Supplemental Data for:
Charnock HM, Cairns G, Pickering GJ and Kemp BS. 2022. Production method and wine style influence metal profiles in sparkling wines. Am J Enol Vitic 73:162-174. doi: 10.5344/ajev.2022.21051.

Supplemental Table 1 Internationally regulated maximum acceptable levels for metal content in wine according to the International Organization of Vine and Wine (2015).

Metal[a]	Maximum Acceptable Level (mg/L)
Ag	<0.1
As	0.2
B	80
Br	1
Cd	0.01
Cu	1
Na	80
Pb	0.15
Zn	5

[a]Ag: silver, As: arsenic, B: boron, Br: bromine, Cd: cadmium, Cu: copper, Na: sodium, Pb: lead, Zn: zinc.

Supplemental Table 2 Sample information pertaining to production method (Charmat method: C; traditional method: T), wine style (non-rosé: N; rosé: R), closure (cork or crown cap), and vintage.

Sample ID	Method	Style	Closure	Vintage[a]	Sample ID	Method	Style	Closure	Vintage[a]
1	C	N	Crown	2018	38	T	N	Cork	NV
2	C	N	Crown	2017	39	T	N	Cork	NV
3	C	N	Crown	2018	40	T	N	Cork	2014
4	C	N	Crown	2017	41	T	N	Cork	2012
5	C	N	Cork	2017	42	T	N	Cork	2015
6	C	N	Crown	NV	43	T	N	Cork	2017
7	C	N	Cork	2018	44	T	N	Cork	NV
8	C	N	Cork	NV	45	T	N	Crown	2017
9	C	N	Cork	2019	46	T	N	Cork	2017
10	C	N	Cork	2016	47	T	N	Cork	2006
11	C	N	Cork	2012	48	T	N	Crown	2019
12	C	N	Cork	NV	49	T	N	Crown	NV
13	C	N	Cork	2013	50	T	N	Cork	2006
14	C	N	Cork	2013	51	T	N	Cork	NV
15	C	N	Cork	NV	52	T	N	Cork	2011
16	C	R	Cork	NV	53	T	N	Cork	NV
17	C	R	Cork	NV	54	T	N	Cork	2013
18	C	R	Cork	2016	55	T	N	Cork	NV
19	C	R	Cork	2017	56	T	N	Cork	NV
20	T	N	Cork	2016	57	T	N	Cork	2010
21	T	N	Cork	2016	58	T	N	Cork	2017
22	T	N	Cork	NV	59	T	N	Crown	2018
23	T	N	Cork	2006	60	T	N	Cork	2012
24	T	N	Crown	2006	61	T	N	Cork	2012
25	T	N	Crown	NV	62	T	N	Cork	NV
26	T	N	Cork	2013	63	T	R	Crown	2016
27	T	N	Crown	2017	64	T	R	Cork	2016
28	T	N	Cork	2015	65	T	R	Crown	2015
29	T	N	Cork	NV	66	T	R	Cork	2015
30	T	N	Cork	2015	67	T	R	Cork	NV
31	T	N	Cork	2013	68	T	R	Crown	2015
32	T	N	Cork	NV	69	T	R	Cork	2015
33	T	N	Cork	NV	70	T	R	Cork	NV
34	T	N	Cork	NV	71	T	R	Cork	NV
35	T	N	Cork	2014	72	T	R	Cork	NV
36	T	N	Cork	2016	73	T	R	Cork	NV
37	T	N	Cork	2016					

[a]NV: no vintage.

Supplemental Table 3 Multielement calibration standards for inductively coupled plasma-mass spectrometry.

