

Supplementary Material

Table S1. Oenological properties of investigated Amarena wines in relation to bottle aging. For every parameter, data were expressed as mean \pm standard deviation of n=15 samples coming from 5 bottles, where every sample was analyzed three times. TPC: total phenol content; TAC= total anthocyanin content.

Sample	Alcoholic grade (% vol.)	pH	Total dry extract (g/L)	Total sugars (g/L)	Total acidity (g/L tartaric acid)	Volatile acidity (g/L acetic acid)	Malic acid (g/L)	TPC (mg GAE/L)	TAC (mg ME/L)
AMAR1	14.68 \pm 0.30 ^a	3.56 \pm 0.05 ^a	190.93 \pm 6.11 ^a	172.05 \pm 8.25 ^a	7.48 \pm 0.30 ^a	0.79 \pm 0.05 ^a	2.91 \pm 0.46 ^a	3221.93 \pm 141.74 ^a	58.50 \pm 3.75 ^a
AMAR2	15.96 \pm 0.91 ^b	3.73 \pm 0.02 ^b	170.47 \pm 16.04 ^{a,b}	142.68 \pm 8.51 ^b	7.93 \pm 0.22 ^{a,b}	0.70 \pm 0.02 ^b	3.73 \pm 0.18 ^b	3147.47 \pm 157.05 ^a	59.02 \pm 3.05 ^a
AMAR3	16.02 \pm 0.98 ^b	3.81 \pm 0.04 ^c	150.74 \pm 9.48 ^b	136.58 \pm 9.55 ^b	7.62 \pm 0.20 ^{a,b}	0.91 \pm 0.04 ^c	3.74 \pm 0.15 ^b	3421.93 \pm 185.09 ^a	71.75 \pm 2.57 ^b
AMAR4	14.06 \pm 0.11 ^c	3.88 \pm 0.05 ^c	90.84 \pm 6.66 ^c	72.05 \pm 4.25 ^c	8.15 \pm 0.26 ^b	0.82 \pm 0.05 ^a	4.43 \pm 0.29 ^c	2927.33 \pm 140.24 ^b	27.66 \pm 1.54 ^c
AMAR6	12.82 \pm 0.18 ^d	3.57 \pm 0.02 ^a	129.93 \pm 8.59 ^d	108.99 \pm 8.77 ^d	7.29 \pm 0.17 ^a	0.46 \pm 0.02 ^{d,e}	1.98 \pm 0.17 ^d	2623.87 \pm 123.15 ^b	15.77 \pm 0.71 ^d
AMAR11	13.85 \pm 0.36 ^e	3.97 \pm 0.01 ^d	111.77 \pm 6.08 ^e	91.80 \pm 6.35 ^c	5.99 \pm 0.37 ^c	0.62 \pm 0.03 ^f	1.12 \pm 0.14 ^e	2792.00 \pm 144.05 ^b	17.71 \pm 2.91 ^d
AMAR20	13.74 \pm 0.26 ^{c,e}	4.30 \pm 0.03 ^e	63.84 \pm 1.58 ^f	55.10 \pm 2.79 ^e	6.06 \pm 0.45 ^c	0.52 \pm 0.04 ^d	1.06 \pm 0.03 ^e	1995.73 \pm 259.84 ^c	4.23 \pm 0.49 ^e
AMAR25	13.11 \pm 0.45 ^d	4.26 \pm 0.07 ^f	47.06 \pm 3.66 ^g	30.06 \pm 2.28 ^f	5.40 \pm 0.21 ^c	0.43 \pm 0.02 ^{d,e}	0.34 \pm 0.06 ^f	1501.13 \pm 167.76 ^d	3.62 \pm 0.55 ^e

a–g: different superscript letters in the same column indicate significantly different values for a given parameter (p < 0.05 by post hoc Tukey's HSD test); same superscript letters in the same column indicate not significantly different values for

a given parameter (p > 0.05 by post hoc Tukey's HSD test).

Table S2. Chromaticity of samples from Amarena wines in relation to bottle aging. For every parameter, data were expressed as mean \pm standard deviation of n=15 samples coming from 5 bottles, where every sample was analyzed three times.

