

# SOLUBLE SOLIDS CONTENT AND TITRATABLE ACIDITY ESTIMATES FOR 'MÁXIMO' GRAPEVINE AS A FUNCTION OF DEGREE-DAYS FOR SUMMER AND WINTER GROWING SEASONS

## STIMA DI ZUCCHERI E DELLA ACIDITÀ TITOLABILE DE LA VITE 'MÁXIMO' IN BASE AI GRADI GIORNO NEL CORSO DEL RACCOLTO ESTIVO E INVERNALE

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### Abstract

The increasing importance in producing grapes for wine purpose in the State of São Paulo (Brazil) induced the development of a field trial aiming to characterize the maturation curve during summer and winter seasons for the grapevine IAC 138-22 'Máximo' grafted on the rootstock IAC 766 'Campinas' and trellised with upright branches. The total soluble solids (TSS) values were higher during the winter growing season when compared to the summer growing season. The titratable acidity (ATT) was higher during the winter growing season. Also, polynomial equations of second degree are shown to estimate the TSS and ATT as a function of accumulated degree-days starting at the flowering date.

**Keywords:** grapevine, degree-days, ripening.

**Parole chiave:** vite, grado-giorno, maturazione.

### Introduction

The 'Máximo' grapevine cultivar is gradually replacing others cultivars at the eastern region of the São Paulo State for wine making purposes. Due to the increment of rural tourism and increasing importance in producing handmade wine, 'Máximo' has been utilised and it is necessary to evaluate its potential in accumulating sugar, once harvest takes place during rainy period (January-February), condition which is not favorable to increase berry sugar content.

The growers are changing the date of pruning, allowing a second yield and harvest during drier months (June-July), when the climatic conditions are more favourable to increase berry sugar content. This technique has been used at for fine wine at several states in Brazil: Minas Gerais (Mota *et al.*, 2010) and São Paulo (Regina *et al.*, 2011; Santos *et al.*, 2011). The success obtained using the double cropping for different grape wine cultivars induced the development of this field trial aiming to characterize the maturation curve of the 'Máximo' during the summer and winter growing seasons and develop equations relating sugar content and titratable acidity as a function of accumulated degree-days starting at the flowering date.

### Materials and Methods

The field trial was run in a vineyard of IAC 138-22 'Máximo' grapevine cultivar situated at Jundiá - São Paulo State - Brazil (latitude: 23°12'S; longitude: 46°53'W; altitude: 700m). The climatic classification according to Koeppen is Cfa for lower altitude areas and Cfb for localities with higher altitude. The vines were grafted on IAC 766 'Campinas' rootstock and the eight years old vineyard was conducted with vertical shoot position. The spacing was 2m between rows and 1m between plants. The pruning dates were, respectively, August 8th, 2011 (summer growing season) and February 6th, 2012 (winter growing season).

The experimental design was totally random and a sample

of 100 berries was weekly collected from maturation stage ("veraison") to harvest to evaluate: total soluble solids (TSS) and titratable acidity (ATT). TSS was measured by hand refractometer and ATT was determined by titration using a NaOH 0,1N solution and adopting the value of pH=8,2 as final.

The obtained values of TSS and ATT were compared to the accumulated growing degree-days starting at the flowering date, using a base temperature of 10°C. Through regression analysis, equations to estimate TSS and ATT were developed and the one with higher correlation coefficient was chosen.

### Results and Discussion

Curves of TSS and ATT are shown to characterize the maturation behaviour of 'Máximo' during the summer and winter growing seasons. Also the comparison of TSS and ATT values against accumulated degree-days are shown aiming to help the grape grower to obtain estimations of these parameters using meteorological data.

**Maturation curve** – values of TSS and ATT against time for the summer and winter growing seasons are shown in Figure 1. During the summer growing season the values of TSS obtained at harvest were about 14 °Brix. However, for the winter growing season TSS values reached 17°Brix. The lower values of TSS obtained during the summer growing season were due to harvest coincide with rainy months, while the harvest of the winter growing season happens during month when less amount of rain occurs (drier months). Same behaviour of maturation grape berry sugar content during summer and winter seasons were found by grapevine cultivars in different Brazilian climatic conditions (Mota *et al.*, 2010; Regina *et al.*, 2011).

