UNDER TRELLIS COVER CROP INDUCES GRAPEVINE TOLERANCE TO BUNCH ROT

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Abstract:

Context and purpose of the study - Botrytis bunch rot occurrence is one of the most important limitations for the wine industry in humid environments. A positive correlation between grapevine growth and susceptibility to fungal pathogens has been found. In theory the effect of grapevine vegetative growth on bunch rot expression results from direct effects (cluster architecture, nitrogen status among others) and indirect ones (via microclimate). However, a reduction in bunch rot incidence can be achieved in some circumstances without major vine growth reduction. The present study was aimed to test the general hypothesis that bunch rot susceptibility is affected by vine vigor, but other factors associated with grapevine vegetative expression could be even more relevant.

Material and methods - The experiment was conducted over three growing seasons in Southern Uruguay. We tested Vertical Shoot Positioned (VSP) versus Lyra trellis systems with conventional flour management consisting alleyway tall fescue with 1.0 m wide weed-free strips under the trellis (VSP-H and Lyra-H), and VSP with under-trellis cover crop (VSP-UTCC). UTCC consists in the full cover of the vineyard soil with tall fescue (*Festuca arundinacea*). In all treatments, deficit drip irrigation was provided at mid-day stem potential (SWP) thresholds of -0.9 MPa. Treatments were arranged in a split-plot randomized block design with trellis system (Lyra vs VSP) as main plots and flour management schemes (H vs UTCC) as subplots. Shoot growth rate, SWP, berry size, berry composition (titratable acidity, Brix, and yeast available nitrogen) and bunch rot incidence and severity were monitored over the seasons, as well as final vine yield, cluster weights, berryfirmness and pruning weights.

Results - In VSP-H and Lyra-H treatments Botrytis bunch rot incidence progressively increased with pruning weight per meter of cordon length (PW/m). However, even associated with an increased number of shoots per vine, Lyra significantly reduce vine vigor, average disease occurrence was comparable between both trellis systems. Contrarily, bunch rot incidence was every season remarkably lower in VSP-UTCC compared to Herbicide treatments (Lyra-H and VSP-H) even when vegetative development (shoot elongation rate, PW/m, PAR%) and fruit maturation (TSS, titratable acidity) was compared to Lyra-H. Associated with berry weight, bunch size was significantly reduced by VSP-UTCC treatment.These may underline the important role of cluster architecture in the lower B. cinerea infection. However, the strong difference observed in disease occurrence between UTCC and H treatment in our study could not be explained by just this factor since UTCC also significantly affected other bunch rot infection triggers (reduced juice N levels and increased berry firmness). Botrytis bunch rot is a complex disease, and many of the three-way interactions (host, environment and pathogen) are poorly understood. Our results don't allow to identify the specific mechanism by which UTCC induced a higher tolerance to botrytis bunch rot, however a clear effect on pathogen or host plant behavior was detected. Its seems to be more related to direct factors than indirect ones associated with canopy microclimate.

Keywords: Tannat, Botrytis bunch rot, under trellis cover crop, Fescue, vine vigor.

1. Introduction.

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Introduction and objective

Botrytis bunch rot occurrence is one of the most important limitations for wine industry in humid environments. A positive correlation between grapevine vigor and susceptibility to fungal pathogens has been found. However, a reduction in bunch rot incidence can be achieved in some circumstances without major vine growth reduction. The present study was aimed to test the hypothesis that, bunch rot susceptibility is affected by vine vigor, but other factors associated with grapevine vegetative expression could be even more relevant.

Materials and methods

Treatments. We tested VSP versus Lira trellis systems, both with conventional flour management (alleyway tall fescue with 1.0 m wide weed-free strips under the trellis) (VSP-H and L-H) versus VSP with under-trellis cover crop (VSP-UTCC).

Measurements: Shoot growth rate, SWP, berry size, berry composition (pH, titratable acidity, Brix, FAN, total anthocyanin concentration) and bunch rot incidence and severity were monitored over the seasons, as well as final vine yield, cluster weights, berry firmness and pruning weights.

