Australian Government
Grape and Wine Research and Development Corporation

GrapeLinks
Viticultural Knowledge Management

Benchmarking Victorian Shiraz 2005-2011

Erika Winter, Stephen Lowe, Andrea Hart
and very many grape growers and winemakers

Australian Government
Grape and Wine Research and Development Corporation

GrapeLinks
Viticultural Knowledge Management

Funding: GWRDC RITA and DFA FarmReady

Aims:

- to use affordable methods and technology on very many vineyards of several regions

- to create a scoring system that encompasses bunch zone temperature and other "pointers of quality"

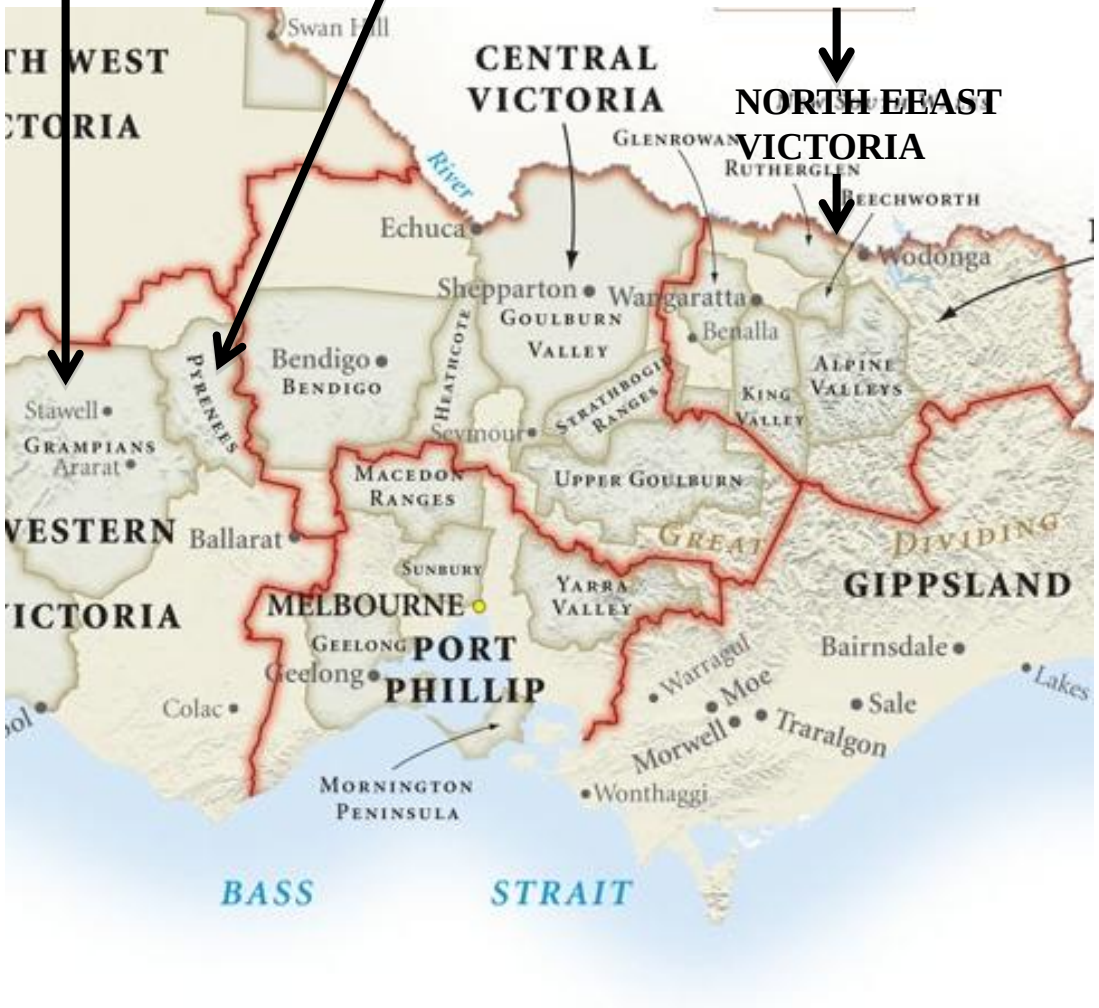
- to measure important grape parameters and wine flavours

- to extend findings to enable viticulturists and winemakers to get the best our of their Shiraz sites

- to enhance local knowledge to adapt to a more variable climate

The Viticultural Regions of Shiraz Benchmarking

Grampians (2), Pyrenees (2) NE Victoria (26)



Differences: altitude, aspect, slope, row orientation, soil, meso-climate
BUT: Microclimate in the bunch zone can be manipulated!

King Valley

Grampians

Australian Government
Grape and Wine Research and Development Corporation

GrapeLinks
Viticultural Knowledge Management

26 Shiraz vineyards in NE Victoria

NE VIC Shiraz 06 Vineyard information (N= new vineyard)

Vineyard Code	Area (Ha)	Slope %	Aspect facing which direction	Vine age	Trellis type	No. of wires	Row orientation	Row spacing in m	Vine spacing in m	Pruning Method	Clone	Root stock	Irrigation type	Water Source	Rain before verais.	Rain after verais.	Rain total mm	Yield (t/ha) insert post harvest
1A	3.2	20	ne	7	vsp	1	nw/se	3	2.0	spur	pt23	r99	drip	dam	245	70	315	10.0
2B	0.1	3	wnw	12	s/d	1	e/w	2.5	1.5	cane	na	schw	non	sky	225	71	316	6.0
3G	10.2	10	sw	10	s/d	1	nw/se	3	2.0	spur	na	na	drip	dam	210	72	317	5.9
4KN	3.0	3	e	4	vsp	1	ne/sw	3	1.8	spur	1654	paul	drip	creek	255	73	318	11.3
5R	6.0	10	sw	9	sprawl	1	ne/sw	3	2.1	spur	1654	r99	drip	dam	243	74	319	8.7
6R	12.0	10	wnw	8	s/d	1	nw/se	3	2.0	spur	1654	schw	drip	dam	230	75	320	11.0
7K	2.1	5	wsw	12	s/h	2	n/s	3	1.8	spur	na	schw	drip	dam	205	76	321	7.2
8O	4.0	0	0	14	s/d	1	n/s	3	3.0	spur	pt23	schw	furr	river	215	77	322	9.9
9O	6.0	15	wnw	8	s/d	1	n/s	3	2.0	spur	tahbilk	rug/paul	drip	dam	270	78	323	2.8
10A	3.0	10	nw	11	s/d	1	ne/sw	3	2.0	spur	pt23	schw	non	sky	339	79	324	5.0
11A	2.4	25	e	8	s/d	1	n/s	3	2.0	spur	1654	teleki	drip	dam	237	80	325	9.3
12B	1.0	3	n	8	s/d	1	n/s	3	2.4	spur	pt23	schw	drip	dam	268	81	326	4.0
13G	2.1	3	wsw	12	vsp	1	nw/se	3.3	2.7	spur	pt23	schw	non	sky	222	82	327	6.0
14K	4.4	0	0	12	s/d	1	n/s	3	3.0	spur	pt23	schw	drip	dam	255	83	328	7.5
15R	4.5	3	w	10	s/h	2	e/w	3	2.0	spur	pt23	kober	drip	river	220	84	329	12.5
16R	2.2	3	n	9	s/h	2	ne/sw	3	2.0	spur	pt23	kober	drip	dam	265	85	330	10.0
17G	2.0	5	sw	8	vsp	1	nw/se	3	1.8	cane	pt23	rugg	drip	dam	208	86	331	4.4
18G	2.3	3	e	8	s/d	1	n/s	3	2.0	spur	pt23	schw	drip	dam	207	87	332	3.7
19B	3.4	10	n	7	s/d	1	n/s	3	2.0	spur	pt23	schw	drip	dam	257	88	333	6.3
20A	4.0	0	0	11	s/d	1	ne/sw	3	3.0	spur	pt23	schw	drip	river	251	89	334	13.0
21B	5.0	25	w	8	s/d	1	e/w	2.7	1.8	spur	bvrc12	r99	drip	dam	265	90	335	3.7
22G	2.0	1	nw	36	sprawl	1	ne/sw	3.3	1.8	spur	na	arg1	drip	dam	225	91	336	5.0
23K	5.0	10	n	8	s/d	1	e/w	3	3.0	spur	pt23	schw	drip	dam	267	92	337	5.0
24R	2.0	0	0	6	s/h	1	n/s	3	2.0	spur	bvrc12	schw	drip	river	261	93	338	10.0
25K	1.5	15	w	10	s/d	1	n/s	2.7	2.5	spur	1654	schw	drip	river	275	94	339	2.0
26G	3.0	10.0	sw	10	s/d	1	nw/se	3	2.0	box he.	na	na	drip	dam	210	95	340	10.3
Av.	3.7	7.8		10.2											243.5	82.5	327.5	7.3

Australian Government
Grape and Wine Research and Development Corporation

GrapeLinks
Viticultural Knowledge Management

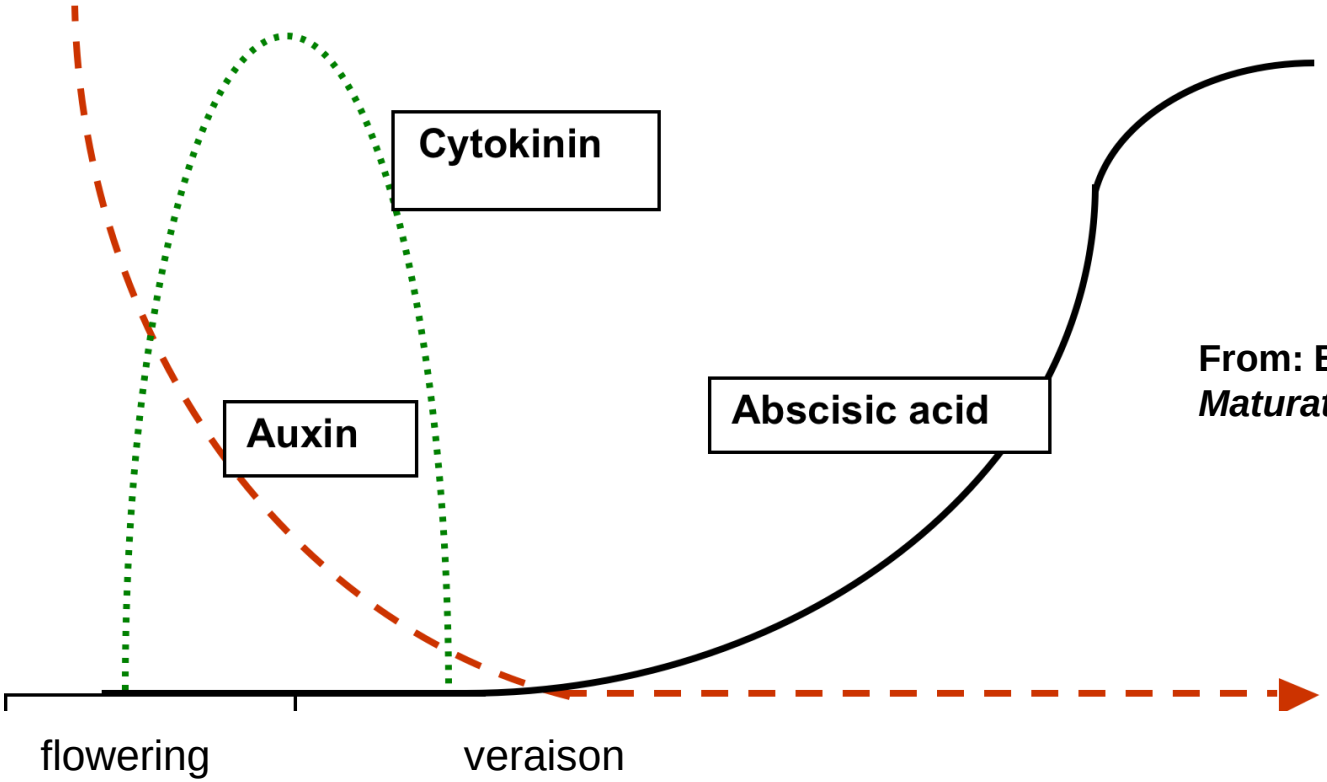
Large amount of vineyard and canopy data collected

