Figure S1. Correlation between 3-MH concentrations at the end of fermentation and H_2S released during fermentation of Pinot Noir must by 11 wine strains with different *IRC7* genotypes. The correlation coefficient (r) was 0.66 (P= 0.029).

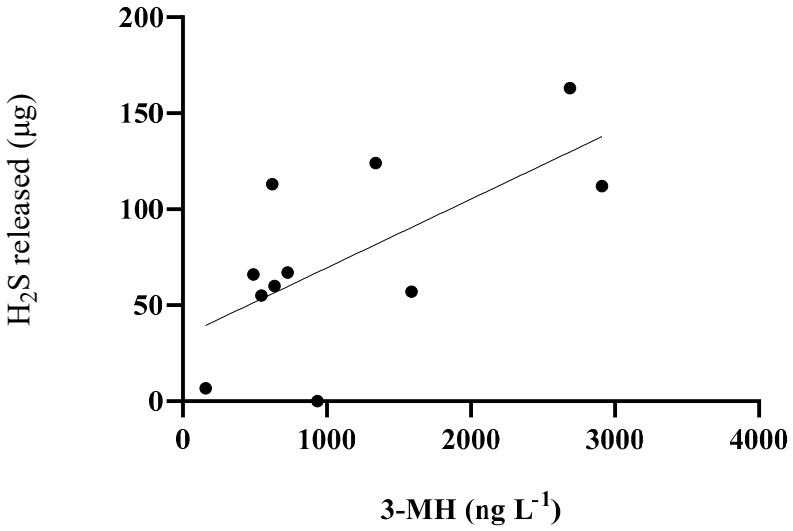

Figure S2. Regression coefficients from a partial least squares model generated to relate volatile composition for the the Grenache wines made with different yeast strains with aroma (A) attributes: a) 3-factor model for *red fruit* aroma*;* b) *red fruit* aroma – excluding AWRI1776; c) *cherry/confectionary* aroma - excluding AWRI1776. Abbreviations of volatiles can be found in Table S8.

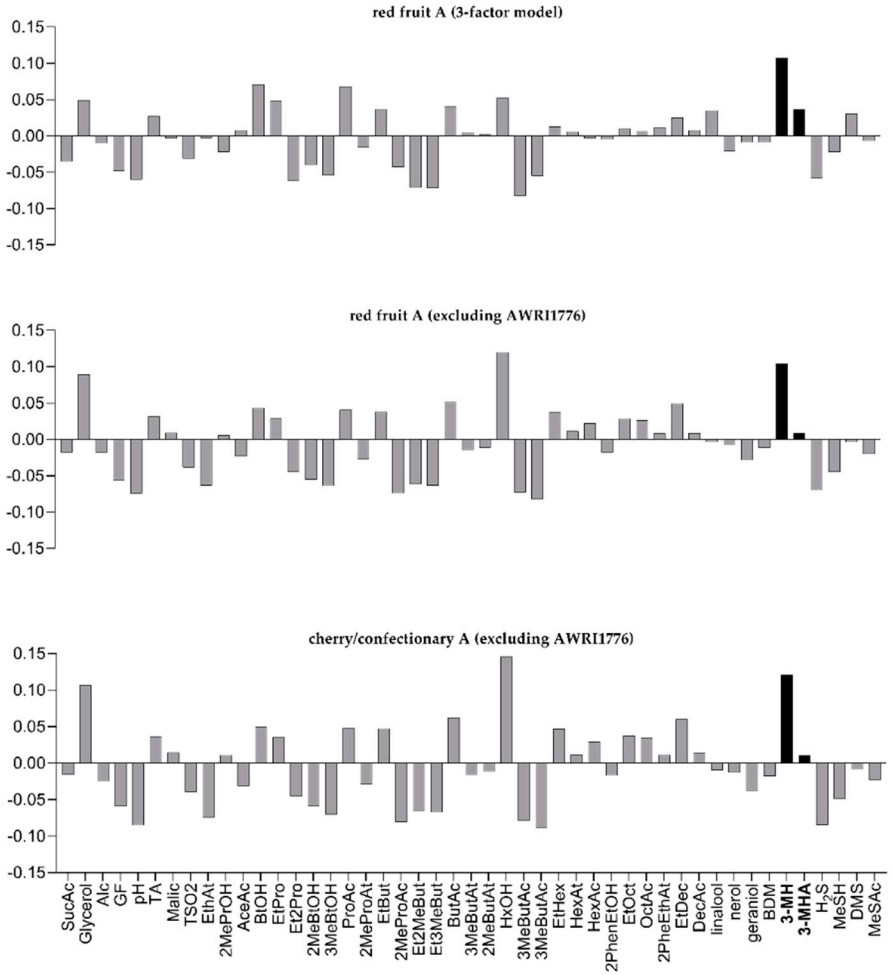

Table S1: Free thiols validation

Validation data for free thiol (3-MH, 3-MHA, and 4-MMP) analysis. LOD and LOQ are defined as signal-to-noise equal to three and ten, respectively.

Calibration function, spike recovery, and repeatability were all determined in a commercially available Shiraz wine.

