



Impact of leaf removal on Istrian Malvasia wine quality

Marijan Bubola¹, Igor Lukić¹, Sanja Radeka¹, Paolo Sivilotti²,
Andreja Vanzo³, Dejan Bavčar³, Klemen Lisjak³

¹Institute of Agriculture and Tourism, Poreč, Croatia

²University of Udine, Udine, Italy

³Agricultural Institute of Slovenia, Ljubljana, Slovenija

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Area of Istrian Malvasia cultivation



■ North Adriatic area:

- ✓ Croatia (mostly in Istria region)
- ✓ Slovenia (Primorska region)
- ✓ Italy (mostly in Friuli region)

Cultivated area in Croatia

- 2000 ha
- Almost 60% of vineyard area in Istria region.
- More than 10% of vineyard area in Croatia (2nd most widespread variety in Croatia).
- It is still widely planted in Istria.



Main traits of cv. Istrian Malvasia

- ✓ Moderate to high yield
- ✓ High wine quality (semiaromatic wine)
- ✓ Well accepted by consumers
- ✓ Local, autochthonous variety, typical for the area
- ✓ Adequate for different wine styles:
 - young wines (most present in the market),
 - aged wines (including barrel aged),
 - sparkling wines,
 - sweet wines (from dried grapes),
 - wines obtained by long maceration.



Productive characteristics of Istrian Malvasia

- High vigor (strong vegetative growth), especially on deep, fertile soils.
- Medium to large leaves.
- Tends to develop laterals.
- Result: dense canopies, clusters grow in shade.
- Summer pruning practices are necessary to avoid excessive shade.



Aim of the study

- The aim of this study was to assess the effects of three different sunlight exposure conditions (obtained by leaf removal) on:
 - ✓ microclimate conditions in the cluster zone,
 - ✓ volatile aroma compounds,
 - ✓ hydroxycinnamic acids,
 - ✓ sensory characteristics of Istrian Malvasia wines.

Treatments

1. **Untreated control**
2. **Mechanical leaf removal** with tractor mounted roll-over defoliator (Model DS0, VBC Macchine Agricole, Italy) - 35% of leaves removed in basal 50 cm of the canopy wall
3. **Hand leaf removal** - 70% of leaves removed in the basal 50 cm of the canopy wall

Leaf removal was applied at pea-size stage of berry development (berries 7-9 mm), on 17 June 2014



Untreated control (17 June 2014)



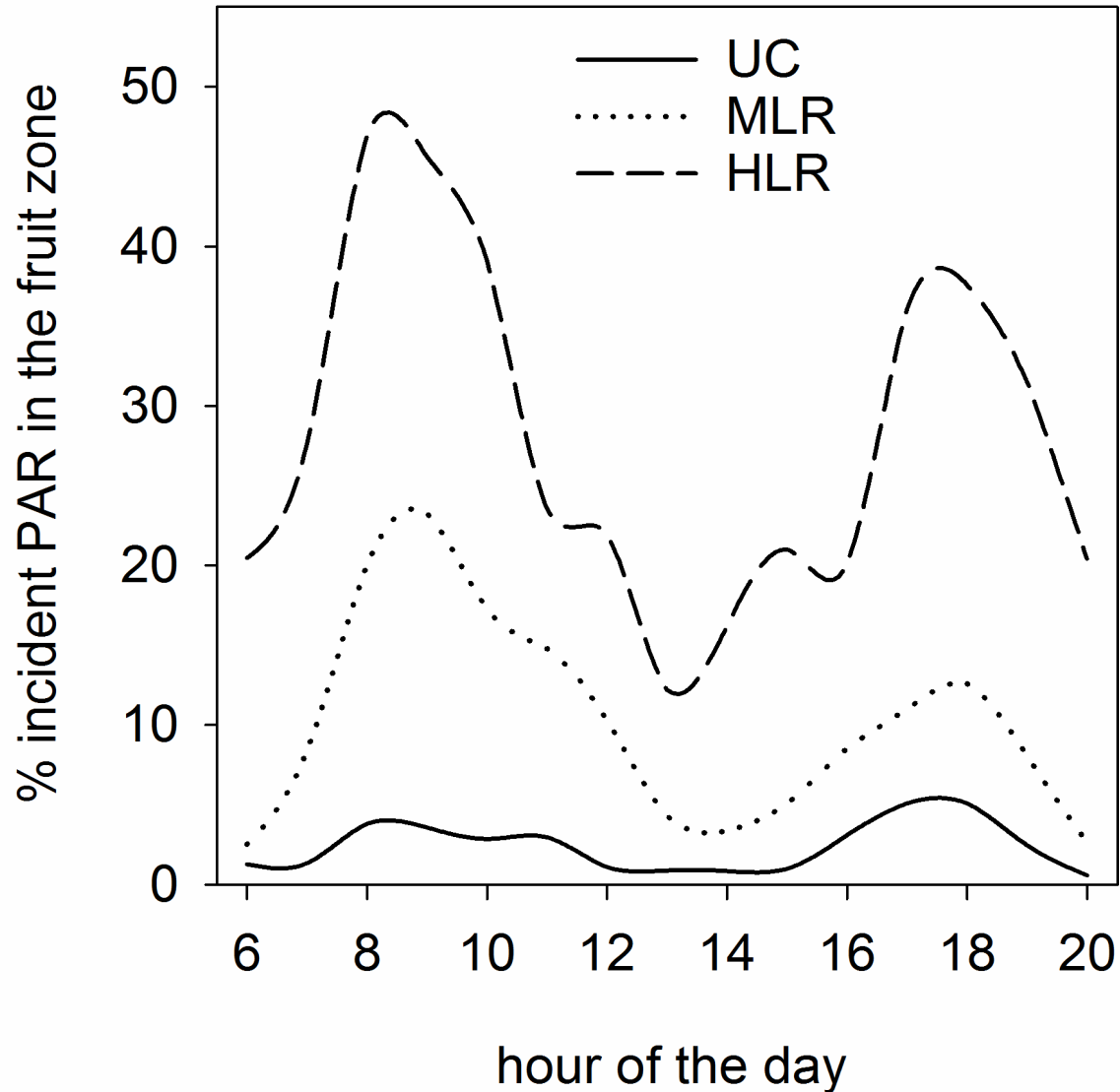
Mechanical leaf removal (17 June 2014)