					50% VERAISON										Pre- HARVEST						
Vineyard Code	Trimmed	no. of leaves/ shoot sized 100 cm^2	no. of leaves/ shoot sized 150 cm^2	no. of leaves/ shoot sized 200 cm^2	**Active leaf area cm2**	No act. Leaves	leaf no. per shoot	**young/ active leaves**	av. bunch number per shoot	No. of actively growing tips per shoot	% of canes lignified	leaf layers over bunches front	no of leaf layers over bunches back	leaf condition mature leaves	condit. four oldest leaves	condit. younger leaves	leaf layers over bu. front	front =	leaf layers over bu. back	Av Bunch weight (gm)	**Vine balance**
1A	1	20.2	2.5	5.7	3535	28	37	0.77	1.6	0.1	4.0	1.9	1.9	4.9	2.9	4.0	1.5	e	2.1	180	12.3
2B	1	15.7	3.1	4.4	2915	23	31	0.75	1.4	0.0	2.6	1.3	2.3	4.7	3.0	4.0	0.8	s	1.4	120	17.4
3G	1	31.9	5.7	5.3	5105	43	59	0.73	1.0	0.3	3.4	3.2	2.2	5.0	2.7	3.7	0.8	e	3.1	150	34.0
4KN	1	16.8	2.9	3.5	2815	23	30	0.77	1.4	0.1	4.3	1.9	2.5	4.9	3.2	3.7	0.9	w	1.8	150	13.4
5R	1	30	2.7	5.1	4425	38	50	0.75	1.1	0.4	2.7	2.2	2.1	5.0	3.1	4.0	2.1	n	2.2	150	26.8
6R	1	20.1	4.8	5.7	3870	31	45	0.68	1.5	0.6	3.5	2.8	3.1	4.9	3.2	4.0	2.7	s	3.5	200	12.9
7K	1	16.9	2.5	4.6	2985	24	30	0.80	1.0	0.0	3.2	1.7	2.2	3.9	2.9	3.7	1.6	w	1.2	170	17.6
8O	1	15.7	2.0	5.2	2910	23	29	0.80	1.4	0.1	4.1	2.0	1.9	4.7	3.0	4.0	1.6	e	1.9	95	21.9
9O	1	24.8	2.6	2.9	3450	31	40	0.76	0.8	0.0	3.3	1.5	1.0	3.4	2.3	3.9	1.7	w	0.7	100	43.1
10A	1	12.5	4.1	5.5	2965	22	32	0.68	1.5	0.1	4.2	0.6	3.0	4.9	3.1	4.0	0.6	e	3.1	200	9.9
11A	1	30.2	3.3	5.0	4515	38	50	0.77	1.4	0.1	3.3	1.4	2.6	4.0	3.3	4.0	1.5	e	2.5	150	21.5
12B	1	15.7	2.5	6.5	3245	25	36	0.70	1.0	0.1	4.2	1.5	1.9	4.6	3.2	4.0	0.9	e	1.4	180	18.0
13G	1	17.3	2.7	3.2	2775	23	34	0.68	1.6	0.0	2.9	1.7	2.3	4.2	2.4	3.8	1.2	w	1	85	20.4
14K	1	25.2	5.0	7.2	4710	37	50	0.75	1.7	0.8	1.7	1.5	4.6	4.9	3.7	4.0	0.8	e	3.2	180	15.4
15R	1	11.2	3.2	4.2	2440	19	31	0.61	1.3	0.1	3.8	3.0	3.6	5.0	3.1	4.0	1.6	n	2.8	160	11.7
16R	1	22.2	2.7	6.5	3925	31	41	0.77	1.1	0.0	2.5	1.0	2.2	3.3	2.1	3.7	0.9	n	1.7	110	32.4
17G	0	16.3	2.1	4.0	2745	22	31	0.73	1.5	0.0	4.0	1.2	1.5	5.0	2.9	3.6	1.2	e	1.7	90	20.3
18G	1	15	3.1	5.5	3065	24	36	0.65	1.5	0.2	3.8	2.7	1.9	4.8	2.4	3.8	1.8	w	1.2	160	12.8
19B	1	27.1	3.4	7.3	4680	38	50	0.75	1.2	0.8	3.7	2.8	1.7	5.0	2.3	3.6	1.4	w	0.8	220	17.7
20A	1	32.7	4.3	6.3	5175	43	55	0.79	1.4	0.9	2.6	1.5	2.1	4.7	3.1	4.0	1.5	w	1.8	260	14.2
21B	1	29.1	1.7	6.6	4485	37	49	0.76	1.3	0.0	4.1	1.7	1.9	4.0	2.7	3.8	1.3	n	1.5	130	26.5
22G	1	14.9	4.0	2.0	2490	21	32	0.65	1.7	0.0	3.6	2.9	2.9	5.0	3.5	4.0	2.6	n	2.9	130	11.3
23K	1	24	3.7	7.5	4455	35	47	0.74	1.2	0.3	3.5	2.1	1.1	4.6	3.5	4.0	2.2	n	1.5	140	26.5
24R	0	28.9	4.9	5.2	4665	39	60	0.65	1.7	0.6	2.1	2.3	2.7	5.0	3.6	4.0	2.2	e	2.2	105	26.1
25K	1	29.1	3.3	9.0	5205	41	54	0.77	0.8	0.6	3.4	2.5	1.8	5.0	3.0	3.9	2.1	w	1.2	180	36.1
26G	1	25.7	3.5	6.2	4335	35	51	0.69	1.4	0.3	3.4	3.3	2.2	4.9	3.5	4.0	2.7	w	1.2	185	16.7
Av.	0.9	21.9	3.3	5.4	3765	31	42	0.73	1.3	0.3	3.4	2.0	2.3	4.6	3.0	3.9	1.5		1.9	153	20.7
	1=y 0=no	use template diam. 11.3cm	use template diam. 13.8cm	use template diam. 16cm	calculation			calcuation	after bunch removal if done	average for the vine	1=<20% 2=21-40% 3=41-60% 4=61-80% 5=81-100	.		5=green 4=pale green 3 =yellowing 2=yell/brown 1 = absent				direction		from fruit assessment	leaf area/g fruit wt
Av.	last y.	17.3	5.2	5.0	3795	28	41	0.7	1.8	0.4	3.4	2.5	3.4	3.7	2.5	3.5	1.9		2.2	158	13.0

Why is cane lignification score at veraison a pointer?

It shows the transition from Auxin predominance (cell elongation) and Cytokinin (plant growth hormone) phase to Abscisic acid (ripening hormone)

CK is enhanced by too much water and nitrogen, ABA by drought.



From: Blouin and Guimberteau
Maturation et Maturité des Raisins

Australian Government
Grape and Wine Research and Development Corporation

GrapeLinks
Viticultural Knowledge Management

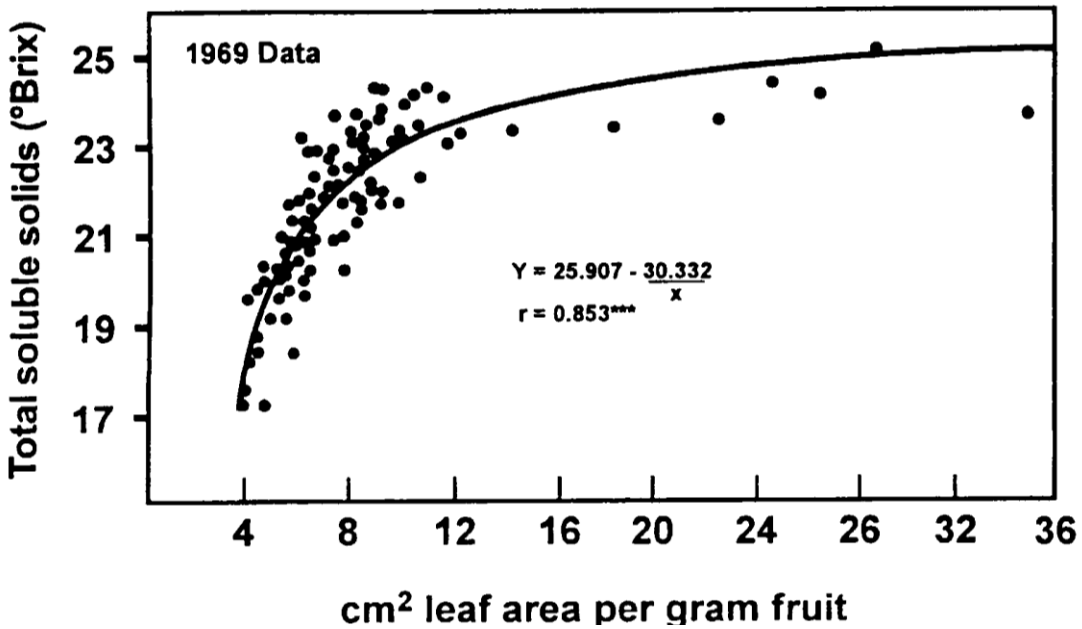
Veraison and pre harvest leaf cover and vine balance

					50% VERAISON										Pre- HARVEST						
Vineyard Code	Trimmed	no. of leaves/ shoot sized 100 cm^2	no. of leaves/ shoot sized 150 cm^2	no. of leaves/ shoot sized 200 cm^2	**Active leaf area cm2**	No act. Leaves	leaf no. per shoot	**young/ active leaves**	av. bunch number per shoot	No. of actively growing tips per shoot	% of canes lignified	leaf layers over bunches front	no of leaf layers over bunches back	leaf condition mature leaves	condit. four oldest leaves	condit. younger leaves	leaf layers over bu. front	front =	leaf layers over bu. back	Av Bunch weight (gm)	**Vine balance**
1A	1	20.2	2.5	5.7	3535	28	37	0.77	1.6	0.1	4.0	1.9	1.9	4.9	2.9	4.0	1.5	e	2.1	180	12.3
2B	1	15.7	3.1	4.4	2915	23	31	0.75	1.4	0.0	2.6	1.3	2.3	4.7	3.0	4.0	0.8	s	1.4	120	17.4
3G	1	31.9	5.7	5.3	5105	43	59	0.73	1.0	0.3	3.4	3.2	2.2	5.0	2.7	3.7	0.8	e	3.1	150	34.0
4KN	1	16.8	2.9	3.5	2815	23	30	0.77	1.4	0.1	4.3	1.9	2.5	4.9	3.2	3.7	0.9	w	1.8	150	13.4
5R	1	30	2.7	5.1	4425	38	50	0.75	1.1	0.4	2.7	2.2	2.1	5.0	3.1	4.0	2.1	n	2.2	150	26.8
6R	1	20.1	4.8	5.7	3870	31	45	0.68	1.5	0.6	3.5	2.8	3.1	4.9	3.2	4.0	2.7	s	3.5	200	12.9
7K	1	16.9	2.5	4.6	2985	24	30	0.80	1.0	0.0	3.2	1.7	2.2	3.9	2.9	3.7	1.6	w	1.2	170	17.6
8O	1	15.7	2.0	5.2	2910	23	29	0.80	1.4	0.1	4.1	2.0	1.9	4.7	3.0	4.0	1.6	e	1.9	95	21.9
9O	1	24.8	2.6	2.9	3450	31	40	0.76	0.8	0.0	3.3	1.5	1.0	3.4	2.3	3.9	1.7	w	0.7	100	43.1
10A	1	12.5	4.1	5.5	2965	22	32	0.68	1.5	0.1	4.2	0.6	3.0	4.9	3.1	4.0	0.6	e	3.1	200	9.9
11A	1	30.2	3.3	5.0	4515	38	50	0.77	1.4	0.1	3.3	1.4	2.6	4.0	3.3	4.0	1.5	e	2.5	150	21.5
12B	1	15.7	2.5	6.5	3245	25	36	0.70	1.0	0.1	4.2	1.5	1.9	4.6	3.2	4.0	0.9	e	1.4	180	18.0
13G	1	17.3	2.7	3.2	2775	23	34	0.68	1.6	0.0	2.9	1.7	2.3	4.2	2.4	3.8	1.2	w	1	85	20.4
14K	1	25.2	5.0	7.2	4710	37	50	0.75	1.7	0.8	1.7	1.5	4.6	4.9	3.7	4.0	0.8	e	3.2	180	15.4
15R	1	11.2	3.2	4.2	2440	19	31	0.61	1.3	0.1	3.8	3.0	3.6	5.0	3.1	4.0	1.6	n	2.8	160	11.7
16R	1	22.2	2.7	6.5	3925	31	41	0.77	1.1	0.0	2.5	1.0	2.2	3.3	2.1	3.7	0.9	n	1.7	110	32.4
17G	0	16.3	2.1	4.0	2745	22	31	0.73	1.5	0.0	4.0	1.2	1.5	5.0	2.9	3.6	1.2	e	1.7	90	20.3
18G	1	15	3.1	5.5	3065	24	36	0.65	1.5	0.2	3.8	2.7	1.9	4.8	2.4	3.8	1.8	w	1.2	160	12.8
19B	1	27.1	3.4	7.3	4680	38	50	0.75	1.2	0.8	3.7	2.8	1.7	5.0	2.3	3.6	1.4	w	0.8	220	17.7
20A	1	32.7	4.3	6.3	5175	43	55	0.79	1.4	0.9	2.6	1.5	2.1	4.7	3.1	4.0	1.5	w	1.8	260	14.2
21B	1	29.1	1.7	6.6	4485	37	49	0.76	1.3	0.0	4.1	1.7	1.9	4.0	2.7	3.8	1.3	n	1.5	130	26.5
22G	1	14.9	4.0	2.0	2490	21	32	0.65	1.7	0.0	3.6	2.9	2.9	5.0	3.5	4.0	2.6	n	2.9	130	11.3
23K	1	24	3.7	7.5	4455	35	47	0.74	1.2	0.3	3.5	2.1	1.1	4.6	3.5	4.0	2.2	n	1.5	140	26.5
24R	0	28.9	4.9	5.2	4665	39	60	0.65	1.7	0.6	2.1	2.3	2.7	5.0	3.6	4.0	2.2	e	2.2	105	26.1
25K	1	29.1	3.3	9.0	5205	41	54	0.77	0.8	0.6	3.4	2.5	1.8	5.0	3.0	3.9	2.1	w	1.2	180	36.1
26G	1	25.7	3.5	6.2	4335	35	51	0.69	1.4	0.3	3.4	3.3	2.2	4.9	3.5	4.0	2.7	w	1.2	185	16.7
Av.	0.9	21.9	3.3	5.4	3765	31	42	0.73	1.3	0.3	3.4	2.0	2.3	4.6	3.0	3.9	1.5		1.9	153	20.7
	1=y 0=no	use template diam. 11.3cm	use template diam. 13.8cm	use template diam. 16cm	calculation			calcuation	after bunch removal if done	average for the vine	1=<20% 2=21-40% 3=41-60% 4=61-80% 5=81-100	.		5=green 4=pale green 3 =yellowing 2=yell/brown 1 = absent				direction		from fruit assessment	leaf area/g fruit wt
Av.	last y.	17.3	5.2	5.0	3795	28	41	0.7	1.8	0.4	3.4	2.5	3.4	3.7	2.5	3.5	1.9		2.2	158	13.0

