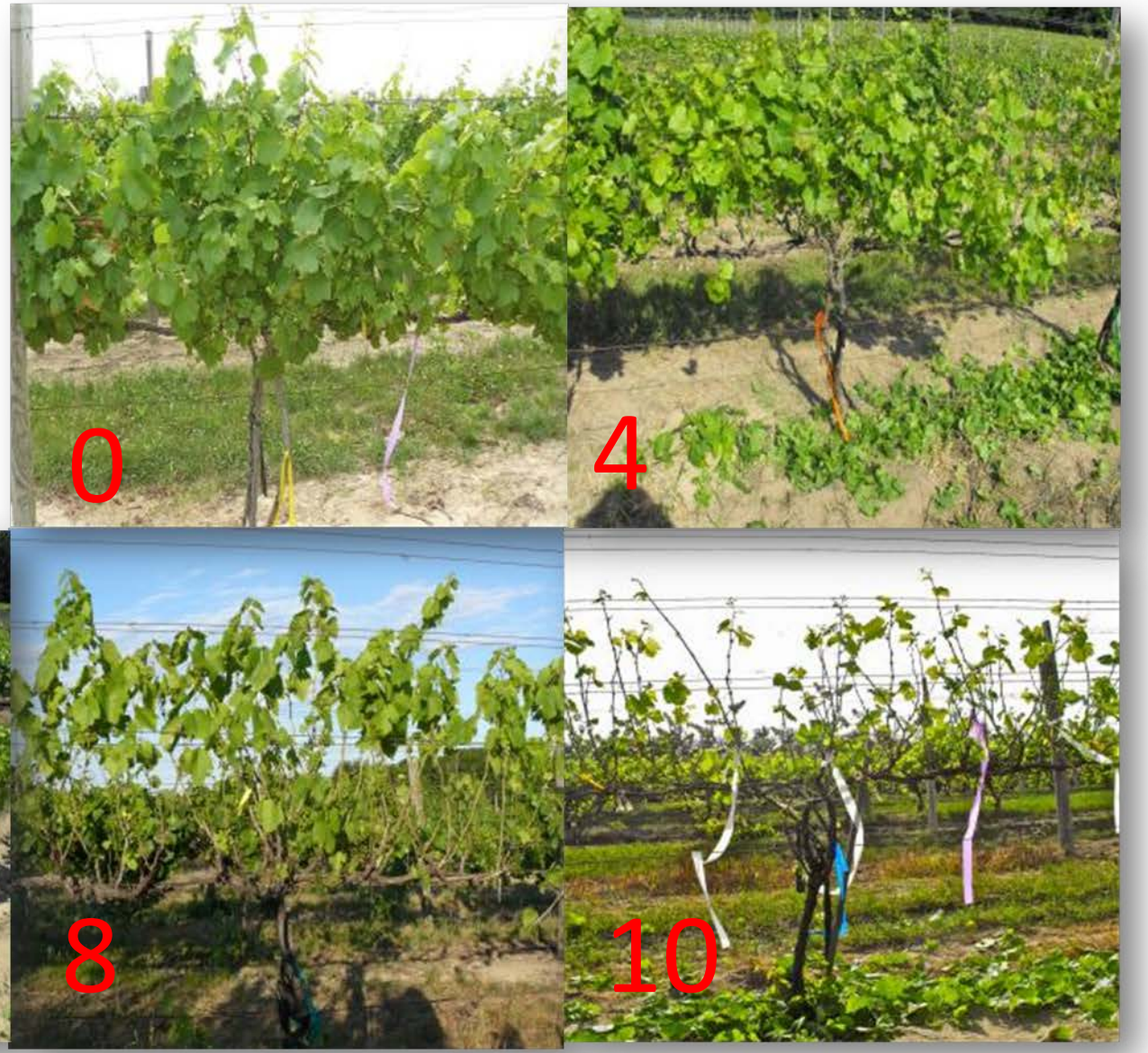
Compressed air blown to the canopy

Research on Leaf Removal (at MSU)

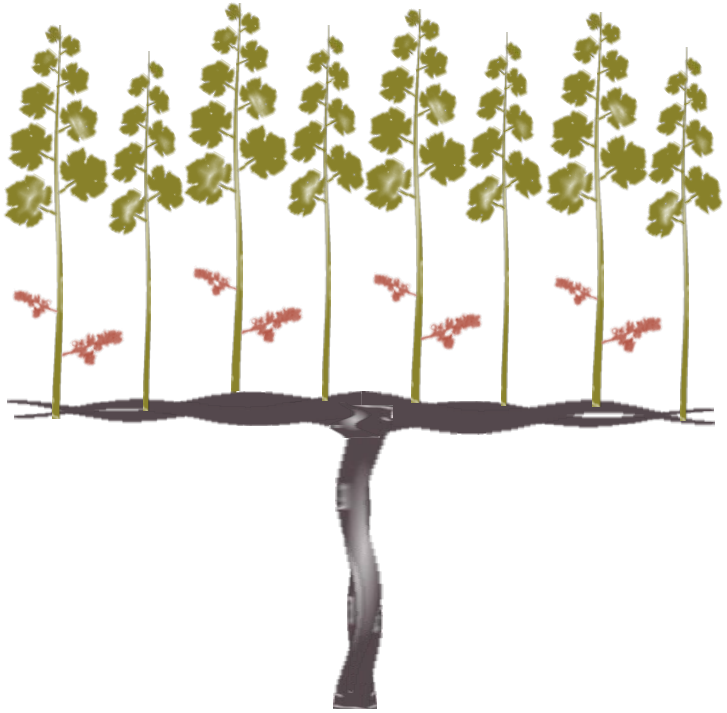
	PB	B	FS
Yield Reduction	29 %	33 %	5 %
Quality Increase (ºBrix)	11 %	3 %	2 %
Disease Reduction	71 %	70 %	35 %