Compound	MRM transitions Quantifier (qualifier)	Retention time (CV)	Internal standard	MRM transitions Quantifier (qualifier)	Retention time (CV)	Injection size (µL)	Calibration range (ng/L)	R^2	LOD	LOQ	Spike recovery (measured amount ng/L)	Repeatability CV (n = 7)
3-MH	244.2 → 144.0 (244.2 → 111.0)	1.73 (0.28%)	d_{10}-3-MH	254.3 → 144.9 (254.3 → 111.1)	1.68 (0.29%)	5	0, 15 – 6170	0.9988	1.57	5.25	89% (5501)	3.15%
3-MHA	286.2 → 143.8 (286.2 → 110.9)	3.57 (0.11%)	d_5-3-MHA	291.3 → 144.1 (291.3 → 85.2)	3.55 (0.15%)	10	0, 1 – 1090	0.9999	0.15	0.51	101% (443)	4.54%
4-MMP	242.2 → 144.2 (242.2 → 111.3)	1.51 (0.35%)	d_{10}-4-MMP	252.5 → 145.1 (252.5 → 111.1)	1.47 (0.36%)	10	0, 2 - 430	0.9994	0.37	1.23	97% (167)	6.80%

Table S2: Bound thiols validation

Compound	MRM transitions Quantifier (qualifier)	Retention time (CV)	Internal standard	MRM transitions Quantifier (qualifier)	Retention time (CV)	Injection size (µL)	Calibration range (µg/L)	R^2	LOD	LOQ	Spike recovery (measured amount µg/L)	Repeatability CV (n = 7)
3-S-cysteinylhexan-1-ol *(S)*-diastereomer	222.1 → 205.1 (222.1 → 101.1, 222.1 → 83.0)	1.55 (0.97%)	d_8-3-S-cysteinylhexan-1-ol *(S)*-diastereomer	230.2 → 213.1 (230.2 → 109.3, 230.2 → 90.2)	1.49 (0.87%)	2	0, 5 - 450	0.9970	0.78	2.60	95.2% (300)	6.82%
3-R-cysteinylhexan-1-ol *(R)*-diastereomer	222.1 → 205.1 (222.1 → 101.1, 222.1 → 83.0)	1.65 (0.85%)	d_8-3-R-cysteinylhexan-1-ol *(R)*-diastereomer	230.2 → 213.1 (230.2 → 109.3, 230.2 → 90.2)	1.59 (0.78%)	2	0, 5 - 511	0.9959	0.70	2.35	96.1% (255)	6.35%
3-S-glutathionylhexan-1-ol *(S)*-diastereomer	408.6 → 333.3 (408.6 → 279.4, 408.6 → 262.2, 408.6 → 162.1)	3.24 (1.02%)	d_9-3-S-glutathionylhexan-1-ol *(S)*-diastereomer	417.6 → 288.4 (417.6 → 271.3, 417.6 → 162.2)	3.08 (1.01%)	2	0, 11 - 648	0.9962	1.84	6.13	89.1% (432)	6.67%
3-R-glutathionylhexan-1-ol *(R)*-diastereomer	408.6 → 333.3 (408.6 → 279.4, 408.6 → 262.2, 408.6 → 162.1)	3.56 (0.96%)	d_9-3-R-glutathionylhexan-1-ol *(R)*-diastereomer	417.6 → 288.4 (417.6 → 271.3, 417.6 → 162.2)	3.37 (0.98%)	2	0, 11 - 864	0.9994	2.70	8.99	99.2% (432)	5.40%
4-glutathionyl-4-methylpentan-2-one	406.0 → 256.1 (406.0 → 179.1, 406.0 → 162.1)	1.52 (1.75%)	d_{10}-4-glutathionyl-4-methylpentan-2-one	413.3 → 266.3 (413.3 → 284.3, 413.3 → 179.2)	1.48 (0.94%)	2	0, 5 - 819	0.9957	0.26	0.87	94.8% (546)	6.26%
4-cysteinyl-4-methylpentan-2-one	220.2 → 122.1 (220.2 → 99.2)	0.80 (1.12%)	d_{10}-4-cysteinyl-4-methylpentan-2-one	226.1 → 122.2 (226.1 → 105.2)	0.78 (1.24%)	2	0, 4 - 519	0.9956	0.17	0.57	88.8% (519)	6.91%
3-S-cysteinylglycinehexan-1-ol *(S)*-diastereomer	279.4 → 262.2 (279.4 →162.1)	2.11 (1.01%)	d_8-3-S-cysteinylhexan-1-ol *(S)*-diastereomer	230.2 → 213.1 (230.2 → 109.3, 230.2 → 90.2)	1.49 (0.87%)	2	0, 4 - 309	0.9996	1.09	3.62	91.3% (309)	7.68%
3-R-cysteinylglycinehexan-1-ol *(R)*-diastereomer	279.4 → 262.2 (279.4 → 62.1)	2.37 (1.02%)	d_8-3-R-cysteinylhexan-1-ol *(R)*-diastereomer	230.2 → 213.1 (230.2 → 109.3, 230.2 → 90.2)	1.59 (0.78%)	2	0, 4 - 309	0.9995	0.64	2.15	88.3% (309)	6.90%

Table S3. Sensory attributes, definitions and composition of reference standards for the sensory study on the Grenache wines.

