Casassa LF, Kuster ST, Gannet P and Watrelot AA. 2023. Temperature and cap management effects on the chemical, phenolic, and chromatic composition of Pinot noir wines from the central coast of California. Am J Enol Vitic 74:0740031. DOI: 10.5344/ajev.2023.23031

Supplemental Table 1 One-way analysis of variance of individual treatments of fermentation temperature and cap management regime on the basic chemical composition of Pinot noir wines at bottling. Average values of three tank replicates (n = 3). Cold, targeting an average fermentation temperature of 12°C; Cold/Hot, fermentation temperatures of 12°C from day 0 to 7 and of 26°C from day 8 to 14; Hot, targeting an average fermentation temperature of 26°C throughout; PD, two punch-downs per day; No PD, no punch-downs.

	Ethanol (% v/v)	pH	Titratable acidity (g/L tartaric acid)	Glucose + fructose (g/L)	Acetic acid (g/L)	Malic acid (g/L)	Lactic acid (g/L)	Acetaldehyde (mg/L)	Viscosity (cP)[a]
Cold PD	14.88 a[b]	3.68 b	5.15 b	0.37 b	0.24 cd	0.03 b	1.07 a	14.66 bc	1.96 ab
Cold No PD	14.79 a	3.74 ab	5.10 b	0.39 b	0.20 d	0.32 a	0.87 b	35.00 a	2.12 a
Cold/Hot PD	14.45 bc	3.76 ab	5.32 b	1.41 a	0.28 c	0.03 b	1.12 a	13.33 bc	1.85 bc
Cold/Hot No PD	14.62 ab	3.74 ab	5.15 b	1.21 ab	0.25 cd	0.03 b	1.01 a	22.66 b	1.77 c
Hot PD	14.20 c	3.75 ab	5.77 a	0.52 ab	0.47 a	0.00 b	1.01 a	9.00 c	1.84 bc
Hot No PD	14.47 bc	3.79 a	5.72 a	0.66 ab	0.36 b	0.02 b	1.09 a	13.00 bc	1.76 c
p value	**0.0020**	0.2500	**<0.0001**	0.1140	**<0.0001**	**0.0040**	**0.0070**	**0.0020**	**0.0060**

[a]Units for viscosity measurement were measured in centipoise (cP).
[b]Different letters within a column indicate significant differences for Fisher's least significant difference test and α < 0.05. Significant *p* values are shown in bold fonts.

Supplemental Table 2 One-way analysis of variance of individual treatments of fermentation temperature and cap management regime on microbial populations expressed in cells/mL of Pinot noir wines at the end of the maceration period. When appropriate, results are present in log (10) scale. Cold, targeting an average fermentation temperature of 12°C; Cold/Hot, fermentation temperatures of 12°C from day 0 to 7 and of 26°C from day 8 to 14; Hot, targeting an average fermentation temperature of 26°C throughout; PD, two punch-downs per day; No PD, no punch-downs.

	Acetic acid bacteria	*Lactobacillus brevis/hilgardii/ fermentum*	*Lactobacillus plantarum/casei/ mali*	*Lactobacillus kunkeei*	*Oenococcus oeni*	*Zygosaccharomyces* spp.	*Pediococcus* spp.	*Brettanomyces bruxellensis*	*Saccharomyces cerevisiae*[a]
Cold PD	7.9×10^3 b[b]	57 a	<40 b	<40 b	<40 b	<40 a	<40	<40	$>1 \times 10^7$
Cold No PD	3.3×10^3 b	57 a	43 b	<40 b	97 a	<40 a	<40	<40	$>1 \times 10^7$
Cold/Hot PD	1.7×10^4 b	<40 a	<40 b	<40 b	<40 b	<40 a	<40	<40	$>1 \times 10^7$
Cold/Hot No PD	8.1×10^3 b	<40 a	<40 b	<40 b	<40 b	<40 a	<40	<40	$>1 \times 10^7$
Hot PD	2.1×10^4 b	<40 a	<40 b	47 b	<40 b	47 a	<40	<40	$>1 \times 10^7$
Hot No PD	2.4×10^5 a	<40 a	110 a	1.8×10^3 a	<40 b	<40 a	<40	<40	$>1 \times 10^7$
p value	**0.037**	0.346	**< 0.0001**	**0.002**	**0.047**	0.458	---	---	---

[a]Determined to be commercial yeast strain D-20 by DNA yeast fingerprinting.
[b]Different letters within a column indicate significant differences for Fisher's least significant difference test and α < 0.05. Significant *p* values are shown in bold fonts.