Standard 1	Standard 2A	Standard 3	Standard 4
Cerium	Aluminum	Antimony	Boron
Dysprosium	Arsenic	Gold	Germanium
Erbium	Barium	Hafnium	Molybdenum
Europium	Beryllium	Iridium	Niobium
Gadolinium	Cadmium	Palladium	Phosphorus
Holmium	Calcium	Platinum	Rhenium
Lanthanum	Cesium	Rhodium	Silicon
Lutetium	Chromium	Ruthenium	Sulfur
Neodymium	Cobalt	Tellurium	Tantalum
Praseodymium	Copper	Tin	Tin
Scandium	Gallium		Titanium
Samarium	Iron		Tungsten
Terbium	Lead		Zirconium
Thorium	Lithium		
Thulium	Magnesium		
Yttrium	Manganese		
Ytterbium	Nickel		
	Potassium		
	Rubidium		
	Selenium		
	Silver		
	Sodium		
	Strontium		
	Thallium		
	Uranium		
	Vanadium		
	Zinc		

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Supplemental Table 4 Metal concentrations (mg/L) in 73 sparkling wines produced in Canada's Niagara Peninsula as determined by inductively coupled plasma-mass spectrometry and inductively coupled plasma-optical emission spectrometry.

Sample ID	Al[a]	Sb	As	Ba	Be	B[b]	Cd	Ca	Cr	Co	Cu	Fe	Pb	Mg	Mn	Mo	Ni	K	Se	Na	Sr	Tl	Sn	U	V	Zn
1	0.20	n.d.[c]	0.054	0.039	0.0013	1.9	0.00016	53	0.017	n.d.	0.230	n.d.	n.d.	89	1.10	n.d.	0.015	370	0.0074	15.0	0.35	n.d.	n.d.	n.d.	n.d.	1.60
2	0.09	n.d.	0.013	0.025	n.d.	3.1	0.00010	59	n.d.	n.d.	n.d.	n.d.	n.d.	51	0.65	n.d.	n.d.	490	n.d.	29.0	0.19	n.d.	n.d.	n.d.	n.d.	0.73
3	0.19	n.d.	0.016	0.037	0.0011	2.0	0.00014	56	0.017	n.d.	0.230	n.d.	n.d.	93	1.10	n.d.	0.015	390	n.d.	16.0	0.37	n.d.	n.d.	n.d.	n.d.	1.60
4	0.37	n.d.	0.012	0.039	n.d.	3.3	0.00014	64	n.d.	n.d.	0.018	0.64	n.d.	54	0.52	n.d.	n.d.	260	n.d.	23.0	0.35	n.d.	n.d.	n.d.	0.063	0.36
5	n.d.	n.d.	0.045	0.018	n.d.	2.7	n.d.	52	0.018	n.d.	0.160	0.72	n.d.	51	0.75	n.d.	0.014	480	0.0094	9.7	0.22	n.d.	n.d.	n.d.	n.d.	0.96
6	2.00	n.d.	0.034	0.065	0.0064	3.2	0.00041	79	0.032	n.d.	0.094	1.30	0.0120	65	0.65	n.d.	0.025	350	0.0066	31.0	0.34	n.d.	n.d.	n.d.	n.d.	0.54
7	n.d.	n.d.	0.014	0.036	0.0011	3.0	n.d.	66	0.019	n.d.	0.017	1.00	0.0062	81	0.49	n.d.	0.016	590	n.d.	15.0	0.29	n.d.	n.d.	n.d.	n.d.	0.63
8	0.72	n.d.	0.013	0.054	0.0018	2.4	n.d.	92	0.016	n.d.	0.019	0.75	0.0083	93	0.58	n.d.	0.017	490	n.d.	19.0	0.39	n.d.	n.d.	n.d.	n.d.	0.52
9	n.d.	n.d.	0.012	0.044	n.d.	3.4	n.d.	87	n.d.	n.d.	0.038	n.d.	n.d.	89	0.64	n.d.	0.013	750	n.d.	21.0	0.26	n.d.	n.d.	n.d.	n.d.	1.00
10	0.70	n.d.	0.014	0.035	n.d.	3.5	n.d.	58	0.043	n.d.	0.120	0.98	0.0064	62	0.40	n.d.	0.027	370	n.d.	20.0	0.40	n.d.	n.d.	0.00060	n.d.	1.10
