



Master's Thesis Title: The use of carbon isotope discrimination measured in juice as indicator of grapevine genotype responses to seasonal variation in soil water availability.

Student name:	Martina HAINES
Institution/Company involved:	I'Institut des sciences de la vigne et du vin (ISVV)

Jury members (name/position):

Jason SMITH (Viticulture, Hochschule Geisenheim University)
Cornelis VAN LEEUWEN (Viticulture, Bordeaux Sciences Agro)
Doris RAUHUT (Microbiology, Hochschule Geisenheim University)
Marco HOFMANN (Viticulture, Hochschule Geisenheim University)

Names and emails of supervisors:

Jason SMITH	Jason.Smith@hs-gm.de
Cornelis VAN LEEUWEN	vanleeuwen@agro-bordeaux.fr

Date and location of the oral examination (if known): 25 September 2017

Confidential: No

Abstract (max 300 words):

Topic position and objectives: This research project aims to aid in the selection of drought-resistant plant material to address the impacts of forecasted water deficits associated climate change in AOC Bordeaux. The research objectives are as follows: 1) determine if there a difference in the carbon isotope composition ($\delta^{13}\text{C}$) among a selection of varieties of *Vitis Vinifera*; 2) if there is a difference in $\delta^{13}\text{C}$ among varieties, determine if this difference is due to differences in soil water status during maturation; and 3) explore the application of $\delta^{13}\text{C}$ as a tool to compare the responses of *Vitis Vinifera* to seasonal variation in water availability.

Methods: Five years of $\delta^{13}\text{C}$ measurements in juice, at harvest, for 48 varieties of *Vitis vinifera* were compared. Water balance models were created to compare the $\delta^{13}\text{C}$ measured in varieties based on similar average fraction of transpirable soil water during sugar accumulation.

Results: There are significant differences in $\delta^{13}\text{C}$ among varieties in all years, except 2014. When grouped by similar average FTSW during sugar accumulation, there are significant differences in $\delta^{13}\text{C}$ among varieties in wetter conditions and in drier conditions. There is a significant linear relationship between $\delta^{13}\text{C}$ in wetter conditions and $\delta^{13}\text{C}$ in drier conditions. There are, however, also significant differences in the absolute difference between average $\delta^{13}\text{C}$ in wetter conditions and average $\delta^{13}\text{C}$ in drier conditions among varieties.

Main conclusions: This thesis showed that there is a wide range in $\delta^{13}\text{C}$ measured on grape juice at ripeness and significant differences among varieties. It is extremely unlikely that significant differences among varieties are due to different soil water status during maturation. When combined with a measure of soil water status, $\delta^{13}\text{C}$ is a promising tool to compare responses to variation in water availability. There is a wide range of response to drought that could be exploited to adapt to increasing water deficit in Bordeaux.

Keywords (5): climate change, Vitis Vinifera, drought response, carbon-13 discrimination, carbon isotope