

IRRIGATION CUTOFF ON 'BRS CLARA' SEEDLESS GRAPEVINES DURING BERRY RIPENING STAGE

SUPPRESSION DE L'IRRIGATION SUR LE CEPAGE 'BRS CLARA' PENDANT LA MATURATION DU RAISIN

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SUMMARY

The seedless table grape cultivar 'BRS Clara' (*Vitis vinifera* L.) presents yellowish-green berries and was developed for growing in tropical regions. In Brazilian tropical areas irrigation is usually an essential tool. Irrigation cutoff during berry ripening stage is sometimes adopted by grape growers to reduce water application and to increase water use efficiency. This study aimed to evaluate the response of 'BRS Clara' grapevines to irrigation cutoff during ripening stage. The experiment was carried out in Jales, SP, Brazil (20°16'S, 50°33'W, 483m), from June to October 2010, using 'BRS Clara' plants grafted on 'IAC-572' and conducted in a overhead trellis system. The vineyard was irrigated by microsprinklers and covered with polyethylene screen, that is a common practice in the region to protect the grapes against bat and bird attacks. The soil moisture conditions were monitored employing tensiometers installed at 15 cm and 45 cm deep. The experimental design was completely randomized with two treatments, with irrigation (CI) and without irrigation (SI) during fruit ripening. Production and fruit quality variables were evaluated including berry and bunch mass, yield per plant, diameter and length of berries, soluble solids and titratable acidity. There was no difference between treatments for all parameters evaluated. In irrigation treatment (CI) it was applied 41.9 mm during the ripening period, representing 16.1% of total irrigation. The soil water potential in the CI treatment stayed near field capacity, whereas the treatment without irrigation (SI) showed a decrease trend during part of the period, reaching values closed to 70kPa. This reduction did not affect subsequent culture performance. It must be considered, however, that rainfall occurrence was registered since the last week of September and during October, rewetting the soil and approaching the soil water potential values in both treatments.

RÉSUMÉ

Le cépage de table sans pépins 'BRS Clara' (*Vitis vinifera* L.), présente des baies vert jaunâtre et a été développé pour produire dans les régions tropicales. Dans les zones tropicales du Brésil l'irrigation est généralement un outil nécessaire. La suppression de l'irrigation pendant la maturation du raisin est parfois adoptée par les viticulteurs pour réduire la demande d'eau et pour augmenter l'efficacité de l'utilisation de l'eau. Cette étude a eu pour but l'évaluation de la réponse du cépage 'BRS Clara' à la coupure de l'irrigation en période de maturation du raisin. L'expérience a été réalisée en Jales, SP, Brésil (20° 16'S, 50 33'W, 483m), de Juin à Octobre 2010, en utilisant une parcelle de 'BRS Clara' greffé sur 'IAC-572' et conduite dans le système latada. Le vignoble a été irrigué par micro aspersion et recouvert par une protection de polyéthylène, pratique courante dans la région pour protéger les raisins contre les attaques d'oiseaux. Les conditions d'humidité du sol ont été suivies en utilisant des tensiomètres installés à 15 cm et 45 cm de profondeur. Le dispositif expérimental était installé complètement au hasard avec deux traitements, avec irrigation (CI) et sans irrigation (SI) au cours de la maturation du raisin. Les variables de production et de qualité des raisins ont été évalués, en incluent les baies, le volume de la grappe, le rendement par plante, le diamètre et la longueur des baies, les solides solubles et l'acidité titrable. Les résultats n'ont pas montré aucune différence entre les traitements pour toutes les variables évaluées. Sur le traitement avec irrigation (CI), a été appliqué 41,9 mm d'irrigation pendant la période de maturation, ce qui représenté 16,1% du total d'irrigation. Le potentiel hydrique du sol dans le traitement CI à rester proche de la capacité au champ, tandis que le traitement sans irrigation (SI) a montré une tendance à la baisse pendant une partie de la période, avec des valeurs proches à 70 kPa. Cette réduction n'a pas y d'incidence subséquente sur la performance de la culture. On doit considérer, toutefois, que des pluies ont été enregistrées à partir de la dernière semaine de Septembre et en Octobre, avec la ré humidification du sol en rapprochant les valeurs potentielles en eau du sol dans les deux traitements.

Keywords: viticulture, *Vitis spp*, evapotranspiration, table grape, grapevine

Mots-Clés: *Vitis spp*, l' evapotranspiration, raisin de table, vigne

INTRODUCTION

In tropical regions, due to soil water deficit during part of the year, the use of irrigation is usually essential for table grape production. The water, however, are frequently scarce and irrigated area has increased significantly. So, it needs to save water and to reduce financial and environmental costs. These objectives, however, should only be implemented if there are no negative effects on yield and fruit quality. The use of deficit irrigation is a strategy to increase water productivity and also crop profitability (Feres and Soriano, 2007).