Concerning on ATT (Fig. 1) it was observed a continuous decrease in values reaching at harvest 110 meq.L<sup>-1</sup> for the

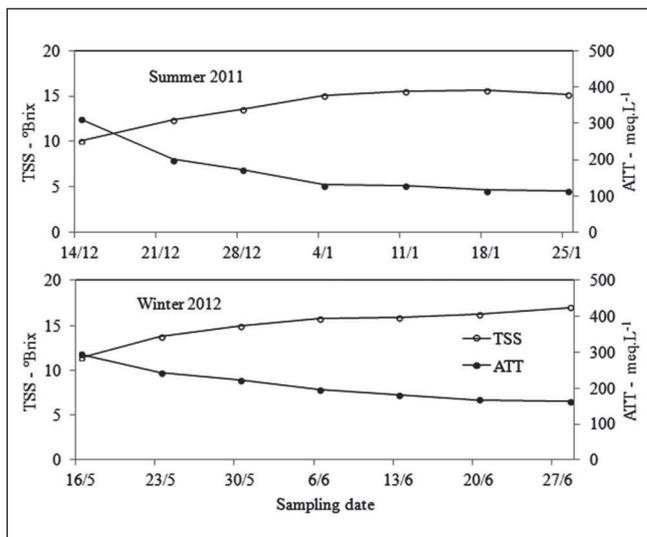


Fig. 1 - Total soluble solids and titratable acidity for 'Máximo' grapevine during summer and winter growing season at Jundiaí (São Paulo, Brazil).

Fig. 1 - Zuccheri e acidità titolabile per IAC 138-22 'Máximo' vite nel corso del raccolto estivo e invernale a Jundiaí (San Paolo, Brasile).

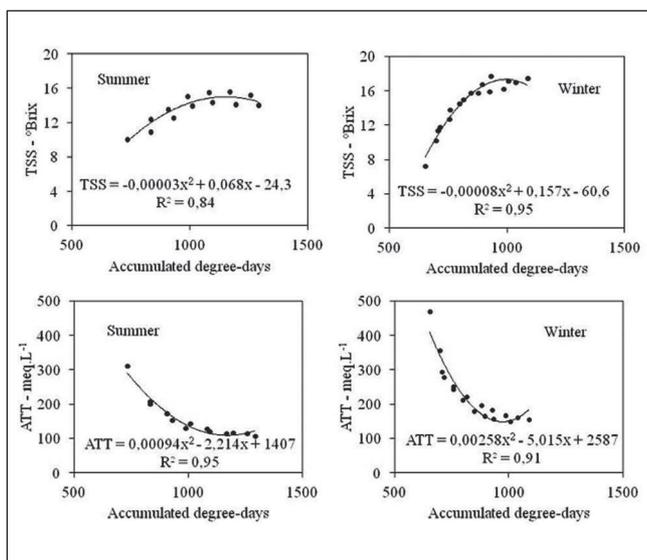


Fig. 2 - Comparison of total soluble solids (TSS) and titratable acidity (ATT) and accumulated degree-days for 'Máximo' grapevine during summer and winter growing season at Jundiaí (São Paulo, Brazil).

Fig. 2 - Comparazione tra zuccheri e acidità titolabile con gradi giorno accumulati durante il raccolto estivo e invernale a Jundiaí (San Paolo, Brasile).

summer and 150 meq.L<sup>-1</sup> for the winter growing season. The obtained values were similar to the values related by Santos *et al.* (2011) for the Syrah cultivar grown at Jundiaí (São Paulo State, Brazil).

**Comparison between TSS, ATT and degree-days** – in Fig. 2 is shown the relationship between the observed values of TSS and ATT and accumulated degree-days from flowering date for the 'Máximo' cultivar grown during the summer and winter seasons. The equations with best fit based on the highest value of the determination coefficient (R<sup>2</sup>) were obtained for the second degree polynomial type as follows:  $Y = a + b x + c x^2$ , where, Y is TSS (°Brix) or ATT (meq.L<sup>-1</sup>); x is the accumulated degree-days (base temperature=10°C) starting at the flowering date and a, b and c are coefficients of the polynomial equation.

In Fig. 2 are shown the values of R<sup>2</sup> and the obtained coefficients for the polynomial equations to estimate TSS and ATT for summer and winter growing seasons based on degree-days.

The obtained values of R<sup>2</sup> were high but it should be stated the limitation in using second degree polynomial equations for values higher than 1200 degree-days (summer) and 1000 degree-days (winter).

## Conclusions

Higher values of sugar content were observed during the winter growing season when compared to the summer growing season for the 'Máximo' grapevine cultivar and degree-days can be used to estimate sugar content and titratable acidity using second degree polynomial equations.

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