Sample	Luminosity (Y)	Hue (x)	Purity (y)
AMAR1	3.53 \pm 0.30 ^a	0.56 \pm 0.02 ^a	0.19 \pm 0.03 ^a
AMAR2	3.21 \pm 0.24 ^a	0.54 \pm 0.05 ^a	0.18 \pm 0.02 ^a
AMAR3	3.38 \pm 0.58 ^a	0.58 \pm 0.04 ^a	0.23 \pm 0.03 ^{a,b}
AMAR4	3.45 \pm 0.31 ^a	0.70 \pm 0.05 ^b	0.28 \pm 0.03 ^b
AMAR6	5.18 \pm 0.33 ^b	0.67 \pm 0.04 ^{b,a}	0.29 \pm 0.04 ^{b,c}
AMAR11	14.44 \pm 0.65 ^c	0.58 \pm 0.04 ^{b,a}	0.34 \pm 0.02 ^c
AMAR20	13.33 \pm 0.67 ^c	0.62 \pm 0.04 ^{b,a}	0.36 \pm 0.03 ^c
AMAR25	17.60 \pm 0.26 ^d	0.61 \pm 0.03 ^{b,a}	0.39 \pm 0.03 ^c

a-g: different superscript letters in the same column indicate significantly different values for a given parameter ($p < 0.05$ by post hoc Tukey's HSD test); same superscript letters in the same column indicate not significantly different values for a given parameter ($p > 0.05$ by post hoc Tukey's HSD test).

Table S3. Element profile of Amarena wines in relation to bottle aging. Data were expressed as mean \pm standard deviation of n=15 samples coming from 5 bottles, where every sample was analyzed three times.

Sample	Na (mg/L)	Mg (mg/L)	K (mg/L)	Mn (mg/L)	Fe (mg/L)	Cu (mg/L)	Zn (mg/L)	Cd (μ g/L)	Pb (μ g/L)
AMAR1	0.63 \pm 0.12 ^a	59.59 \pm 4.88 ^a	1784.03 \pm 237.42 ^a	0.85 \pm 0.03 ^a	2.75 \pm 0.35 ^a	0.052 \pm 0.012 ^a	0.69 \pm 0.11 ^a	8.43 \pm 2.53 ^a	60.07 \pm 8.76 ^a
AMAR2	0.92 \pm 0.06 ^b	66.12 \pm 1.97 ^a	2045.67 \pm 109.27 ^a	0.57 \pm 0.02 ^b	2.53 \pm 0.18 ^a	0.049 \pm 0.018 ^a	0.72 \pm 0.09 ^a	9.30 \pm 3.77 ^a	85.60 \pm 10.75 ^b
AMAR3	1.87 \pm 0.13 ^c	75.81 \pm 1.95 ^b	1959.00 \pm 162.00 ^a	0.83 \pm 0.06 ^a	2.90 \pm 0.35 ^a	0.12 \pm 0.012 ^b	0.52 \pm 0.12 ^a	8.88 \pm 1.48 ^a	57.65 \pm 9.86 ^a
AMAR4	1.48 \pm 0.07 ^d	84.03 \pm 1.84 ^c	2067.88 \pm 112.59 ^a	0.30 \pm 0.04 ^c	1.68 \pm 0.21 ^b	0.015 \pm 0.007 ^d	0.11 \pm 0.03 ^b	1.27 \pm 0.42 ^b	1.25 \pm 0.33 ^c
AMAR6	1.57 \pm 0.09 ^d	87.75 \pm 2.96 ^c	2724.22 \pm 120.63 ^b	1.27 \pm 0.15 ^d	3.85 \pm 0.09 ^c	0.79 \pm 0.10 ^c	1.52 \pm 0.16 ^c	1.20 \pm 0.41 ^b	1.65 \pm 0.56 ^c
AMAR11	2.45 \pm 0.14 ^e	96.71 \pm 2.35 ^d	2958.17 \pm 171.13 ^b	2.12 \pm 0.21 ^e	4.08 \pm 0.48 ^c	0.41 \pm 0.07 ^f	1.99 \pm 0.12 ^d	1.33 \pm 0.32 ^b	22.27 \pm 6.17 ^d
AMAR20	2.54 \pm 0.11 ^e	169.56 \pm 10.44 ^c	4075.77 \pm 151.18 ^c	2.34 \pm 0.32 ^e	6.66 \pm 0.85 ^d	0.77 \pm 0.11 ^e	2.03 \pm 0.14 ^d	1.13 \pm 0.51 ^b	20.60 \pm 4.99 ^d
AMAR25	2.94 \pm 0.15 ^f	113.78 \pm 8.17 ^f	5225.35 \pm 190.06 ^d	11.66 \pm 1.376 ^f	10.95 \pm 1.40 ^e	1.64 \pm 0.40 ^g	7.00 \pm 0.17 ^e	1.17 \pm 0.51 ^b	34.3 \pm 5.80 ^d