Supplemental Table 3 Two-way analysis of variance separating the effects of fermentation temperature and cap management regime on the phenolic composition of Pinot noir wines after one year of bottle aging. Mv-3-gl., malvidin-3-glucoside equivalents; SPP, small polymeric pigments; LPP, large polymeric pigments; TPP, total polymeric pigments; CE, catechin equivalents; Cold, targeting an average fermentation temperature of 12°C; Cold/Hot, fermentation temperatures of 12°C from day 0 to 7 and of 26°C from day 8 to 14; Hot, targeting an average fermentation temperature of 26°C throughout; PD, two punch-downs per day; No PD, no punch-downs.

	Anthocyanins (mg/L Mv-3-gl.)	SPP (AU at 520 nm)	LPP (AU at 520 nm)	TPP (AU at 520 nm)	Tannins (mg/L CE)	Total phenolics (mg/L CE)	Nontannin phenolics (mg/L CE)
Fermentation temperature (T)							
Cold	120 b[a]	1.435 b	0.090 c	1.525 b	38 c	571 c	532 c
Cold/Hot	152 a	1.694 a	0.483 b	2.176 a	168 b	949 b	781 b
Hot	140 ab	1.413 b	0.663 a	2.077 a	240 a	1087 a	847 a
p value	0.0760	**0.0096**	**<0.0001**	**0.0007**	**<0.0001**	**<0.0001**	**<0.0001**
Cap management regime (PD regime)							
PD	119 b	1.307 b	0.431 a	1.738 b	165 a	921 a	756 a
No PD	155 a	1.721 a	0.393 a	2.113 a	133 b	817 b	684 b
p value	**0.0041**	**<0.0001**	0.4996	**0.0046**	**0.0258**	**0.0035**	**0.0025**
Interactions							
T × PD regime	0.1633	0.1288	0.0676	0.0969	**0.0015**	**0.0118**	0.1027

[a]Different letters within a column indicate significant differences for Fisher's least significant difference test and $\alpha < 0.05$. Significant *p* values are shown in bold fonts.

Supplemental Table 4 Two-way analysis of variance separating the effects of fermentation temperature and cap management regime on the detailed anthocyanin composition of Pinot noir wines after one year of bottle aging. Mv-3-gl., malvidin-3-glucoside equivalents; Cold, targeting an average fermentation temperature of 12°C; Cold/Hot, fermentation temperatures of 12°C from day 0 to 7 and of 26°C from day 8 to 14; Hot, targeting an average fermentation temperature of 26°C throughout; PD, two punch-downs per day; No PD, no punch-downs.

	Delphinidin-3-glucoside	Cyanidin-3-glucoside	Petunidin-3-glucoside	Peonidin-3-glucoside	Malvidin-3-glucoside	Total anthocyanin-derived pigments	Polymeric pigments	Total anthocyanins (mg/L Mv-3-gl.)
Fermentation temperature (T)								
Cold	1.749 b[a]	0.000 b	3.459 b	4.297 b	51.440 a	9.683 ab	3.976 b	73.580 a
Cold/Hot	3.851 a	0.428 a	4.811 a	8.813 a	58.635 a	12.902 a	6.085 a	94.477 a
Hot	3.504 a	0.429 a	4.332 ab	8.998 a	58.688 a	8.502 b	5.134 a	88.199 a
p value	**0.0013**	**<0.0001**	0.1044	**0.0057**	0.6495	0.0798	**0.0057**	0.1715
Cap management regime (PD regime)								
PD	2.301 b	0.000 b	3.203 b	6.387 b	48.361 b	8.798 a	3.877 a	72.994 a
No PD	3.769 a	0.572 a	5.198 a	8.352 a	64.147 a	11.928 b	6.253 b	99.176 b
p value	**0.0020**	**<0.0001**	**0.0013**	0.0924	**0.0487**	0.0564	**<0.0001**	**0.0088**
Interactions								
T × PD regime	0.8262	**<0.0001**	0.4149	0.5937	0.1143	0.3675	**0.0334**	0.4656

[a]Different letters within a column indicate significant differences for Fisher's least significant difference test and $\alpha < 0.05$. Significant *p* values are shown in bold fonts.

Supplemental Table 5 Two-way analysis of variance separating the effects of fermentation temperature and cap management regime on the detailed flavonol composition of Pinot noir wines after one year of bottle aging. Qc-3-gl., quercetin-3-glucoside equivalents; Cold, targeting an average fermentation temperature of 12°C; Cold/Hot, fermentation temperatures of 12°C from day 0 to 7 and of 26°C from day 8 to 14; Hot, targeting an average fermentation temperature of 26°C throughout; PD, two punch-downs per day; No PD, no punch-downs.