Why does vine balance (leaf area/ fruit weight 20 shoots) matter?

Every bunch is fed by the leaves on its shoot!

Kliever and Weaver showed already in 1971 (and many others later) that less than 10cm^2 of active leaf area per 1g fruit is not enough.
Di Stefano et al. showed 1983 it also affected terpene aromas
Ideal is 10-15 for Shiraz (15-25 for Pinot noir) in unstressed conditions



From: ***Kliewer and Dokoozlian, 2001***

Bunchzone temperature monitoring

Electronic data loggers are initiated and inserted facing the bunch zone

They measure temperature every hour from veraison to harvest

Result is:

-Cumulative degree hours base 0^{o}C

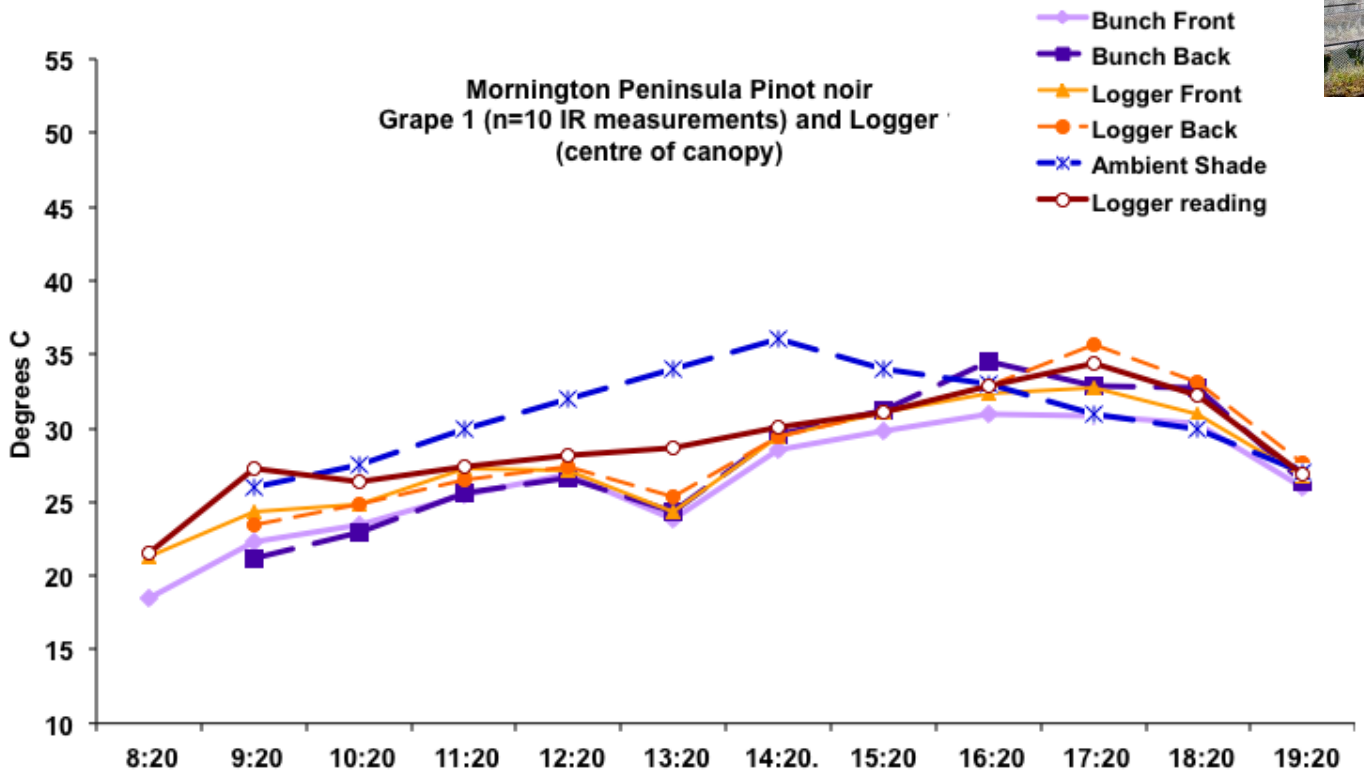
-Cumulative degree hours above 35^{o}C (heatloads)

-Cumulative degree h below 15^{o}C

-Cumulative degree hours in beneficial bracket 15-35^{o}C

Data logger data are within 3 degrees of bunch temperatures when in the canopy

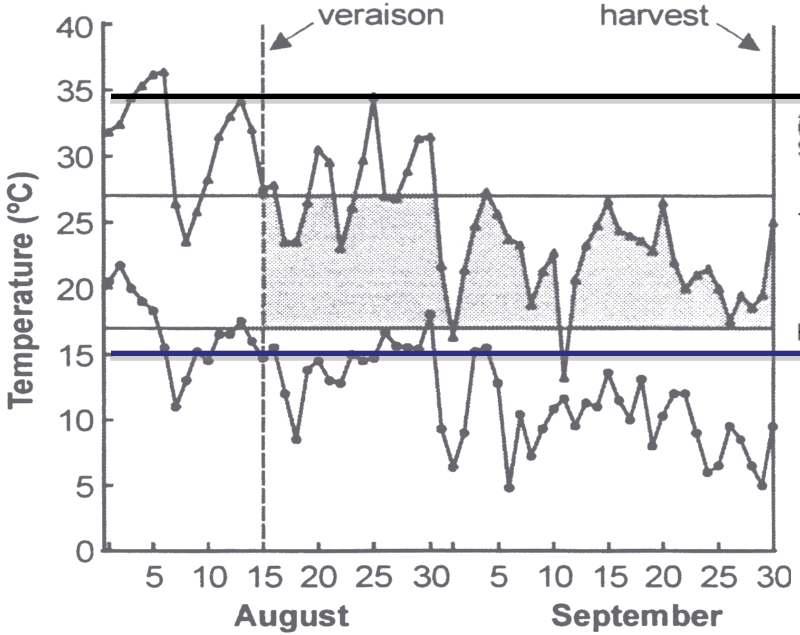
From: *Winter and Boysen 2010*



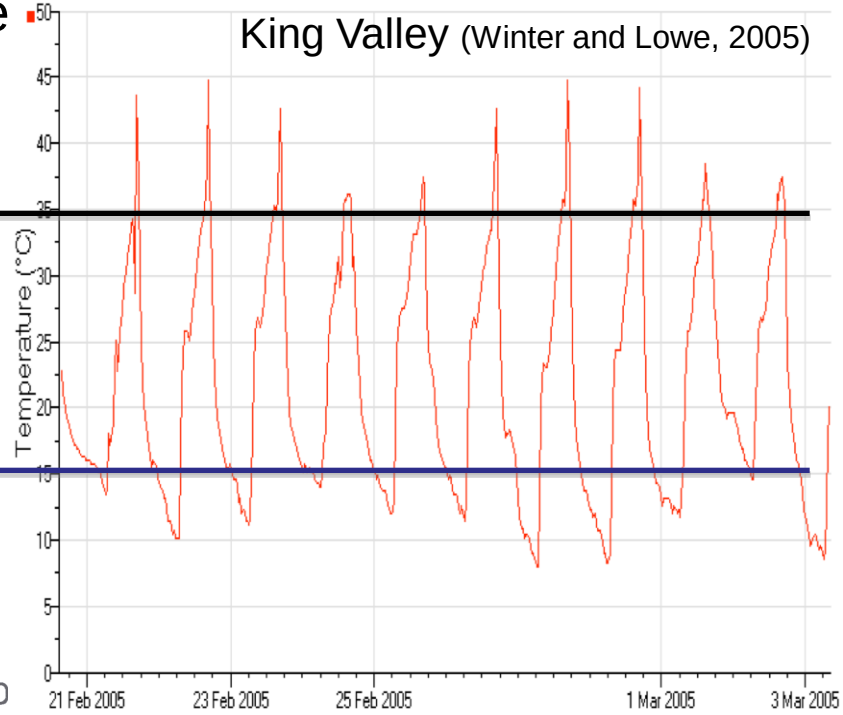
Why do hourly bunch zone temperature measurements matter?

