Addressing exposure of Chardonnay and Shiraz in Queensland vineyards

An extension project has been undertaken in a number of vineyard sites in Queensland over the 2009/10 growing season. This project, led by Ursula Kennedy and Robert Learmonth from the University of Southern Queensland, has focussed on the effects of fruit exposure by way of different canopy management treatments on the fruit and wine quality of Chardonnay and Shiraz. Preliminary findings of effects on Chardonnay were presented earlier this year, and this article further discusses impacts of exposure on fruit quality and also final wine quality.

Exposure is an important issue to growers and winemakers in Queensland as the state's vineyards are the most northerly and amongst the highest in altitude in the country, thus being subject to in very high levels of ultra violet radiation. Sun exposure in white wine grapes may result in increased phenolic concentration (Macaulay and Morris, 1993), and berry shrivel and browning (Tarara et al. 2000) while in red varieties can lead also to sunburn but also can impair anthocyanin accumulation or in fact lead to degradation of anthocyanins (Haselgrove et al. 1999, Dry 2009).

The project

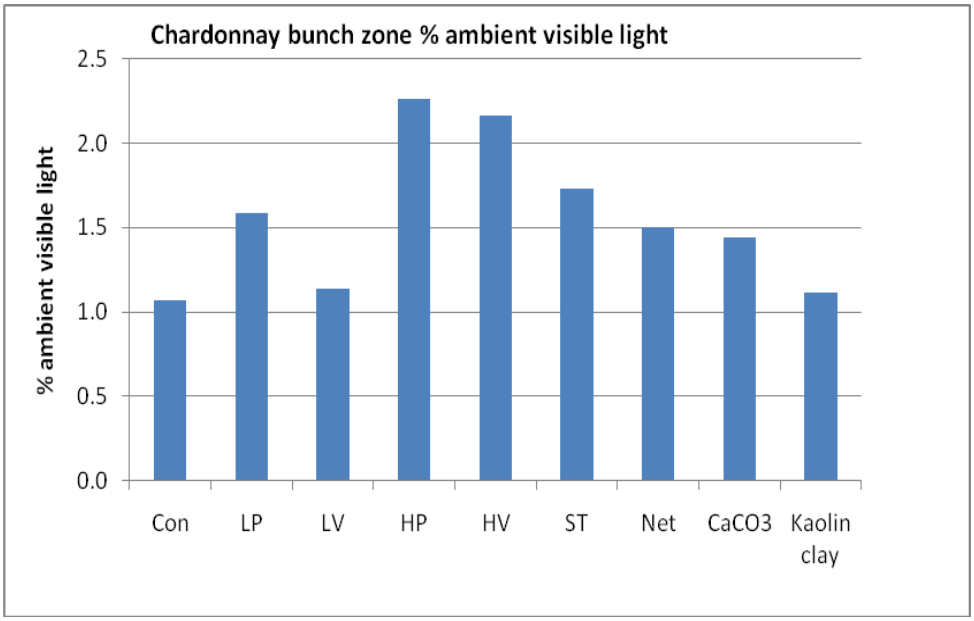
For this project demonstrations were set up on vineyards located in the Granite Belt, South Burnett and Scenic Rim with growers invited to inspect the sites prior to harvest, and fruit from the Granite Belt site chemically analysed and processed into wine for sensorial assessment. Fruit exposure techniques applied in this project included leaf removal from the fruit zone on either the most easterly (low - L) or on both sides of the canopy (high - H), done at pea size (P) and at veraison (V); 50% shoot removal (ST); throwover bird net (Net); application of commercial 'sunscreen' products (calcium carbonate and kaolin clay); and a non manipulated VSP 'control' (C), and 'sprawl' in the Shiraz.