Attribute	Definition/Synonyms	Standard
Appearance		
Red colour	The degree of red colour in the sample	
Brown tinge	The degree of brown hue in the sample	
Aroma		
Overall fruit	Intensity of the overall fruity aromas in the sample	
Red fruit	Intensity of the aroma of red fruits and berries: raspberries, cranberries and strawberries	2 x frozen raspberries (Sara Lee) and 1 frozen strawberry (Welch's)
Dark fruit	Intensity of the aroma of dark fruits and berries: blackberries, plums, blueberries and blackcurrant	2 x frozen blueberries, 1 x frozen blackberry (Sara Lee), 1 mL blackcurrant syrup (Ribena), and 3 g of plum paste (Maggie Beers)
Cherry/ Confectionary	Intensity of the aroma of cherry flavoured confectionary and banana	Standard 1. 5 g Cherry Lips (Fundy Gum) not in wine. Standard 2. 20 µL ester mix: 2400 mg/L isoamyl acetate, 120 mg/L ethyl butyrate, 320 mg/L ethyl-hexanoate, 540 mg/L, ethyl octanoate, 140 mg/L phenyl-ethyl-acetate
Floral	Intensity of the aroma of flowers rose and orange blossom	20 µL of 10 mL/L linalool and 20 µL of methyl anthranilate of 0.184 g/L
Stewed apple/Port-like	Intensity of the aroma of stewed, bruised apples and Port-like stewed fruit	100 µL of 1 g/L β-damascenone
Tinned Vegetable	Intensity of the aroma of tinned and cooked vegetables	1 µL of 0.1% v/v dimethyl disulfide
Earthy	Intensity of aroma earthiness and mushrooms	Standard 1. 50 µL of 4 mg/L Geosmin. Standard 2. 10 g fresh button mushroom (Foodland) not in wine
Stalky	Intensity of the aroma of green stalks, capsicum, rhubarb stalks, fresh leaf, stalk and spinach	3 µL of 53.82 mg/L of 3-isobutyl-2-methoxypyrazine
Flint	Intensity of flint and struck match	3 µL of 1 mg/L benzyl mercaptan

Attribute	Definition/Synonyms	Standard
Drain	Intensity of the aroma of dirty drain, natural gas and boiled eggs	20 µL of 2 % mercaptoethanol v/v and 0.01 g wood ash
Pungent	Intensity of the aroma and effect of alcohol.	4 mL of 95% food grade ethanol (Tarac Technologies)
Nail Polish Remover/Vinegar	Intensity of the aroma of nail polish remover and vinegar	20 µL of 1000 g/L acetic acid and 5 µL of 1000 g/L
Palate		
Overall flavour intensity	Intensity of overall flavours in the sample.	
Dark fruit	Intensity of the flavour of various dark fruits: blackberries, plums, blueberries and blackcurrants	
Red fruit	Intensity of the flavour of red fruits and berries: raspberries, cranberries and strawberries	
Cherry/Confectionary	Intensity of the flavour of cherry flavoured confectionary and banana	
Stewed apple/Port-like	Intensity of the aroma of stewed, bruised apples and Port-like stewed fruit	
Viscosity	The perception of the body, weight or thickness of the wine in the mouth. Low = watery, thin mouth feel. High = oily, thick mouth feel.	1.5 g/L carboxymethylcellulose sodium salt (Sigma Aldrich) in water
Acidity	Intensity of acid taste in the mouth including aftertaste.	2 g/L L-(+)-tartaric acid (Chem-Supply) in water
Astringency	The drying and mouth-puckering sensation in the mouth. Low = coating teeth; Medium = mouth coating & drying; High = puckering, lasting astringency.	0.43 g/L alum sulfate (Ajax fine Chem Supply PTY LTD in water
Bitterness	The intensity of bitter taste perceived in the mouth, or after expectoration.	0.15 g/L Quinine sulfate (Sigma Aldrich) in water

Attribute	Definition/Synonyms	Standard
Hotness	The intensity of alcohol hotness perceived in the mouth, after expectoration and the associated burning sensation. Low = warm; High = hot, burning.	8% food grade alcohol (Tarac Technologies) in water
Nail Polish Remover/Vinegar	Intensity of nail polish remover and vinegar flavour; including aftertaste.	
Fruit AT	The lingering fruit flavour perceived in the mouth after expectorating.	

All red wine standards were added to 30 mL of 2017 Yalumba premium selection bag-in-box Shiraz unless otherwise noted.

