Monowai Chardonnay HML study

Twenty four treatment regimes were tested, with five reps of each (except the Untreated, which had ten reps) – presumably in a complete block design, so Rep represents position in vineyard.

The regimes consisted of combinations of eight early treatments and eleven late ones (see below)

		Late treatment										
		0.5% Fish Oil	1% Fish Oil	2% Fish Oil	50%HML32	50%HML40	Grower Treatment	HML32	HML40	Protector	Tank 40	Untreated
Early treatment	Conventional							●				●
	Grower Treatment						●					
	HML32	●	●		●			●		●		●
	HML40		●	●		●			●	●		●
	HML40+Cu								●			●
	Non Residual				●			●		●		●
	Tank 40										●	●
	Untreated											●

Berry weight and brix from each rep of each treatment were measured.

Because the treatment combinations are not balanced, data was analysed using GenStat's unbalanced ANOVA, early and late treatment (plus their interaction) as treatment factors, and with Rep as a block factor. The unbalanced ANOVA procedure screening tests give marginal (not adjusted for other factors) and conditional (adjusted for other factors) significance tests; here we look at the conditional tests

	Berry weight		Brix	
Conditional tests	v.r.	p	v.r.	p
Early treatment (6 df)	0.6	0.750	1.5	0.178
Late treatment (9 df)	11.8	<.001	83.4	<.001
Interaction (7 df)	1.7	0.114	0.8	0.578

So it appears what the early treatment was had little effect on berry weight or Brix, once we take into account late treatment. Late treatment does appear to have an effect, even allowing for the early treatment. The interaction term (capturing any synergies between early and late treatments) is not significant for either berry weight or Brix.
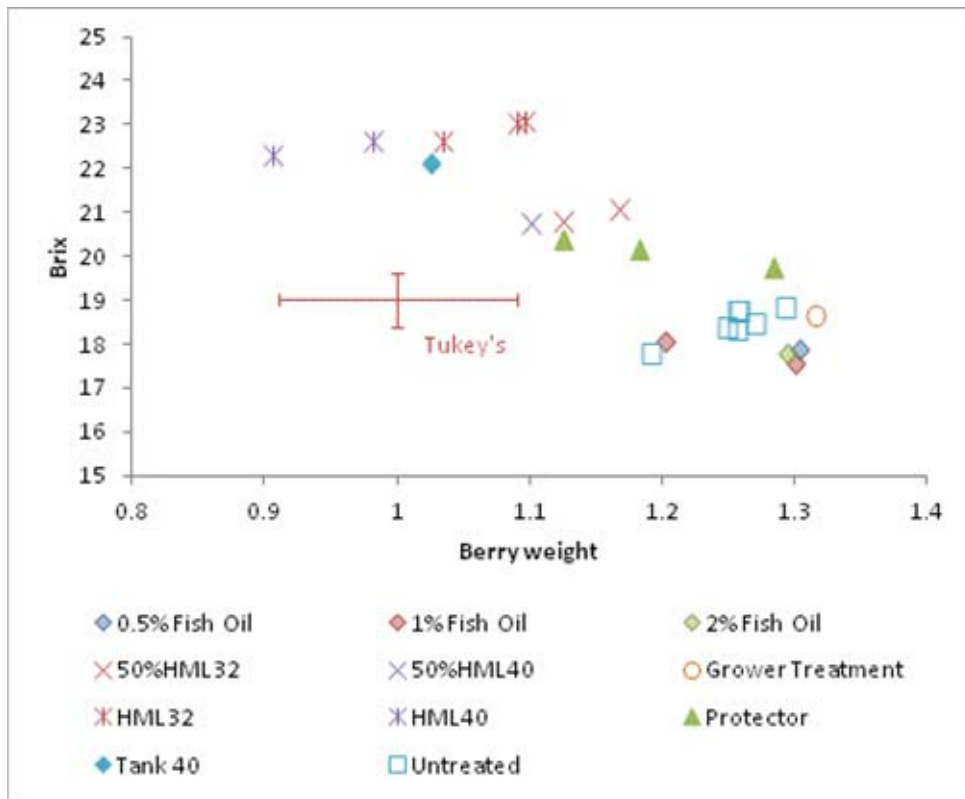
	Berry weight		Brix	
Means				
Late treatment	Mean	SE	Mean	SE
0.5% Fish Oil	1.30	0.045	17.88	0.31
1% Fish Oil	1.25	0.032	17.80	0.22
2% Fish Oil	1.29	0.045	17.76	0.31
50%HML32	1.14	0.032	20.90	0.23
50%HML40	1.10	0.045	20.76	0.31
Grower Treatment	1.32	0.045	18.64	0.31
HML32	1.07	0.028	22.91	0.20
HML40	0.96	0.035	22.56	0.25
Protector	1.21	0.026	20.07	0.18
Tank 40	1.03	0.045	22.12	0.31
Untreated	1.24	0.019	18.41	0.13
Average LSD (Untreated with rest)	0.08		0.59	
Average LSD (Others)	0.11		0.75	
Approximate Tukey's HSD				
Untreated with rest	0.13		0.97	
Others	0.18		1.24	

