Fruit Thinning in Wine Grape Varieties

Cluster thinning is often employed in wine varieties to help achieve a certain crop load and quality level. The amount of fruit to remove from a given vine is a function of many individual factors, including vine vigor, variety and rootstock, growing season conditions, and even the contract with the buyer. Because conditions in eastern North America can vary greatly from year to year, the need for cluster thinning and the amount to be removed can also change every season. The goal of cluster thinning, then, is to achieve both the quality *and* quantity parameters that will satisfy both the grower and their buyers.

When clusters are removed from the vine, we are altering its *crop load* – the balance of exposed leaf area and fruit. Cluster thinning will have the greatest impact on vines that are over cropped, meaning they have more fruit than the vine can get to the desired level of maturity. By removing clusters, we decrease the number of berries that receive nutrients and photosynthates from the vine, which ends up improving the overall quality of the remaining crop.

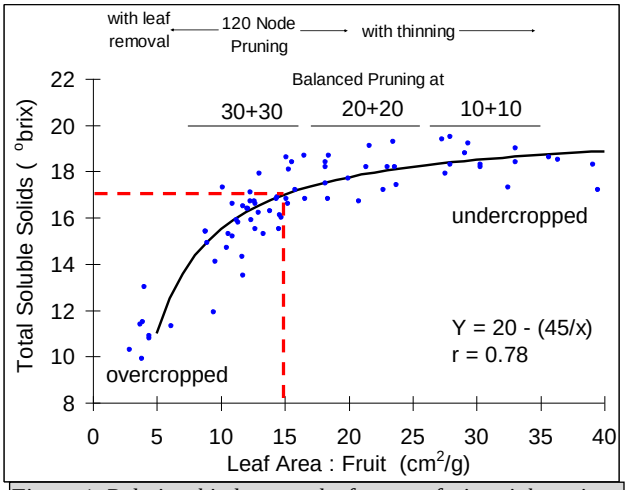

Figure 1. Relationship between leaf area to fruit weight ratio and soluble solids in Concord. Similar relationships have been found in studies with other grape varieties.

Source: Dr. Terry Bates, Cornell University

The graph shown here is based on Concord growth and development, but it illustrates the point quite well (similar curves have been found in other grape varieties). Vines that are over cropped have a low leaf area to fruit ratio, and would be located on the left end of the graph (Figure 1). By removing some of the clusters, we increase the ratio of leaf area to fruit (moving to the right on the curve), approaching the point where the curve starts to level off. The goal of everything we do in the vineyard is to maintain the vines as close to that "shoulder" of the curve as possible. That is where vineyard production is most efficient – achieving optimum quality while producing a full crop.

On the other hand, when vines are vigorous and produce large canopies (as many vineyards are this year), they can be under cropped, which would put them to the right side of the curve. By removing clusters, we push the vines even further to the right on the graph, which shows that we wouldn't expect to see any further improvement in fruit quality – soluble solids, in this case. In other words, thinning fruit in this situation provides no quality benefit, but penalizes the grower by reducing the yields that they would otherwise get paid for.

Notice also that nowhere on this graph is the phrase "tons per acre" used. The ability to ripen fruit is not determined by an acre of land, but by the individual vines within that acre, and how they are managed by the grower. The measure of pounds/vine is somewhat of an improvement when discussing a relationship between yield and quality, but even that is not adequate because it does not take into consideration the size of the vine, i.e., how much leaf area it is capable of producing.

Putting It Into Practice

The impact that cluster thinning will have on the final crop will be influenced by just how much is removed and when the clusters are removed.

Timing

Clusters can be removed from the vines anytime during the growing season, but the impacts to the remaining fruit and the vine will vary depending on when it is done. Most fruit thinning is done between fruit set and near the end of veraison. One potential impact of thinning closer to fruit set is that the vine will compensate for the removed crop by producing larger berries on the remaining clusters. By removing competing sinks from the vine, more energy is directed to the growing berries that are undergoing cell division, which will create larger berries. Waiting to thin until lag phase or the ripening phase of berry development generally will not result in larger berries. This is not always the case, however. If vines are vigorous and the rate of cell division is not limited by the larger crop already, cluster thinning would not impact final berry size and weight.