Some studies have been conducted in the Northeast region of Brazil using deficit irrigation in different grapevine cultivars (Basso et al., 1999; Marinho et al., 2009; Souza et al., 2009). However, there is no deficit irrigation studies in the tropical Northwest region of São Paulo state, nor with 'BRS Clara' grapevine cultivar. This region is one of the leading table grape producers in the state and 'BRS Clara' (*Vitis vinifera* L.) is a seedless grapevine cultivar with yellowish-green berries that was developed by Brazilian Agricultural Research Corporation (Embrapa) and launched in 2003 for growing in tropical regions (Camargo and Ritschel, 2008).

The objective of this study was to evaluate the response of 'BRS Clara' to irrigation cutoff during berry ripening stage in the Northwest region of São Paulo State, Brazil.

MATERIAL AND METHODS

The experiment was carried out in Jales, SP, Brazil (20°16'S, 50°33'W, 483m) at the Tropical Viticulture Experimental Station of Embrapa Grape and Wine Research Center, from June to October 2010, using

According to Köppen climatic classification system (Rolim et al., 2007), the regional climate is tropical humid (Aw) with dry winters and hot and rainy summers. The soil is classified as Eutrophic Red Yellow Argissolo, with 69% sand and 22% clay. The vine space in the rows was 3.0m and the distance between rows was 2.5m. The vineyard was irrigated by microsprinklers and covered with polyethylene screen installed at 0.5m above plant canopy, which is a common practice in the region to protect the grapes against hail and bat and bird attacks.

The soil moisture conditions were monitored employing tensiometers installed at 15 cm and 45 cm deep. The experimental design was completely randomized with two treatments, with irrigation (CI) and without irrigation (SI) during fruit ripening, and 12 replicates with one plant per replicate. Production and fruit quality variables were evaluated including berry and bunch mass, yield per plant, diameter and length of berries, soluble solids and titratable acidity.

RESULTS AND DISCUSSION

The results are shown in Table 1. It can be observed that there was no significant difference between treatments, according to the F test, for all evaluated variables. In irrigation treatment (CI) it was applied 41.9 mm during the ripening stage, representing 16.1% of total irrigation. It must be noted, however, that there was a period of soil rewetting after irrigation cutoff, once rainfall occurrences have been registered in the last week of September and during the month of October (Figures 1 and 2), which is common at this period of the year in the region.

Table I – Grapevine production variables for 'BRS Clara' grapes with (CI) and without (SI) irrigation during the berry ripening stage. Jales, SP, Brazil, 2010.

Variables de production du cépage 'BRS Clara' avec (CI) et sans (SI) l'irrigation pendant la phase de maturation des baies. Jales, SP, Brésil, 2010.

Treatment	Berry Mass (g)	Bunch Mass (g)	Grape Yield (Kg plant ⁻¹)	Berry Diameter (mm)	Berry Length (mm)	Soluble Solids (°Brix)	Titratable Acidity (meq L ⁻¹)
CI	4.0 ^{NS}	439.2 ^{NS}	16.3 ^{NS}	16.2 ^{NS}	22.7 ^{NS}	20.5 ^{NS}	60.2 ^{NS}
SI	4.4 ^{NS}	397.1 ^{NS}	17.6 ^{NS}	16.3 ^{NS}	23.1 ^{NS}	20.2 ^{NS}	66.5 ^{NS}

^{NS}Not significant by the F test at 5% of probability.

'BRS Clara' plants grafted on IAC-572 and conducted in a horizontal overhead trellis system at 1.80m height.

In the irrigation treatment (CI), the soil water matric potential (SWMP) values at 15 cm depth were kept above -33 kPa, while in the treatment without irrigation (SI) these values ranged from -50 kPa

to -67 kPa (Figure 1). At 45 cm depth the SWMP values reached a minimum of -24 kPa and -30 kPa for CI and SI treatments, respectively (Figure 2). Melo and Ribeiro (2011) observed that a SWMP equal to -30 kPa during the whole culture cycle showed the best results for grapevine bud fertility, while values of -70 kPa affected grape yield. However, the present results showed that SWMP values near -70 kPa during the berry ripening stage (SI treatment) did not provide any subsequent effect on culture performance.