11	0.58	n.d.	0.015	0.049	0.0017	3.6	0.00010	74	n.d.	n.d.	0.140	0.58	0.0080	66	0.96	n.d.	0.015	540	n.d.	14.0	0.36	n.d.	n.d.	n.d.	n.d.	1.10
12	n.d.	n.d.	0.014	0.019	n.d.	2.7	n.d.	68	0.016	n.d.	0.029	0.85	0.0056	66	1.20	n.d.	0.016	320	n.d.	13.0	0.31	n.d.	n.d.	n.d.	n.d.	0.92
13	0.61	n.d.	0.014	0.035	0.0011	2.3	0.00015	69	0.014	n.d.	n.d.	1.20	0.0085	73	1.10	n.d.	0.015	470	n.d.	17.0	0.37	n.d.	n.d.	n.d.	n.d.	0.80
14	0.68	n.d.	n.d.	0.022	n.d.	2.7	n.d.	45	n.d.	n.d.	0.300	n.d.	n.d.	50	0.38	n.d.	n.d.	330	n.d.	13.0	0.18	n.d.	n.d.	n.d.	n.d.	1.30
15	0.97	0.016	0.029	0.041	0.0012	4.6	0.00023	68	0.015	n.d.	n.d.	5.10	0.0077	74	1.20	0.022	0.017	650	n.d.	35.0	0.36	n.d.	n.d.	n.d.	0.110	0.78
16	0.69	n.d.	0.020	0.055	0.0037	3.5	0.00011	86	0.027	n.d.	n.d.	0.98	0.0066	74	0.81	n.d.	0.020	810	n.d.	22.0	0.38	n.d.	n.d.	n.d.	n.d.	1.20
17	0.57	n.d.	0.012	0.042	n.d.	2.8	n.d.	65	0.024	n.d.	0.012	0.60	0.0059	60	0.50	n.d.	0.016	680	n.d.	16.0	0.21	n.d.	n.d.	n.d.	n.d.	0.55
18	0.53	n.d.	0.011	0.028	n.d.	2.7	0.00033	59	0.017	n.d.	0.130	1.00	n.d.	73	0.37	n.d.	0.019	350	n.d.	14.0	0.39	n.d.	n.d.	n.d.	n.d.	0.80
19	1.50	n.d.	0.030	0.120	0.0037	3.3	0.00046	69	0.014	0.0058	n.d.	0.79	0.0085	79	1.80	0.023	0.023	880	n.d.	37.0	0.35	n.d.	n.d.	n.d.	0.080	1.00
20	0.32	n.d.	0.054	0.035	n.d.	3.5	0.00012	66	0.010	n.d.	0.034	n.d.	n.d.	56	0.71	n.d.	n.d.	430	0.0100	42.0	0.12	n.d.	n.d.	n.d.	n.d.	0.87
21	0.40	n.d.	0.026	0.034	n.d.	2.7	0.00018	43	0.021	n.d.	0.031	0.97	0.0078	66	0.69	n.d.	0.023	440	0.0054	29.0	0.32	n.d.	n.d.	n.d.	n.d.	1.20
22	0.25	n.d.	0.020	0.015	n.d.	5.0	0.00013	44	0.013	n.d.	0.023	n.d.	n.d.	70	0.37	n.d.	n.d.	320	n.d.	6.4	0.09	n.d.	n.d.	n.d.	n.d.	0.64
23	0.23	n.d.	0.014	0.020	n.d.	2.2	n.d.	87	0.011	n.d.	0.210	n.d.	n.d.	64	0.30	n.d.	n.d.	200	n.d.	31.0	0.32	n.d.	n.d.	n.d.	n.d.	0.74
24	0.19	n.d.	0.016	0.046	n.d.	3.3	0.00018	58	0.013	n.d.	0.034	n.d.	0.0062	75	0.38	n.d.	0.014	380	n.d.	9.9	0.21	n.d.	n.d.	n.d.	n.d.	0.50
25	0.27	n.d.	0.016	0.030	n.d.	2.0	0.00012	70	n.d.	n.d.	0.170	n.d.	n.d.	63	0.31	n.d.	n.d.	260	n.d.	31.0	0.25	n.d.	n.d.	n.d.	n.d.	1.40
26	0.74	n.d.	0.014	0.064	0.0027	3.9	0.00012	74	0.016	n.d.	0.028	3.00	0.0080	83	2.40	n.d.	0.014	720	n.d.	15.0	0.28	n.d.	n.d.	n.d.	n.d.	1.30

Continued on next page.

Supplemental Table 4 ***continued*** Metal concentrations (mg/L) in 73 sparkling wines produced in Canada's Niagara Peninsula as determined by inductively coupled plasma-mass spectrometry and inductively coupled plasma-optical emission spectrometry.