Table S4. Mean sensory attribute scores for the yeast strains and Tukey's honestly significant different test values. A: aroma, F: Flavour, AT: After Taste

Attribute	AWRI 778	AWRI 1776	AWRI 1833	AWRI 2260	AWRI 2878	AWRI 2914	HSD
Red colour intensity	5.21	4.42	5.15	5.03	5.03	5.27	0.46
Brown tinge	1.06	3.22	1.32	1.81	1.63	0.97	0.60
Overall fruit A	5.61	5.35	5.82	5.48	5.64	5.77	0.60
Red fruit A	5.11	4.69	5.35	4.74	5.07	5.43	0.65
Dark fruit A	3.12	3.19	3.10	3.28	3.28	3.09	ns
Cherry/Confectionary A	3.24	2.83	3.67	3.16	3.27	3.63	0.65
Floral A	3.56	2.79	3.69	3.07	3.45	3.60	1.14
Stewed apple/Port-like A	2.42	2.75	2.21	2.40	2.25	2.21	0.72
Tinned vegetable A	1.79	2.45	1.58	2.20	1.72	1.63	0.63
Earthy A	2.07	2.48	1.83	2.09	2.04	2.14	0.59
Stalky A	1.88	2.12	2.05	2.19	1.96	2.12	ns
Flint A	1.57	1.92	1.52	1.61	1.48	1.58	ns
Drain A	1.30	1.76	1.12	1.56	1.09	1.06	0.40
Pungent A	4.46	4.53	4.32	4.70	4.58	4.64	ns
Nail Polish Remover/Vinegar A	2.77	2.30	2.04	2.41	2.25	2.16	ns
Overall fruit F	5.51	5.44	5.68	5.54	5.43	5.64	ns
Dark fruit F	3.29	3.57	3.42	3.61	3.38	3.37	ns
Red fruit F	5.04	4.62	5.19	4.86	4.83	5.14	0.39
Cherry/Confectionary F	3.27	3.25	3.75	3.36	3.26	3.46	ns
Stewed apple/Port-like F	2.87	3.16	2.45	2.71	2.44	2.35	0.34
Viscosity	3.14	3.14	3.20	3.05	3.17	3.03	ns
Acidity	4.29	4.15	4.32	4.52	4.42	4.51	ns
Astringency	3.64	3.50	3.62	3.82	3.47	3.74	ns
Hotness	4.34	4.55	4.39	4.68	4.19	4.26	ns
Bitterness	3.52	3.70	3.43	3.66	3.42	3.41	ns
Fruity AT	4.14	3.84	3.96	4.16	3.98	4.23	ns
Nail Polish Remover/Vinegar AT	2.61	2.16	2.13	2.08	2.11	1.85	ns

Table S5. Cysteine-*S*-conjugate β-lyase activity towards STC in cell-free protein extracts from 39 yeast strains with different *IRC7* genotypes

AWRI number	Strain description/origin[a]	β-lyase activity (nmol min^{-1} mg $protein^{-1}$)	*IRC7* genotype[b]
213	Wine isolate, Australia	2.44	$IRC7^S$ / $IRC7^S$
350	**AWRI350 (Maurivin)**	2.29	$IRC7^S$ / $IRC7^S$
735	Cider and wine yeast, Switzerland	2.16	$IRC7^S$ / $IRC7^S$
793	Wine isolate, New Zealand	1.80	$IRC7^S$ / $IRC7^S$
796	**AWRI796 (Maurivin)**	1.80	$IRC7^S$ / $IRC7^S$
833	Wine isolate, Australia	1.60	$IRC7^S$ / $IRC7^S$
1483	**Lalvin ICV D254 (Lallemand)**	1.60	$IRC7^S$ / $IRC7^S$
1709	Wine isolate, Germany	1.93	$IRC7^S$ / $IRC7^S$
1716	Wine isolate, Australia	2.20	$IRC7^S$ / $IRC7^S$
1833	**Uvaferm 43 (Lallemand)**	2.20	$IRC7^S$ / $IRC7^S$
2255	**Uvaferm HPS (Lallemand)**	2.14	$IRC7^S$ / $IRC7^S$
2874	**Fermicru VR5 (Oenobrands)**	2.04	$IRC7^S$ / $IRC7^S$
1490	**Lalvin Rhone 2323 (Lallemand)**	2.49	$IRC7^S$ / $IRC7^S$ *Y56stop*
1742	Wine isolate, Australia	1.83	$IRC7^S$ / $IRC7^S$ *Y56stop*
2865	**Collection Cepage Pinot (DSM)**	1.47	$IRC7^S$ *G304D* / $IRC7^S$ *Y56stop*
1017	**AWRI R2 (Maurivin)**	7.22	$IRC7^S$/ $IRC7^L$
1537	**VIN13 (Anchor Yeast)**	6.30	$IRC7^S$ / $IRC7^L$
2878	**NT112 (Anchor Yeast)**	8.20	$IRC7^S$ / $IRC7^L$
1482	Wine isolate, Australia	5.20	$IRC7^S$ *Y56stop* / $IRC7^L$
1487	**Lalvin Rhone 2056 (Lallemand)**	5.21	$IRC7^S$ *Y56stop* / $IRC7^L$
838	**Lalvin EC1118 (Lallemand)**	2.39	$IRC7^S$ / $IRC7^L$ *T185A*