	Quercetin-3-glucuronide	Quercetin-3-glucuronide	Quercetin aglycone	Other flavonols	Total flavonols (mg/L Qc-3-gl.)
Fermentation temperature (T)					
Cold	3.293 b[a]	0.000 b	2.862 c	2.415 a	8.571 b
Cold/Hot	5.517 a	0.000 b	6.802 b	2.903 a	15.222 a
Hot	4.903 a	0.832 a	7.971 a	2.323 a	16.029 a
p value	**<0.0001**	**0.028**	**<0.0001**	0.266	**<0.0001**
Cap management regime (PD regime)					
PD	3.715 b	0.315 a	3.980 b	1.736 b	9.746 b
No PD	5.427 a	0.240 a	7.777 a	3.358 a	16.802 a
p value	**<0.0001**	0.769	**<0.0001**	**0.000**	**<0.0001**
Interactions					
T × PD regime	0.420	0.914	0.281	0.072	0.269

[a]Different letters within a column indicate significant differences for Fisher's least significant difference test and α < 0.05. Significant *p* values are shown in bold fonts.

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Supplemental Table 6 One-way analysis of variance of individual treatments of fermentation temperature and cap management regime on the detailed tannin composition of Pinot noir wines after three months of bottle aging. EE, epicatechin equivalents; Cold, targeting an average fermentation temperature of 12°C; Cold/Hot, fermentation temperatures of 12°C from day 0 to 7 and of 26°C from day 8 to 14; Hot, targeting an average fermentation temperature of 26°C throughout; PD, two punch-downs per day; No PD, no punch-downs.

	Tannin content (mg/L EE)	Enthalpy (J/mol)	Molecular mass (g/mol)	Mean degree of polymerization	Catechin extension subunit (%)	Epicatechin extension subunit (%)	Catechin terminal subunit (%)	Epicatechin terminal subunit (%)
Cold PD	99 c[a]	-1495 ab	658 c	2.27 c	8.8 a	47.05 b	26.67 ab	17.384 a
Cold No PD	104 c	-1346 a	775 ab	2.61 ab	6.40 c	55.92 a	28.06 a	9.599 c
Cold/Hot PD	170 b	-2137 abc	697 bc	2.40 bc	8.43 ab	49.97 b	24.63 bcd	16.953 a
Cold/Hot No PD	185 b	-2239 abc	826 a	2.84 a	7.33 bc	57.44 a	23.68 cd	11.533 b
Hot PD	179 b	-2451 bc	702 bc	2.42 bc	7.90 ab	50.72 b	25.02 bc	16.343 a
Hot No PD	245 a	-2772 c	842 a	2.90 a	6.67 c	58.78 a	22.13 d	12.403 b
p value	**<0.0001**	0.0580	**0.0014**	**0.0014**	**0.0024**	**<0.0001**	**0.0090**	**<0.0001**

[a]Different letters within a column indicate significant differences for Fisher's least significant difference test and $\alpha < 0.05$. Significant *p* values are shown in bold fonts.

Supplemental Table 7 Two-way analysis of variance separating the effects of fermentation temperature and cap management regime on CIELab color parameters of Pinot noir wines after one year of bottle aging. Results expressed in CIELab units. Cold, targeting an average fermentation temperature of 12°C; Cold/Hot, fermentation temperatures of 12°C from day 0 to 7 and of 26°C from day 8 to 14; Hot, targeting an average fermentation temperature of 26°C throughout; PD, two punch-downs per day; No PD, no punch-downs.

	L*	a*	b*	C*	H
Fermentation temperature (T)					
Cold	79.029 a[a]	20.643 b	4.817 a	21.219 b	13.496 a
Cold/Hot	76.329 a	23.751 a	4.641 a	24.208 a	11.110 a
Hot	76.859 a	22.639 ab	4.875 a	23.175 ab	12.378 a
p value	0.1489	0.1249	0.7092	0.1212	0.2528
Cap management regime (PD regime)					
PD	79.415 a	20.261 b	4.586 a	20.797 b	12.981 a
No PD	75.396 b	24.427 a	4.969 a	24.938 a	11.675 a
p value	**0.0034**	**0.0036**	0.1310	**0.0027**	0.2617
Interactions					
T × PD regime	0.4274	0.4794	0.2516	0.4808	0.4118

[a]Different letters within a column indicate significant differences for Fisher's least significant difference test and $\alpha < 0.05$. Significant *p* values are shown in bold fonts.