



## Early defoliation (hand vs mechanical) for improved crop control and grape composition in Sangiovese (*Vitis vinifera* L.)

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- With world-wide wine production exceeding consumption, crop control is currently a priority in many viticultural regions of the world. This is usually achieved through winter pruning in combination with cluster thinning. But whereas these practices work well in moderate-vigor situations, that's not necessarily the case in vigorous vineyards, where crop control can create excessive shoot growth and yield compensation due to a boost in the development of basal and secondary buds.
- As a result, and in the authors' opinion, alternative ways of controlling crop should be explored. The current candidates with the most likelihood to succeed include: *growth regulators*, *mechanical flower or berry thinning*, and *early leaf removal*. The goal of this study is to determine whether pre- or post-bloom leaf removal, conducted by hand or mechanically, is able to limit yields in a high-cropping cultivar such as Sangiovese.
- The study took place from 2004 to 2006 in Bologna, Italy, in a 10-yr old Sangiovese/SO4 trained to a vertical shoot positioned horizontally-divided canopy (double curtain). The authors compared the following treatments:
  - 1) **Non-defoliated control;**
  - 2) **Hand removal of the 6 basal leaves at the stage of "separate flower buttons";**
  - 3) **Mechanical removal of the 6 basal leaves at the stage of "separate flower buttons";**
  - 4) **Hand removal of the 6 basal leaves at fruitset;**
  - 5) **Mechanical removal of the 6 basal leaves at fruitset.**

• The mechanical leaf removal was done with a tractor-mounted leaf-plucker, using suction coupled to rotating cutting blades (due to the divided canopy, only the outer side of the foliage walls could be leaf removed). The day before imposing the leaf removal treatments, the authors tagged specific shoots for follow up. To be able to determine the number of flowers in a cluster before and after the different treatments, they photographed the basal clusters in the tagged shoots against a black background. Then, by comparing the number of flowers counted in the photos with the actual number of flowers they counted in a sample, they were able to establish a linear relationship between the two. The authors also monitored leaf area with a leaf area meter, keeping main and lateral contributions separate. At harvest, the tagged clusters in each of the treatments were evaluated for compactness, incidence of rot, juice basic chemistry, and juice anthocyanins and total phenols.

• Results .

	Effect on:	Hand LR	Mechanical LR
CANOPY	Main leaf area	—	—
	Leaf area / Fruit weight	—	—
CLUSTER	Fruitset	↓ ↓ (particularly pre-bloom)	↓
	Next-season fruitfulness	—	—
	# of berries	↓ ↓	↓
	Berry size	—	—
	Cluster weight		↓
	Cluster compactness	↓	↓
	Bunch rot	— (reduced, but not significantly)	— (reduced, but not significantly)
	Yield	↓ ↓	
JUICE	Brix	↑ (particularly pre-bloom)	↑ (particularly pre-bloom)
	TA, pH	—	—
	Anthocyanins, Total phenols	↑	↑

In conclusion, *manual leaf removal* resulted in a pronounced decrease in fruitset, yield per shoot, cluster weight, berries per cluster, and cluster compactness, and an increase in fruit quality traits such as soluble solids, anthocyanins, and total phenols, regardless of timing of the leaf removal. The year-to-year variations were small. On the other hand, *mechanical leaf removal* was able to deliver most of the advantages of hand leaf removal, but to a lesser extent. With mechanical leaf removal, the challenge is to strike the right compromise between stripping off sufficient leaf area to elicit an effect, and yet, not too much to cause damage to the inflorescences. In the authors' opinion, mechanical leaf removal has potential, but its performance clearly needs improvement. Overall, early leaf removal was effective in reducing yield and improving grape quality in Sangiovese. The authors do caution, however, against excessive cluster exposure in warm climates, which can decrease color and may cause sunburn.

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