



## Manual and mechanical leaf removal in the bunch zone (*Vitis vinifera* L. cv Barbera): Effects on berry composition, health, yield and wine quality, in a warm temperature area

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- Fruit-zone leaf removal (LR) is one of the most common summer vineyard practices, used to improve ripening and reduce fungal disease. Its success has often been associated with the *phenological stage* of intervention, *severity* of the intervention, and *climate* [*we could probably add block vigor here*]. Since Barbera –one of the main Italian varieties- is highly acidic and highly vulnerable to *Botrytis*, these Italian authors had good reason to study the influence of leaf removal method (hand or mechanical) and leaf removal timing (fruit set or veraison), on the efficiency of pesticide applications, yield, and the quality of the resultant wines.

- The study took place in Carpeneto (North Italy) from 2001 to 2003. Climatic conditions were very different these 3 years, with 2002 very wet, and the flanking 2001 and 2003 dry and warm. The Barbera (clone R4)/5BB vines were 14 years-old at the start of the trial, trained to a Guyot in espalier, and spaced at 1.0 x 2.5 m. The trial design was a completely randomized block with 3 replicates per treatment. There were a total of 8 treatments:

- |                        |                              |
|------------------------|------------------------------|
| 1) No LR               | + Anti-Botrytis fungicide    |
| 2) Early hand LR       | + Anti-Botrytis fungicide    |
| 3) Early mechanical LR | + Anti-Botrytis fungicide    |
| 4) Late hand LR        | + Anti-Botrytis fungicide    |
| 5) Late mechanical LR  | + Anti-Botrytis fungicide    |
| 6) No LR               | (No anti-Botrytis fungicide) |
| 7) Early mechanical LR | (No anti-Botrytis fungicide) |
| 8) Late mechanical LR  | (No anti-Botrytis fungicide) |

- **Effect of LR on pesticide efficiency.** The authors measure this efficiency by spraying a mixture that contained a tracer that could later be assessed by a colorimetric method. LR significantly improved spraying efficiency in all 3 years of the trial.

- **Effect of LR on cluster health.** The effect varied with the year. In 2001 – a year of strong *Botrytis* pressure- LR improved cluster health. In 2002 –a year of strong sour rot incidence- LR was not able to reduce the spread of the disease. In 2003 – a year prone to sunburn- the control vines fared better than those that had their leaves removed. In this last year, the early LR showed less negative effects than the late LR.

- **Effect of LR on yield.** *Yield* and *cluster numbers* tended to be lower in the LR. Since this yield reduction affected both manual and mechanical operations, it was probably caused by inadvertent removal of clusters by hand, and machine damage, respectively. Another possible explanation offered by the authors is a decrease in shoot fertility in the years after LR. *Berry weights* were also lower, but only if the

LR was performed late (veraison) and by hand. A possible explanation here could be that late LR caused an increase in fruit temperature, and in turn, higher berry dehydration that led to weight loss.

• **Effect of LR on must composition.** The effect of LR on *Brix* depended on the year. In 2001, only the LR performed by hand at veraison caused a significant increase in *Brix*. In 2002, both manual LR treatments –early and late- increased *Brix*. And in 2003, there was no effect (this was a year in which ripening conditions were already optimal). As for *titratable acidity*, the results were extremely variable for the authors to draw conclusions (higher in the LR vines in 2001, lower in the LR vines in 2002, and unaffected in 2003). Similar to *Brix*, LR increased skin *total phenols* and *anthocyanins* only in 2002, the year with wet and cool weather.

• **Effect of LR on wine composition and sensory characteristics.** The positive effect of LR on total phenols observed in 2002 was also observed in the wine (whereas it had the opposite effect in 2001). The authors also ranked the wines according to the following sensory parameters: color intensity and acceptability, odor intensity and acceptability, taste balance and acceptability, and total acceptability. [They do not mention whether “intensities” and “acceptabilities” were scored separately]. In 2002, the best wines in terms of their sensory characteristics (particularly color) and acceptability were the LR wines that had been hand-treated. This was also true for 2003, but the differences were less obvious.

So, how do we know whether to remove leaves, when, and how? Here are some guidelines based on the conclusions of this study:

- \_ leaf removal in Barbera decreased the influence of *Botrytis cinerea* and improved fungicide penetration, therefore, it is a good “weapon” against this disease;
- \_ the timing of intervention –fruit set or veraison- did not have an important impact;
- \_ the method used –hand or machine- did not have an important impact either, except that the operation was 10 times faster by machine;
- \_ what did have an important impact was the individual year’s weather –cold conditions (unfavorable for ripening) improved quality, and warm conditions hurt quality (higher sunburn risk).

Quoting the authors, “in warmer areas or years, or in south-exposed vineyards, the real usefulness of leaf removal needs to be accurately evaluated. From this point of view, a randomized leaf-removal performed mechanically may prove advantageous over a manual intervention removing leaves around the clusters”. If only we could know early on whether the growing conditions would be favorable or unfavorable for ripening!

<i>Effect of LR on:</i>	<i>2001 (warm, dry)</i>	<i>2002 (cold, wet)</i>	<i>2003 (warm, dry)</i>
<b>Pesticide efficiency</b>	↑	↑	↑
<b>Cluster health</b>		–	
<b>Yield</b>	↓	↓	↓
<b>Brix</b>	↑ (only hand, veraison)	↑ (only hand)	–
<b>Total phenols</b>	–	↑	–
<b>Anthocyanins</b>	–	↑	–

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