Sample ID	Al[a]	Sb	As	Ba	Be	B[b]	Cd	Ca	Cr	Co	Cu	Fe	Pb	Mg	Mn	Mo	Ni	K	Se	Na	Sr	Tl	Sn	U	V	Zn
27	0.99	n.d.	0.014	0.020	n.d.	3.9	0.00031	78	0.016	n.d.	0.240	0.96	0.0054	67	0.81	n.d.	n.d.	210	n.d.	17.0	0.24	n.d.	n.d.	n.d.	n.d.	0.68
28	0.93	n.d.	0.012	0.030	n.d.	3.7	0.00036	57	0.016	n.d.	0.360	0.94	0.0074	62	0.74	n.d.	n.d.	310	n.d.	15.0	0.23	n.d.	n.d.	n.d.	n.d.	0.67
29	0.11	n.d.	n.d.	n.d.	n.d.	3.8	0.00013	72	0.012	n.d.	0.015	n.d.	n.d.	86	0.59	n.d.	0.013	120	n.d.	7.4	0.19	n.d.	n.d.	n.d.	n.d.	0.92
30	0.57	n.d.	0.037	0.025	n.d.	3.3	n.d.	44	0.013	n.d.	0.019	0.60	0.0066	55	0.32	n.d.	0.011	610	0.0080	13.0	0.17	n.d.	n.d.	n.d.	n.d.	1.10
32	0.96	n.d.	0.031	0.045	0.0030	3.6	n.d.	65	0.015	n.d.	0.015	n.d.	0.0073	66	0.35	n.d.	0.011	500	0.0059	25.0	0.22	n.d.	n.d.	n.d.	n.d.	0.83
33	n.d.	n.d.	0.031	0.019	n.d.	3.0	n.d.	63	n.d.	n.d.	0.017	n.d.	n.d.	75	1.30	n.d.	0.012	530	0.0058	13.0	0.15	n.d.	n.d.	n.d.	n.d.	1.50
34	2.20	n.d.	0.031	0.048	0.0030	4.7	n.d.	65	0.017	n.d.	0.061	n.d.	0.0079	62	0.33	n.d.	0.013	440	0.0070	43.0	0.18	n.d.	n.d.	n.d.	n.d.	0.94
35	0.84	n.d.	0.029	0.039	0.0019	4.3	n.d.	58	0.014	n.d.	0.053	n.d.	0.0062	55	0.41	n.d.	0.011	540	0.0057	22.0	0.24	n.d.	n.d.	n.d.	n.d.	0.52
36	0.66	n.d.	0.029	0.036	n.d.	3.9	0.00022	36	0.014	n.d.	0.032	0.64	n.d.	52	0.45	n.d.	0.014	620	0.0054	11.0	0.19	n.d.	n.d.	n.d.	0.019	0.66
37	0.61	n.d.	0.022	0.030	n.d.	3.2	0.00020	65	n.d.	n.d.	0.030	n.d.	n.d.	65	0.43	n.d.	0.016	530	n.d.	8.0	0.24	n.d.	n.d.	n.d.	n.d.	0.85
38	n.d.	n.d.	0.026	0.030	n.d.	3.0	n.d.	66	n.d.	n.d.	0.039	n.d.	n.d.	80	0.45	n.d.	0.014	340	n.d.	7.1	0.21	n.d.	n.d.	n.d.	0.012	1.30
39	0.53	n.d.	0.021	0.026	n.d.	2.5	0.00027	86	0.018	n.d.	0.015	0.50	0.0063	99	0.86	n.d.	0.017	470	0.0051	7.2	0.28	n.d.	n.d.	n.d.	n.d.	1.10
40	0.61	n.d.	0.025	0.025	n.d.	3.4	n.d.	37	0.014	n.d.	0.029	n.d.	0.0066	71	0.35	n.d.	0.011	380	0.0052	17.0	0.29	n.d.	n.d.	n.d.	n.d.	0.39