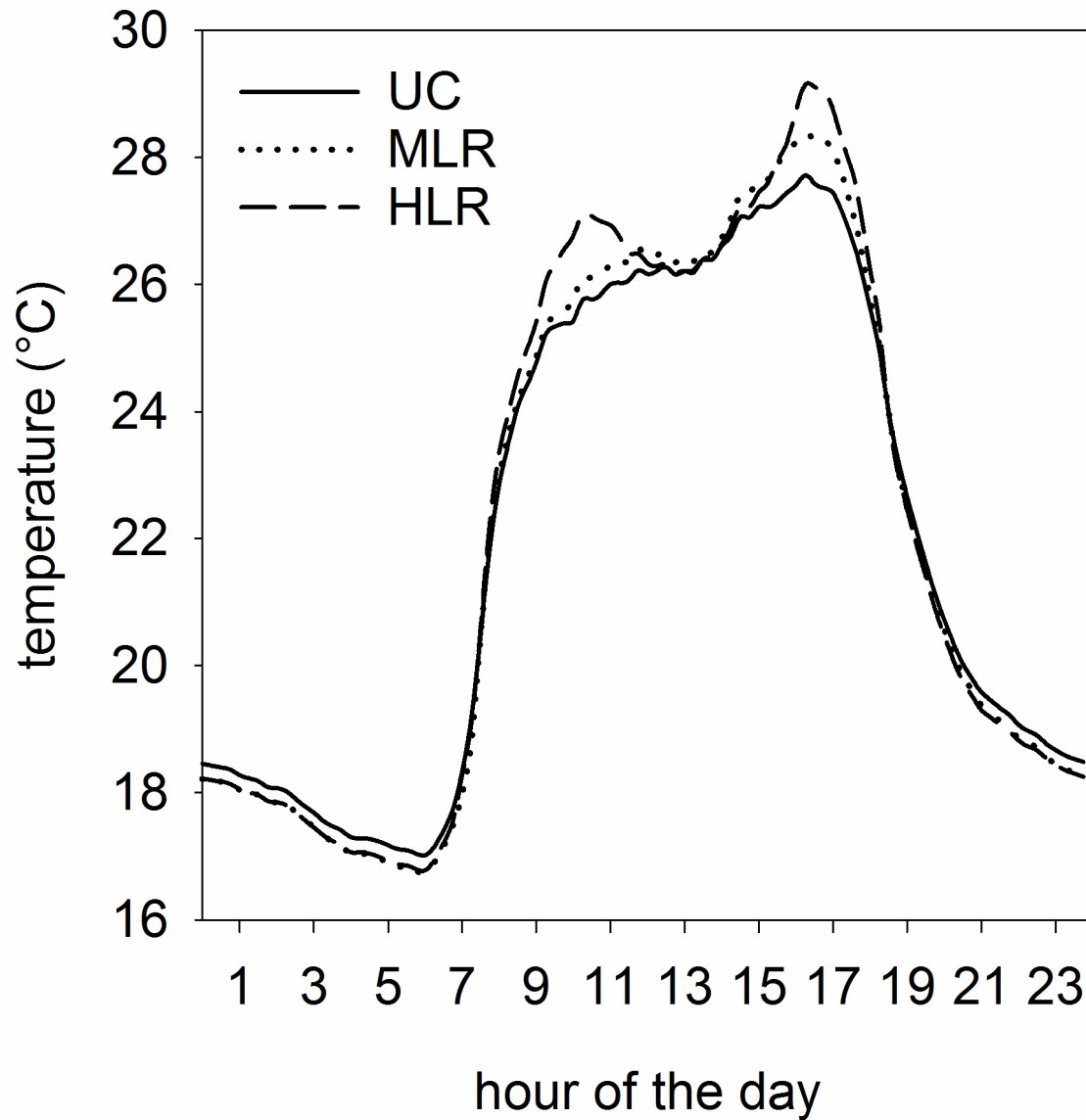
Hand leaf removal (17 June 2014)



