

## Abstract

This paper aims at providing an easy, fast and non-destructive method for the early estimation of vineyard yield. The proposed method takes advantage of the correlation between the bunch volume at different phenological stages and its weight at harvest.

Experimental measurements of the grape bunch height and circumference were carried out manually, using a dedicated non-destructive tool. The bunch volume is then estimated, using the cone volume formula.

More than twenty thousands data were statistically processed : these data cover four vintages (2001-2004), three phenological stages (fruit set, bunch closing, and veraison and 19 *Vitis vinifera* cultivars.

The aim of this method is to build correlation models between the measured volume and the real weight at harvest, in order to predict the average bunch weight per plot at an early stage. Thus, models were built for each variety and at each specific stage.

Then, the influence of the growing region, the phenological stage, the variety and the vintage were studied. The model accuracy proved to be highly influenced by the number of plots included in the model. As for the growth stage, the average weight prediction is reliable from the bunch closing stage, with cross-validation errors below 20% and below 13% at veraison stage. The models were tested on an independent test set- vintage 2004 -, with an error increase of 1.5-2 compared to the cross-validation one.

Three homogeneous clusters of varieties, with quite similar relationship between early volume estimation and harvest weight could be found, enabling models to be built on groups of varieties, and not only single cultivars. As for the vintages, year 2003 was atypical from all the others; thus, introducing this year into the models impaired somewhat their performances, for predicting bunch weights on measurements coming from on a different year.