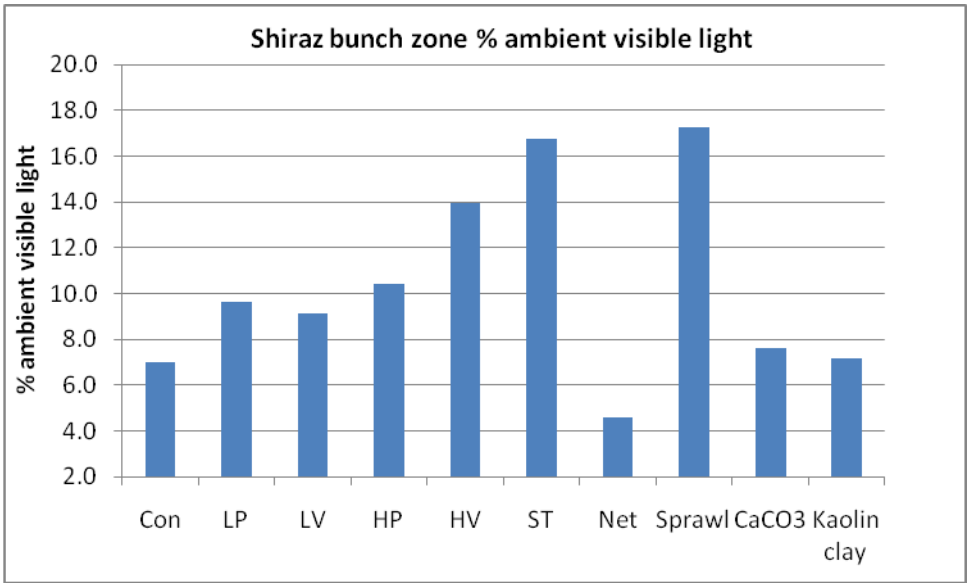
The Granite Belt vineyard on which the demonstration was set was, unfortunately, subject to hail and frost events in late 2009, resulting in some damage to vines. This combined with late season water stress and disease pressures to impact on the results of this trial.

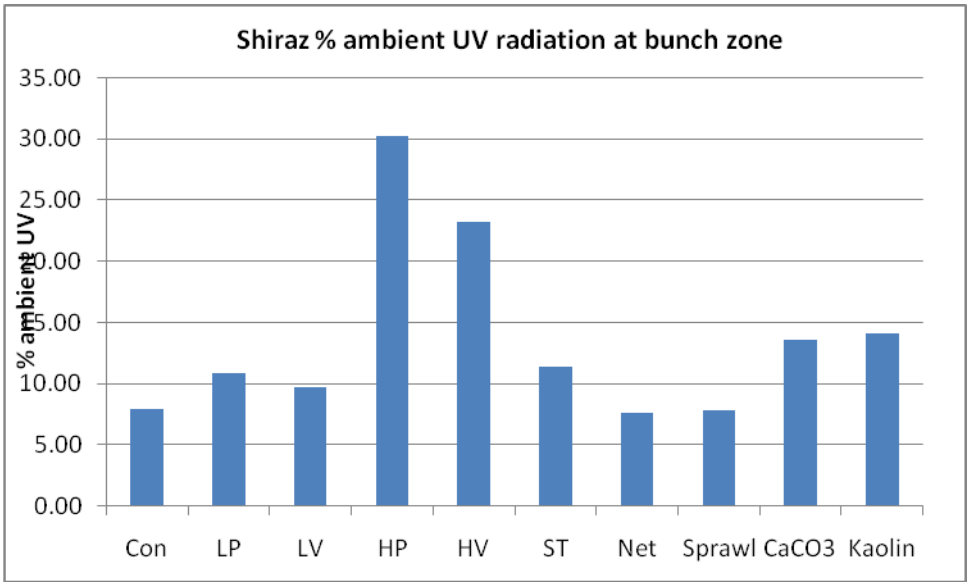
Vine light measures

Visible light measures were taken in the vine bunch zones at veraison, with ultra violet light radiation also measures in bunch zones of Shiraz. Visible light was measured by ceptometry and ultra violet radiation by dosimetry, percentage of ambient radiation calculated for all treatments. As expected the vines that were subject to leaf removal had the highest percent light penetration, the Shiraz shoot thinned and sprawl also very high and Shiraz control and netted vines lowest visible light penetration. Light penetration into Chardonnay vines was not as expected, heavily leaf plucked and shoot thinned vines highest and little difference seen between others. It should also be noted that all Chardonnay vines had quite low light penetration, the vertical plane of Chardonnay canopies being quite dense.