Another question that gets asked in relation to timing is how long to let "extra" fruit hang on the vine if it is being used to slow down shoot growth. To answer this, we go back to the concept of competing sinks for nutrients and photosynthates. During the vegetative stage of development (before veraison), shoot tips and clusters compete for the vine's resources. Reducing the strength of the sink that competes with shoot growth, by removing clusters, will enable more resources to be devoted to shoot development. In other words, the longer that fruit hangs on the vine, the longer it competes with the shoots as a sink for resources from the vine. So in this case, fruit should be removed once the vines reach veraison.

Thinning fruit after veraison is a game of diminishing returns as it gets later in the season. Both average temperature and day length are declining at this point in the season, so thinning later means that there is less opportunity for the vine to take advantage of the reduced crop load. To maximize the potential impact to ripening, fruit should be thinned at or prior to veraison.

How Much to Remove

This is one of those areas where our standard Extension answer really applies – "It depends." And it depends on a lot of things – the growing season, the variety and rootstock, characteristics of the site, and the buyer's quality and quantity expectations. But it all leads back to the idea of having a balance of adequate leaf area to ripen a given amount of fruit.

Part of the struggle with this question is the over-hanging myth that lower yields automatically result in better grape and wine quality. This can be true to a certain point, as illustrated by the crop load figure discussed earlier in this article. But at some point, there is no further benefit gained from reducing crop below a certain level. Vines that are under cropped are capable of producing fruit with negative characteristics similar to over cropped vines.

The only real way to know how much to remove is through experimentation and trials on your own vineyard, and with detailed record keeping. By understanding how a vineyard block behaves under different types of conditions, and how that impacts the fruit that comes from it, a grower can start to get a sense of how much fruit those vines can adequately ripen under a given set of circumstances.

The other consideration that must be made is how the grower will be compensated for thinning their crop if it is required by their buyers. Not only is there a direct loss of yield, but the practice itself costs money as well, and growers and wineries should be having conversations about how that will be handled. Trent Preszler, Todd Schmit and Justine Vanden Heuvel did some very nice work on this, developing a model for how to calculate the minimum price needed to compensate growers for a particular level of cluster removal (a summary of the paper is reproduced at the end of this article). Whether this particular model or other means are used, it is important the economic impact of the practice to the grower be given adequate consideration.

Resources:

Hellman, E.W. and T. Casteel. “Crop Estimation and Thinning” in *Oregon Viticulture*, ed. Edward Hellman. Oregon State University Press, 2003.
http://winegrapes.tamu.edu/grow/tentative%20pdf/thinning.pdf

Kliewer, M. and N. Dokoozlian. 2005. Leaf Area/Crop Weight Ratios of Grapevines: Influence of Fruit Composition and Wine Quality. Am. J. of Enol. and Vit. 56(2): 170-181.

Pool, R. 2001. Estimating and adjusting crop weight in Finger Lakes vineyards.
http://www.fruit.cornell.edu/grape/pool/cropsize.html

Preszler, T., T. Schmit and J. Vanden Heuvel. 2010. A model to establish economically sustainable cluster thinning practices. http://agribusiness.dyson.cornell.edu/docs/pub/trade/RIPE-Econ-Cluster-Rem.pdf

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Sun, Q., G. Sacks, S. Lerch and J. Vanden Heuvel. 2012. Impact of Shoot and Cluster Thinning on Yield, Fruit Composition and Wine Quality in Corot Noir. Am. J. of Enol. and Vit. 63(1): 49-56.

Skinkis, Patty. “Crop Thinning: Cluster Thinning or Cluster Removal”.
http://www.extension.org/pages/31767/crop-thinning:-cluster-thinning-or-cluster-removal