

Supplementary Materials

Evaluation of energy savings in white winemaking: impact of temperature management combined with specific yeasts choice on required heat dissipation during industrial-scale fermentation

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Supplementary material: Complete data set of volatile compounds analyses. Compounds in concentrations above the odor threshold are in red, compounds displaying statistical significance are in *italics* ($p\text{-val}<0.05$) and ***bold, italics*** ($p\text{-val}<0,01$) (2020 trials, t-test). Odor descriptors and sensory thresholds are reported as in: (Binati et al., 2020; Fedrizzi et al., 2007; Ferreira et al., 2002; Guth, 1997; Jiang and Zhang, 2018; San-Juan et al., 2011)

Sensory Family	Molecule	unit	2020.00				pval	2020.00		2019.00		Odor threshold	Odor description
			v122 15-17°C	v124 15-17°C	v121 19°C	v123 19°C		15-17°C	19°C	v102 - 15°C	v101 - 19°C		
Norisoprenoids	<i>β-Damascenone</i>	µg/L	0.20	0.21	0.14	0.15	<i>0.02</i>	0.21	0.15	7.60	6.70	0.05	baked and ripe fruit, apple, rose, honey
Terpens	(±)-Trans-Nerolidol	µg/L	0.15	0.18	0.12	0.13	0.11	0.17	0.13	27.90	33.40	400.00	vegetable, sweet, fruity
Terpens	<i>Citronellol</i>	µg/L	0.18	0.18	0.03	0.03	<i>0.01</i>	0.18	0.03	30.30	41.70	100.00	green, fruity
Terpens	<i>Cymene -Para-</i>	µg/L	3.86	3.94	2.35	2.49	<i>0.01</i>	3.90	2.42	2.33	2.11		
Terpens	<i>Eucalyptol (1,8-Cineole)</i>	µg/L	0.56	0.63	0.53	0.60	<i>0.04</i>	0.60	0.56	1.83	2.25		
Terpens	<i>Geraniol</i>	µg/L	0.23	0.26	0.43	0.43	<i>0.04</i>	0.25	0.43	32.70	23.40	30.00	floral, green, fruity
Terpens	<i>Linalol</i>	µg/L	0.26	0.29	0.24	0.26	<i>0.03</i>	0.28	0.25	11.50	13.70	25.00	flower, lavender
Terpens and Norisoprenoids													
Acids	<i>Butyric Acid</i>	µg/L	49.63	55.97	88.37	93.83	<i>0.01</i>	52.80	91.10	98.80	76.40	200.00	Fatty
Acids	<i>Decanoic Acid</i>	µg/L	120.90	139.10	92.00	108.00	<i>0.02</i>	130.00	100.00	4048.50	4870.60	5000.00	Fatty, unpleasant
Acids	Dodecanoic Acid	µg/L	32.57	33.23	25.25	27.35	0.07	32.90	26.30	336.90	447.30		
Acids	Heptanoic Acid	µg/L	1.13	1.15	1.37	1.51	0.13	1.14	1.44	151.50	299.90	3000.00	Fatty, dry
Acids	<i>Hexanoic Acid</i>	µg/L	1123.20	1216.80	1109.20	1250.80	0.75	1170.00	1180.00	4035.40	4195.70	420.00	cheese,fatty
Acids	Isobutyric Acid	mg/L	274.40	285.60	325.50	374.50	0.17	280.00	350.00	81.00	78.60	500.00	fatty, rancid, cheese
Acids	Isovaleric Acid	mg/L	308.20	361.80	185.07	212.93	0.06	335.00	199.00	672.80	585.60	200.00	Isobutyric acid
Acids	<i>Octanoic Acid</i>	mg/L	595.20	684.80	589.00	651.00	0.38	640.00	620.00	512.50	150.40	500.00	Rancid, harsh, cheese, fatty acid
Acids													
γ- e δ-Lactones	Gamma-Butyrolactone	mg/L	17.10	18.90	12.42	13.18	0.06	18.00	12.80	200.70	220.60		
γ- e δ-Lactones	<i>Gamma-Decalactone</i>	µg/L	17.01	19.19	3.69	3.91	<i>0.04</i>	18.10	3.80	12.00	17.70		
γ- e δ-Lactones	Gamma-Hexalactone	µg/L	2.07	2.15	2.03	2.15	0.51	2.11	2.09	3.30	6.60	300.00	fruity, overall woody
γ- e δ-Lactones	<i>Gamma-Nonalattone</i>	µg/L	8.65	9.75	26.77	28.43	<i>0.01</i>	9.20	27.60	7.20	7.20		
