

Assessing the relationship between cordon strangulation, dieback, and fungal trunk disease symptom expression

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Background & Aims

- Permanent cordon arms wrapped tightly around the cordon wire may be susceptible to strangulation, early decline and dieback
- Fungal pathogens including *Eutypa lata* are also a major driving force behind cordon decline
- Nature of the relationship between these factors of decline has not been studied in depth
- This research aimed to investigate the relationship between these factors by assessing their incidence in commercial vineyards displaying varying degrees of cordon decline






Methods

10 Vineyard sites were surveyed in the Barossa Valley and Adelaide Hills wine regions in South Australia in the spring of 2020 and 2021

Visual Assessments

Degree of Strangulation

- Assessed on a 0-to-4 scale

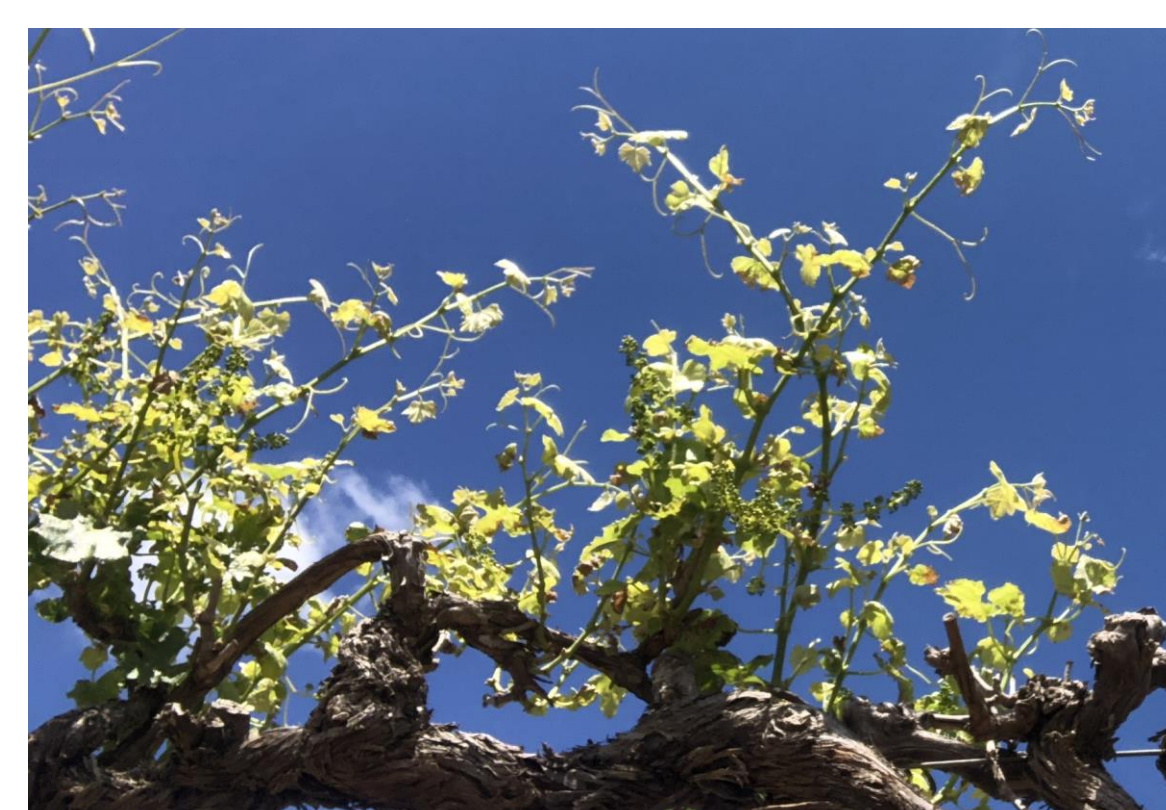
0	no strangulation	Cordon positioned entirely on top of wire or otherwise lacking significant wire contact. Minimal to no pressure applied from wire to cordon.	
1	minimal strangulation	Cordon wrapped loosely around wire with much of cordon directly in contact with wire. Minimal pressure applied from wire to cordon and though cordon slightly coiled, minimal to no embedding of wire in wood of cordon.	
2	moderate strangulation	Cordon wrapped moderately tightly around wire with almost all of cordon in direct contact with wire. Moderate pressure applied from wire to cordon, with wire slightly embedded within cordon wood in some areas. Cordon coiled in shape and wire also potentially slightly coiled as a result of contact with cordon.	
3	severe strangulation	Cordon wrapped tightly around wire with almost all of cordon in direct contact with wire. Large amount of pressure applied from wire to cordon and in many areas wire visibly embedded deeply in cordon wood. Cordon coiled in shape and wire likely coiled as well in line with shape of cordon.	
4	very severe strangulation	Cordon wrapped extremely tightly around wire with almost all of cordon in direct contact with wire. Large amount of pressure applied from wire to cordon and in many areas wire no longer visible as so deeply embedded in cordon wood. Cordon tightly coiled in shape with creases visible in cordon wood.	

