



Estimation of grape quality in vineyards using a new viticultural index

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- Five viticultural parameters have been proposed in the literature as particularly important for defining a balanced vine able to produce high quality grapes: 1) total leaf area/yield, 2) yield/pruning weight, 3) pruning weight/linear meter of canopy length, 4) total leaf area/linear meter of canopy length, and 5) leaf density (leaf layer number). For very high-quality production, 2 more variables have been added to the list: 6) canopy surface area (exposed leaf area), and 7) visual assessment using an evaluation card (which, in turn, makes use of some of the above parameters).
- It would be really useful for the wine industry to be able to evaluate potential grape quality in the vineyard in a fast and reliable manner using the most relevant of these parameters. Towards this goal, the current authors have already successfully used: 1) the ratio of canopy surface to yield, as well as 2) a score-sheet card developed by them, called the “Vitur” card. (See the original article for a reproduction of this card. Briefly, the “Vitur” card includes the following criteria: canopy surface/yield, leaf layer number, leaf health status, water stress symptoms, presence of growing tips, vigor, fruit health status, fruit exposure, cluster size, fruit color homogeneity, berry size.) But the “Vitur” card, like every visual evaluation card, has an obvious drawback: its subjectivity. The goal of this study was to analyze the relationships between the main viticultural parameters, juice composition, and the “Vitur” score value, in an effort to develop a more objective method of assessing vine balance.
- The study took place in La Rioja, Spain, during 2002-2004, on VSP-trained Grenache and Tempranillo. Using 10 representative vines, the authors measured the following: 1) **growth and yield parameters**: shoot number, total (main+lateral) shoot length, cluster number, yield, pruning weight, total leaf area, canopy leaf area; 2) **quality assessment** by Vitur score-sheet; 3) calculation of the parameter “(canopy surface/yield) / total shoot length” (CS/Y/TSL or “Toda index”); and 4) **grape analysis**: polyphenol index, color intensity, total anthocyanins, extractable anthocyanins, sugar, total acidity, tartaric acid, and malic acid.
- **Results.** 1) When the authors calculated “(canopy surface/yield) / total shoot length”, or the Toda index, it showed a strong correlation ($R^2=0.856$) with the Vitur value obtained both in 2003 and 2004. 2) In Tempranillo, the authors found a good correlation between CS/Y (canopy surface/yield), on the one hand, and phenolic composition and color intensity on the other. But the correlations improved substantially when CS/Y/TSL, rather than CS/Y, was used. In Grenache, the correlations were somewhat different. The authors found a poor correlation between CS/Y/TSL and color intensity, but a good correlation between CS/Y/TSL and phenolic composition. 3) The values provided by the Vitur scorecards also presented good correlations with the various grape compositional parameters, but the correlation coefficients were lower than those corresponding to the CS/Y/TSL. Finally, 4) the authors found the best correlation between quality indices and grape composition to be that between the CS/Y/TSL index and sugar content ($R^2=0.658$), which was much higher than that obtained with the Vitur scorecard ($R^2=0.381$).

- As the authors explain, the ratio between canopy surface area/yield is a well-known indicator of vine balance. Furthermore, total vine shoot length is a good indicator of vine vigor. Therefore, the compounded CS/Y/TSL index is an excellent estimator of a balanced relationship between *vegetative growth* and *yield*.

In summary, the Toda index (canopy surface/yield/total shoot length) proved to be a more powerful indicator for grape quality assessment than other viticultural indices. The authors suggest that the Vitur score-sheet, which is necessarily subjective, can be replaced with the new Toda index, which is faster and more objective. Additionally, the Toda index displayed good correlations with the lab phenolic measurements, and though it is probably early to say, the authors believe it could be useful in estimating phenolic composition.