AWRI number	Strain description/origin[a]	β-lyase activity (nmol min^{-1} mg $protein^{-1}$)	*IRC7* genotype[b]
1001	Wine isolate, Australia	2.80	*$IRC7^S$ / $IRC7^L$ T185A*
1638	**Platinum (Maurivin)**	5.21	*$IRC7^S$ / $IRC7^L$ T185A*
2260	**Lalvin QA23 (Lallemand)**	2.20	*$IRC7^S$ / $IRC7^L$ T185A*
2858	**Zymaflore VL1 (Laffort)**	2.20	*$IRC7^S$ / $IRC7^L$ T185A*
947	Wine isolate	3.40	*$IRC7^S$ P146A / $IRC7^L$ T185A P146R*
740	Wine isolate, Germany	1.80	*$IRC7^S$ / $IRC7^L$ T185A P146R G321D*
1776	Wine isolate, New Zealand	2.60	*$IRC7^S$ T185A / $IRC7^L$ T185A P146R*
934	UCD 48-41, Fruit isolate, USA	10.11	*$IRC7^L$ / $IRC7^L$*
2914	**Maurivin UOA Maxithiol (Maurivin)**	11.66	*$IRC7^L$ / $IRC7^L$*
1082	NCYC 761, Palm wine isolate	7.81	*$IRC7^L$ E374G / $IRC7^L$ E374G*
2829	PW5, Palm wine isolate, Nigeria	13.99	*$IRC7^L$ E374G / $IRC7^L$ E374G*
1729	Wine isolate, Australia	9.40	*$IRC7^L$ / $IRC7^L$ D47N*
1688	**Zymaflore VL3c (Laffort)**	6.00	*$IRC7^L$ T185A / $IRC7^L$ T185A*
2913	**Maurivin Sauvignon (Maurivin)**	5.24	*$IRC7^L$ T185A / $IRC7^L$ T185A*
739	Apple skin, England	3.19	*$IRC7^L$ T185A K43R / $IRC7^L$ T185A K43R*
1493	**Lalvin 71B (Lallemand)**	4.70	*$IRC7^L$ T185A K43R / $IRC7^L$ T185A K43R*
778	Wine isolate, Australia	3.34	*$IRC7^L$ T185A / $IRC7^L$ T185A G321D*
2861	**Zymaflore X5 (Laffort)**	7.88	*$IRC7^L$ / $IRC7^L$T185A P146A*

[a]Commercial strains are indicated in bold-face type, while yeast manufacturer is shown in brackets.

[b]*IRC7* genotype, as determined in Cordente et al (2019). *$IRC7^S$* corresponds to the allele found in the haploid laboratory strain BY4742 (encoding for 340 amino acids); while *$IRC7^L$* corresponds to the long allele from the commercial strain Maurivin UOA Maxithiol (AWRI2914), and encoding for 400 amino acids.

Table S6. Pearson correlation coefficients (r) between the concentration of free thiols (3-MH and 3-MHA) and their precursors in Pinot Noir wines fermented with 11 strains with different *IRC7* genotypes. Two-tailed Pearson correlation analysis was conducted with $\alpha = 0.05$. * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$. [a]ΣPrecursors represents the sum of all precursors as 3-MH equivalents.

	ΣPrecursors[a]	GSH-3-MH	Cys-Gly-3-MH	Cys-3-MH	3-MH	3-MHA
ΣPrecursors	**1**					
GSH-3-MH	0.99***	**1**				
Cys-Gly-3-MH	0.80**	0.81**	**1**			
Cys-3-MH	0.81**	0.77**	0.42	**1**		
3-MH	-0.57	-0.58	-0.32	-0.25	**1**	
3-MHA	-0.65*	-0.67*	-0.37	-0.35	0.95***	**1**

Table S7. Pearson correlation coefficients (r) for the concentrations of free thiols (3-MH and 3-MHA) and volatile sulfur compounds (VSCs) in Pinot Noir wines fermented with 11 strains with different *IRC7* genotypes, and different β-lyase activities. Two-tailed Pearson correlation analysis was conducted with $\alpha = 0.05$. * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$. [a]H_2S released during fermentation was measured using silver nitrate selective gas detector tubes.

	H_2S	H_2S released[a]	MeSH	MeSAc	3-MH	3-MHA	β-lyase
H_2S	**1**						
H_2Stube	0.12	**1**					
MeSH	0.23	0.19	**1**				
MeSAc	0.30	0.41	0.48	**1**			
3-MH	0.08	0.66*	-0.05	0.25	**1**		
3-MHA	0.15	0.60*	0.03	0.33	0.95***	**1**	
β-lyase	-0.19	0.50	-0.04	0.17	0.93***	0.93***	**1**

Table S8. Summary of volatile and non-volatile compounds produced by six wine yeast strains in Grenache wine after 9 months in bottle. The results are the average of triplicate ferments ± standard deviation.