Cordon Dieback

- Assessed on a 0-to-100% scale as a proportion of entire cordon length which had died back and where canopy was no longer present

Foliar Symptoms of *Eutypa Dieback*

- Assessed on a 0-to-100% scale as a proportion of canopy displaying characteristic *Eutypa dieback* foliar symptoms (stunted shoots with chlorotic and yellow leaves, often cupped and with tattered margins)



Eutypa dieback foliar symptoms

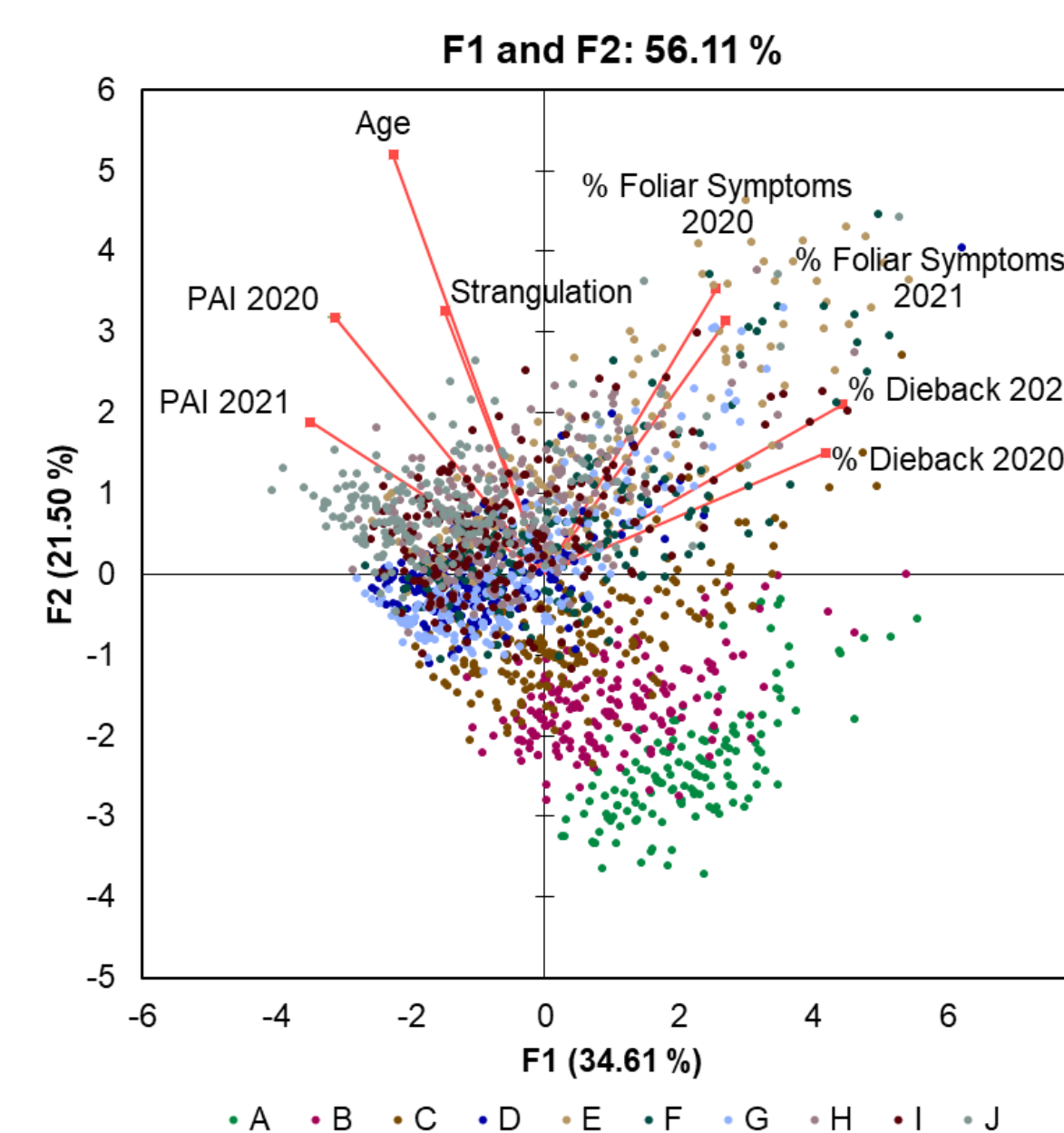
Canopy Assessment with VitiCanopy

- One upwards facing image taken from 80 cm below the cordon of each vine and used for the algorithmic determination of plant area index (PAI)

