

Regulated deficit irrigation of cv. *Touriga Nacional* in Douro Demarcated Region, Portugal



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1. INTRODUCTION

The competition and globalization of wine markets has forced mountain viticulture regions to introduce changes in their productive process and commercial strategies, to improve their competitiveness, specially under a climate change scenario. The Douro Demarcated Region (DDR), located in the Northeast of Portugal, include approximately 44.000 ha of vineyards, most of which planted in steep slope conditions. The climate is characterized by scarce rainfall, high temperatures, high radiation levels and large evapotranspiration losses during the summer season, influencing physiological processes, production and quality parameters of grapevine. Considering such conditions, the use of Regulated Deficit Irrigation (RDI) in DDR vineyards can play a predominant role in mitigating such negative impacts, improving water use efficiency and regulating vital functions of vine plants.

2. METHODOLOGY

- The experimental design was settled in 2002 in a commercial vineyard (cv. *Touriga Nacional* X 196-17, located at Quinta dos Aciprestes (Real Companhia Velha wine company) planted in 1998 and trained on bilateral *Royat* with 12 buds per plant (Alves F et al., 2012).
- In 2015, three treatments (with four replications) were compared:
 - 1) NI (non-irrigated, rain fed)
 - 2) RDI 25% (Regulated Deficit Irrigation, 25% of ETC)
 - 3) RDI 50% (Regulated Deficit Irrigation, 50% of ETC).
- The RDI was applied from July to August, totalizing an amount of 67,5mm for RDI 25% and 135,2mm for RDI 50%.
- 2015 was a particular drought year (320 mm between November and August, with an amount of 8 mm on the monitoring period), with several heat waves, resulting in severe stresses symptoms in non-irrigated vineyards.
- Predawn leaf water potential was assessed through Ψ_{pd} , measured in six uncovered leaves (n=24), every 7 days, with a pressure chamber (model PMS 600).
- Productivity and qualitative parameters (titratable acidity, pH, probable alcohol content and phenolic compounds) were also assessed.
- Data were submitted to a variance analysis (ANOVA), through SPSS 16.0 for Windows (SPSS Inc., Chicago, IL, USA).

3. RESULTS AND DISCUSSION

Predawn leaf water potential - From mid-July to the harvest date (middle September), the plants located in the NI modality developed under severe water deficit conditions, reaching the value of **-1,25MPa** in middle September. Plants of both RDI modalities developed under a moderate to strong deficit conditions, resulting however in significant differences on this parameter, when compared with NI (Fig. 1).

RDI had a positive significant effect on **yield**, on both modalities, when compared with NI modality, in which only 2 Kg/plant were recorded (Fig. 2). The same effect was observed on **berry weight** (RDI 25%: 20% and RDI 50%: 28%).

Qualitative parameters was affected by RDI treatments, with an increase in **probable alcohol** (Fig. 3), being only significant at harvest in RDI 50%, and a decrease in acidity and pH, although without significant differences (data not showed).

Concerning phenolics compound, it was only observed a significant decrease of the total polyphenols on RDI 50%.

4. CONCLUSIONS

On the conditions of this study, the application of RDI strategies resulted in a moderate to strong deficit conditions, allowing however to increase and regulate production, without compromising quality parameters, in particular in RDI 25%.

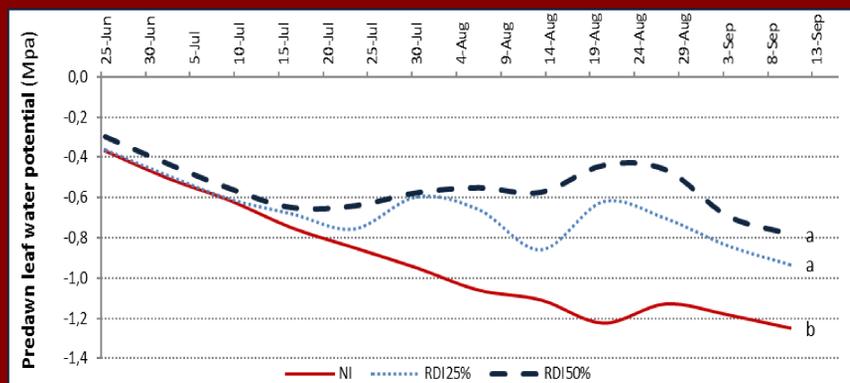


Fig. 1 Evolution of the predawn leaf water potential (Mpa) on each modality during 2015. Different letters show significant differences ($p < 0,05$).

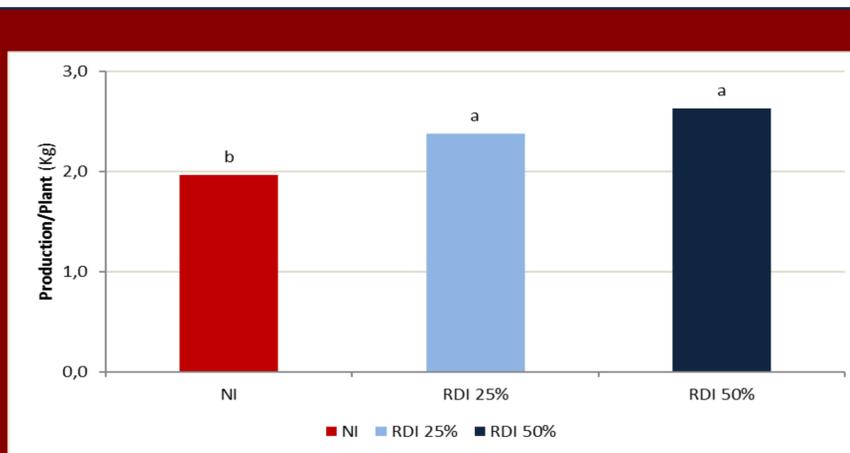


Fig. 2 Production per plant (Kg) in each modality during 2015. Different letters show significant differences ($p < 0,05$).

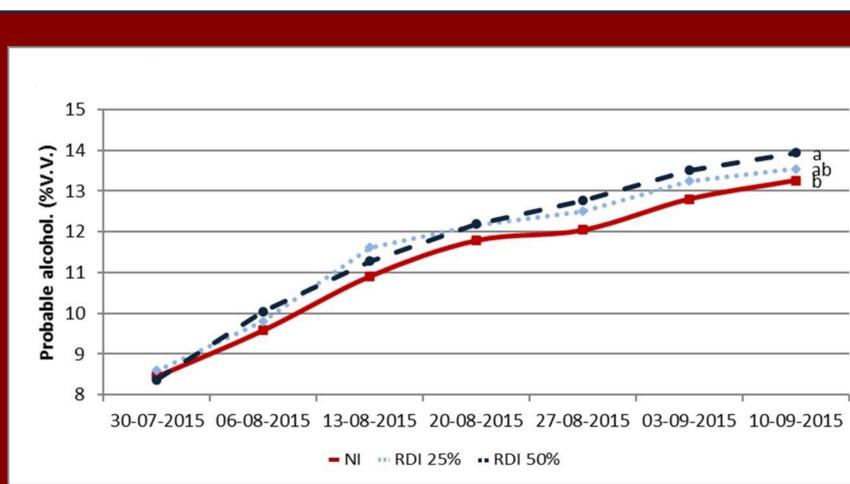


Fig. 3 Evolution of probable alcohol content (%V.V.) on each modality during 2015. Different letters show significant differences ($p < 0,05$).

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