UV light measures, taken only in Shiraz, again indicated greatest UV radiation in the bunch zones of heavily leaf plucked vines. Interestingly the other treatments all showed similar bunch zone UV conditions to the control. One point of interest is the slightly elevated UV shown in the vines subject to sunscreen sprays – it is possible that these sprays were actively reflecting UV light away from the surrounding leaves and bunches.


Chardonnay bunch zone % ambient visible light
% ambient visible light
2.5
2.0
1.5
1.0
0.5
0.0
Con
LP
LV
HP
HV
ST
Net
CaCO3
Kaolin clay


Shiraz bunch zone % ambient visible light
% ambient visible light
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
Con
LP
LV
HP
HV
ST
Net
Sprawl
CaCO3
Kaolin clay



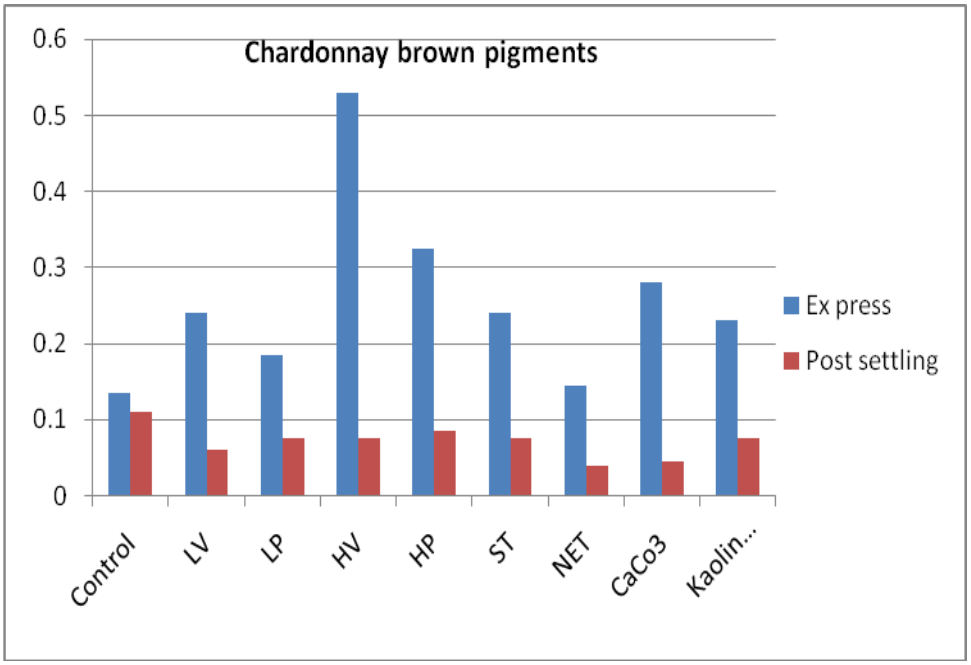
Fruit analysis

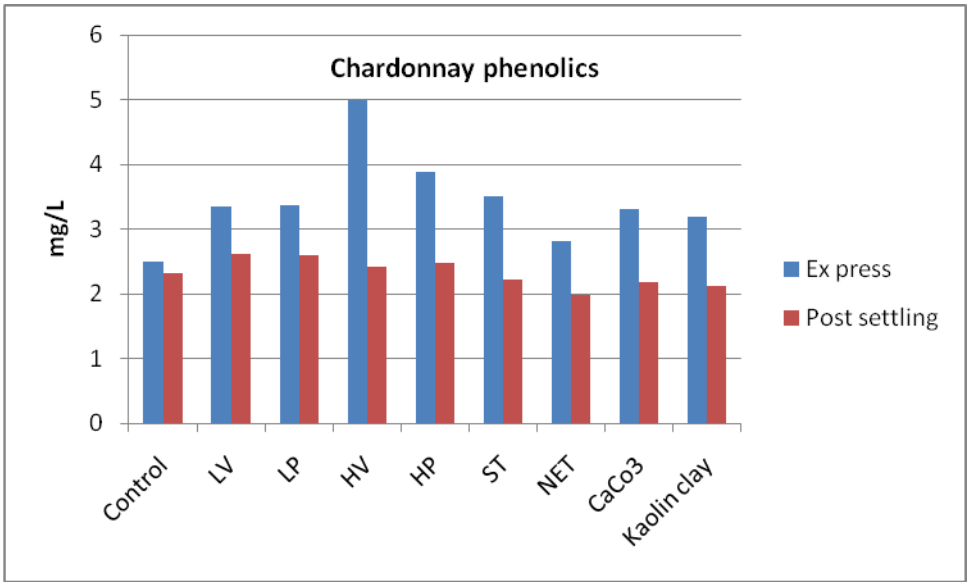
Fruit was harvest when the vineyards were deemed ripe for commercial harvest. No appreciable differences were seen in measures of TSS, pH and titratable acidity between the different treatments for both varieties.

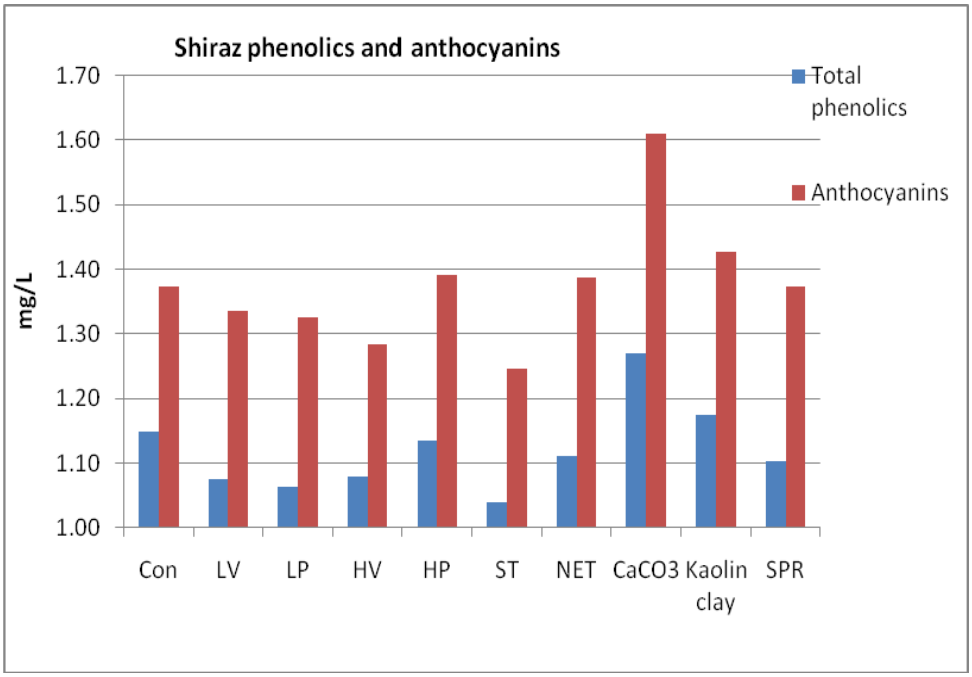
Spectral measures were carried out on fruit, in particular to assess total phenolics, anthocyanins for Shiraz and pre and post juice settling brown pigments for Chardonnay.

