

CABERNET SAUVIGNON RIPENING IN CHILE: FOLLOW-UP STUDY FROM 2012 TO 2018

Authors: M. Isabel MOENNE^{1*}, Ricardo RODRIGUEZ¹, Juan CURY¹, Miguel RENCORET¹

¹VSPT Wine Group, Avenida Vitacura 2670 Piso 16, Santiago, Chile

*Corresponding author: mmoenne@vsptwinegroup.com

Abstract:

Context and purpose of the study – Temperature is a relevant parameter during vineyard development, affecting vine phenology and grape maturity. Moreover, the climate of the different Chilean valleys influences the varieties cultivated, the ripening period and the final quality of the wines. The use of growing degree days (GDD) is known worldwide for the study of climate in viticulture regions. However, little is known about the evolution of maturity and the sugar loading stop, based on this parameter. GDD, as being independent of the date variable, allows incorporating the effect of climate in the analysis. The present study was aimed to understand the variation between seasons and the effect of temperature in grape maturity and in bioclimatic index. We found correlations that allow predict the behavior of next years, based on growing degree days.

Material and methods – Temperatures were collected from national agro climatic network (AGROMET). Four meteorological stations were consulted depending on the location of the company vineyards. Growing degree days (GDD) were calculated with a base temperature of 10°C from September 1 through March 31. Huglin index, a bioclimatic index of the ripening period, was calculated using daily mean temperature, daily maximum temperature and a day length coefficient of 1, because the vineyard is placed in latitude lower 40°00'. Grape maturity was monitored once a week, recording the sugar concentration and the volume of grapes with Dyostem machine. These data was used to calculate the sugar loading dynamics and the date of sugar loading stop. In average, 145 blocks of Cabernet Sauvignon were measured from four different valleys (Maule valley (M), Curicó valley (C), Maipo Valley (Ma) and Rapel valley (R)).

Results – For the three valleys, the sugar loading stop was beginning at lower GDD for 2015 and 2017, influenced by the higher temperatures in January. But the average potential alcohol was lower in these years, reaching 12.1; 12.3; 13.1 and 11.4 %v/v at 2015 and 12.4; 11.3; 13.5 and 11.9 %v/v at 2017 for M, R, Ma y C respectively. The rate of sugar loading was higher in M and C valley than R and Ma valley for 2015 and 2017, indicating that the high temperatures affect greater R and Ma valley than the other valleys studied. Moreover, in 2017, the dynamics of maturity (mg of sugar per berry) were lower compared with 2015, due to the higher temperatures registered in Cabernet sauvignon blocks in January to April. The maximum temperatures in 2017 were 39.4°C including 13 days with temperatures over 35°C in M valley, 36°C including 7 days with temperatures over 35°C in R, 37°C including 5 days with temperatures over 35°C in Ma valley and 35.7°C including 3 days with temperatures over 35°C in C valley. These temperatures generated a blockage of vines. On the other hand, the year 2014 was the best season, with average potential alcohol at the sugar loading stop of 14.5; 13.6; 14 and 13%v/v for M, R, Ma and C valley. In 2014, the maximum quantity of sugar per berry was higher (250-350 mg of sugar per berry), perhaps because the vines have enough time to load sugars, with lower temperatures from January to April compared with the other years. A year to year comparison of the 4 valleys reveals that the maximum quantity of sugar per berry was decreasing the last three years, from 200-300 mg of sugar per berry in 2012, 2013 and 2015 to 170-260 in 2016, 2017 and 2018 approximately. Analyzing the bioclimatic index, M valley has a warm climate from 2014 onwards; C valley has a warm temperate climate from 2014 onwards and R and Ma valley has a warm climate the last two years. The data of bioclimatic index showed a tendency towards a warm climate. The GDD curves have a polynomic tendency respect to the date. These results could be used to predict GDD for 2019 and a probable date of harvest.

Keywords: Grapevine, Degree day, Cabernet, Sauvignon, Climate, Ripening, Maturity.

1. Introduction.

Cabernet Sauvignon Ripening in Chile: Follow-up study from 2012 to 2018

M. Isabel Moenne¹, Ricardo Rodríguez¹, Juan Cury² and Miguel Rencoret¹

¹ VSPT Wine Group, Avenida Vitacura 2670, 16th Floor, Las Condes, Santiago de Chile.

Introduction

Cabernet Sauvignon is the most important grape vine variety in Chile, representing 28.7% of the liters produced.