We can legitimately use the LSDs for planned comparisons – for instance I imagine the study was designed to look at HML 32 vs HML40, the HML treatments vs the corresponding 50% HML treatments, and the fish oil dose rates

(The dose rate of fish oil does not cause a significant difference in berry weight or Brix. HML 32 and HML 40 do not produce significantly different Brix, but HML 40 produces significantly lower berry weight than HML 32. The 50% HML treatments produce significantly lower Brix than the full HML treatments, and 50% HML 40 produces significantly heavier berries than HML 40)
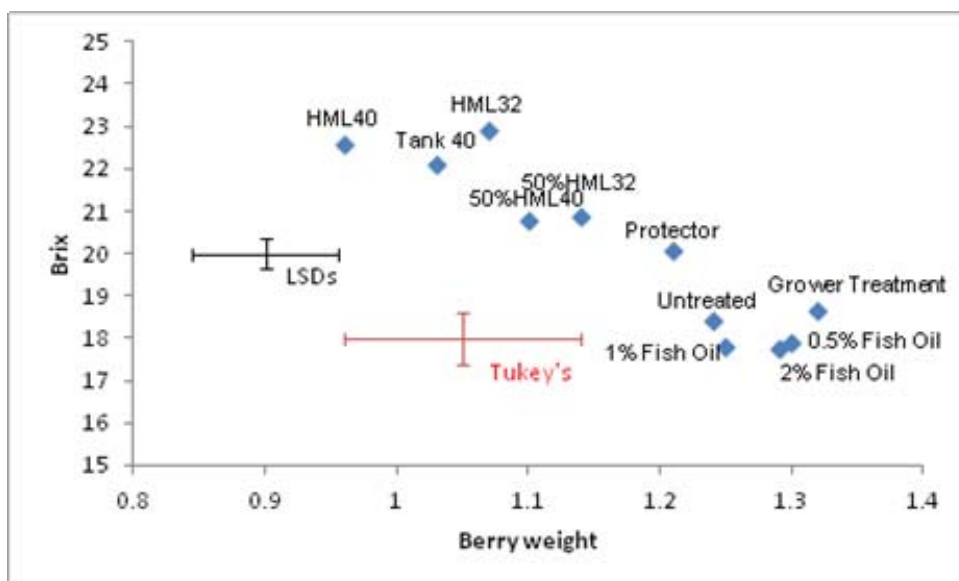
In a similar vein, we can plot the means for all the treatment combinations, along with the Tukey's honestly significant difference bars for weight and Brix, to get an idea whether there are any promising early-late treatment combinations. Points are colour coded by their late treatment.

As might be expected from the p-values for the interaction, Brix values do not seem to vary much once we have accounted for the late treatment. For some of the late treatments, there is a wider spread of berry weights depending on the early treatment; Protector with HML32 as an early treatment gives a higher berry weight than Protector with either HML 40 early or Non-Residual early (but the difference is not significant). Again, 1% Fish Oil with HML 32 as an early treatment gives higher berry weights than with HML 40 as an early treatment (but again, not significantly so)