Comparison of SPAD Values and Fungal Disease Level of Canadice and Mars Grape Varieties Growing on Different Training Systems

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INTRODUCTION

Training systems, which are part of viticultural practices, influence grapevine growth, development, yield, fruit composition and berry quality, and possibly grapevine's response to biotic and abiotic stresses. Choosing an appropriate training system is one of the most important decisions to enhance these benefits. Grapevines can be severely affected by different types of diseases which have an impact on the overall plant productivity. These diseases can be caused by various organisms, including bacteria, virus, fungi, nematodes and insects. Diseases caused by fungi are among the ones that cause severe damage to grapevines throughout the growing season, with different fungal diseases appearing at different times over the course of the plant's development. Fungal diseases can affect almost every part of the grapevines, namely shoots, leaves and berries. Some of the most common fungal diseases attacking grapevines are black rot, anthracnose, powdery mildew, downy mildew, and gray mold caused by *Botrytis cinerea*.

The aim of this study was to evaluate how grapevine training systems affect the vine physiology and susceptibility to fungal diseases.

MATERIALS & METHODS

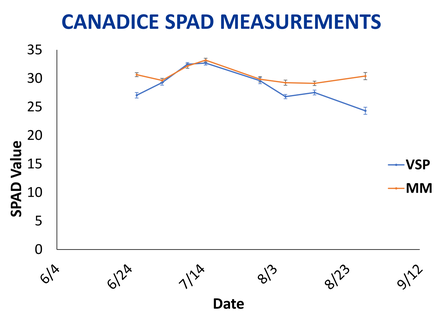
Plant growth experimental settings:

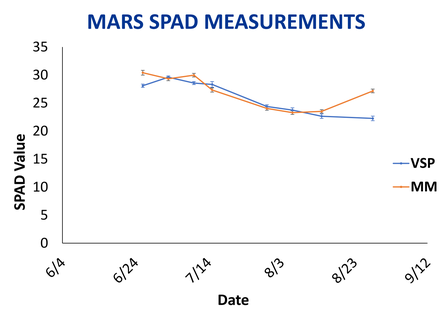
- Location: Woodman Research Farm
- Grape varieties: Canadice and Mars
- Training systems: Vertical shoot positioning (VSP) and modified Munson (MM)
- Planting: RCBD with 4 replicates, with training system as main plot and grape variety as subplot; 3 vines/subplot
- Vineyard management: conventional, including fungicide treatments

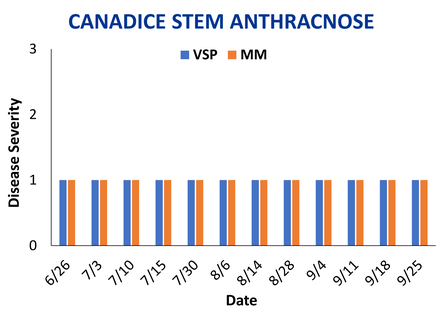
Data collection:

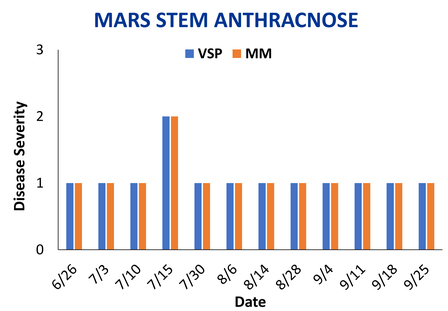
- All data was collected during the 2019 growing season
- SPAD readings were taken on 2 leaves of each plant using a SPAD meter. Measurements were taken weekly from flowering to veraison.
- Disease scouting was conducted weekly from flowering to harvest. Disease identification was made based on visual appearance of symptoms and rated using a 0 to 4 scale: 0 - no visible symptoms (0%), 1 - symptoms visible < 50% plant, 2 - symptoms visible 50% plant, 3 - symptoms visible >50% plant, 4 - symptoms visible in entire plant (100%).