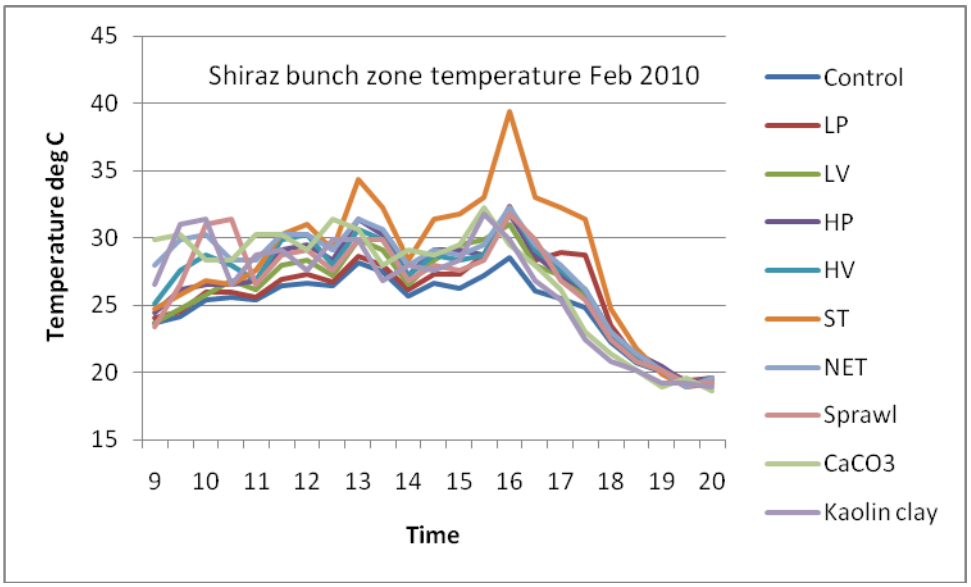
Shiraz vines subject to sunscreen sprays were slightly higher in phenolics than control vines, with all other treatments slightly lower. Results for anthocyanin concentration varied, with the vines to which sunscreen sprays were applied showing greatest anthocyanin accumulation, the LP, LV, HV and ST vines lower. It is possible that this is due to bunch exposure as the 'sunscreen' vines were subject to lower light exposure and the leaf thinned and ST vines higher, however the results for other treatments are inconclusive, and it should be noted that day time temperature showed similar trends for all treatments. The 4pm spike in temperature for the ST vines may be due to lack of canopy uniformity as noted in the summary below.

For Chardonnay the HP and HV treatments, followed by LP and LV and sunscreen sprays, showed the highest levels of phenolics and brown pigments pre settling, however a in all treatments settling resulted in a decrease in juice total phenolics and brown pigments.


Chardonnay brown pigments
0.6
0.5
0.4
0.3
0.2
0.1
0
Control
LV
LP
HV
HP
ST
NET
CaCo3
Kaolin...
Ex press
Post settling


Chardonnay phenolics
mg/L
6
5
4
3
2
1
0
Control
LV
LP
HV
HP
ST
NET
CaCo3
Kaolin clay
Ex press
Post settling





Wine assessment

Wines were assessed by judges at the Royal Agricultural Society of Queensland Wine Show and Mediterranean Challenge, using a flavour profile system. Similar trends were observed amongst all treatments for both Chardonnay and Shiraz and no obvious differences between treatments.

Conclusion

In conclusion it should be reiterated that this vineyard was subject to a number of inclement weather events – frost and hail – early in the growing season. Vines suffered a degree of damage to shoots as a result of this, thus across the vineyard there was a distinct lack of uniformity. This, combined with some water stress leading to defoliation and disease pressures late in the season, resulted in the different treatments not appearing to be appreciably different from each other.

Nonetheless there were some observations made on quality of fruit from different treatments. Highly exposed fruit developed higher levels of sunburn, and the overall consensus from growers was that control and netted fruit was of the best quality with regard to sun exposure.

This work is continuing, analysis of wines for Ca concentration and heat stability currently being carried out. It is hoped to repeat this project in the 2010/11 season, targeting a number of vineyards which have a lower incidence of frost and hail events.

This work was carried out as an extension project by staff from the University of Southern Queensland and Queensland Primary Industry and Fisheries, and is supported by the Queensland industry and GWRDC RITA grant RT08/03-1 "Addressing fruit exposure and sunburn in Queensland wine grape vineyards".

References

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