41	0.84	n.d.	0.024	0.023	n.d.	3.9	n.d.	40	0.014	n.d.	0.045	0.77	0.0110	58	0.33	n.d.	n.d.	380	n.d.	24.0	0.37	n.d.	n.d.	n.d.	n.d.	0.48
42	0.62	n.d.	0.023	0.044	n.d.	3.7	n.d.	75	0.013	n.d.	0.040	n.d.	n.d.	64	0.80	n.d.	n.d.	540	0.0052	48.0	0.13	n.d.	n.d.	n.d.	n.d.	0.93
43	0.82	n.d.	0.034	0.034	n.d.	3.6	n.d.	42	n.d.	n.d.	0.270	n.d.	n.d.	72	0.52	n.d.	0.026	390	0.0068	13.0	0.27	n.d.	n.d.	n.d.	n.d.	1.30
44	0.68	n.d.	0.027	0.043	n.d.	2.9	n.d.	48	0.014	n.d.	0.089	n.d.	0.0051	68	0.60	n.d.	0.012	630	n.d.	28.0	0.17	n.d.	n.d.	n.d.	n.d.	0.51
45	1.00	n.d.	0.021	0.042	0.0036	3.1	n.d.	55	0.017	n.d.	0.052	2.10	0.0096	79	0.55	n.d.	0.018	460	n.d.	13.0	0.24	n.d.	n.d.	n.d.	n.d.	0.42
46	0.59	n.d.	0.017	0.021	n.d.	3.6	0.00024	73	n.d.	n.d.	0.022	n.d.	0.0056	73	0.66	n.d.	0.013	390	n.d.	64.0	0.17	n.d.	n.d.	n.d.	n.d.	0.97
47	0.96	n.d.	0.014	0.039	0.0020	3.1	n.d.	78	n.d.	n.d.	0.086	n.d.	0.0066	57	0.83	n.d.	0.010	500	n.d.	24.0	0.22	n.d.	n.d.	n.d.	n.d.	1.10
48	0.82	n.d.	0.020	0.041	n.d.	1.7	n.d.	72	n.d.	n.d.	0.026	0.72	n.d.	67	0.33	n.d.	n.d.	560	n.d.	9.0	0.22	n.d.	n.d.	n.d.	0.048	0.67
49	n.d.	n.d.	0.014	0.019	n.d.	4.6	0.00025	62	0.028	n.d.	0.026	0.58	n.d.	66	0.55	n.d.	0.015	750	n.d.	74.0	0.20	n.d.	0.0075	n.d.	n.d.	0.95
50	0.78	n.d.	0.018	0.041	n.d.	2.1	n.d.	77	n.d.	n.d.	0.016	0.65	n.d.	65	0.36	n.d.	n.d.	330	n.d.	12.0	0.21	n.d.	n.d.	n.d.	0.074	0.49
51	5.20	0.003	0.037	0.041	0.0039	2.5	0.00031	82	0.014	n.d.	0.014	1.90	0.0071	70	1.10	0.033	0.011	240	n.d.	69.0	0.31	n.d.	n.d.	0.00160	0.120	0.81
52	0.51	n.d.	0.011	0.045	n.d.	2.8	0.00022	68	0.023	n.d.	0.280	n.d.	0.0260	66	0.79	n.d.	0.018	810	n.d.	15.0	0.15	n.d.	n.d.	n.d.	n.d.	2.60
53	1.30	n.d.	0.011	0.060	0.0036	3.2	n.d.	64	0.012	n.d.	n.d.	n.d.	0.0058	60	0.31	n.d.	n.d.	650	n.d.	14.0	0.20	n.d.	n.d.	n.d.	n.d.	0.73
54	1.50	n.d.	0.013	0.058	0.0021	4.5	n.d.	65	0.016	n.d.	n.d.	0.86	0.0084	74	1.40	n.d.	0.014	810	n.d.	16.0	0.20	n.d.	n.d.	0.00078	n.d.	0.98