Pinot noir
Chardonnay
Merlot
Cabernet Franc



The Physiological Reason

Sabbatini P., Sivilotti P., Acimovic D., Sternard Lemud M. and U. Vrhovsek. 2016. Physiological impact of cluster zone leaf removal on vine carbon allocation and fruit secondary metabolites. X ISHS International Symposium on Grapevine Physiology and Biotechnology



With early leaf removal a significant amount of photosynthetically active leaves is removed. The vine undergoes a temporary situation a stress that results in a lower berry set, thus the clusters have a reduced number of berries and so also a reduced compactness. With later applications of leaf removal no modifications of number of berries would be obtained.

Data to Support

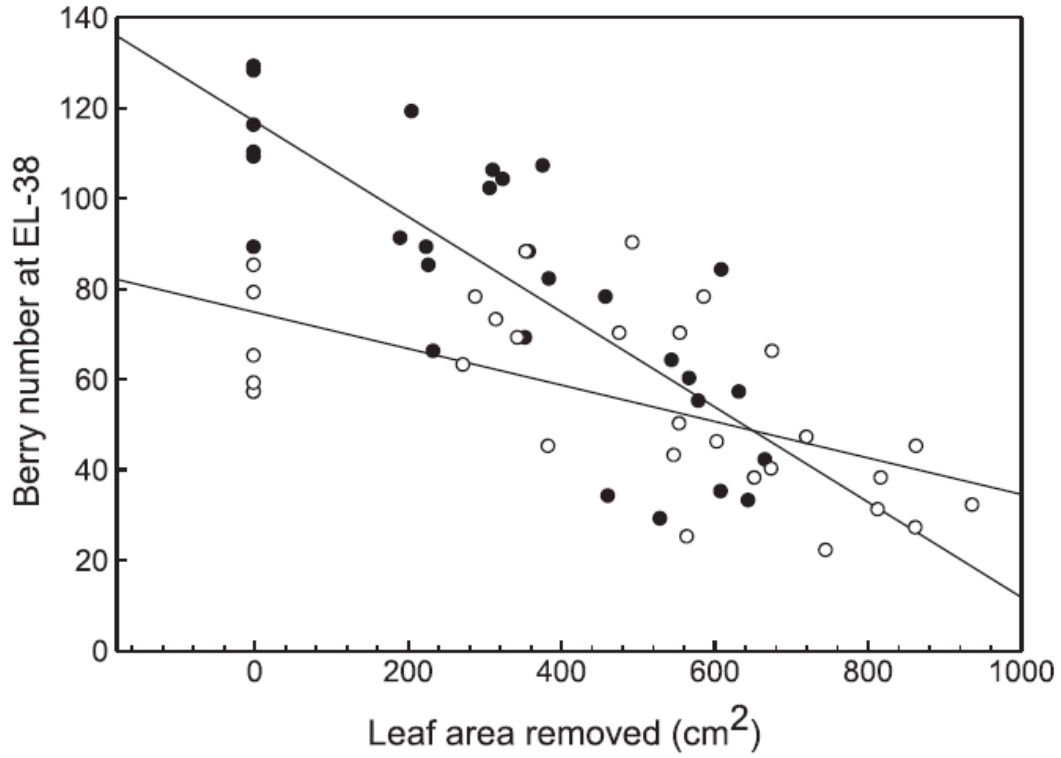


Figure 2. Linear regression between removed leaf area and berry number at development stage EL-38 (Lorenz et al. 1995). Regression is based on a sample of 30 vines for each year, 2011 (●) (R^2 = 0.64) and 2012 (○) (R^2 = 0.36).