% incident photosynthetic active radiation (PAR) in the fruit zone



Cluster temperature



Varietal thiols

	Control	Mechanical LR	Hand LR
4-methyl-4-sulfanylpentan-2-one (ng/L)	7.9a	5.6b	4.9b
3-sulfanylhexan-1-ol (ng/L)	306b	387a	411a
3-sulfanylhexyl acetate (ng/L)	ND	ND	ND

Monoterpenes and β -damascenone

	Control	Mechanical LR	Hand LR
Linalool ($\mu\text{g/L}$)	9.8b	10.3b	11.9a
α -terpineol ($\mu\text{g/L}$)	4.2	4.3	4.5
Citronellol ($\mu\text{g/L}$)	5.0b	8.8a	4.9b
Nerol ($\mu\text{g/L}$)	1.0b	2.3a	2.3a
Geraniol ($\mu\text{g/L}$)	8.9b	12.7a	11.2a
β -damascenone ($\mu\text{g/L}$)	1.5b	2.4a	2.4a

Ethyl esters

	Control	Mechanical LR	Hand LR
Ethyl isobutyrate ($\mu\text{g/L}$)	26.6	30.9	30.6
Ethyl butyrate ($\mu\text{g/L}$)	191.0b	226.2b	281.1a
Ethyl 2-methylbutyrate ($\mu\text{g/L}$)	4.4c	5.5b	6.2a
Ethyl 3-methylbutyrate ($\mu\text{g/L}$)	12.9b	14.9ab	16.9a
Ethyl hexanoate ($\mu\text{g/L}$)	208.5b	284.2a	303.2a
Ethyl octanoate ($\mu\text{g/L}$)	80.7b	120.8a	115.9a