Continued on next page.

Supplemental Table 4 *continued* Metal concentrations (mg/L) in 73 sparkling wines produced in Canada's Niagara Peninsula as determined by inductively coupled plasma-mass spectrometry and inductively coupled plasma-optical emission spectrometry.

Sample ID	Al[a]	Sb	As	Ba	Be	B[b]	Cd	Ca	Cr	Co	Cu	Fe	Pb	Mg	Mn	Mo	Ni	K	Se	Na	Sr	Tl	Sn	U	V	Zn
55	n.d.	n.d.	0.016	0.035	n.d.	3.7	n.d.	70	n.d.	n.d.	0.016	0.72	n.d.	90	1.30	n.d.	0.014	620	n.d.	13.0	0.20	n.d.	n.d.	n.d.	n.d.	1.50
56	0.97	n.d.	0.012	0.056	0.0037	2.0	n.d.	92	n.d.	n.d.	n.d.	0.53	0.0138	62	0.44	n.d.	0.010	315	n.d.	15.0	0.20	n.d.	n.d.	n.d.	n.d.	0.73
57	0.72	n.d.	0.025	0.025	n.d.	2.9	0.00028	55	n.d.	n.d.	0.041	3.80	n.d.	76	0.59	n.d.	0.014	400	n.d.	5.6	0.29	n.d.	n.d.	n.d.	n.d.	0.43
58	0.83	n.d.	0.021	0.024	0.0010	3.5	0.00024	68	0.026	n.d.	n.d.	0.58	0.0056	61	1.10	n.d.	0.022	560	n.d.	21.0	0.24	n.d.	n.d.	n.d.	n.d.	0.76
59	0.76	n.d.	0.026	0.082	0.0019	3.5	0.00020	58	0.016	n.d.	0.014	1.20	0.0089	98	0.73	n.d.	0.019	710	0.0058	12.0	0.44	n.d.	0.0061	n.d.	0.020	1.10
60	1.70	n.d.	0.016	0.034	n.d.	3.7	0.00031	70	0.012	0.0060	0.042	3.00	0.0077	69	1.80	n.d.	0.082	610	n.d.	24.0	0.30	n.d.	n.d.	n.d.	n.d.	0.37
61	1.60	n.d.	0.030	0.058	0.0027	2.6	0.00023	74	0.020	n.d.	0.028	0.81	0.0053	68	0.52	0.015	0.014	270	n.d.	15.0	0.28	n.d.	n.d.	0.00087	0.055	0.65
62	0.57	n.d.	0.013	0.019	n.d.	4.9	n.d.	56	n.d.	n.d.	0.028	n.d.	n.d.	53	4.50	n.d.	0.012	400	n.d.	11.0	0.10	n.d.	n.d.	n.d.	n.d.	1.70
63	0.19	n.d.	0.025	0.022	n.d.	3.5	n.d.	47	0.014	n.d.	n.d.	0.53	n.d.	95	0.52	n.d.	0.020	465	n.d.	13.0	0.23	n.d.	n.d.	n.d.	n.d.	0.84
64	0.10	n.d.	0.020	0.025	n.d.	3.0	0.00011	58	n.d.	n.d.	n.d.	n.d.	0.0057	87	1.50	n.d.	0.012	660	n.d.	3.9	0.28	0.0026	n.d.	n.d.	n.d.	0.95
65	0.25	n.d.	0.017	0.029	n.d.	3.8	0.00012	51	n.d.	n.d.	0.023	0.53	n.d.	67	0.49	n.d.	0.014	480	n.d.	12.0	0.22	n.d.	n.d.	n.d.	n.d.	0.81
66	0.65	n.d.	0.032	0.031	n.d.	4.1	n.d.	44	n.d.	n.d.	0.035	n.d.	0.0050	56	0.40	n.d.	0.010	470	0.0061	29.0	0.21	n.d.	n.d.	n.d.	n.d.	0.60
67	0.65	n.d.	0.022	0.039	n.d.	3.6	0.00025	61	n.d.	n.d.	0.022	n.d.	n.d.	48	0.68	n.d.	0.010	500	0.0054	32.0	0.22	n.d.	n.d.	n.d.	n.d.	1.00
68	0.55	n.d.	0.016	0.043	n.d.	3.7	n.d.	54	0.011	n.d.	0.019	0.60	n.d.	74	0.54	n.d.	0.017	770	n.d.	13.0	0.21	n.d.	n.d.	n.d.	n.d.	0.89
69	0.53	n.d.	0.022	0.031	n.d.	2.7	0.00012	47	n.d.	n.d.	0.013	n.d.	0.0110	68	0.31	n.d.	0.012	620	n.d.	16.0	0.17	n.d.	n.d.	n.d.	n.d.	0.88
70	1.20	n.d.	0.027	0.049	0.0041	4.7	0.00019	58	0.014	n.d.	n.d.	1.70	0.0088	120	0.66	n.d.	0.014	550	0.0060	13.0	0.65	n.d.	n.d.	n.d.	0.018	0.97
71	n.d.	n.d.	0.015	0.023	n.d.	4.1	0.00013	62	0.011	n.d.	0.016	0.61	n.d.	59	0.78	n.d.	0.017	810	n.d.	10.0	0.20	n.d.	n.d.	n.d.	n.d.	0.46
72	n.d.	n.d.	0.017	0.027	n.d.	3.9	0.00013	66	n.d.	n.d.	0.017	0.69	n.d.	80	0.99	n.d.	0.013	585	n.d.	16.0	0.25	n.d.	n.d.	n.d.	n.d.	1.40
73	0.54	n.d.	0.016	0.021	n.d.	2.4	0.00013	71	0.012	n.d.	0.057	n.d.	n.d.	68	0.90	n.d.	0.017	560	n.d.	9.3	0.23	n.d.	n.d.	n.d.	n.d.	0.95

