

Does recycled carpet mulch used as a weed suppressant affect canopy temperature and grape quality?

Introduction

The effects of excessive weed competition with vines for water, nutrients and sunlight are known to reduce yields, fruit quality and increase disease pressure (Balderi C. 1972). High humidity and persistent rainfall during the summer months aggravate fungal diseases and promote season long weed problems making disease management more challenging and costly (Hosteler G et al 2007). Various techniques are used to control weeds below vine canopies. Most common are cultivation, herbicide and natural or geotextile mulches. All of these methods can have adverse consequences: disruption of soil structure and erosion, accumulation of herbicide within the soil, herbicide resistant weeds (Hutton et al 2006, Whitelaw-Weckhert M 2005) and increased canopy microclimate humidity (Dejan T et al. 2007). Research (Tescic et al, 2007) has shown that floor coverings and mulches beneath vine rows led to lower soil moisture, whereas Van der Westhuizen (1980) recognised that soil temperatures were more constant under synthetic mulch giving a more active growth rate. This was confirmed by Hosteler et al (2007) stating that synthetic mulches significantly increased subsoil temperatures, and that geotextile mulches increase soil nutrients therefore improving fruit yields.



Other research has found that vineyards where mulching is used for weed control increased beneficial soil microbial activity and biodiversity in the rhizosphere. This was found to reduce pest and pathogen infection through parasitic, predatory and antagonistic actions. This enhanced healthy vine growth by minimising root injury by pest nematodes and fungal pathogens (Hutton et al 2006). Weckert and Rahman (2009) established that organic matter from mulches improve soil structure by increasing aggregation, soil structure and easily mineralised organic matter.



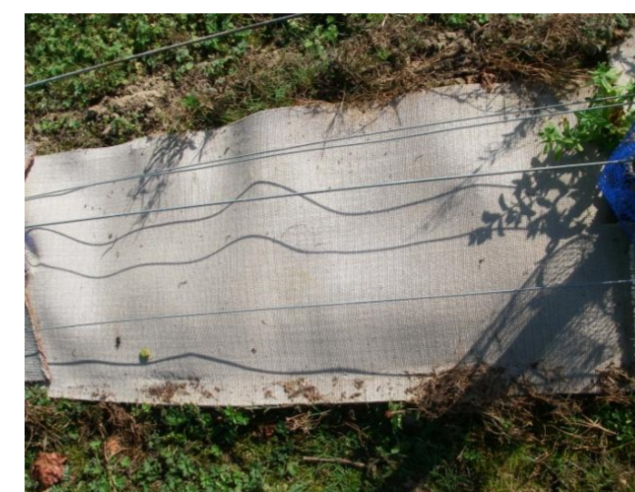
Aims of research

Increasing demand by growers to reduce pesticides and consumers preference for more sustainable products has encouraged unassociated industries to develop recycling plans beneficial to other industries. Established in 2008 Carpet Recycling UK aims to stimulate the market for carpet recycle (CRUK 2009).

Increasing demand for products to be recyclable has led to innovative benefits for post consumer wool carpets as a renewable resource. Currently 500,000 tonnes of used (CRUK 2009) carpet is incinerated or landfilled; as wool carpet is made up of mainly natural fibres it offers the advantage of being biodegradable. Due to its open weave construction wool carpet blocks sunlight and suppresses weed growth, whilst permitting water filtration and gas exchange. It also acts as mulch, assisting soil management by moderating soil temperature, assisting in soil retention on gradients and provides moisture retention in dryer climates. Furthermore, the carpet degrades adding to the organic matter stimulating soil micro-fauna. The initial proposal was suggested by Carpet Recycling UK and was based on a similar piece of research conducted at Melton Estate Vineyard, Christchurch, New Zealand on newly planted vines between 2007 and 2008.

Experimental Design

The area selected for the experiment was at Rock Lodge vineyard, on sandy clay soil, cultivars were Chardonnay, rootstock 330, clone 75 and were planted in 2003. The 600mm x 3metre mulch strip was fitted to the ground with wire staples in a central length of the row, with the remaining part of the row being a control. The central of the alley is a mown grass sward and all rows and vines were maintained using identical vineyard practices. The rows were sprayed with Glyphosate prior to the mulch being fitted. The temperature data logger was installed in the vine canopy in the carpet mulched zone and in the canopy of the uncarpeted area of the same row. The data logger ran temperature recordings (Co) every 30 minutes from 10th August until 16th October (harvest). The carpets used were wool with hessian back. At harvest the grapes were analysed at Plumpton College using a Radox diagnostic analyser and an Oenofoss analyser.



Results and discussion

The weed suppression was very effective under the mulched area, which can be associated with the lack of light interception.

Anecdotal comments from another vineyard (Melbury Vale, Dorset) using the carpet mulch were not as positive. It was found that at this site, the carpet often got caught in machinery and was not as effective, this problem was not noted at Rock Lodge Vineyard.

The results from the grape samples show the mulched area has a higher Specific Gravity, eluding to greater potential alcohol. It also has a higher pH, this being close to an expected level for UK sparkling wine production. The higher TA for the mulched vines, whilst still a low figure, illustrates that these vines maintained acidity.

The malic acid level in the mulched area was substantially higher than the unmulched, and is not ripening as well. Malic acid accumulates early in berry development, and declines during ripening due to dilution and respiration.