- Enzymes in grapes hate heat above 35° C and are lazy below 15° C
- Time spent in the beneficial temperature bracket/day is a quality pointer
- More so than “wide distance between night and day” as aspired to in Europe, in Australia it can be

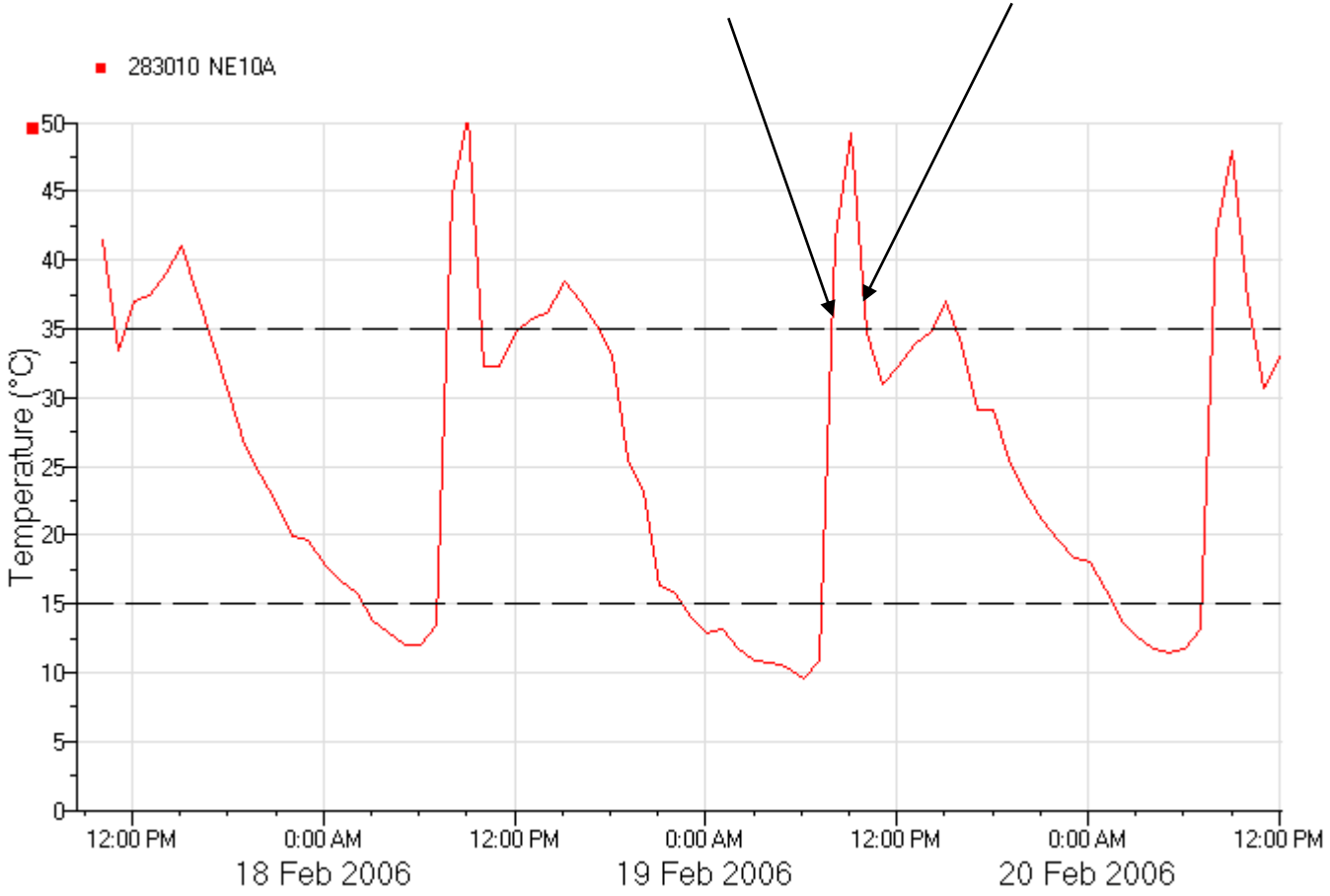
Burgundy *(Iland and Fetzer, 1990)*



King Valley (Winter and Lowe, 2005)



Close-up of diurnal curve :The time-tracer shows for 2006 that the heat peak in 10A is between 7.45 and 9.45 am

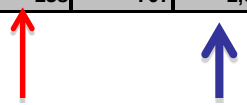


Australian Government
Grape and Wine Research and Development Corporation

GrapeLinks
Viticultural Knowledge Management

Annual variations in bunchzone temperatures 2006 hot vs 2005 cold

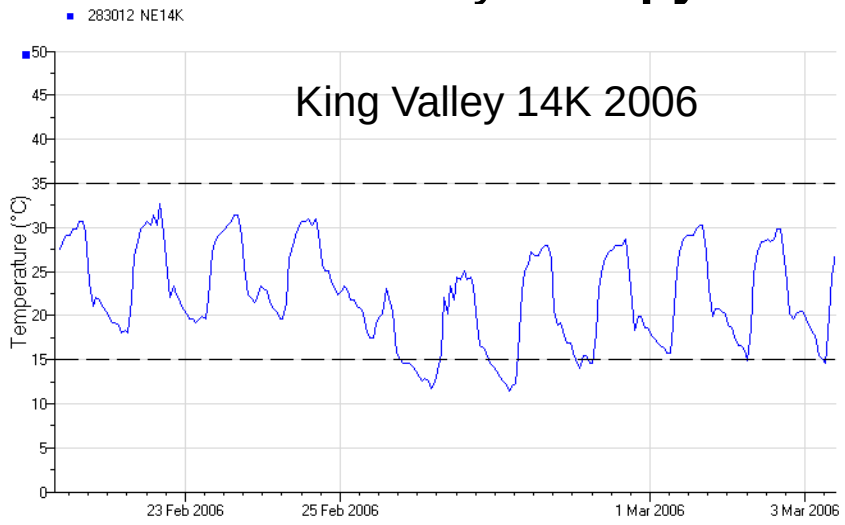
Vineyard Code	06 No. of days ver-harv.	05 No. of days ver. to harv.	06 Ver-Ha degree hours above 0°C	05 Ver-Ha degree hours above 0°C	06 Average degree hours above 0	05 Average degree hours above 0	Ver-Ha degree hours above 35 °C	05 Ver-Ha degree hours above 35 °C	Ver-Ha degree hours below 15°C	05 Ver-Ha degree hours below 15°C	Ver-Ha degree hours between 15 and 35 °C	05 Ver-Ha degree hours between 15 and 35 °C	Average degree hours between 15 and 35 °C	Average degree hours between 15 and 35 °C
1A	40	35	24,058	17,379	601	497	486	26	306	612	23,266	16,741	582	478
2B	54	52	26,260	23,140	486	445	226	66	1,843	2,164	24,191	20,910	448	402
3G	37	57	22,596	27,992	611	491	466	202	498	1,660	21,632	26,130	585	458
4KN	67	na	29,964		447		151		3,056		26,757		399	
5R	42	61	23,831	28,469	567	467	677	614	880	3,127	22,274	24,728	530	405
6R	na	41		19,307		471		89		1,039		18,179		443
7K	34	47	21,114	23,240	621	494	379	203	323	1,243	20,412	21,794	600	464
8O	36	52	21,080	24,723	586	475	410	74	286	1,368	20,384	23,281	566	448
9O	41	67	26,107	33,878	637	506	944	475	245	1,740	24,918	31,663	608	473
10A	31	57	17,692	23,840	571	418	710	213	889	3,582	16,093	20,045	519	352
11A	40	43	24,209	21,619	605	503	547	175	428	1,225	23,234	20,219	581	470
12B	39	52	20,921	24,206	536	466	399	424	1,002	2,104	19,520	21,678	501	417
13G	40	51	24,059	25,365	601	497	183	136	272	1,148	23,604	24,081	590	472
14K	60	61	26,869	26,512	448	435	0	2	1,823	1,855	25,046	24,655	417	404
15R	39	45	24,989	22,505	641	500	805	144	249	886	23,935	21,475	614	477
16R	42	43	24,370	19,871	580	462	820	35	861	1,391	22,689	18,445	540	429
17G	26	38	15,908	19,348	612	509	182	78	128	746	15,598	18,524	600	487
18G	47	63	29,941	31,724	637	504	1,385	138	184	1,156	28,372	30,430	604	483
19B	44	54	24,096	24,691	548	457	160	26	932	2,019	23,004	22,646	523	419
20A	46	na	27,116		589		503		534		26,079		567	
21B	32	43	18,958	19,957	592	464	408	18	347	1,268	18,203	18,671	569	434
22G	46	64	27,402	30,387	596	475	940	207	561	2,276	25,901	27,904	563	436
23K	39	36	21,777	17,172	558	477	242	125	647	1,116	20,888	15,931	536	443
24R	54	66	34,203	31,514	633	477	914	153	498	2,084	32,791	29,277	607	444
25K	39	59	22,180	27,227	569	461	315	6	364	1,675	21,501	25,546	551	433
26G	40	na	24,170		604		430		530		23,210		580	
Average	42	52	24,155	24,525	579	476	507	158	707	1,630	22,940	22,737	551	442

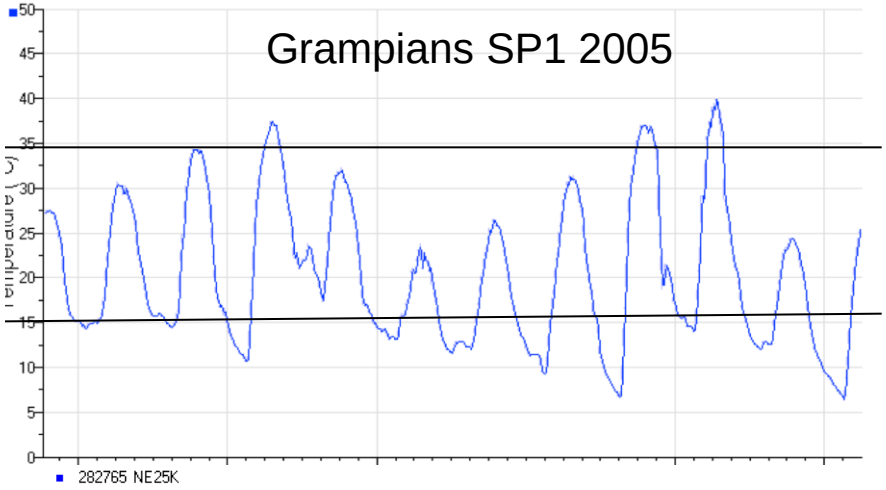


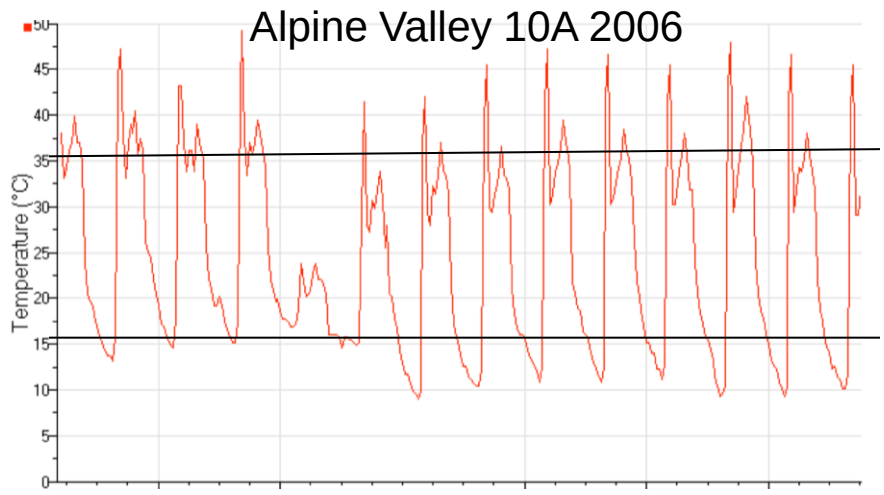
Australian Government
Grape and Wine Research and Development Corporation

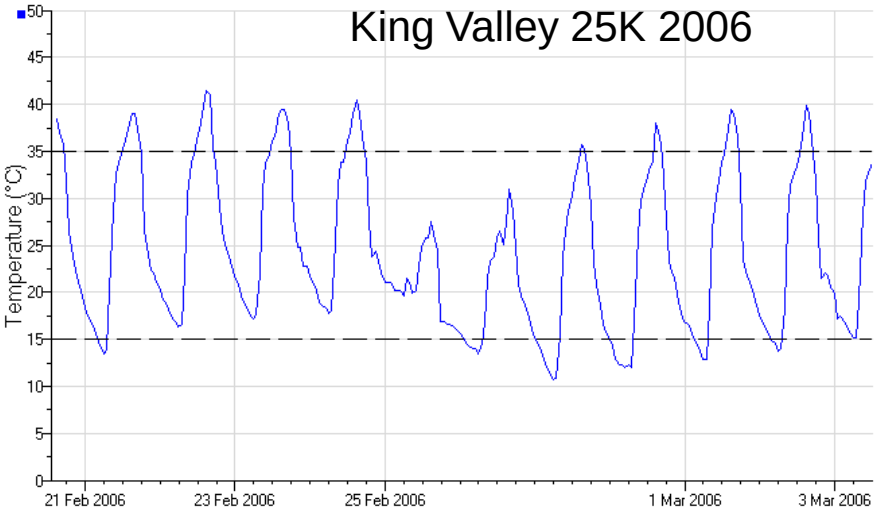
GrapeLinks
Viticultural Knowledge Management

Bunch zone temperature curves during summer days are influenced more by **canopy management** than any other factor