[a]Al: aluminum, As: arsenic, B: boron, Ba: barium, Be: beryllium, Ca: calcium, Cd: cadmium, Co: cobalt, Cr: chromium, Cu: copper, Fe: iron, K: potassium, Mg: magnesium, Mn: manganese, Mo: molybdenum, Na: sodium, Ni: nickel, Pb: lead, Sb: antimony, Se: selenium, Sn: tin, Sr: strontium, Tl: thallium, U: uranium, V: vanadium, Zn: zinc.
[b]Indicates elements analyzed by ICP-OES (all B analyses).
[c]n.d.: not detected.

Supplemental Table 5 Spearman correlation matrix for metals present above the limit of detection in all traditional method sparkling wines from the Niagara-region (n = 54).

	B[a]	Ca	Mg	Mn	K	Na	Sr	Zn
B								
Ca	-0.312*[b]							
Mg	-0.097	0.062						
Mn	0.161	0.276*	0.296*					
K	0.205	-0.169	0.055	0.299*				
Na	0.061	0.137	-0.377**	-0.016	-0.075			
Sr	-0.219	0.011	0.305*	0.069	-0.171	0.038		
Zn	-0.033	0.154	0.206	0.384**	0.215	0.055	-0.106	

[a]B: boron, Ca: calcium, Mg: magnesium, Mn: manganese, K: potassium, Na: sodium, Sr: strontium, Zn: zinc.
[b]* or **: significant at $p < 0.05$ and 0.01, respectively.

Supplemental Table 6 Spearman correlation matrix for metals present above the limit of detection in all Charmat method sparkling wines from the Niagara-region (n = 19).

	B[a]	Ca	Mg	Mn	K	Na	Sr	Zn
B								
Ca	0.389							
Mg	-0.180	0.429						
Mn	-0.004	0.237	0.344					
K	0.415	0.482*[b]	0.383	0.258				
Na	0.518*	0.458	0.170	0.230	0.374			
Sr	0.061	0.266	0.474*	0.084	-0.025	0.175		
Zn	-0.095	-0.337	0.188	0.265	0.053	-0.319	0.118	

[a]B: boron, Ca: calcium, Mg: magnesium, Mn: manganese, K: potassium, Na: sodium, Sr: strontium, Zn: zinc.
[b]*: significant at $p < 0.05$.

Supplemental Table 7 Spearman correlation matrix for metals present above the limit of detection in all samples from non-rosé Niagara-region sparkling wines (n = 58).