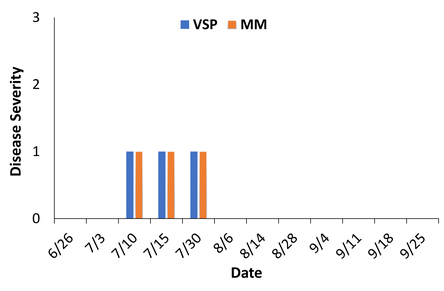
RESULTS

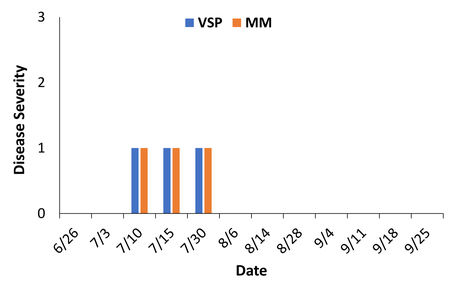


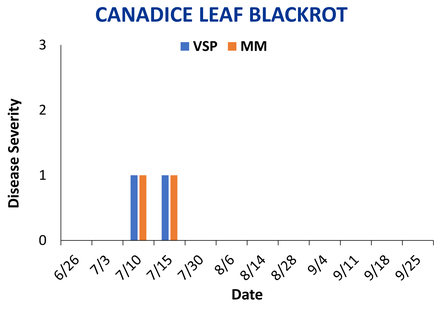


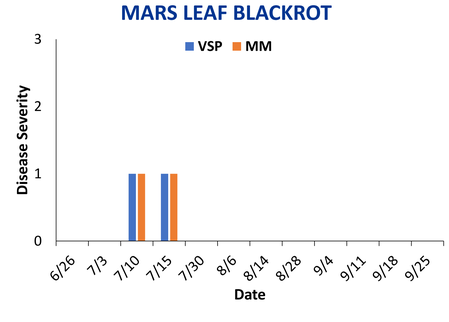


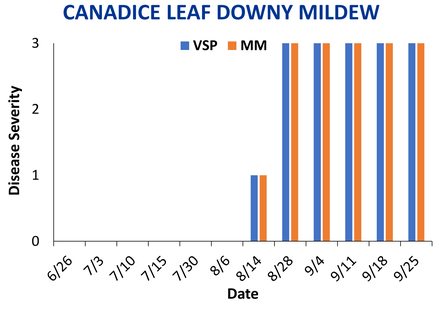


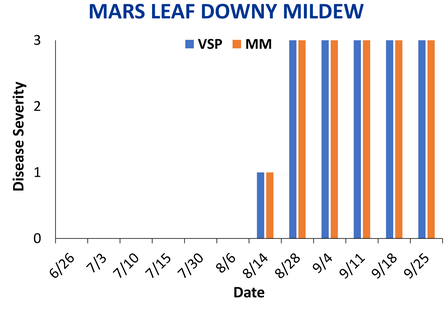












DISCUSSION

The SPAD values showed a trend of increase over four weeks since flowering and appeared to decline thereafter. The trend was similar in both varieties. However, it seems that in the MM training system SPAD values increased again approaching the end of the season. The reason for this might have been the leaf age, as there was less leaf growth at this stage and the leaves present were older. SPAD values are an indication of chlorophyll concentration, so the result might be due to higher chlorophyll accumulation as leaves get older.

The rating scale used in this work did not allow the detection of differences in disease levels between training systems. As expected, several fungal diseases appeared over the course of the growing season. Most of these diseases did not become too severe, which is explained by the treatment of the vineyard with fungicides.

Stem anthracnose appeared from prebloom until buck shot berries, mostly during wet season. The disease lesions appeared at the same level in both varieties and training systems.

Leaf anthracnose and leaf black rot appeared from buck shoot berries until veraison in both grape varieties and training systems. Fungicide treatments and removal of diseased leaves contributed to the control of this disease.

Leaf downy mildew started appearing at bloom, and its severity increased until harvest in both grape varieties and training systems. Of all the fungal diseases appearing during the 2019 growing season, this was the most difficult to control.

FUTURE WORK

The data collected in the field will be followed up with biochemical analysis in the lab, including chlorophyll quantification and a metabolomic study of leaves to better understand how the grapevine physiology may be affected by different training systems. To account for the high variability in the field from season to season, the disease appearance and severity will continue to be monitored for two additional seasons.

FUNDING

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