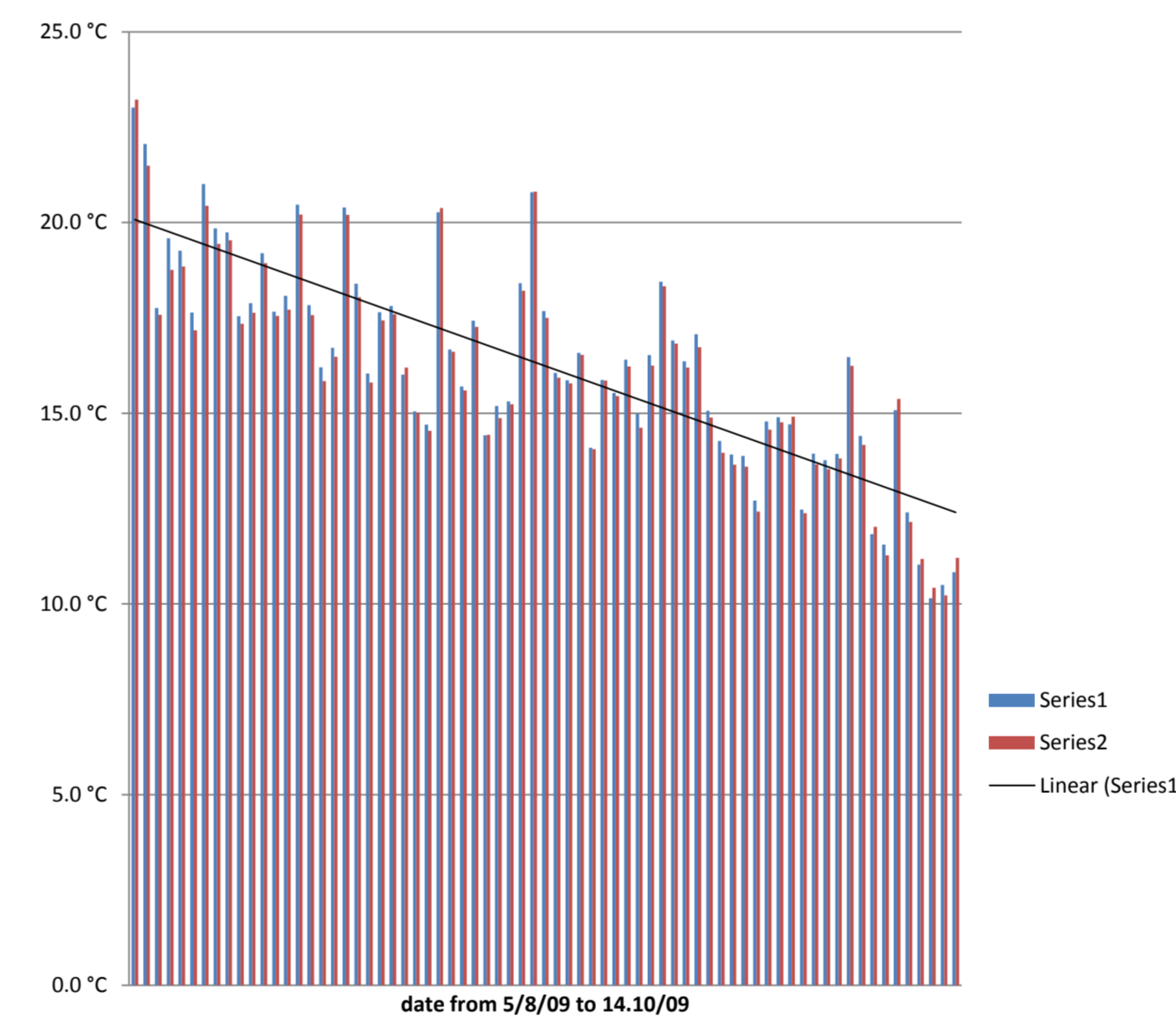


table 1. comparison of data loggers 1(no carpet) and 2 (carpet mulch)

Sample	SG	pH	TA(g/l)	Malic Acid (g/l)	Pan (mg/l)
Row 8 no carpet	1057	2.92	6.57	2.83	62.91
Row 8 carpet	1059	2.97	7.10	3.92	73.64

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The statistical analysis performed on daily mean temperatures from the original data demonstrated by a Paired T-test gave the result 1.64149E-09, this equates to 1.64 x 10 to the power -9 which is 0.0000000164. This indicates that the null hypothesis (that carpet mulch has no effect on canopy temperature) should be rejected and that carpet mulch (data logger 2) HAS a significant effect on canopy temperature.

Conclusions and Recommendations

Although effective as weed suppressant and as a significant influence on canopy temperature, to clearly establish the validity of wool carpet mulch as viable commercial mulch, further research needs to be conducted in several areas:

- Confirm its ability to warm the root zone, temperature data loggers should be buried in the soil surface.
- Extensive soil analysis needs to be monitored as an ongoing programme, with specific reference to toxic organic compounds (latex glues?) and soil pH.
- Vine nutrition analysis (sap or petiole)
- More detailed grape berry analysis
- Disease monitoring should be compared to establish if the carpet harbours spores in its retained moisture.

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