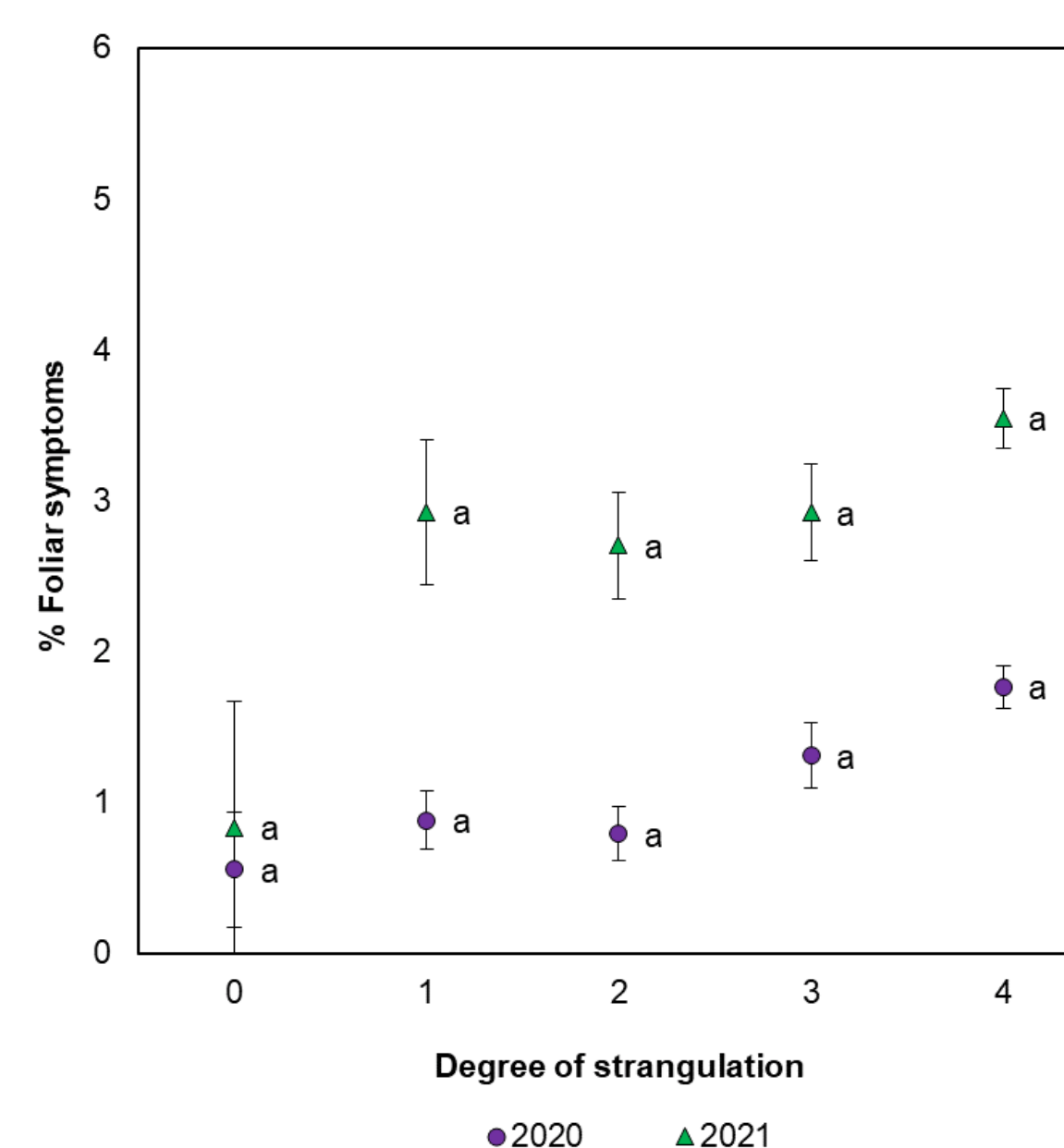
