



Thesis title: Determining the main factors of grape ripening dynamics

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Abstract (max 300 words)

Topic position & objectives:

The aim of this study was to describe sugar accumulation with a sigmoid model and to determine the main drivers influencing its dynamics, such as accumulation speed and maximum sugar content. Further the suitability of the mathematical model to describe and predict grape maturity and hence the harvest date was evaluated.

Methods:

The data set used in this study includes climate, vineyard and grape analysis data from 2004 to 2012 for six different soil-cultivar combinations, situated in climatic identical locations. Implementing the pre-harvest sugar accumulation data in gram per litre and gram per berry into a Sigmoid model delivered maximum sugar content as well as the speed of accumulation and maturity dates in degree days for 54 modalities which were subsequently used for ANOVA and Principle Component Analysis. Further, the maturity dates were tested against the harvest dates in order to evaluate the power of prediction of the model.

Results:

Substantial differences in sugar accumulation behaviour among the soil types and varieties were observed. The maximum sugar concentration and its increase rate are particular depending on yield parameters and leaf to fruit ratio whereas the sugar content per berry and its accumulation rate are influenced by water availability and photosynthetically active leaf area. The prediction power of the model could be seen as good for the majority of modalities, but essential errors in particular vintages show the necessity of model calibration with additional factors such as water dynamics.

Main conclusions:

Main drivers of sugar accumulation could be determined and confirmed by precedent studies using modelled field observation data for the statistical analysis. The model is describing well natural behaviour and makes a data set of sugar values comparable. Further it can be seen as useful to adapt the model for the particularities of a soil-cultivar-climate combination in order to proceed further going investigation of plant physiology or to use the model as a prediction tool for maturity.

Keywords (5): maturity, sigmoid model, sugar accumulation, prediction, terroir