GOBIERNO DE CHILE
MINISTERIO DE AGRICULTURA
INSTITUTO DE INVESTIGACIONES AGROPECUARIAS
INIA

USE OF TRUNK GROWTH RATE AS CRITERIA IRRIGATION SCHEDULING ON TABLE GRAPES CV. CRIMSON SEEDLESS, IRRIGATED BY DRIP

G. Selles,[1] [(*)] R. Ferreyra,[1] I. Muñoz,[1] and H. Silva[2]

1) Instituto de Investigaciones Agropecuarias, Av. Santa Rosa 11610, Santiago, Chile.
2) Facultad de Ciencias Agronómicas, Universidad de Chile, Santa Rosa 11611, Santiago, Chile.
Tel 56-2-7575102, Fax 56-2-7575166
gselles@inia.cl

Introduction

Under drip irrigation conditions, a local measurement of soil water content is not representative of the soil volume explored by plant roots, and several measurements are required to integrate soil moisture of the wetted zone beneath the dripper (Selles *et a*l., 2003; Myburgh, 1996). Therefore, physiological indicators of plant water status could be a better tool as plant water stress indicator under these conditions (Selles and Berger, 1990; Goldhamer *et al.*, 1999). A continuous record of trunk diameter changes for irrigation scheduling purpose have been proposed by different authors (Selles and Berger, 1990; Myburgh, 1996; Van Louwen *et al.*, 2000; Goldhamer and Fereres, 2001). In several fruit species maximum daily trunk growth (MDG) or trunk growth rate(TGR) have been shown to be sensitive to soil moisture availability under water stress conditions (Van Louwen *et al.*, 2000; Goldhamer and Fereres, 2001). However, fruit phenological stage can affect trunk growth rate, specially near fruit ripening, even though no water deficit is involved (van Zyl, 1984, Myburgh, 1996, Selles and Berger, 1990, Marsal *et al*., 2002). Several authors have found that trunk maximum daily shrinkage (MDS) are higher in trees under moderate water stress than well irrigated trees (Selles and Berger, 1990; Hugett *et al*. 1992; Goldhamer and Fereres 2001), but, when water stress is more severe, MDS is

[(*)] *To whom the correspondence should be addressed*

smaller in stressed plants than in well irrigated ones (Hugett *et al*., 1992, Ruiz-Sanchez *et al.*, 2004). The aim of this work was to evaluate the possible use of MDG and MDS as indicators for irrigation scheduling of Crimson Seedless table grapes.

Material and methods

The experiment was carried out in a commercial vineyard, during three grape growth seasons (2002/03; 2003/04; 2004/05). The vineyard was located at Curimon, San Felipe Province (Aconcagua Valley), 5th Region, Chile (70º39'17'' West Long. and 30º44' 19'' South Lat.).

Four irrigation treatments were applied: T1, irrigation at 100 % of ET_c all over the season; T2, irrigation at 75 % of ET_c all over the season; T3 irrigation at 50 % of ET_c all over the season, and T4, not irrigated from the beginning of the season until 79 days after bud-break. From these date up to the end of the season irrigation rate of this treatment was alternated between 100 and 50 % of ET_c. The ET_c was calculated from an automatic weather station (ET_o Penman-Montheith method) and a vine appropriates crop coefficient (Williams *et al.* 2003).

Soil water content (SWC) was monitored with a Capacitive Probe, FDR, (Delta –T probe model PR1) on five access tubes in one plant per treatment. In each treatment two wireless electronic dendrometers (Phytec DE -1M, Israel) were installed on the trunk of the vines (at 1.5 m high) and the diameter changes were continually recorded every 30 minutes during all season. At midday, in the same plants Stem Water Potential (SWP) was measured one or twice per week, using a pressure chamber.

Results and discussion

SWC was related to irrigation water applied in each treatment. T1 presented the highest SWC, close to soil field capacity, followed by T2, T3 and T4. Trunk began its growth 20 to 30 days after bud brake (DABB). Trunk growth was fast between fruit set (50 - 60 DABB) until veraison (103-108 DABB) and average MDG during this period was higher in treatments T1 and T2, than in T3 and T4 (significative difference<0.05). However, when veraison began, trunk growth rate decreased or stopped in all irrigation treatments. Myburgh (1996), Ton *et al*. (2004) and Intrigiolo *et al.* (2005) had found similar results in other vine cultivar.

Average MDG was clearly related with soil water content (r^2 = 0,49) from berry set to veraison, but after this period, MDG there was not a related with soil water content (r^2=0,17). On the other hand, between fruit set to veraison a good relationship was found between average MDG and average berry growth rate (BGR). This means that, in this period, the faster the trunk growth, the faster will be the growth of the berry, and a bigger berry size will be obtained at harvest. Berry diameter reached almost the 85% of its final size at veraison. In relation to MDS, it shows a complex behavior, MDS were higher from fruit set to veraison, and was not clearly related with irrigation treatments.

On the other hand, Stem Water Potential measured at midday (SWP) were well related with irrigation treatments. A good relationship was also found between SWP and BGR from fuit set to veraison (r^2 = 0,53). However MDG was more sensible to soil water content than SWP.

In conclusion, our results suggest that MDG and SWP can be used as a tool for irrigation scheduling. MDS is not an appropriated indicator for irrigation scheduling purposes in table grapes cv. Crimson Seedless.

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