Australian Government
Grape and Wine Research and Development Corporation

GrapeLinks
Viticultural Knowledge Management

Canopy management summer 2005

King Valley 14K

Grampians SP1

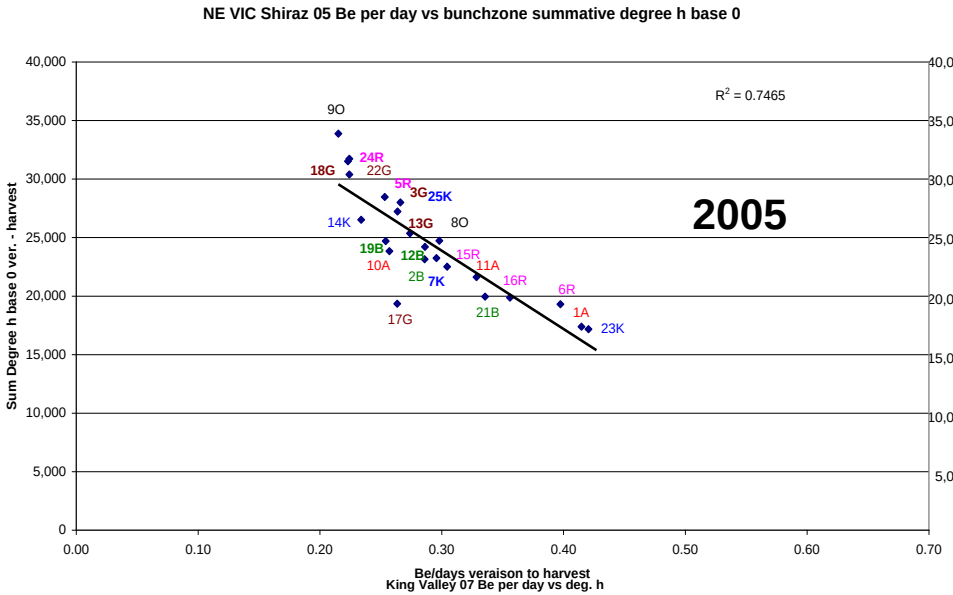
Alpine Valley 10A

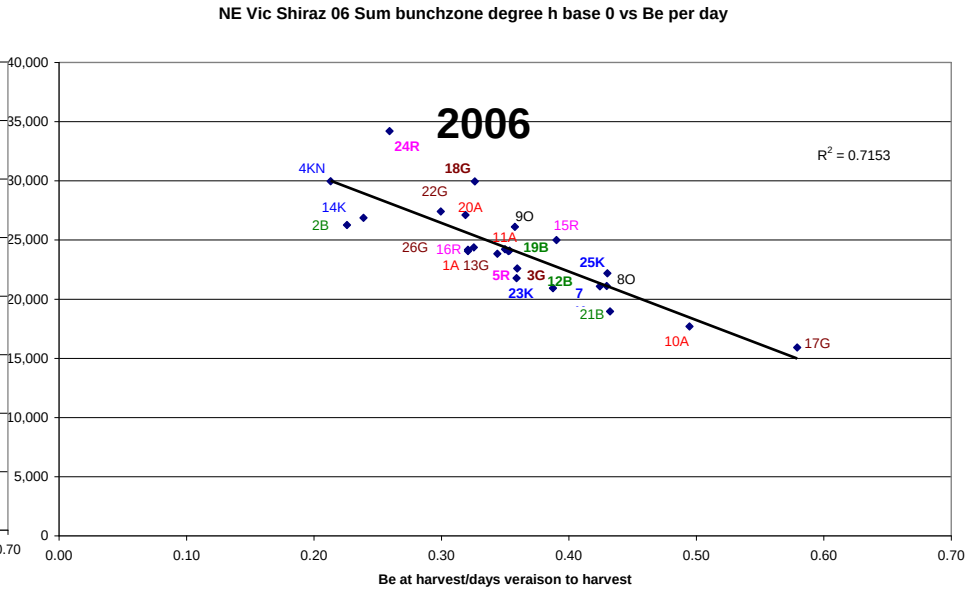
King Valley 25K

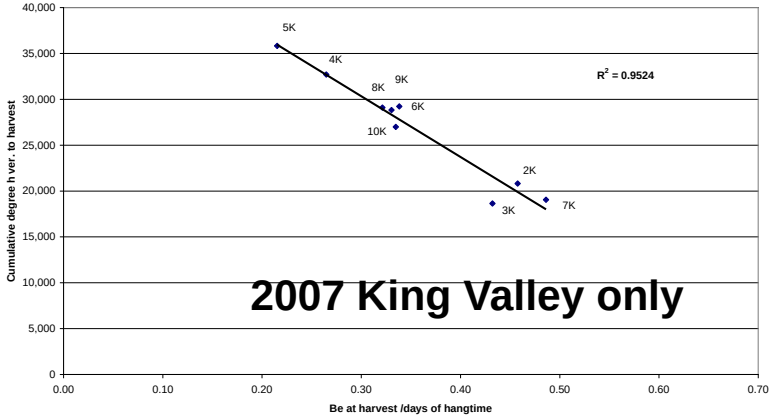
Australian Government
Grape and Wine Research and Development Corporation

GrapeLinks
Viticultural Knowledge Management

High amounts of cumulative degree h were significantly correlated with slow sugar accumulation/day in berries, 3 years data!





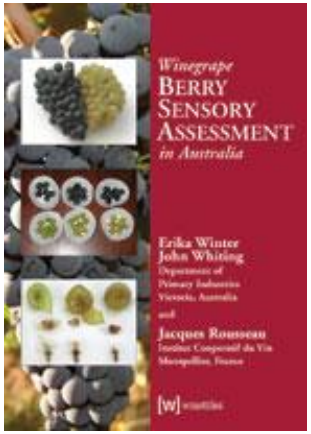


Heatloads slow sugar ripening!
Also burn off aromas,
kill colour…

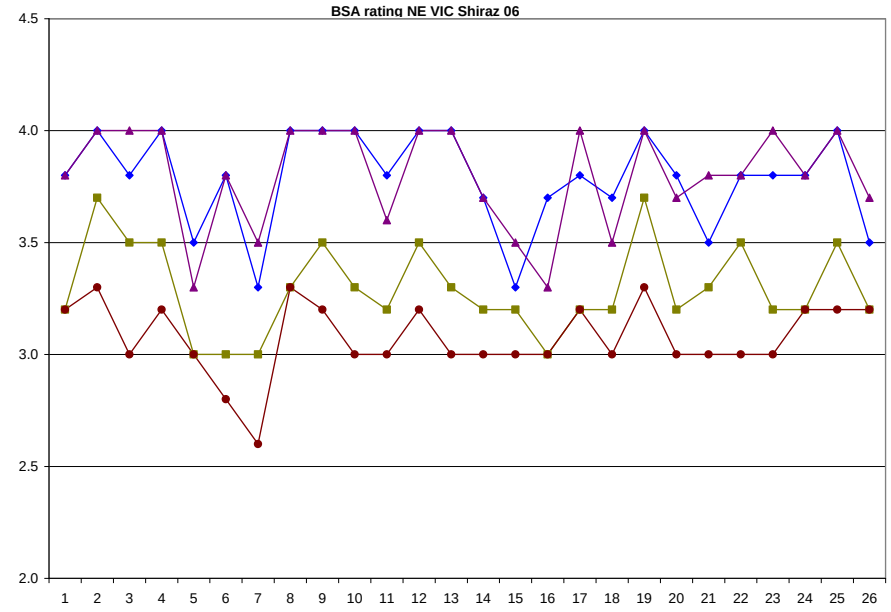
Since then confirmed by plenty of new research!

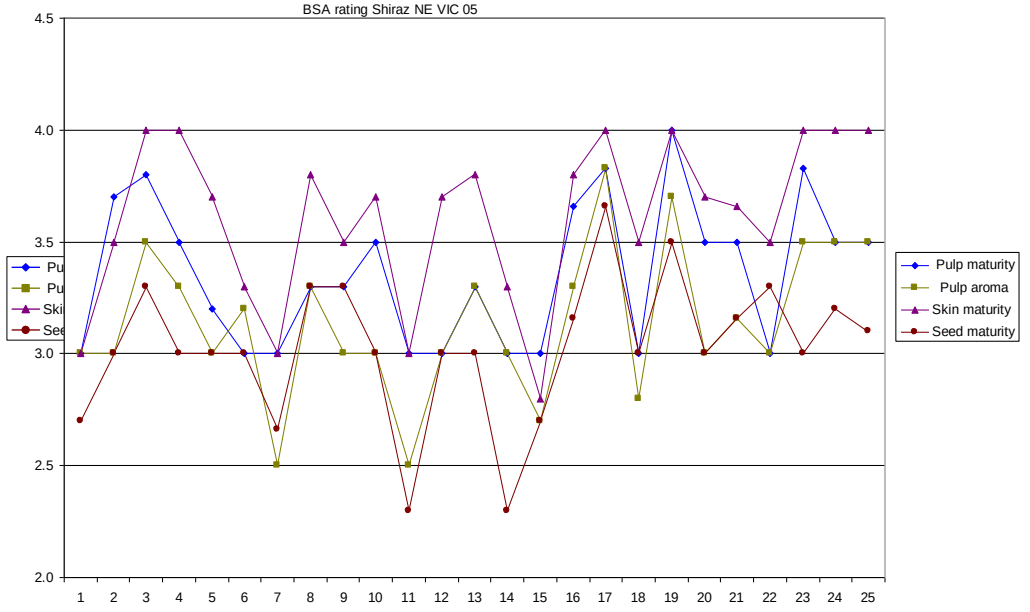
Australian Government
Grape and Wine Research and Development Corporation

GrapeLinks
Viticultural Knowledge Management



Berry Sensory Assessment 2006 hot vs 2005 cool





Low skin maturity and low pulp aroma

Australian Government
Grape and Wine Research and Development Corporation

GrapeLinks
Viticultural Knowledge Management

Scoresheet for 5 month old wine 2006
Judged by Nick Bulleid MW

NE VIC Shiraz 06 Young unfinished wine assessments

Aroma (0=absent, 5= intense) | Mouthfeel (0=absent, 5 = intnese)

Vineyard Code	Herbaceous	Bitter	Green/ White Pepper	Black Pepper	Raspberry	Plum	Blackberry	Mulberry	Licorice	Black olive	Jam	Tannin softness	Tannin intensity	Hue	Colour	"Wine Show" Score	Taster's note
1A																	
2B	3	2	3	1	3	2	1	0	0	0	0	3	1	3	2	14.5	oaky
3G	0	0	0	1	3	3	4	2	2	0	1	3	3	5	4	16.5	
4KN	0	0	0	1	3	1	2	1	0	0	0	4	3	3	3	17.0	
5R	0	0	0	1	1	3	2	2	1	0	0	2	2	2	3	14.5	aldehyde
6R	2	1	2	1	3	1	1	0	0	0	0	2	3	3	3	14.0	
7K	0	0	0	0	1	3	4	3	2	0	2	2	4	4	5	16.5	mouse
8O	0	0	0	1	2	4	4	3	2	3	2	3	3	5	4	17.0	
9O	0	0	0	0	2	3	3	2	0	0	0	4	4	2	3	16.0	
10A	0	0	0	1	2	2	3	1	0	0	0	3	4	3	4	15.5	aldehyde
11A																	
12B	0	0	0	2	3	1	2	0	0	0	0	2	4	4	3	15.5	va
13G	0	0	0	0	2	4	2	2	2	0	3	5	4	3	4	15.0	aldehyde
14K																	
15R																	
16R	0	0	0	0	1	3	2	1	0	0	2	3	3	3	4	14.5	aldehyde
17G	0	0	0	1	1	4	3	2	2	1	2	3	5	4	5	16.0	
18G																	
19B	3	1	3	3	2	3	2	2	0	0	0	3	4	3	4	15.0	
20A	1	0	0	1	3	1	1	1	0	0	0	2	3	4	2	15.0	
21B	0	0	0	0	0	4	2	2	3	3	3	3	3	4	5	14.0	
22G	1	0	1	0	3	2	1	1	0	0	0	2	2	4	3	14.0	oaky
23K	1	1	1	3	2	4	3	2	2	1	2	3	3	3	4	16.5	leesy
24R																	
25K	1	0	1	0	3	2	2	1	0	0	0	2	2	2	3	14.5	chewy
26G																	

Group wine tasting King Valley with Nick Bulleid and Chris Killeen

Australian Government
Grape and Wine Research and Development Corporation

Heatloads and wine score
King Valley Shiraz 2006

GrapeLinks
Viticultural Knowledge Management

Location	Anthocyanins (mg/g berry FW)	Total Phenolics (mg/g berry FW)	Bunch heat loads Morning	Bunch heat loads Afternoon	Leaf layers East or south	Leaf layers West or north	Average Degree h between 15°C and 35° C	Wine score
1A	1.4	4.6	+	++	1.5	2.1	582	n.a.
2B	1.7	7.5	+	-	0.8	1.4	448	14.5
3G	1.9	5.3	++	+	0.8	3.1	585	16.5
4K	1.6	4.4	--	-	1.8	0.9	399	17.0
5R	1.4	6.4	+	++	2.2	2.1	530	14.5
6R	1.2	4.1			2.7	3.5	na	14.0
7K	1.7	5.7	+	+	1.2	1.6	600	16.5
8O	1.6	6.6	+	+	1.6	1.9	566	17.0
9O	1.6	8.3	+	++	0.7	1.7	608	16.0
10A	1.8	6.3	++	+	0.6	3.1	519	15.5
11A	1.6	5.2	+	++	1.5	2.5	581	n.a.
12B	1.8	5.0	+	++	0.9	1.4	501	15.5
13G	2.5	12.5	-	-	1.0	1.2	590	15.0
14K	1.6	3.1	--	--	0.8	3.2	417	n.a.
15R	1.5	4.4	+	++	2.8	1.6	614	n.a.
16R	1.9	11.1	+	++	1.7	0.9	540	14.5
17G	2.0	5.0	++	+	1.2	1.7	600	16.0
18G	1.8	6.5	+	++	1.2	1.8	604	n.a.
19B	1.8	5.5	++	-	0.8	1.4	523	15.0
20A	2.1	7.1	++	+	1.8	1.5	567	15.0
21B	2.3	8.1	++	+	1.5	1.3	569	14.0
22G	1.2	5.1	+	++	2.9	0.6	563	14.0
23K	1.8	5.4	++	-	1.5	2.2	536	16.5
24R	1.2	4.2	++	++	2.2	2.2	607	n.a.
25K	2.0	7.5	++	+	1.2	2.1	551	14.5
26G	1.5	4.6	++	+	1.2	2.7	580	n.a.