a–g: different superscript letters in the same column indicate significantly different values for a given parameter ($p < 0.05$ by post hoc Tukey's HSD test); same superscript letters in the same column indicate not significantly different values for a given parameter ($p > 0.05$ by post hoc Tukey's HSD test).

Table S4. Volatile compounds (mg/L) of Amarena wines during bottle aging. Data were expressed as mean \pm standard deviation of n=15 samples coming from 5 bottles, where every sample was analyzed three times.

Analyte	AMAR1	AMAR2	AMAR3	AMAR4	AMAR6	AMAR11	AMAR20	AMAR25
Acetaldehyde	26.19 \pm 1.31 ^a	22.49 \pm 0.96 ^b	36.74 \pm 1.72 ^c	41.91 \pm 1.83 ^d	50.01 \pm 1.75 ^e	68.89 \pm 1.18 ^f	79.37 \pm 1.08 ^g	87.17 \pm 1.49 ^h
Ethyl acetate	40.56 \pm 0.96 ^a	41.83 \pm 0.84 ^a	38.27 \pm 1.17 ^b	55.01 \pm 1.02 ^c	93.60 \pm 1.27 ^d	86.25 \pm 1.06 ^e	96.56 \pm 0.84 ^f	102.87 \pm 1.87 ^g
Methanol	50.69 \pm 1.16 ^a	53.49 \pm 1.45 ^b	53.94 \pm 1.43 ^b	60.66 \pm 1.88 ^c	53.55 \pm 1.13 ^b	56.02 \pm 1.77 ^c	59.59 \pm 1.52 ^c	60.51 \pm 1.56 ^c
<i>Higher alcohols</i>								
Propan-1-ol	31.73 \pm 1.33 ^a	51.66 \pm 1.28 ^b	39.81 \pm 2.02 ^c	40.21 \pm 1.94 ^c	40.49 \pm 1.87 ^c	39.35 \pm 2.13 ^c	36.84 \pm 2.23 ^c	37.52 \pm 1.61 ^c
Isobutanol	62.89 \pm 1.81 ^a	60.69 \pm 1.52 ^a	50.52 \pm 1.20 ^b	61.27 \pm 1.51 ^a	72.51 \pm 1.66 ^c	69.19 \pm 1.81 ^c	80.52 \pm 1.97 ^d	81.82 \pm 2.15 ^d
Butan-1-ol	0.72 \pm 0.13 ^a	0.68 \pm 0.12 ^a	0.69 \pm 0.13 ^a	0.86 \pm 0.06 ^a	1.04 \pm 0.16 ^b	2.16 \pm 0.23 ^c	2.00 \pm 0.11 ^c	2.07 \pm 0.12 ^c
2-methyl-1-butanol	29.63 \pm 1.76 ^a	29.30 \pm 1.65 ^a	23.48 \pm 1.66 ^b	27.52 \pm 1.60 ^a	38.99 \pm 1.16 ^c	40.29 \pm 1.39 ^c	50.23 \pm 1.73 ^d	49.99 \pm 1.20 ^d
3-methyl-1-butanol	179.67 \pm 4.24 ^a	177.24 \pm 4.16 ^a	182.00 \pm 4.46 ^a	176.71 \pm 3.38 ^a	180.50 \pm 4.72 ^a	190.43 \pm 3.52 ^b	199.12 \pm 5.34 ^{b,c}	203.35 \pm 4.44 ^c
Total	304.64 \pm 18.31 ^a	319.57 \pm 17.98 ^{a,b}	296.50 \pm 9.31 ^a	306.57 \pm 9.71 ^a	333.53 \pm 11.21 ^{b,c}	341.42 \pm 29.23 ^{b,c}	368.71 \pm 28.21 ^c	374.75 \pm 19.29 ^c
