INTEGRATED PROTECTION IN VITICULTURE

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OP4 - A 2-YEAR MULTIVARIATE ANALYSIS OF MULTIPATHOGENS DAMAGE (DOWNY MILDEW AND POWDERY MILDEW) RELATED TO SOIL RESISTIVITY, GRAPEVINE VIGOR AND YIELD LOSS

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Our aim was to establish a viticultural zoning, based on precision viticulture techniques, and to investigate the relationships with grapevine susceptibility and epidemiological development of downy and powdery mildews. Two independent and key variables in the grapevine production system were used with a geographical information system (GIS): i) soil electrical resistivity and ii) the grapevine biomass index NDVI. In one Medoc estate "chateau", mapping of the whole vineyard allowed us to define different classes of a-priori homogeneous "Physiological Functioning Units" (PFU) by combining these two variables. Per cultivar (cv), Merlot noir and Cabernet sauvignon, 3 and 6 PFUs classes were studied, respectively. For each PFU, per cv, two experimental plots were repeated. Each plot consisted of two close groups, each of 5 adjacent vines, either untreated or protected by fungicides according to the chateau strategy. A weekly symptom monitoring for both pathogens was performed throughout the season. In addition, various other key viticultural variables were investigated focusing on a overall multipathogens indicator, the Assessment Indicator of Damage in Bunches, AIDB (Fermaud et al, Austral.J.G.W.Res., 2016). Different yield components were assessed and other topographic, fruit maturity and/or host-plant variables (altitude, distance to the Gironde river, vine age, rootstock, row orientation…). A Principal Component Analysis (PCA) was performed to show and visualize relationships between AIDB and the other variables. The results in 2015 and 2016, were based mostly on downy mildew epidemics as the major disease and, to a lesser extent, on powdery mildew. The two main PCA axes represented 49.8% of the relationships and variations within the whole dataset. The first axis represented the yield components, year of planting and production of grapevine biomass (NDVI) in both years, corresponding to younger and more vigorous grapevine plants. The second axis showed a clear negative correlation between the multipathogens pressure (AIDB) and soil resistivity.

Yield loss was correlated positively with the AIDB indicator. The altitude was closely related to the resistivity. An important distance to the Gironde estuary and a high soil resistivity were two variables reflecting a potential lower availability of soil water. Thus, it was rational to detect negative relationships between resistivity, altitude and distance to the river, on one side, opposite to the AIDB and the yield potential without any diease, on the other side. Results will be discussed to put forward hypotheses concerning key parameters for better explaining the plot susceptibility to these major diseases.

Keywords: precision viticulture, indicators of plot susceptibility to fungal diseases, IPM, epidemiology, crop loss, multipathogens risk indicators