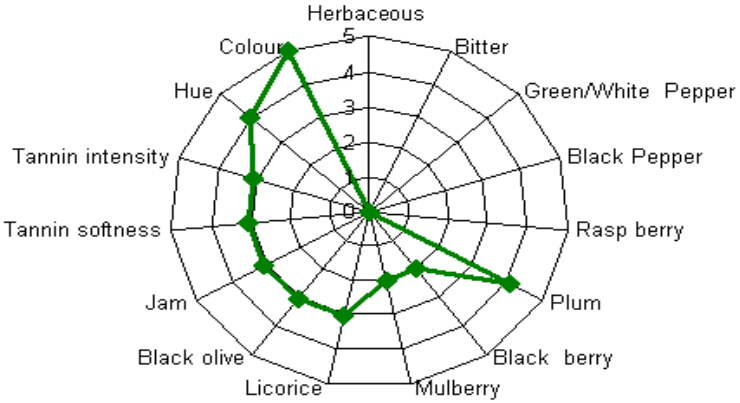
Australian Government
Grape and Wine Research and Development Corporation

Bunch zone temperatures and wine aromas

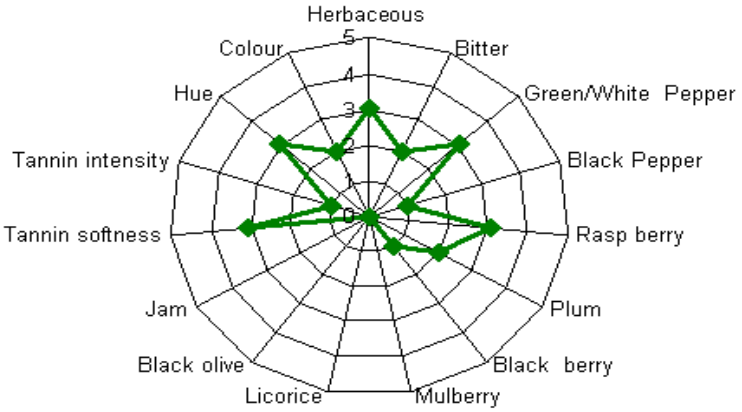
GrapeLinks
Viticultural Knowledge Management

2006 Benchmarking NE Victorian Shiraz

21B Hot bunchzone = Jammy flavours



2B Cold bunchzone =Green flavours



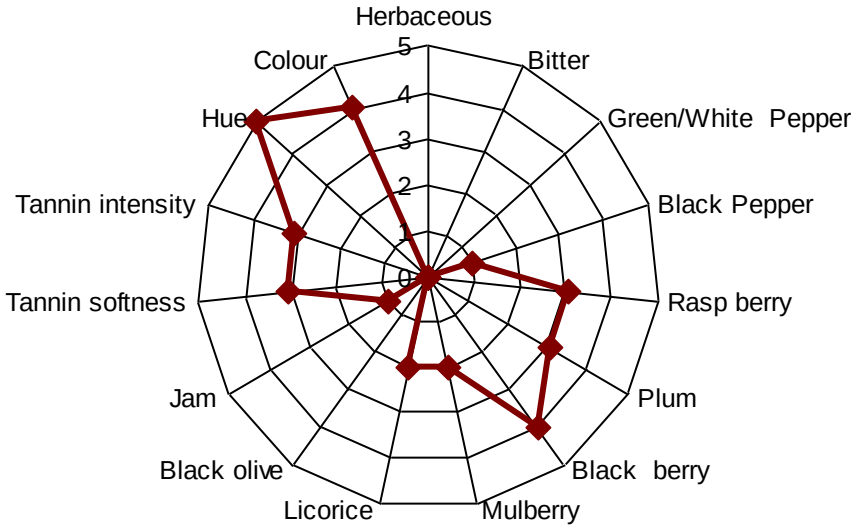
Australian Government
Grape and Wine Research and Development Corporation

GrapeLinks
Viticultural Knowledge Management

Wine aroma with differential canopy management, Glenrowan 2006

North-East

South-West



Australian Government
Grape and Wine Research and Development Corporation

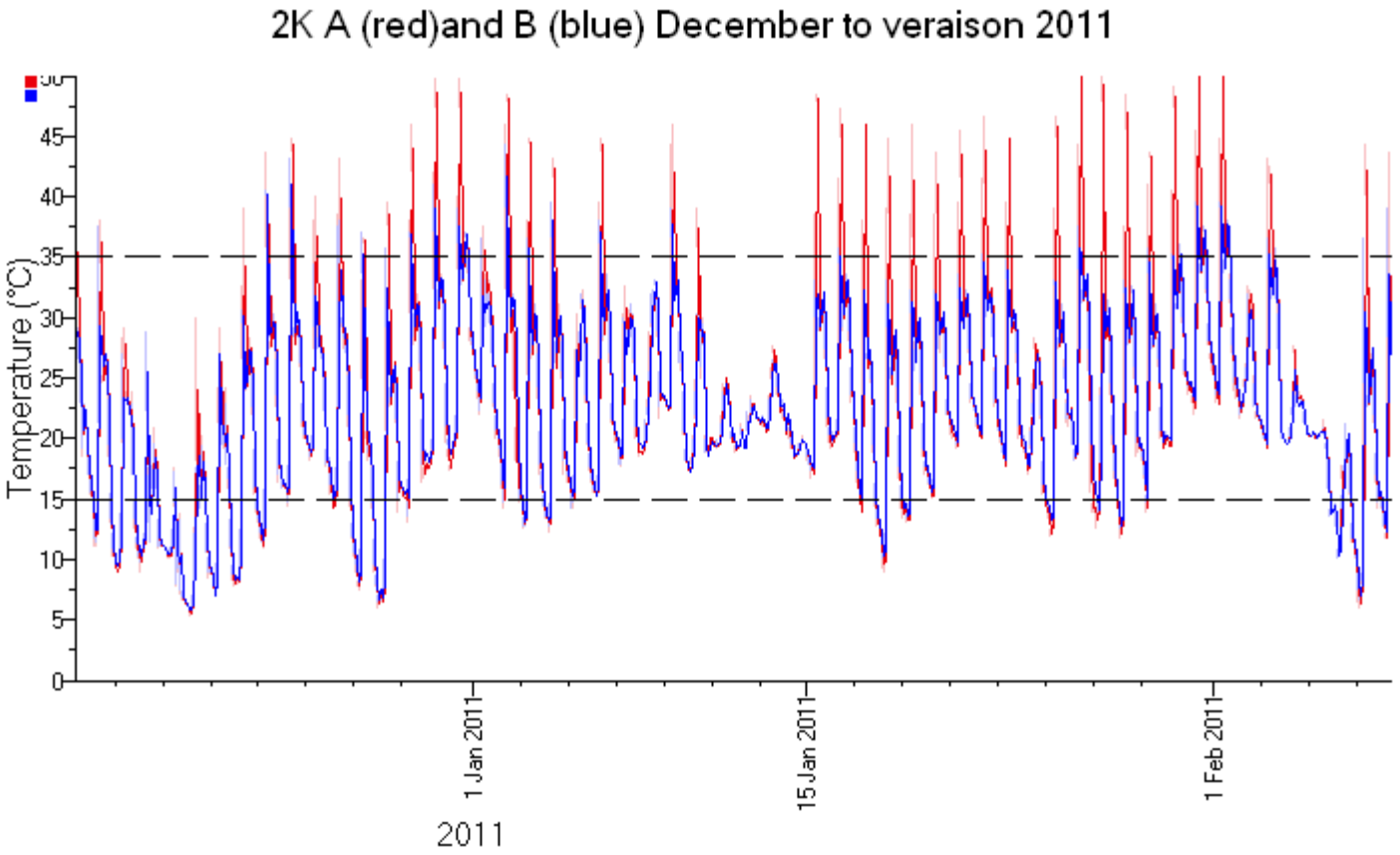
GrapeLinks
Viticultural Knowledge Management

FarmReady On Farm trials:

Comparison of east + west open (A) and west covered bunchzones (B) in 5 varieties

2K Shiraz <u>pre veraison</u> during hot weather:

West exposure creates hotter and colder bunchzones



Australian Government
Grape and Wine Research and Development Corporation

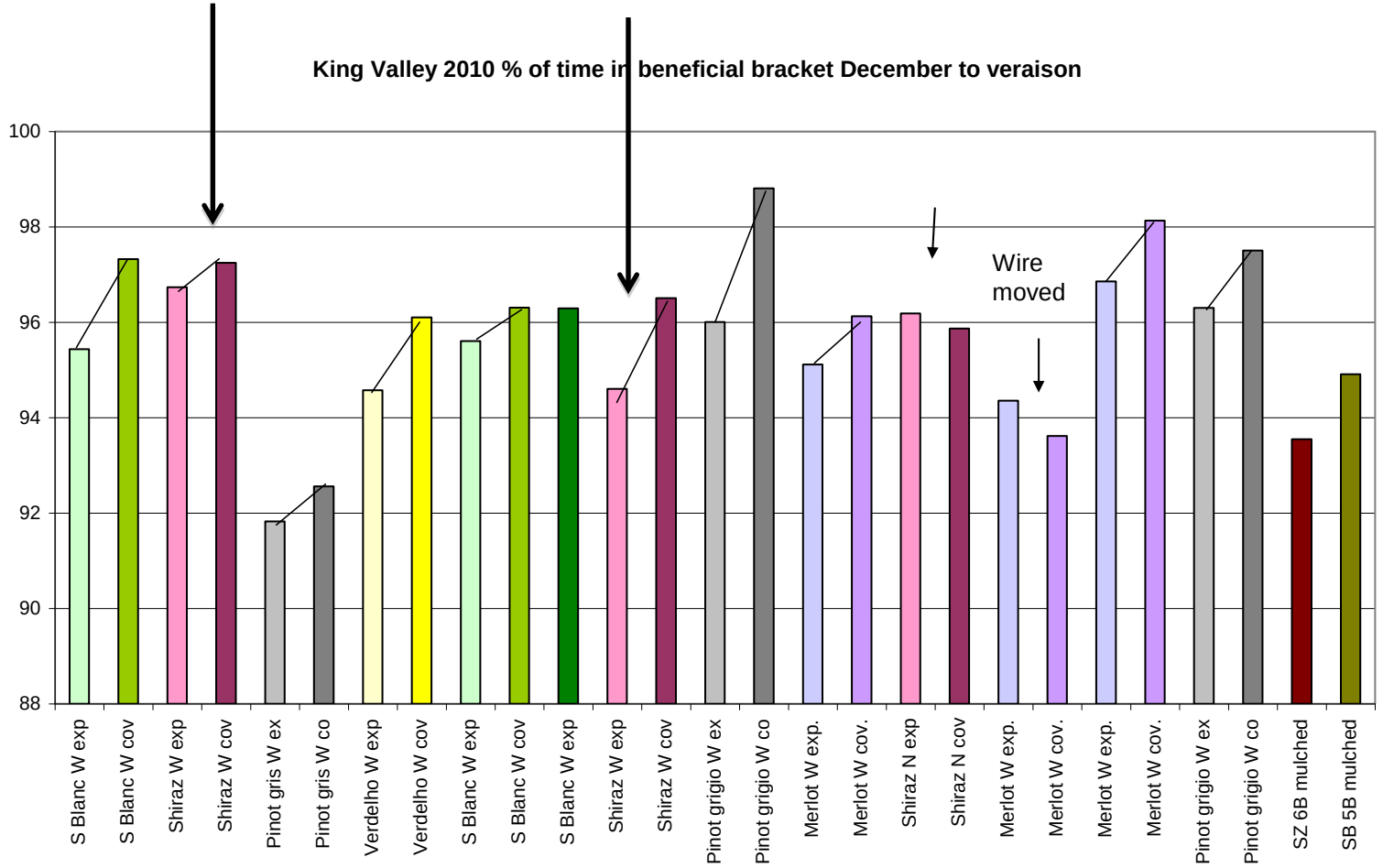
GrapeLinks
Viticultural Knowledge Management