Identification of a defoliation severity threshold for changing fruitset, bunch morphology and fruit composition in Pinot Noir

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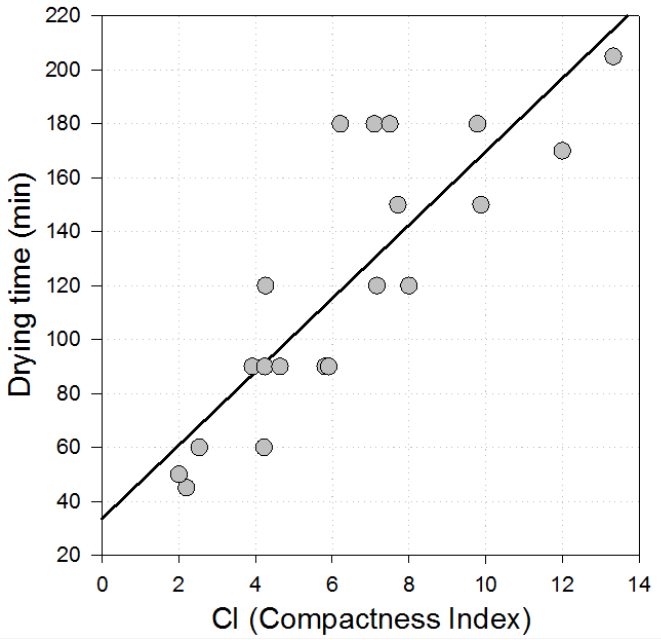
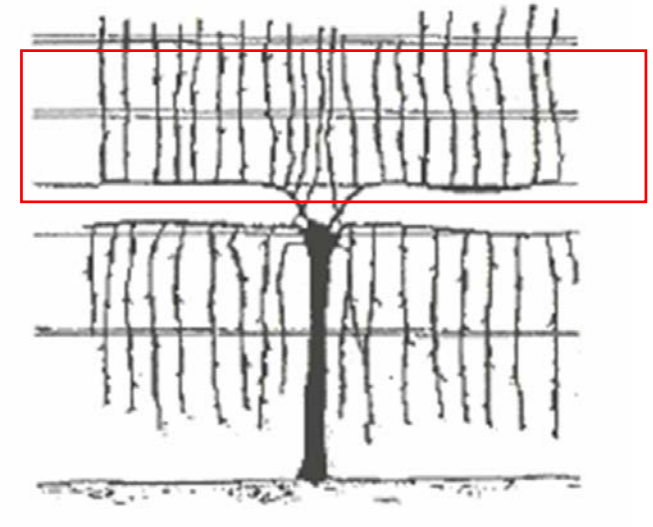


Sabbatini et al, 2012

Leaf removal: a tool to improve crop control and fruit quality in vinifera grapes

The Case of Riesling

Location was South West Research and Extension Center, Benton Harbour, Michigan
Cultivar used in the experiments was Riesling clone 49 trained in a Scott Henry trellising system



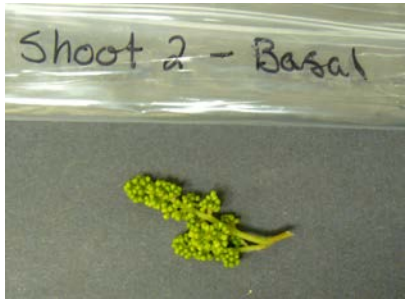
The six basal leaves at full bloom removed from the upper cordon. Lower cordon was not included in the experiments.

Control vs. Leaf Removal

A photographic comparison of the control vines (no defoliation) and the defoliated vines against a black cardboard background. The cardboard is clearly visible in the defoliated group.

Impact on Fruit Set

	Number of flowers		Number of berries		% Fruit set	
Treatment	Mean	SD ±	Mean	SD ±	Mean	SD ±
Control	**187.2 a**	61.50	**115.7 a**	48.17	**63 a**	19.08
Defoliated	**208.2 a**	61.32	**88.9 b**	34.42	**43 b**	15.23



Defoliation treatment reduced fruit set by 30% in relation to non-defoliated control

Bunch Cluster Rot

	Number of infected berries		Percentage of infected berries	
Treatment	Mean	SD ±	Mean	SD ±
Control	**30.7 a**	15.1	**35.9 a**	12.9
Defoliated	**8.5 b**	4.9	**11.8 b**	10.8
Significance	*		*	

Significant difference between the two groups in absolute terms and in relative terms. This corresponds to what has been found in other research and other varieties

Berry Analysis

	Pulp Weight (g)		Berry Weight (g)		°Brix		Total Acidity (g/L)		Total Terpenes (mg/L)	
Treatment	Mean	SD ±	Mean	SD ±	Mean	SD ±	Mean	SD ±	Mean	SD ±
Control	**1.41 a**	0.29	**1.9 a**	0.28	**17.6 a**	1.69	**7.5 a**	1.41	**1.46 a**	0.80
Defoliated	**1.21 a**	0.26	**1.8 a**	0.37	**18.7 a**	1.42	**7.1 a**	1.41	**1.61 a**	1.34
Significance	ns		ns		ns		ns		ns	

Summary

- DIRECT
- Reduction in fruit set
- Reduction of yield per vine (20-30%)
  - Increase the number of buds per vine to accommodate the yield reduction?
- INDIRECT
- Reduction in bunch rot
- Not increase quality contrarily to Pinot noir, Chardonnay, Merlot and Pinot Gris
  - Further research on-going
- APPLICATION
- Pre-bloom and bloom applications
- Fruit set not effective to reduce berries per cluster and cluster morphology