Similar results were also obtained by Marinho et al. (2009) with the cultivar 'Superior Seedless', and by Ezzahouani and Williams (2007) with the cultivar 'Danlas'. In the first study, the authors concluded that cutting water application from 13 to 21 days before harvest did not affect grape yield and quality, on the contrary, these two aspects showed positive responses, contributing to increase water use efficiency. In the second study, it was also concluded that the suspension of water application during ripening stage did not affect the cultivar

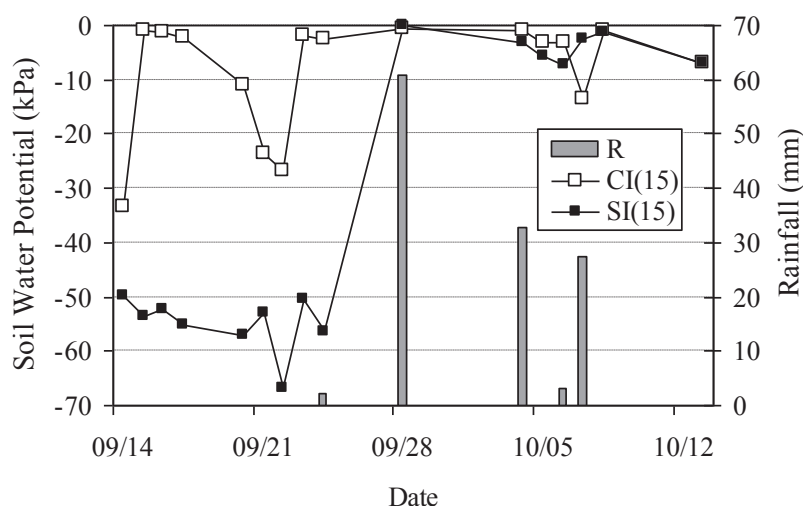


Figure 1 – Soil water matric potential at 15 cm depth for treatments with (CI) and without (SI) irrigation, during BRS Clara ripening stage. Jales, SP, Brazil, 2010.

Potencial matricielle d'eau du sol à une profondeur de 15 cm pour les traitements avec (CI) et sans (SI) l'irrigation, pendant le stade de maturation de raisin BRS Clara. Jales, SP, Brésil, 2010.

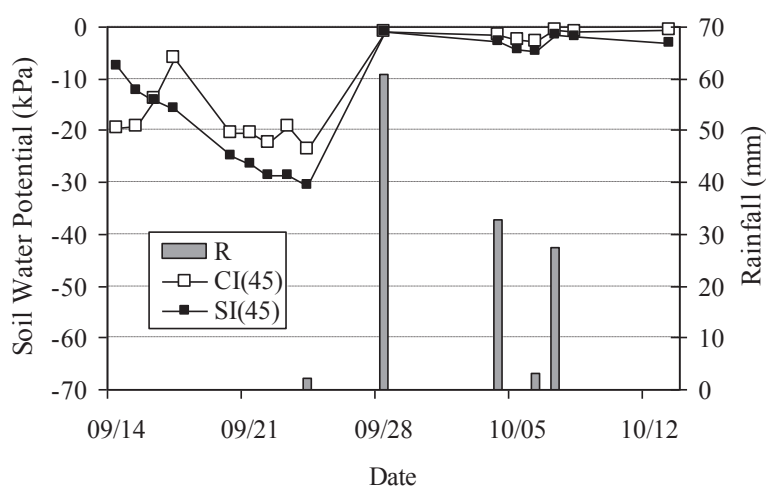


Figure 2 – Soil water matric potential at 45 cm depth for treatments with (CI) and without (SI) irrigation, during BRS Clara ripening stage. Jales, SP, Brazil, 2010.

Potencial matricielle d'eau du sol à une profondeur de 45 cm pour les traitements avec (CI) et sans (SI) l'irrigation, pendant le stade de maturation de raisin BRS Clara. Jales, SP, Brésil, 2010.

production.

Souza et al. (2009), in the same region and soil type used by Marinho et al. (2009), observed that, in general, withholding water during ripening stage of 'Moscato Canelli' and 'Syrah' grapevines maintained the leaf water potential values above -0.2 MPa, which represents the absence of water stress. Blanco et al. (2010), evaluating postveraison regulated deficit irrigation (RDI) effect on seedless table grape 'Autumn Royal' performance, pointed out that applying 80% and 60% of the net irrigation requirements did not affect grape yield and allowed a considerable water saving.

Therefore, reducing or cutting irrigation during grapevine ripening stage might be a strategy to increase water use efficiency in table grape production, even on soils of medium texture, as used in this study and by other authors cited (Marinho et al., 2009; Souza et al., 2009). During ripening period, berry size or mass reduction, due to a moderate water stress, can be recovered by a process of rehydration, what does not occur with water stress in the fruit formation period, because in this case water stress modifies the structural properties of the cells (Ojeda et al., 2001).

CONCLUSION

Although, the occurrence of precipitation during the evaluation period did not allow a larger water deficit in the soil profile, it was observed that a soil water matric potential (SWMP) threshold of -70 kPa at 15 cm depth can be achieved without affecting grapevine performance. Thus, irrigation cutoff can be used in the first two weeks of 'BRS Clara' ripening period with a subsequent soil rehydration by rainfall, or irrigation if no precipitation occurs. This water management strategy could, therefore, maintain yield levels and fruit quality while reducing irrigation water consumption.

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