	Label	AWRI 778	AWRI 1776	AWRI 1833	AWRI 2260	AWRI 2878	AWRI 2914	P values	F values
Main fermentation products									
Ethanol (%, v/v)	Alc	16.1 ± 0.1^{a}	16.0 ± 0^{bc}	16.1 ± 0.1^{ab}	15.9 ± 0.1^{bc}	15.9 ± 0^{c}	15.9 ± 0.1^{c}	0.001	10.2
Acetic acid (g L^{-1})	AceAc	0.92 ± 0.05^{a}	0.22 ± 0.01^{d}	0.45 ± 0.02^{b}	0.23 ± 0.02^{d}	0.37 ± 0.02^{c}	0.26 ± 0.02^{d}	<0.001	452
Succinic acid (g L^{-1})	SucAc	0.94 ± 0.03^{d}	1.46 ± 0.02^{a}	1.04 ± 0.04^{cd}	1.23 ± 0.01^{b}	1.29 ± 0.08^{b}	1.17 ± 0.06^{bc}	< 0.001	42.2
Glycerol (g L^{-1})	Glycerol	7.1 ± 0.2^{c}	8.3 ± 0.2^{a}	7.8 ± 0.2^{ab}	7.5 ± 0.1^{bc}	8.2 ± 0.2^{a}	8.0 ± 0.2^{a}	< 0.001	20.4
Malic acid (g L^{-1})	Malic	nd	nd	nd	0.13 ± 0.03^{b}	1.21 ± 0.25^{a}	nd	< 0.001	18.1
pH	pH	3.56 ± 0.06	3.74 ± 0.0	3.51 ± 0.01	3.52 ± 0.04	3.55 ± 0.04	3.41 ± 0.01	<0.001	38.3
Titratable Acidity pH 8.2	TA	5.3 ± 0.1^{ab}	4.7 ± 0^{c}	5.1 ± 0^{b}	5.0 ± 0.1^{b}	5.4 ± 0.2^{a}	5.0 ± 0.1^{b}	< 0.001	18.8
Residual sugar	GF	0.2 ± 0^{d}	0.5 ± 0.1^{a}	0.2 ± 0^{d}	0.4 ± 0.1^{bc}	0.4 ± 0^{b}	0.3 ± 0^{c}	<0.001	52.1
Free SO_2 (mg L^{-1})	FSO_2	46 ± 1	45 ± 2	44 ± 1	46 ± 2	45 ± 3	46 ± 1	0.744	0.54
Total SO_2 (mg L^{-1})	TSO_2	85 ± 3^{c}	82 ± 3^{c}	90 ±1^{c}	118 ± 6^{b}	146 ± 8^{a}	105 ± 4^{b}	< 0.001	70.0
*Total SO_2, end ferment (mg L^{-1})		<3	<3	<3	33 ± 12^{b}	71 ± 5^{a}	15 ± 4^{c}	0.001	29.6
Yeast fermentation products (µg L^{-1})									
Ethyl acetate (mg L^{-1})	EthAt	60.6 ± 2.2^{a}	43.0 ± 2.8^{c}	32.0 ± 0.2^{d}	41.4 ± 2.0^{c}	53.5 ± 1.7^{b}	53.5 ± 2.6^{b}	< 0.001	73.2
2-methyl propanol (mg L^{-1})	2MePrOH	14.0 ± 1.5^{d}	95.4 ± 3.9^{a}	25.0 ± 1.2^{bc}	29.4 ± 0.4^{b}	22.5 ± 0.3^{c}	24.5 ± 0.5^{bc}	< 0.001	820
Butanol (mg L^{-1})	BtOH	1.78 ± 0.04^{bc}	4.35 ± 0.35^{b}	1.09 ± 0.07^{c}	1.95 ± 0.19^{bc}	1.85 ± 0.10^{bc}	22.7 ± 2.3^{a}	< 0.001	233
Ethyl propanoate	EtPro	29 ± 0.2^{d}	64 ± 3.9^{b}	27 ± 0.6^{d}	46 ± 1.2^{c}	64 ± 2.6^{b}	106 ± 4.1^{a}	< 0.001	380
Ethyl 2-methylpropanoate	Et2MePro	12 ± 1.1^{c}	24 ± 0.7^{a}	15 ± 1.6^{bc}	23 ± 3.0^{a}	22 ± 1.5^{a}	16 ± 0.6^{b}	< 0.001	28.2
2-methylbutanol (mg L^{-1})	2MeBtOH	25.7 ± 1.3^{e}	78.4 ± 3.5^{a}	30.4 ± 0.8^{e}	48.5 ± 1.2^{b}	36.0 ± 1.2^{d}	42.6 ± 1.8^{c}	< 0.001	313
3-methylbutanol (mg L^{-1})	3MeBtOH	152.2 ± 2.6^{e}	252.9 ± 7.7^{a}	165.3 ± 2.4^{d}	230.6 ± 3.9^{b}	169.6 ± 2.7^{d}	204.4 ± 7.7^{c}	<0.001	188