Temperature is a relevant parameter during vineyard development, affecting vine phenology and grape maturity. The use of growing degree days allows us to become independent of the season variable. However, the relationship between this parameter and the maturity of grapes is unknown.

This study was aimed to understand the variation between seasons and the effect of temperature in grape maturity and bioclimatic index.

Data analysis

The data were collected from four important Valleys for the wine industry, during seasons 2012 to 2018



Temperature data were analyzed from five meteorological stations, depending on the location of company vineyards

Grape maturity was monitored once a week

Growing degree days (GDD)

Values calculated from September 1st through March 31st

$$GDD = \frac{T_{max} + T_{min}}{2} - Base Temp \quad \text{Where Base Temp} = 10^{\circ} C$$

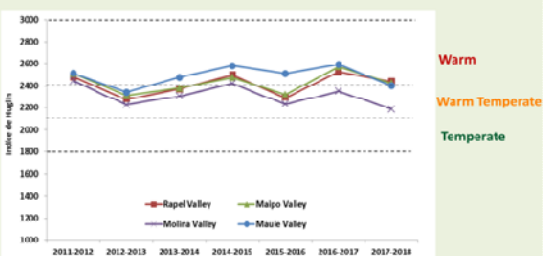
Huglin Index (HI)

Values calculated from October 1st through March 31st. K is the day length coefficient, Tmean is daily mean temperature and Tmax is daily maximum temperature

$$HI = \sum_{October\ 1st}^{March\ 31st} \frac{[(Tmean - 10) + (Tmax - 10)]}{2} * K$$

The Huglin Index

Evolution through the seasons in the blocks selected from the different Valleys

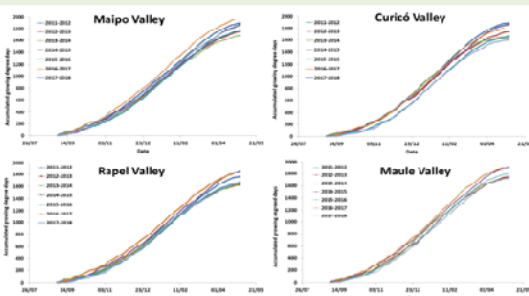


• Maule Valley: Warm climate

• Maipo and Rapel Valleys: Its showed a tendency towards a warm climate

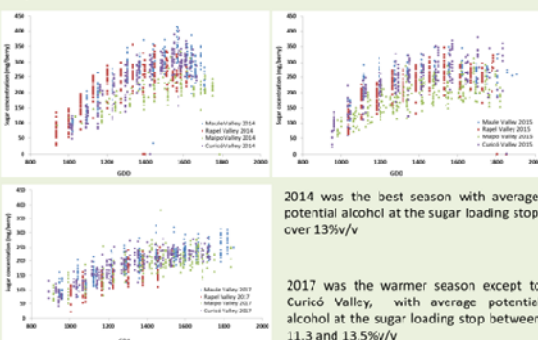
• Molina Valley: Warm Temperate

Growing degree days (GDD)



Curves of GDD suggest a higher accumulation in Maipo and Maule Valley. The lower accumulation was reached in Rapel Valley

Dynamics of maturity



2014 was the best season with average potential alcohol at the sugar loading stop over 13%/v

2017 was the warmer season except to Curicó Valley, with average potential alcohol at the sugar loading stop between 11.3 and 13.5%/v

A comparison of the 4 Valleys reveals that the maximum quantity of sugar per berry was decreasing the last three years, from 200-300 mg of sugar per berry in 2012, 2013 and 2015 to 170-260 in 2016, 2017 and 2018

High temperatures affect greater Rapel and Maipo valley than the other valleys



The rate of sugar loading was lower in Rapel and Maipo Valleys in 2015 and 2017

Conclusion and perspectives

- Bioclimatic index shows a tendency towards a warm climate.
- In the four studied valleys we use the GDD curves to predict a probable date of harvest.
- The results showed a good first correlation, with a deviation of maximum 7 days from the real GDD data (data not showed).
- In the future, this opens the opportunity to predict the behavior of the season since December of the previous year

References

Forcedo, J. and Carbonneau, A. (2004). "A multicriteria climatic classification system from grape-growing regions worldwide". *Agricultural and Forest Meteorology*, 124(1-2):91-97.

Acknowledgements

Ms. Isabel Moenne is supported by a PAI program from the Chilean National Council of Scientific and Technological Research (CONICYT).