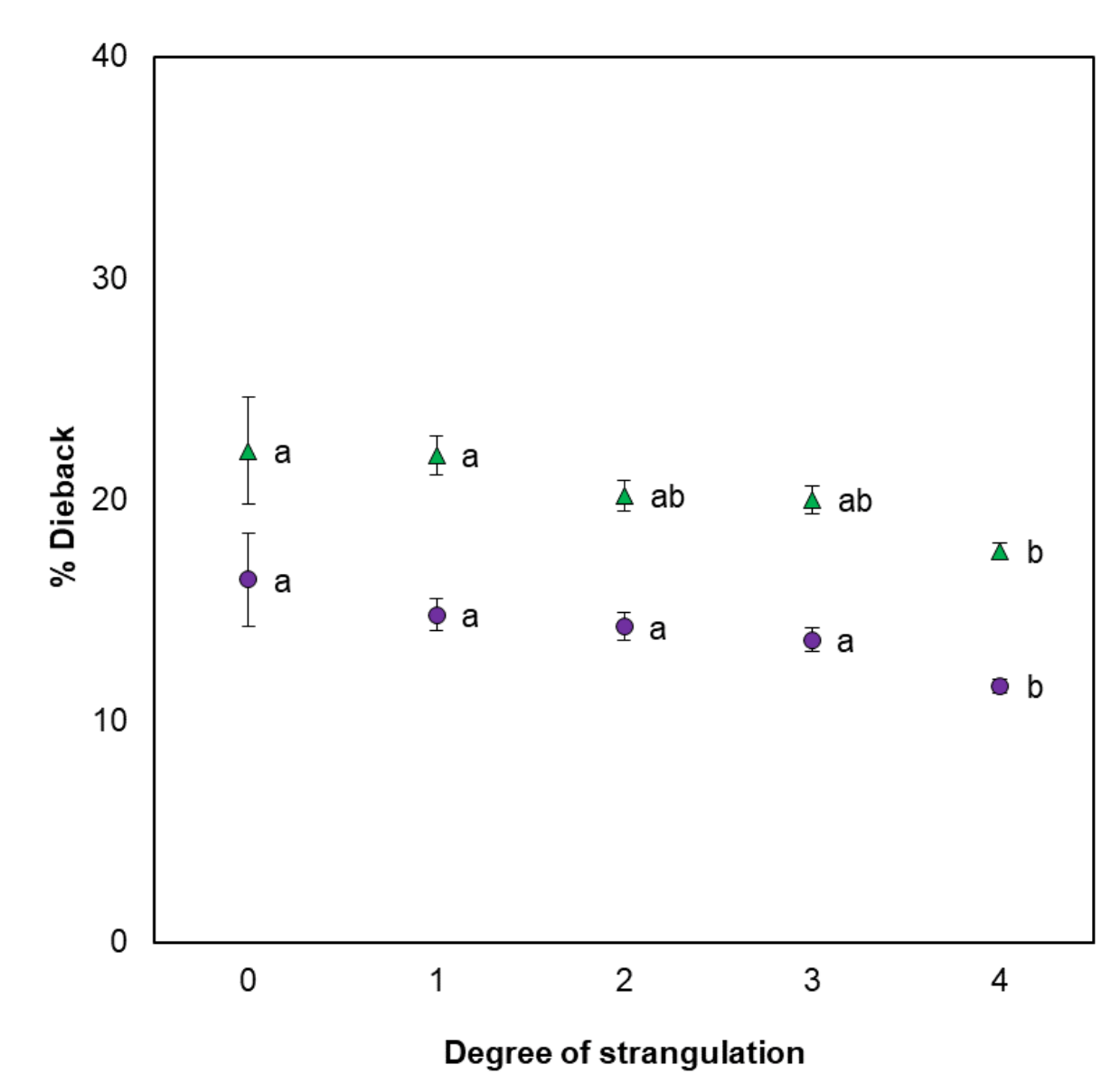
References

