



Effects of mechanical thinning on yield and fruit composition of Tempranillo and Grenache grapes trained to a vertical shoot-positioned canopy

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- Hand thinning is a common cultural practice in Europe. However, due to the high costs involved, there is a great interest in mechanizing this practice. As we know, most other viticultural practices have already been successfully mechanized: leaf removal, shoot thinning, sucker removal, tip removal, hedging, wire moving, and harvest.

- Let's briefly review the history of mechanical thinning. Mechanical thinning using a mechanical harvester was developed in the northeast United States in the early 1990's, in an effort to reduce yield and improve ripening in Concord grapes. Australian researchers further refined it in the next decade, so they could reduce the very high yields of their minimally-pruned Cabernet Sauvignon. The Australians tended to position the beater bars to target only *a portion of the fruit*, thus avoiding the risk of overthinning. European conditions, however, present a new challenge to mechanical thinning: very low yields and the widespread spur-pruning cause the fruit to be concentrated *in a very small zone*.

- The goal of this study was to investigate the effect of mechanical thinning on **yield** and **fruit composition** of Tempranillo/110R and Grenache/110R vines, spur-pruned on a bilateral cordon, and trained to a vertical shoot-positioned system (two shoot-positioning operations per year). The study took place on two locations in La Rioja, Spain, in 2006 and 2007. The Tempranillo site had a clay loam soil, and the Grenache site had a loam-sandy soil. Neither site received any irrigation.

- The authors implemented 3 treatments:

- ? unthinned control

- ? mechanical thinning at low intensity (470 beats per minute)

- ? mechanical thinning at high intensity (500 beats per minute)

Mechanical thinning (MT) was performed with a New Holland VL610 grape harvester (Coex, France), fitted with two pairs of bow rods. The rods were adjusted so that they struck the vine trunks, not the fruit directly, causing thinning to occur due to the canopy vibration. The timing of the mechanical thinning was *10 days before veraison* for the Tempranillo, and at *10-15% veraison* for the Grenache. There were 5 replicates per treatment, with 20 vines per replication (in the Grenache site there were only 2 treatments: a low intensity mechanical thinning and a control).

• **Results:**

1) **Yield:** MT successfully reduced the yield of both varieties on both years by about 65%. Other studies reported reductions within this range. The intensity of MT did not have an effect on yield, probably due to the small difference between the two treatments (470 vs. 500 beats, or 6% difference).

2) **Berries per cluster:** The yield reduction was due to both a “cluster thinning” and a “berry thinning” in Tempranillo (25% fewer clusters, 25% fewer berries per cluster); and to a “berry thinning” in Grenache (41% fewer berries per cluster, same amount of clusters per vine). Other studies reported that mechanical thinning affected mostly the clusters, not the berries. [*I guess the lesson here is that Grenache clusters hold on more strongly*].

3) **Berry weight:** Even though MT caused some reduction in berry weight, this reduction was only significant in Tempranillo. Other authors have reported an increase in berry size with MT, as well as with hand thinning.

4) **Fruit health:** MT significantly reduced *Botrytis* infection. This was likely due to the reduced cluster compaction. Thus, MT did not negatively impact fruit health or quality. (Some damaged clusters and berries did remain attached after MT, but they desiccated in the next 5-7 days, having no impact on the quality of the harvested fruit).

5) **Fruit composition:**

- **Brix:** MT led to significantly higher Brix on both varieties. This increase in sugar accumulation could be due to an increase in canopy surface/yield ratio. Other studies have reported similar higher sugar concentrations with MT.

- **TA:** MT showed significantly lower TA values in Tempranillo, but not in Grenache.

- **pH:** no effect.

Other studies have reported no or little effect of MT on TA or pH.

- **anthocyanins:** no effect in either variety, either per berry or per berry mass.

- **total phenols:** MT significantly increased the concentration of berry phenolics in both varieties, but there was a strong *treatment x year* interaction. That is, for Tempranillo, MT increased phenols in 2007 but not in 2006; for Grenache, MT increased phenols in 2006 (unfortunately, this parameter was not determined in 2007).

In conclusion, mechanical thinning using a mechanical harvester allowed the regulation of yield in a VSP vineyard in a quick and cost-effective way. Mechanical thinning also has the potential to improve fruit quality, as measured by the increased Brix and increased total phenols in certain years. In the authors' opinion, mechanical thinning could be *particularly relevant for Grenache*, since this variety showed one of the lowest total phenol levels in a study that compared eight different varieties.

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