FarmReady On Farm trials:

Comparison of east + west open (A) and west covered bunchzones (B)

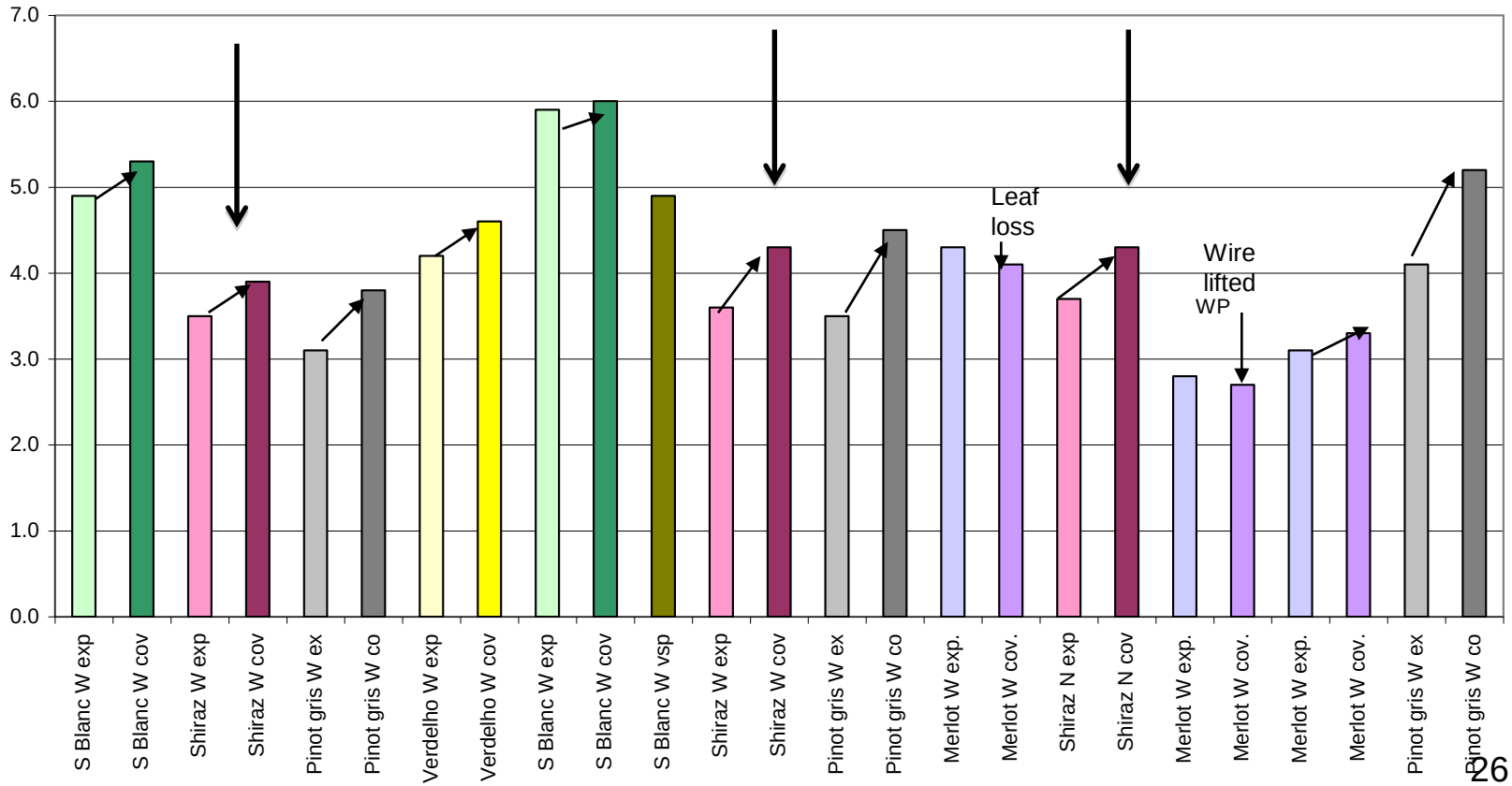
2009/10 5 varieties

Higher percentage in the beneficial bracket with west cover Dec. to veraison



Berry TA in 2010:

Better acid retention in all west covered bunches except where leaf loss or wire lifting had occurred.

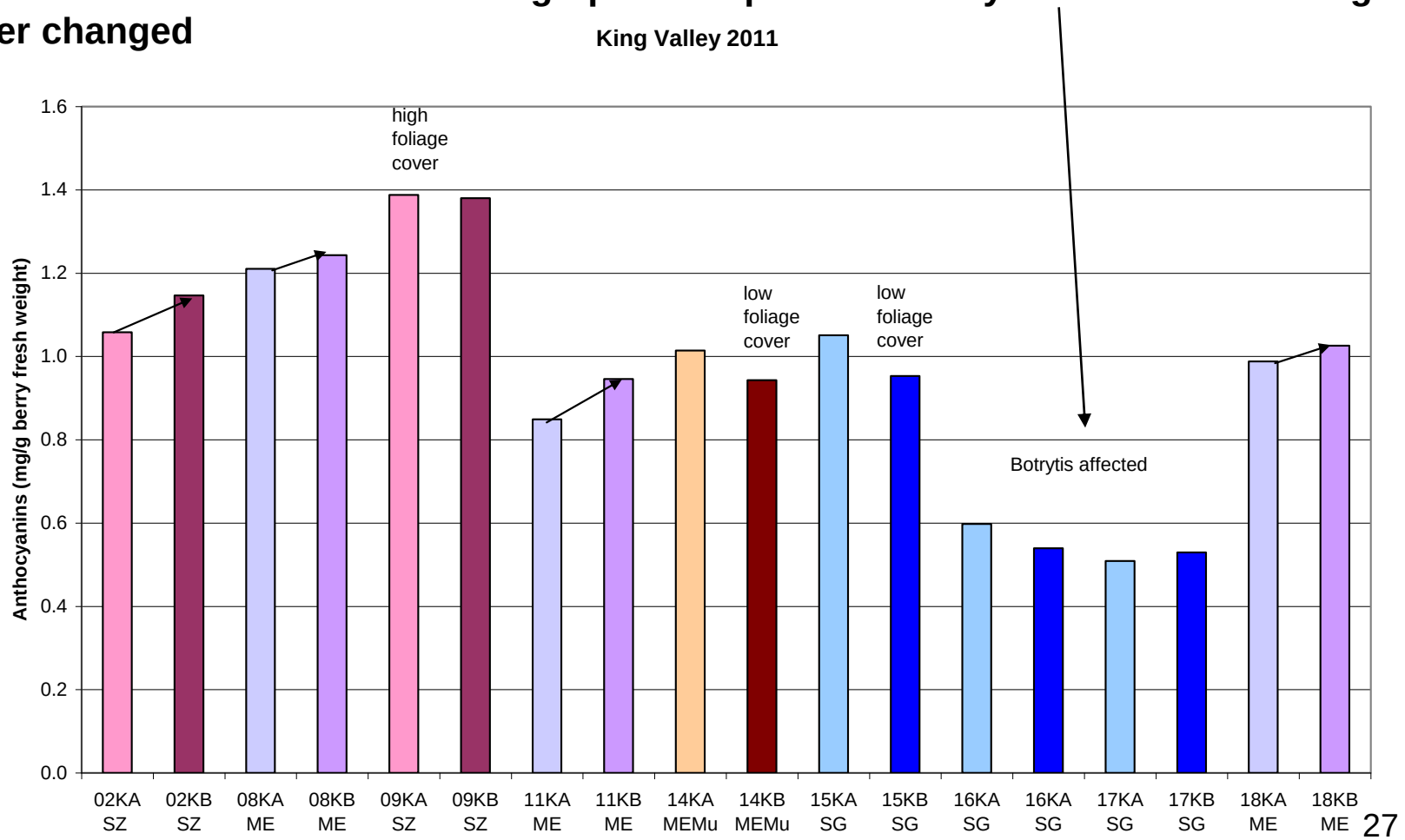


Australian Government
Grape and Wine Research and Development Corporation

GrapeLinks
Viticultural Knowledge Management

2011: Berry colour

Better colour in west covered red grapes except where Botrytis occurred or foliage cover changed