<i>Furanic compounds</i>								
2-furfural	0.89 \pm 0.39 ^a	0.84 \pm 0.35 ^a	1.33 \pm 0.32 ^a	6.54 \pm 1.25 ^b	2.23 \pm 0.80 ^c	9.60 \pm 0.99 ^d	22.94 \pm 2.06 ^e	30.35 \pm 2.17 ^f
5-hydroxymethylfurfural	6.06 \pm 1.08 ^a	6.55 \pm 1.28 ^a	6.11 \pm 1.40 ^a	28.70 \pm 1.60 ^b	7.83 \pm 0.90 ^a	29.67 \pm 1.33 ^b	75.72 \pm 1.60 ^c	95.54 \pm 3.10 ^d
5-methylfurfural	0.062 \pm 0.015 ^a	0.026 \pm 0.012 ^b	0.045 \pm 0.017 ^b	0.12 \pm 0.03 ^c	0.19 \pm 0.07 ^c	0.31 \pm 0.03 ^{c,d}	0.33 \pm 0.04 ^d	0.27 \pm 0.01 ^{c,d}
Furfuril alcol	0.071 \pm 0.02 ^a	0.21 \pm 0.04 ^b	0.16 \pm 0.03 ^b	0.17 \pm 0.02 ^b	0.21 \pm 0.04 ^{b,c}	0.26 \pm 0.04 ^c	0.28 \pm 0.04 ^c	0.28 \pm 0.03 ^c
<i>Ethyl esters</i>								
Ethyl propanoate	0.13 \pm 0.02 ^a	0.22 \pm 0.03 ^b	0.17 \pm 0.02 ^a	0.21 \pm 0.01 ^b	0.17 \pm 0.01 ^a	ND	ND	ND
Ethyl butanoate	0.062 \pm 0.016 ^a	0.097 \pm 0.017 ^a	0.10 \pm 0.02 ^a	0.10 \pm 0.01 ^a	0.080 \pm 0.006 ^a	ND	ND	ND
Ethyl caproate	0.10 \pm 0.03 ^a	0.13 \pm 0.02 ^{a,b}	0.17 \pm 0.02 ^b	0.15 \pm 0.01 ^{a,b}	0.19 \pm 0.01 ^b	ND	ND	ND
Ethyl laureate	0.090 \pm 0.020 ^a	0.11 \pm 0.01 ^a	0.19 \pm 0.01 ^b	0.18 \pm 0.01 ^b	0.19 \pm 0.01 ^b	ND	ND	ND
Ethyl myristate	0.22 \pm 0.03 ^a	0.24 \pm 0.03 ^a	0.22 \pm 0.01 ^a	0.27 \pm 0.02 ^b	0.19 \pm 0.01 ^a	ND	ND	ND
Ethyl palmitate	0.061 \pm 0.008 ^a	0.043 \pm 0.011 ^{a,b}	0.079 \pm 0.009 ^a	0.11 \pm 0.01 ^c	0.10 \pm 0.01 ^c	ND	ND	ND
Ethyl levulinate	0.031 \pm 0.006 ^a	0.029 \pm 0.005 ^a	0.033 \pm 0.003 ^a	0.048 \pm 0.004 ^b	0.045 \pm 0.007 ^b	ND	ND	ND
Diethyl glutarate	0.040 \pm 0.007 ^a	0.033 \pm 0.006 ^{a,b}	0.025 \pm 0.004 ^b	0.061 \pm 0.009 ^c	0.033 \pm 0.006 ^b	ND	ND	ND

a–h: different superscript letters in the same row indicate significantly different values for a given parameter ($p < 0.05$ by post hoc Tukey's HSD test); same superscript letters in the same column indicate not significantly different values for a given parameter ($p > 0.05$ by post hoc Tukey's HSD test).