Carter, M. V. (1991). *The status of Eutypa Lata as a pathogen*. Wallingford, Oxon: Published on behalf of C.A.B. International Mycological Institute by C.A.B. International.
De Bei, R., Fuentes, S., Gilliam, M., Tyerman, S., Edwards, E., Bianchini, N., Smith, J., and Collins, C. (2016). VitiCanopy: A free computer app to estimate canopy vigor and porosity for grapevine. *Sensors*, 16(4), E585. doi:10.3390/s16040585

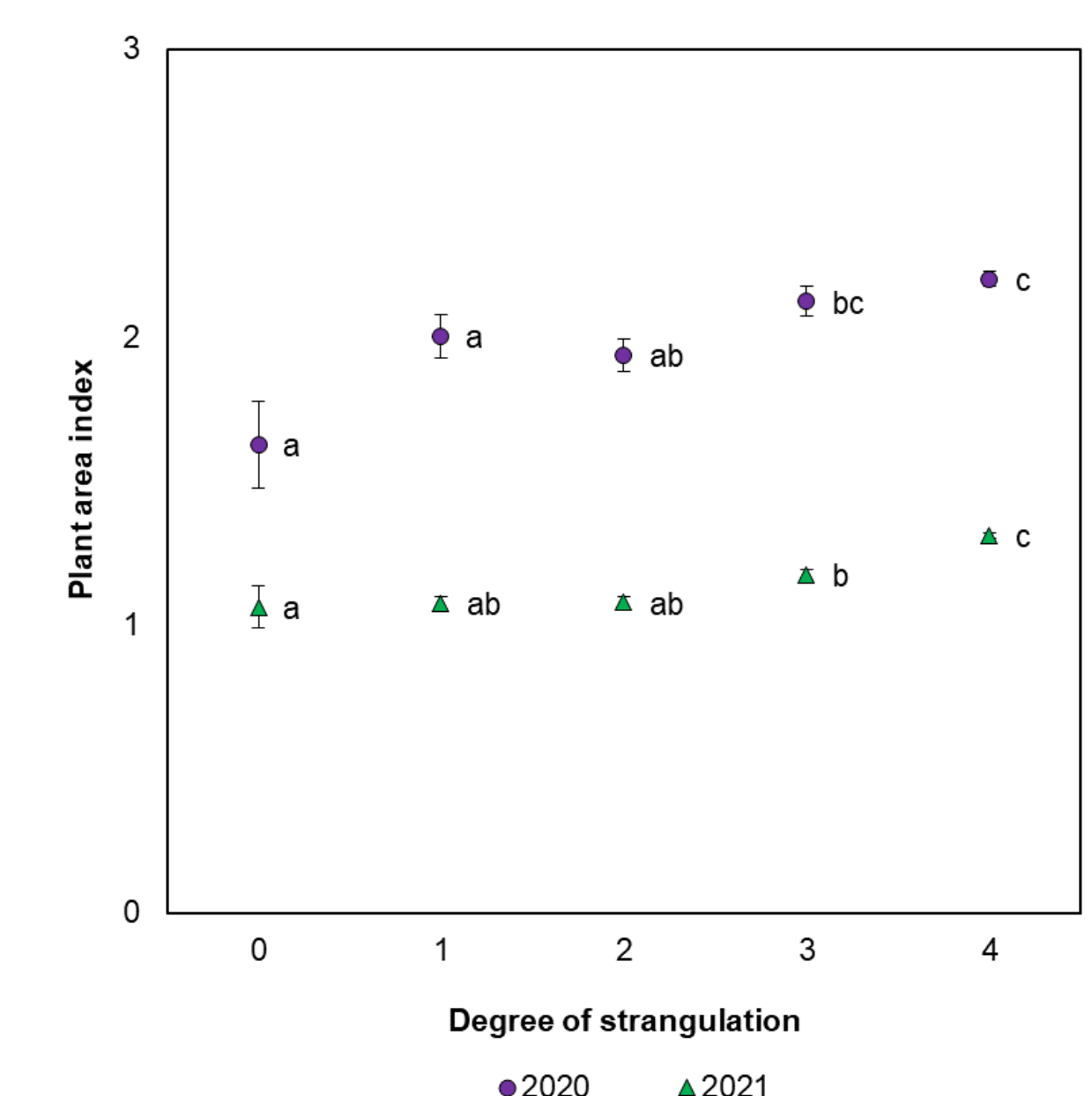
Results



- First two principal components (PCs) explain 56% of the variation in the dataset
- Strong association observed between degree of cordon strangulation and vine age
- Sites with younger cordons such as A, B, and C separated from older sites including D, G, and J
- Percentage of cordon displaying dieback and percentage of foliage displaying symptoms of *Eutypa dieback* increased at all sites between assessed seasons
- Cordons with greatest degree of strangulation (4) surprisingly displayed least amount of dieback



- Trend of increase in *Eutypa dieback* foliar symptoms with increase in degree of strangulation
- Difficult to assign causality here, as many factors may be involved in the propensity of infected vines to express visual symptoms including climatic factors
- PAI decreased at all sites between seasons
- Vines displaying the least amount of strangulation (0, 1, 2) had lower PAI than those displaying the greatest degree of strangulation (4)
- High cordon dieback correlated with low PAI, helping to eliminate the possibility of human error during the visual assessments



Conclusions and Impact of Study

- A negative trend between degree of strangulation and dieback was observed in this survey, but not a strong trend
- Whether tightly wrapping cordons around the cordon wire could influence the susceptibility of vines to fungal trunk disease infection, or the likelihood of infected vines to express symptoms is not immediately clear
- It is possible that cordons which are already under increased stress from the constrictive effects of tight wrapping may be more likely to express symptoms of *Eutypa lata* infection than those which are trained in a less constrictive manner

For more information

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