Australian Government
Grape and Wine Research and Development Corporation

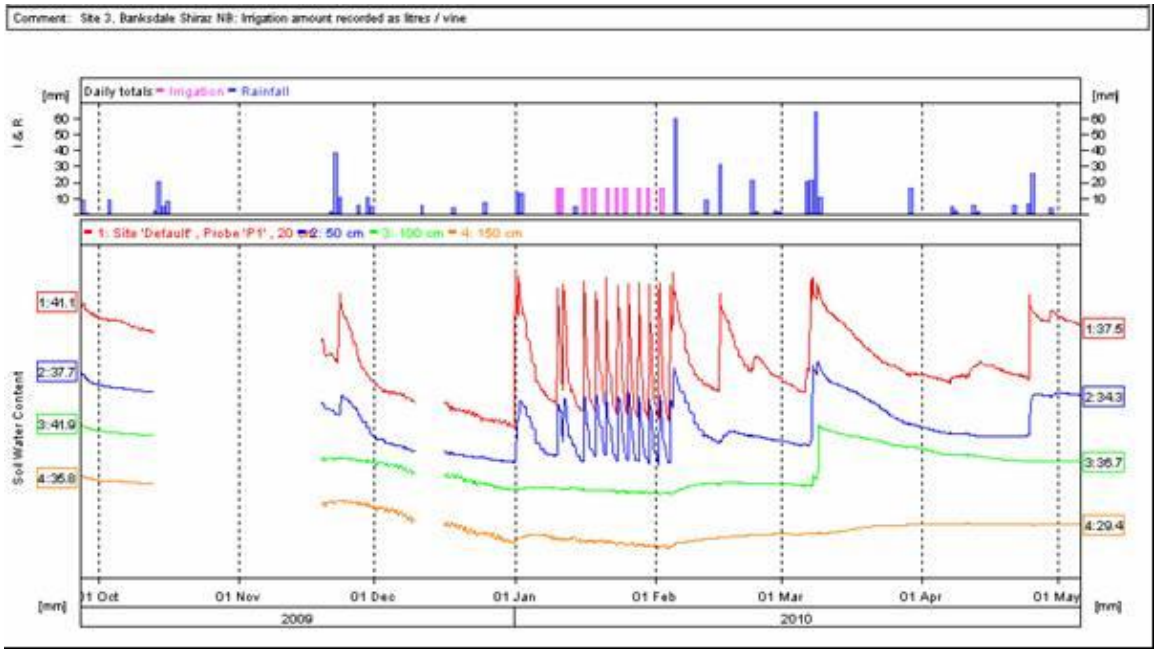
Soil and water management

GrapeLinks
Viticultural Knowledge Management

Adapted Irrigation in 2K Shiraz 2010 according to

Sentek Enviroscan Solo

soil water content monitoring

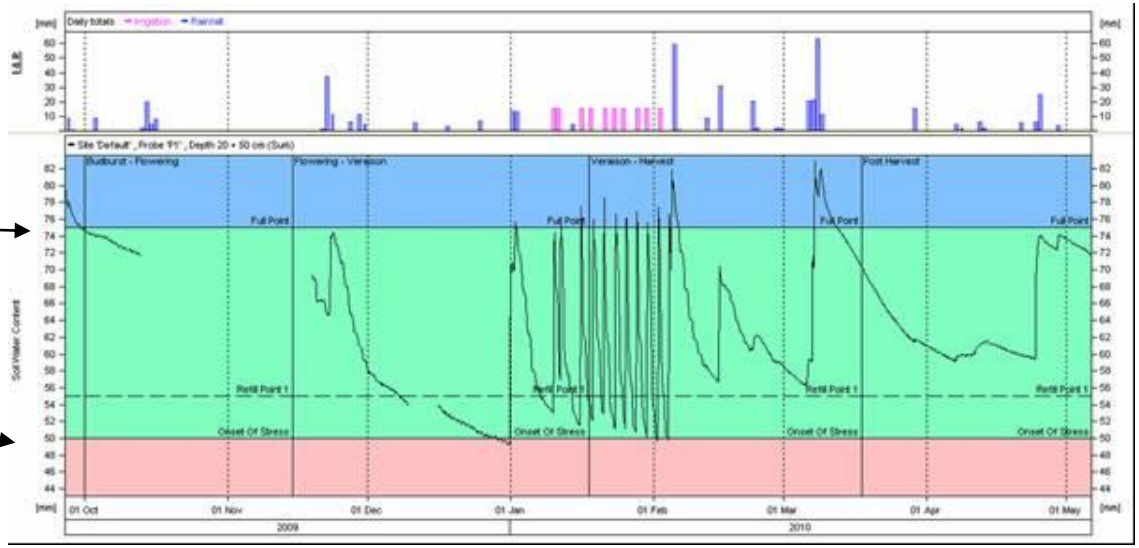


Rain and irrigation

Full point

Desirable soil water content

Stress point



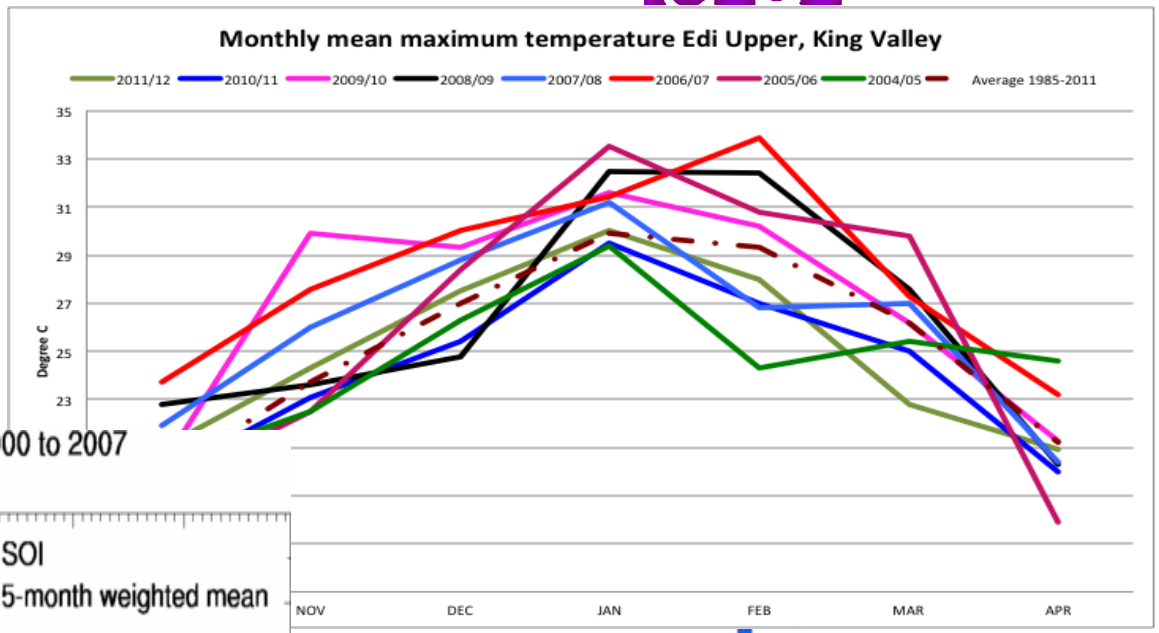
Australian Government

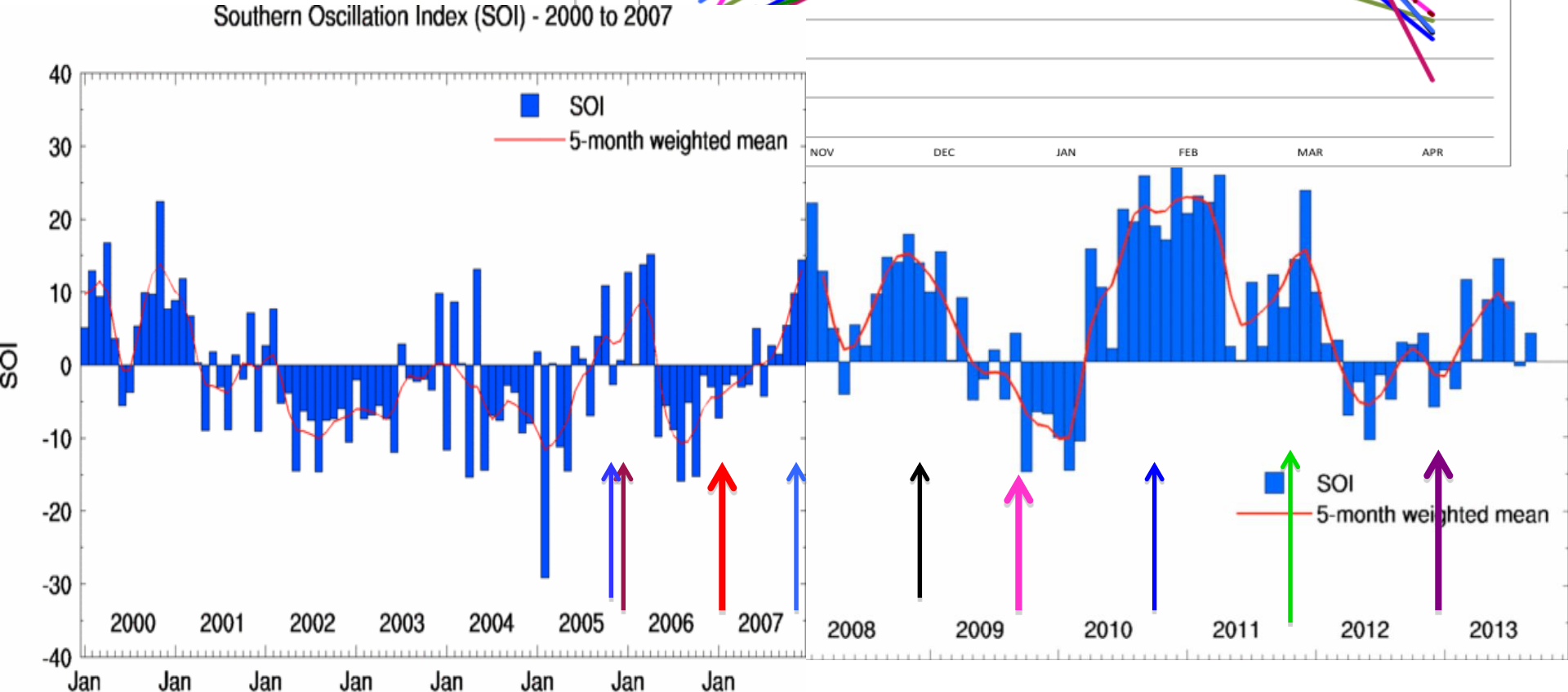
Grape and Wine Research and Development Corporation

GrapeLinks
Viticultural Knowledge Management

Seasonal climatic variations 2005-12

7 years of Shiraz data!

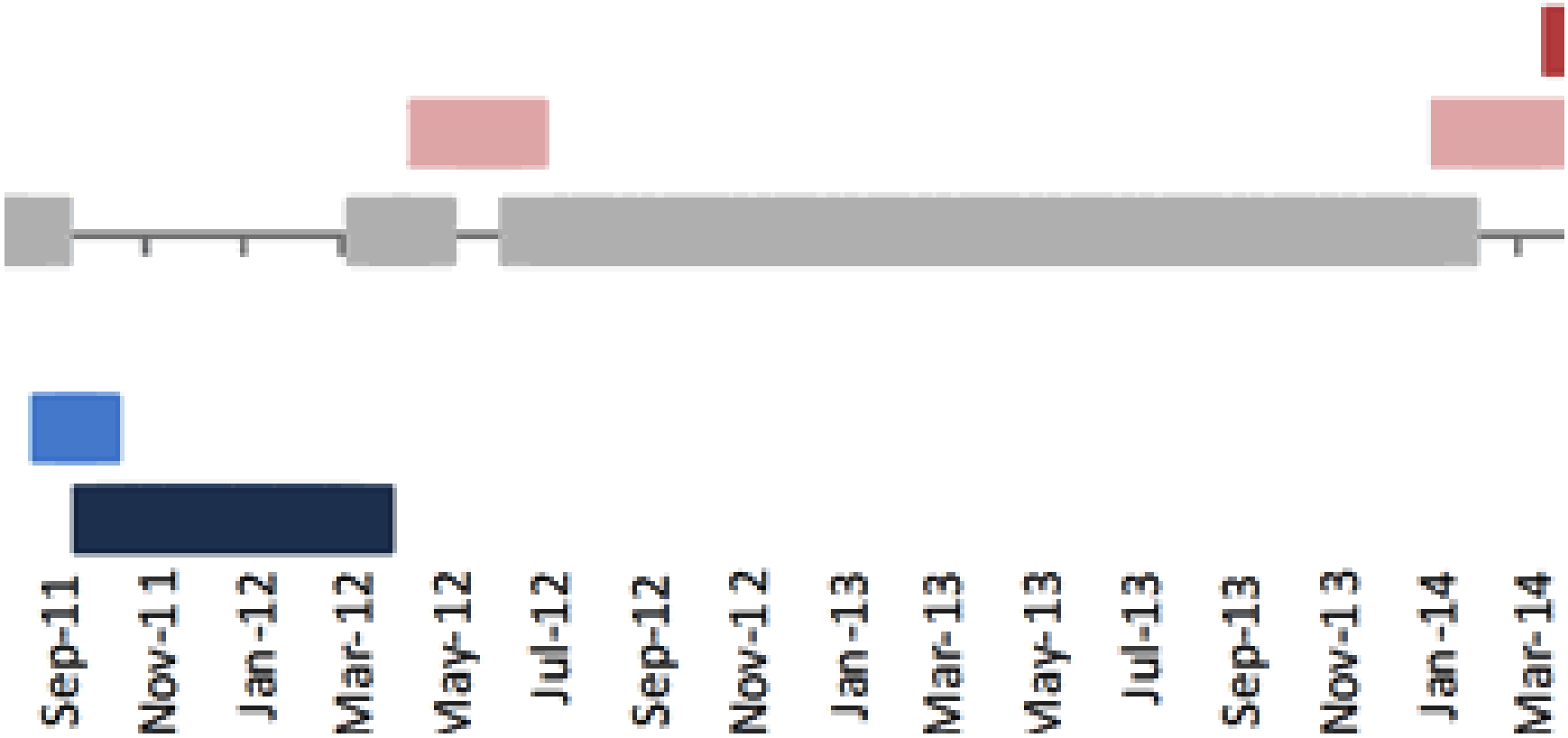




Australian Government
Grape and Wine Research and Development Corporation

GrapeLinks
Viticultural Knowledge Management

BOM ENSO tracker as of 3.6. 2014
El Niño expected



Australian Government
Grape and Wine Research and Development Corporation

Conclusions

GrapeLinks
Viticultural Knowledge Management

Using affordable methods and technology the focus was on the important plant physiological parameters: **plant structure, temperature, water, nutrients**

A detailed scoring system was developed by GrapeLinks – has now used for 10 years! Ongoing for Pinot noir, Chardonnay, Sangiovese.

Pointers for quality Shiraz have been found:
vine balance (15 cm^2/g fruit) and leaf health and position,
grape time in the beneficial bracket (15-35° C),
water management,
adequate nutrition, undervine and soil care, absence of diseases and pests

Links between growing practices and grape and wine quality have been demonstrated for 26 Shiraz vineyards over several years
With similar and high standard management practices **agroclimatic fingerprinting** can be undertaken to differentiate sites in a region

Due to a wide and long data record, problems arising from an increasingly variable meso-climate can be better addressed