Propanoic acid	ProAc	1306 ± 90de	1698 ± 43^{c}	1078 ± 40^{e}	1540 ± 195^{cd}	2119 ± 155^{b}	3725 ± 111^{a}	< 0.001	192
2-methylpropyl acetate	2MeProAt	2.9 ± 0.5^{e}	84 ± 2.0^{a}	0.5 ± 0.7^{e}	25 ± 5.3^{c}	15 ± 1.5^{d}	37 ± 1.2^{b}	< 0.001	472
Ethyl butanoate	EtBut	174 ± 13^{d}	269 ± 11^{bc}	252 ± 12^{c}	288 ± 1.6^{b}	270 ± 10^{bc}	352 ± 20^{a}	< 0.001	61.0
2-methyl propanoic acid	2MeProAc	384 ± 35^{b}	925 ± 140^{a}	409 ± 14^{b}	544 ± 19^{b}	470 ± 26^{b}	458 ± 18^{b}	< 0.001	32.3
Ethyl 2-methylbutanoate	Et2MeBut	2.9 ± 0.1^{c}	6.0 ± 0.3^{ab}	3.5 ± 0.1^{c}	6.9 ± 0.8^{a}	6.4 ± 0.3^{a}	4.9 ± 0.4^{b}	< 0.001	45.8
Ethyl-3-methylbutanoate	Et3MeBut	6.6 ± 0.2^{d}	11.4 ± 0.7^{b}	8.6 ± 0.1^{cd}	15.3 ± 1.4^{a}	12.0 ± 0.7^{b}	10.6 ± 0.5^{bc}	< 0.001	46.8
Butanoic acid	ButAc	1029 ± 22^{d}	2033 ± 112^{b}	1647 ± 69^{c}	1773 ± 48^{bc}	1681 ± 75^{c}	2438 ± 213^{a}	< 0.001	55.0
2-methylbutyl acetate	3MeButAt	25 ± 1.6^{d}	112 ± 7.1^{a}	13 ± 2.2^{e}	49 ± 7.6^{c}	35 ± 2.0^{d}	85 ± 1.3^{b}	< 0.001	214
3-methylbutyl acetate	2MeButAt	385 ± 51^{c}	1,492 ± 154^{a}	140 ± 27^{d}	805 ± 132^{b}	656 ± 54^{b}	1,372 ± 6.0^{a}	< 0.001	109
Hexanol	HxOH	4167 ± 204^{bc}	4873 ± 393^{a}	4725 ± 294^{b}	3529 ± 93^{c}	3971 ± 198^{c}	3996 ± 132^{c}	< 0.001	13.2
3-methyl butanoic acid	3MeButAc	354 ± 18.8^{c}	600 ± 35.5^{a}	421 ± 13.7^{bc}	598 ± 77^{a}	470 ± 18.3^{b}	430 ± 40^{bc}	< 0.001	18.7
2-methyl butanoic acid	2MeButAc	162 ± 9.7^{d}	439 ± 29^{a}	169 ± 0.9^{d}	270 ± 34^{b}	251 ± 19^{bc}	197 ± 11^{cd}	< 0.001	73.7
Ethyl hexanoate	EtHex	187 ± 9.7^{e}	233 ± 5.2^{d}	372 ± 12.7^{b}	402 ± 9.4^{a}	304 ± 13.1^{c}	365 ± 13.3^{b}	< 0.001	182
Hexyl acetate	HexAt	9.4 ± 1.1^{c}	36 ± 5.1^{a}	3.1 ± 0.4^{c}	6.2 ± 1.8^{c}	8.3 ± 0.8^{c}	17.1 ± 1.0^{b}	< 0.001	81.6
Hexanoic acid	HexAc	2457 ± 170^{e}	3433 ± 139^{d}	5506 ± 198^{b}	6271 ± 406^{a}	4335 ± 50^{c}	5161 ± 121^{b}	< 0.001	133
2-phenylethanol (mg L^{-1})	2PhenEtO	17.5 ± 1.0^{d}	34.5 ± 1.4^{b}	19.7 ± 0.8^{d}	35.5 ± 1.6^{b}	26.0 ± 1.2^{c}	42.4 ± 2.7^{a}	< 0.001	115
Ethyl octanoate	EtOct	240 ± 16^{d}	281 ± 14^{d}	450 ± 6.0^{b}	503 ± 17^{a}	383 ± 17^{c}	461 ± 19^{b}	< 0.001	144
Octanoic acid	OctAc	2002 ± 204^{e}	2447 ± 93^{d}	4094 ± 217^{b}	4685 ± 69^{a}	3402 ± 146^{c}	4158 ± 146^{b}	< 0.001	138
2-phenylethyl acetate	2PheEthAt	12 ± 0.7^{d}	65 ± 4.4^{a}	7.0 ± 1.0^{d}	23 ± 2.0^{c}	25 ± 2.4^{c}	49 ± 1.2^{b}	< 0.001	292
Ethyl decanoate	EtDec	12 ± 1.4^{c}	7.1 ± 1.2^{c}	24 ± 1.8^{a}	25 ± 1.1^{a}	18 ± 3.1^{b}	23 ± 2.2^{a}	< 0.001	42.7
Decanoic acid	DecAc	445 ± 32^{d}	354 ± 11^{e}	708 ± 8^{c}	916 ± 9^{a}	663 ± 52^{c}	833 ± 17^{b}	< 0.001	202