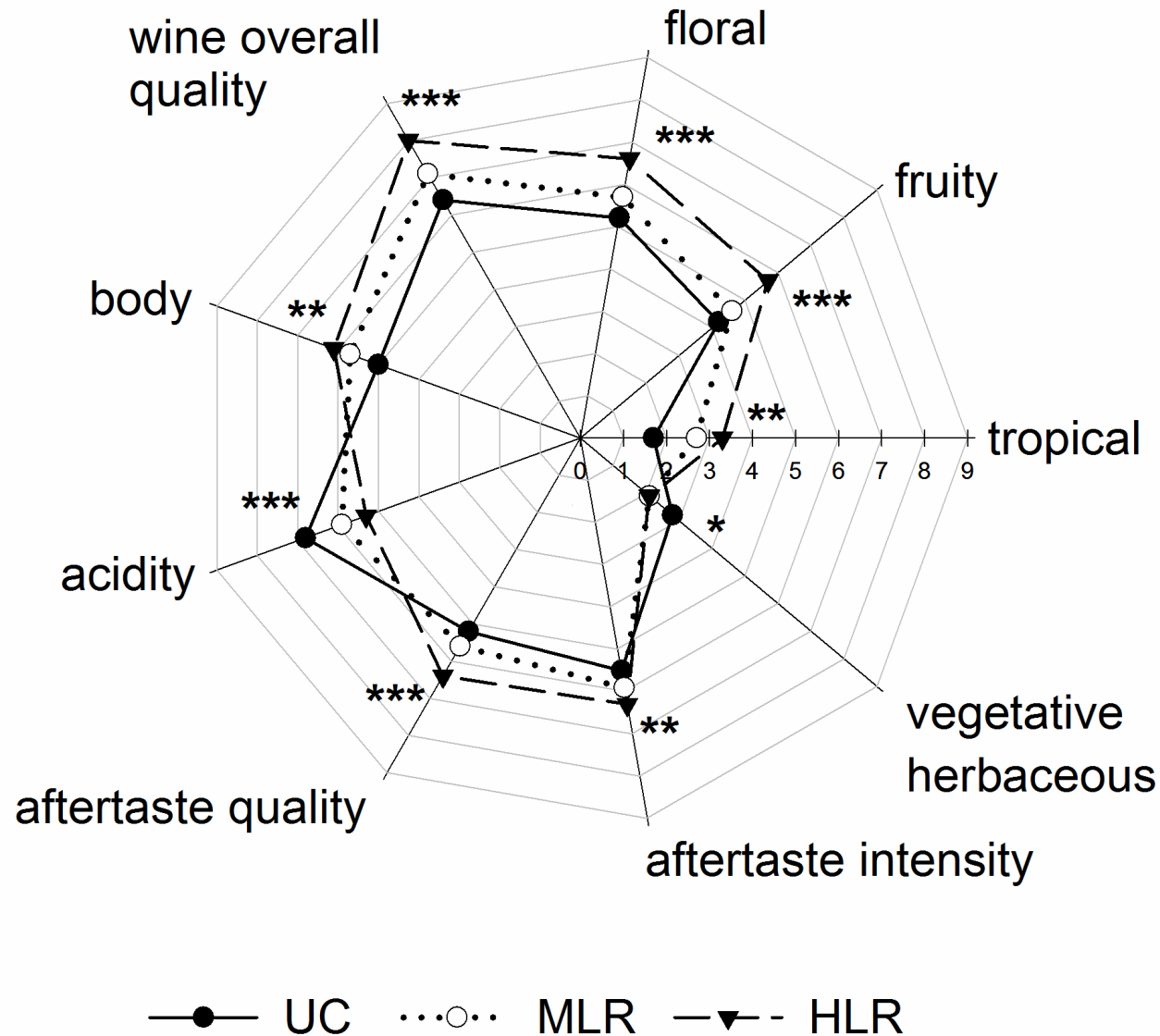
Acetate esters

	Control	Mechanical LR	Hand LR
Isobutyl acetate ($\mu\text{g/L}$)	18.6b	29.5a	29.2a
Isoamyl acetate ($\mu\text{g/L}$)	816.4b	1060.9a	1024.0a
2-phenylethyl acetate ($\mu\text{g/L}$)	915.6	1048.6	1053.1

Hydroxycinnamates

	Control	Mechanical LR	Hand LR
<i>cis</i> -caftaric acid (mg/L)	0.6b	0.8ab	0.9a
<i>trans</i> -caftaric acid (mg/L)	14.1b	16.1b	21.6a
<i>cis</i> -coutaric acid (mg/L)	1.2	1.1	1.3
<i>trans</i> -coutaric acid (mg/L)	1.5	1.5	1.6
<i>cis</i> -fertaric acid (mg/L)	0.2	0.1	0.2
<i>trans</i> -fertaric acid (mg/L)	2.4b	2.6b	2.9a
Caffeic acid (mg/L)	17.7	18.2	21.3
<i>p</i> -coumaric acid (mg/L)	4.5b	5.0a	4.8ab
Ferulic acid (mg/L)	2.4	2.6	2.4
2-S-glutathionyl caftaric acid (mg/L)	5.7	5.8	6.2
Total hydroxycinnamates (mg/L)	50.2b	53.7b	63.3a

Sensory characteristics of Istrian Malvasia wines



Conclusions

- Leaf removal treatments, and especially the more intense hand LR, significantly increased the concentration of several aroma compounds, which directly reflected on the improvement of wine sensory quality.
- Although wine quality was enhanced to a larger extent when leaf removal was performed manually, the treatment by a tractor mounted roll-over defoliator also had a significant positive impact, which implies the possibility to successfully apply such canopy management practice on a large scale viticultural production.

*Thank you
for your
attention!*





