

Evaluation Of Continuous Monitoring Of Peach (*Prunus persica* (L.) Batsch) Growth In Response To Vapor Pressure Deficit In Two Specific Time Of The Last Vegetative Stage

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Introduction

The management of peach fruit growth in Mediterranean areas is determined by different physiological and biochemical factors affected by both environmental factors and agromanagements. Among the environmental variables, the one most influencing fruit growth is VPD (Khosravi et al., 2021). Precision agriculture, by a continuous monitoring of all factors influencing the production, guarantees a better management of the farm. In the last decades, direct monitoring systems of fruit growing have been developed (Morandi et al., 2007). These devices allow measuring fruit gauges diameter constantly by providing real-time information on fruit development (Boini et al., 2017). To assess the fruits' health, it is necessary to monitor the fruit in different phenological phases of growth, especially in the final phase, when the plants require large amounts of water (Morandi et al., 2009).

The objective of this study is to examine how VPD affects the variation of fruit diameter during a day at the beginning of the last phase of the peach growth and the day before the harvest.

Materials and Methods

The study was carried out at the experimental farm of CREA-AA located in Rutigliano (lat.: 40.590 N, long.: 17.010 E, alt.: 147 m asl), on 5-year-old peach trees (*Prunus Persica* L.), cv Calred, grafted on GF 677 with a 5m x 5m planting. The last phase of fruit growth before harvesting (from 5 August to 7 September 2021) was continuously monitored by a system of custom-built fruit gauges diameter developed by Winet, Srl. (Cesena, Italy), able to acquire changes in fruit growth every 15 minutes. The trial was performed on the control (P0) and, on two treatments where two 100 μ m thickness mulch covers were present: C/902 Black White (P1, PolyEur Srl., Benevento, Italy) and C/820 Black Silver (P2, PolyEur Srl., Benevento, Italy). A total of 108 plants were involved in the trial, divided into randomized blocks, in three replicates. Using fruit diameter gauges, 4 fruits along the 4 cardinal points (N, S, W, E) on 3 trees were monitored for each treatment.

Two days were selected for a detailed analysis: the first day after the assembly of gauges (06/08/21, DOY 218) and the day before the harvest (06/09/21, DOY 249). Subsequently, the values of fruit gauges were standardized by using z-scores as described in Scalisi et al., (2019). This standardization permitted to compare the trends of the fruit gauge data in the two selected DOY with the VPD. The z-scores were computed using the R statistical software environment (<http://www.r-project.org>).

Results

The results show (Figures 1-2) that the z-scores, ranging from negative to positive during the day, and the VPD were shown in the doY 218 and 249, respectively. On doY 218 (Figure 1) the fruit growth decreases in the hottest hours, as the VPD has an opposite trend, being maximum in the morning (2.24 kPa). Dynamics were similar for all treatments. In Figure 2, on the other hand, the fruit growth trends in the three treatments almost followed the VPD trend, in this case the maximum value was attended in

early afternoon (VPD 1.87 kPa). Dynamics were different for the three treatments, although with similar trends. These differences, measured in two different DOY of the fruit's vegetative cycle, clearly show how VPD plays a fundamental role in fruit growth (Khosravi et al., 2021). The relationships between fruit development and VPD can be related to the evaporative demand of the atmosphere, strongly related to the VPD dynamics in different period of the year. Furthermore, according to Marino et al (2021), the daily differences in fruit growth are due to the water flows into and out of the fruit, therefore linked to the water state of the tree.

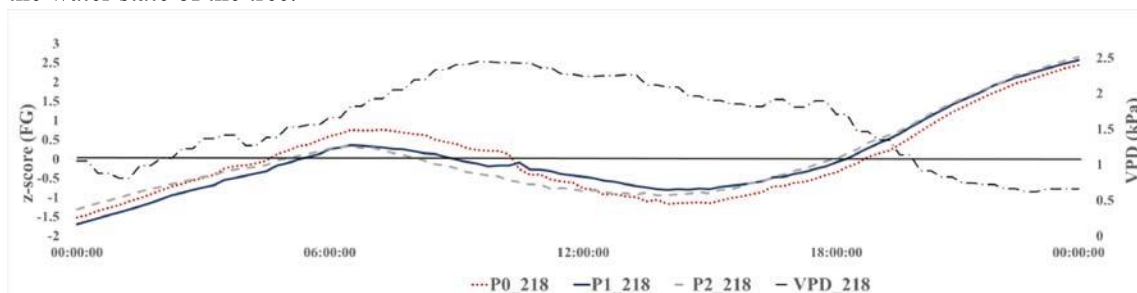


Figure 1: z-score (FG-Fruit Growth-adimensional), at the DOY 218 in the three treatments P0 (control-in red dotted line), P1 (Black White-in blue), P2 (Black Silver-in gray dashed line), compared with VPD (Vapour pressure deficit-black dashed line).

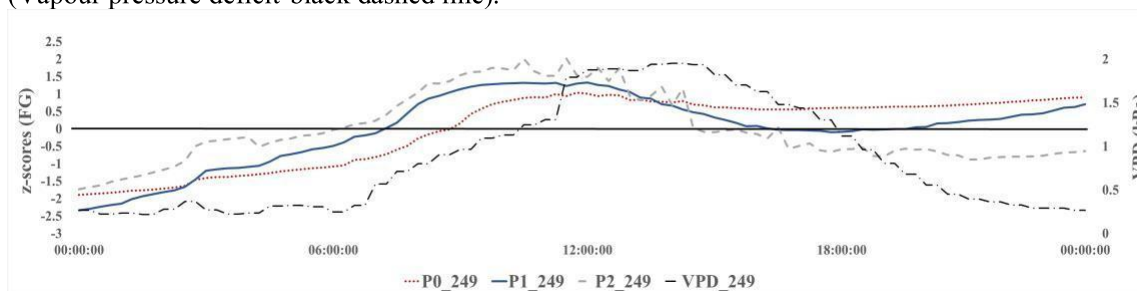


Figure 2: z-score (FG-Fruit Growth-adimensional), at the DOY 249 in the three treatments P0 (control-in red dotted line), P1 (Black White-in blue), P2 (Black Silver-in gray dashed line), compared with VPD (Vapour pressure deficit-black dashed line).

Conclusion

This study analyzed the continuous growth of the diameter of peach fruit in two specific days, the first falls into the last phase of peach fruit growth, the second in pre-harvest. The results showed that in these two days (DOY 218 and 249) the daily growth of the fruit is strongly influenced by the VPD. This comparison can be a tool for translating measured data into readily available data to coordinate the entire management of the orchard. These results will be useful for creating models for the growth of peach fruits and to collect useful results for precision agriculture.

Literature

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