γ- e δ-Lactones	Gamma-Octalactone	µg/L	1.08	1.26	1.30	1.32	0.33	1.17	1.31	9.60	10.50	400.00	vanilla, pastry
Lactones													
Alcohols	1-Hexanol	mg/L	0.13	0.14	0.09	0.09	0.06	0.13	0.09	1.00	0.86	1.10	herbaceous, grass, woody, toasty, dry
Alcohols	2-Ethyl-1-Hexanol	mg/L	3.94	4.18	3.90	4.31	0.71	4.06	4.10	90.00	30.00		
Alcohols	<i>Phenylethyl Alcohol</i>	mg/L	3.38	3.66	4.54	5.22	0.09	3.52	4.88	17.41	18.30	14.00	rose, honey, spice, lilac, pollen
Benzenoids	3-Hexen-1-Ol Cis	µg/L	1.68	1.82	2.27	2.55	0.07	1.75	2.41	13.70	13.90	400.00	fruity, fresh grass
Benzenoids	3-Hexen-1-Ol Trans	µg/L	0.22	0.23	0.33	0.37	0.06	0.22	0.35	62.30	69.50	400.00	green, cut grass
Benzenoids	4-Vinylphenol	µg/L	32.20	34.20	34.59	36.01	0.09	33.20	35.30	151.30	109.40	1150.00	phenolic, unpleasant, band-aid, animal
Benzenoids	Guaiacol <4-Vinyl-	µg/L	9.22	9.79	10.58	12.42	0.20	9.50	11.50	51.60	64.00	770.00	phenolic, unpleasant, band-aid, animal
Alcohols and benzenoids													
Fermentative esters	Diethyl Succinate	µg/L	16.24	16.56	19.97	21.63	0.10	16.40	20.80	14.20	17.10	200.00	vinous
Fermentative esters	<i>Hexyl Acetate</i>	µg/L	217.80	222.20	133.00	147.00	<i>0.04</i>	220.00	140.00	399.30	421.20	670.00	Pleasant fruity, pear
Fermentative esters	<i>Isoamyl Acetate</i>	µg/L	432.40	487.60	340.40	399.60	<i>0.01</i>	460.00	370.00	3532.70	3678.10	1250.00	banana, fruity, sweet
Fermentative esters	<i>Phenyl Ethyl Acetate</i>	µg/L	46.13	47.07	32.37	33.03	<i>0.01</i>	46.60	32.70	1277.00	1578.40	250.00	Pleasant, floral
Ethyl esters - linear acids	<i>Ethyl Decanoate</i>	mg/L	6.79	7.51	7.13	7.88	<i>0.03</i>	7.15	7.50	795.30	1028.80	200.00	waxy, fruity, apple, grape
Ethyl esters - linear acids	<i>Ethyl Eptanoate</i>	µg/L	128.80	151.20	186.20	193.80	0.09	140.00	190.00	1509.70	1579.20	5000.00	fatty, sweet, floral, pear, pineapple
Ethyl esters - linear acids	<i>Ethyl Hexanoate</i>	µg/L	579.60	680.40	614.40	665.60	0.76	630.00	640.00	1768.50	1621.00	1400.00	strawberry, anise, green apple, brandy
Ethyl esters - linear acids	<i>Ethyl Laurate</i>	µg/L	0.99	1.01	2.91	3.09	<i>0.03</i>	1.00	3.00	393.50	241.40	7500.00	Almond, pear
Ethyl esters - linear acids	<i>Ethyl Nonanoate</i>	µg/L	0.21	0.22	0.23	0.25	0.21	0.22	0.24	12.20	11.20		
Esters and Acetates													
Sulphur compounds	<i>DEDS (diethyl disulfide)</i>	µg/L	0.54	0.62	0.33	0.37	0.06	0.58	0.35	0.25	16.50	0.00	onion, garlic and burnt rubber
Sulphur compounds	<i>Diethyl Sulfide</i>	µg/L	16.83	17.17	18.62	19.38	0.07	17.00	19.00	10.40	11.40	0.02	sauerkraut, green onion and cooked vegetables
Sulphur compounds	<i>Ethanol, 2-Mercapto-</i>	µg/L	0.43	0.45	0.54	0.56	<i>0.01</i>	0.44	0.55	2.40	2.60		
Sulphur compounds	<i>Methionol (3-Methylmercapto-1-Propanol)</i>	mg/L	0.06	0.07	0.16	0.18	<i>0.05</i>	0.07	0.17	0.32	0.29	1.50	sulphur, low impact on aroma
Sulphur compounds													
Ageing markers	<i>Furfural</i>	µg/L	26.63	27.17	31.75	33.05	<i>0.04</i>	26.90	32.40	91.00	91.70	14100.00	sweet, bread, almond, floral
Ageing markers	Whiskey Lactone Cis	ng/L	22.56	25.44	17.46	18.54	0.09	24.00	18.00	16.40	18.60	300.00	woody
Ageing markers													