Results

• In VSP-H and L-H treatments bunch rot incidence progressively increased with pruning weight per meter of cordon length (PW/m), while no significant correlation was detected in VSP-UTCC treatment (Fig. 1).

• Bunch rot incidence was every season remarkably lower in VSP-UTCC compared to herbicide treatments (L-H and VSP-H) (Table 1), even when vegetative development (shoot elongation rate, PW/m, PAR%) and fruit maturation (TSS, titratable acidity) was compared to Lyra-H (Table 2).

•Our results don't allow to identify the specific mechanism by which UTCC induced a higher tolerance to bunch rot, however, a clear effect on pathogen or host plant behavior was detected. Its seems to be more related to direct factors (cluster compactness, must nitrogen levels and berry firmness) than indirect ones associated with canopy microclimate.

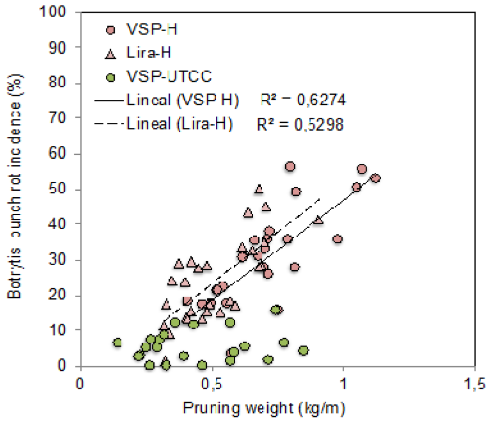

Fig 1. Relationship between pruning weight per meter of trellis and Botrytis bunch rot incidence of Tannat grapevines subjected to different groundcover management and trellis system treatments.

•Table 2 Canopy characteristics, bunch rot infection triggers and Botrytis bunch rot insidence and severity as affected by under trellis ground cover and trellis system treatments.

	Season 2011/2012			Season 2012/2013			Season 2013/2014		
	VSP-H	L-H	VSP-UTCC	VSP-H	L-H	VSP-UTCC	VSP-H	L-H	VSP-UTCC
Pruning weight (kg/m)	0.79 a	0.52 b	0.49 b	0.71 a	0.41 bc	0.36 c	0.65 a	0.58 b	0.41 c
Fruit zone PAR (%)	2.64 b	3.15 ab	4.60 a	1.86 c	5.61 b	8.45 a	2.43 b	3.12 ab	5.01 b
Berry weight (g)	1.90 a	2.01 a	1.66 b	1.72 b	1.86 a	1.54 c	1.77 ab	1.81 a	1.66 b
Cluster weight (g)	287 ab	298 a	263 b	352 ab	394 a	305 c	268 a	243 b	241 b
Brix	20.7 bc	21.2 b	22.0 a	23.9 b	24.2 ab	25.0 a	21.3 ab	20.0 b	21.0 a
Titratable acidity (g/L)	3.94 a	4.26 a	3.37 b	5.25 b	5.69 a	4.89 c	6.05 ab	6.54 a	5.76 b
Yeast available nitrogen (mg/L)	121.1 a	117.6 a	98.3 b	113.7 b	138.8 a	92.8 d	141.7 a	140.3 a	100.2 b
Berry deformation (mm/1N)							3.67 b	3.75 b	4.03 a
Bunch rot incidence (%)	34.3 a	29.8 a	6.0 b	30.5 a	23.6 b	3.4 d	32.7 a	30.5 a	6.1 b
Bunch rot severity (%)	36.4 a	20.1 b	7.0 c	30.8 a	16.5 b	14.5 b	26.7 a	31.1 a	6.9 b

Acknowledgements

This research was supported by ANII (Agencia Nacional de Inves: gación e Innovación), INAVI (Ins: tuto Nacional de Vi: vinicultura), FUCREA (Federación Uruguaya de grupos CREA) and INIA Uruguay (Ins: tuto Nacional de Inves: gación Agropecuaria).