	Label	AWRI 778	AWRI 1776	AWRI 1833	AWRI 2260	AWRI 2878	AWRI 2914	P values	F values
Monoterpenoids/norisoprenoids (µg L^{-1})									
Linalool	linool	14 ± 0.1^{a}	10 ± 0.3^{d}	13 ± 0.2^{bc}	12 ± 0.5^{c}	13 ± 0.8^{bc}	13 ± 0.3^{b}	< 0.001	27.5
Nerol	nerol	5.2 ± 0.8^{ab}	6.7 ± 0.3^{a}	3.9 ± 0.8^{bc}	1.3 ± 1.1^{d}	2.2 ± 0.2^{cd}	0.9 ± 0.3^{d}	<0.001	33.1
Geraniol	gerol	11.6 ± 1.8^{a}	7.8 ± 0.5^{b}	6.8 ± 0.4^{bc}	4.6 ± 0.8^{c}	5.7 ± 0.6^{bc}	6.0 ± 0.2^{bc}	<0.001	23.7
β-Damascenone	BDM	2.8 ± 1.1^{a}	1.7 ± 0.3^{ab}	2.2 ± 0.1^{ab}	1.4 ± 0.1^{b}	1.5 ± 0.2^{ab}	1.9 ± 0.1^{ab}	0.043	3.3
VSCs (µg L^{-1})									
H_2S	H2S	1.8 ± 1.6	0.8 ± 0.3	0.4 ± 0.2	0.4 ± 0.2	0.4 ± 0.2	0.3 ± 0.1	0.12	2.2
MeSH	MeSH	1.1 ± 0.2^{b}	2.8 ± 0.5^{a}	1.3 ± 0.2^{b}	1.4 ± 0.1^{b}	1.4 ± 0.1^{b}	1.1 ± 0.1^{b}	< 0.001	19.9
DMS	DMS	11.5 ± 0.4^{a}	7.3 ± 0.7^{bc}	8.5 ± 0.1^{b}	6.9 ± 0.4^{c}	8.0 ± 0.9^{bc}	7.8 ± 0.2^{bc}	<0.001	28.7
MeSAc	MeSAc	0^{b}	9.8 ± 2.4^{a}	0^{b}	1.9 ± 2.0^{b}	0^{b}	3.2 ± 0.9^{b}	<0.001	25.0
3-MH	3MH	257 ± 75^{d}	459 ± 70^{b}	405 ± 97^{bc}	332 ± 47^{cd}	508 ± 8^{b}	662 ± 54^{a}	<0.001	26.3
3-MHA	3MHA	8.5 ± 7.4^{bc}	0^{c}	0^{c}	0^{c}	15.5 ± 1.4^{ab}	18.9 ± 1.6^{a}	<0.001	26.5

Means with the same superscript letter are not significantly different from each other (Tukey's test, $P < 0.05$).

Table S9. Probability values[†], degrees of freedom (df) and mean square error (MSE) from the analysis of variance.

Attribute	Strain	FRep (Strain)	J*Strain	J*FRep (Strain)	Prep (Strain, FRep)	MSE
Red colour intensity	7.97***	4.33***	1.85**	0.83	1.66ǂ	0.514
Brown tinge	33.1***	2.14*	2.55***	1.29ǂ	1.17	0.416
Overall fruit A	1.51	1.89*	1.87**	1.08	1.69*	0.671
Red fruit A	3.92***	2.63**	1.50*	0.94	1.08	1.117
Dark fruit A	0.37	0.9	1.61*	1.01	0.77	0.840
Cherry/Confectionary A	4.03***	0.68	1.06	0.97	1.42	1.546
Floral A	1.67	0.97	2.73***	1.12	1.05	1.604
Stewed apple/Port-like A	1.45	1.54	1.89**	0.83	0.78	1.249
Tinned vegetable A	5.35***	2.00*	1.19	1	0.77	1.269
Earthy A	2.22ǂ	0.6	1.15	1.16	0.7	0.985
Stalky A	0.61	1.11	1.57*	0.91	1.05	0.966
Flint A	1.58	0.97	1.24	0.84	1.11	0.971
Drain A	2.46*	2.97***	2.54***	0.63	0.78	1.382
Pungent A	2.10ǂ	1.09	0.6	0.91	0.61	1.086
Nail Polish Remover/Vinegar A	1.45	1.89*	1.3	1.05	1.47	2.167
Overall fruit F	0.95	1.63ǂ	1.07	1.13	1.28	0.626
Dark fruit F	1.91	1.3	0.79	0.87	1.63ǂ	0.779
Red fruit F	2.17ǂ	1.22	1.16	0.94	0.68	1.283
Cherry/Confectionary F	1.89	1.07	1.17	0.99	2.27**	1.121

Attribute	Strain	FRep (Strain)	J*Strain	J*FRep (Strain)	Prep (Strain, FRep)	MSE
Stewed apple/Port-like F	3.45**	0.64	2.00***	0.94	1.19	0.981
Viscosity	0.44	2.19*	1.09	0.84	1.39	0.717
Acidity	1.8	1.73ǂ	0.93	0.64	0.61	1.275
Astringency	1.96	2.31*	0.78	0.76	1.19	1.023
Hotness	1.82	1.63ǂ	1.54*	0.68	0.90	1.148
Bitterness	1.30	0.95	1.14	0.54	0.50	1.333
Fruity AT	1.51	1.98*	1.60*	0.61	1.09	0.984
Nail Polish Remover/Vinegar AT	1.67	0.82	1.57*	0.83	1.42	1.878
df	5	12	50	120	18	180

A: aroma, F: Flavour, AT: After Taste. †Significance levels are as follows: * $P \leq 0.05$; ** $P \leq 0.01$; *** $P \leq 0.005$; ǂ $P \leq 0.10$. df = degrees of freedom. Judge effect was significant for all attributes ($P < 0.05$), FRep = Fermentation replicate, PRep = presentation replicate, J = Judge.