	B[a]	Ca	Mg	Mn	K	Na	Sr	Zn
B								
Ca	-0.194							
Mg	-0.132	0.200						
Mn	0.107	0.202	0.322*[b]					
K	0.274*	-0.066	0.124	0.254				
Na	0.096	0.212	-0.212	0.067	0.042			
Sr	-0.282*	0.099	0.315*	0.115	-0.145	0.151		
Zn	-0.074	-0.017	0.134	0.369**	0.161	-0.047	-0.126	

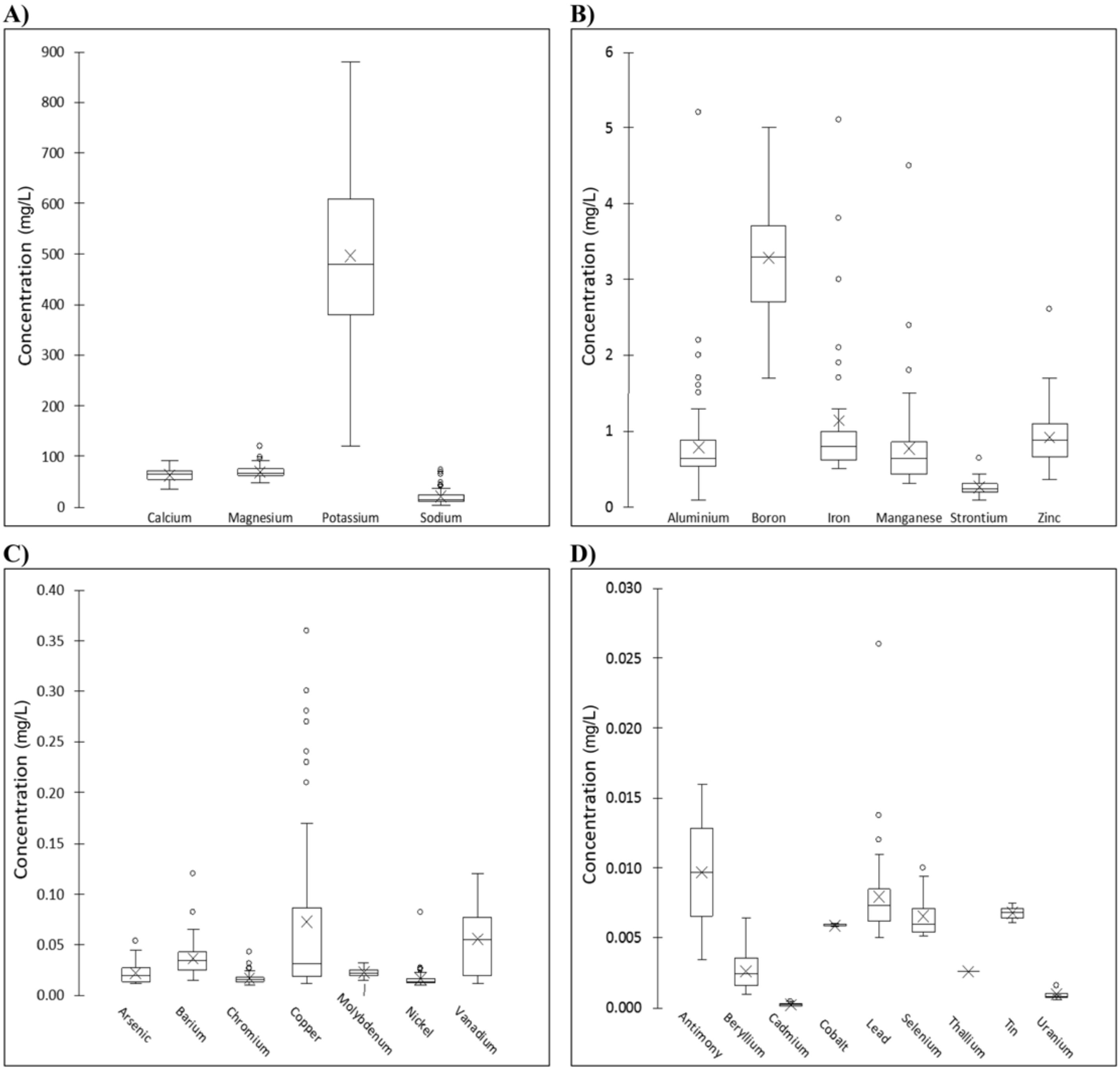
[a]B: boron, Ca: calcium, Mg: magnesium, Mn: manganese, K: potassium, Na: sodium, Sr: strontium, Zn: zinc.
[b]*, **: significant at $p < 0.05$ and 0.01, respectively.

Supplemental Table 8 Spearman correlation matrix for metals present above the limit of detection in all samples from rosé Niagara-region sparkling wines (n = 15).

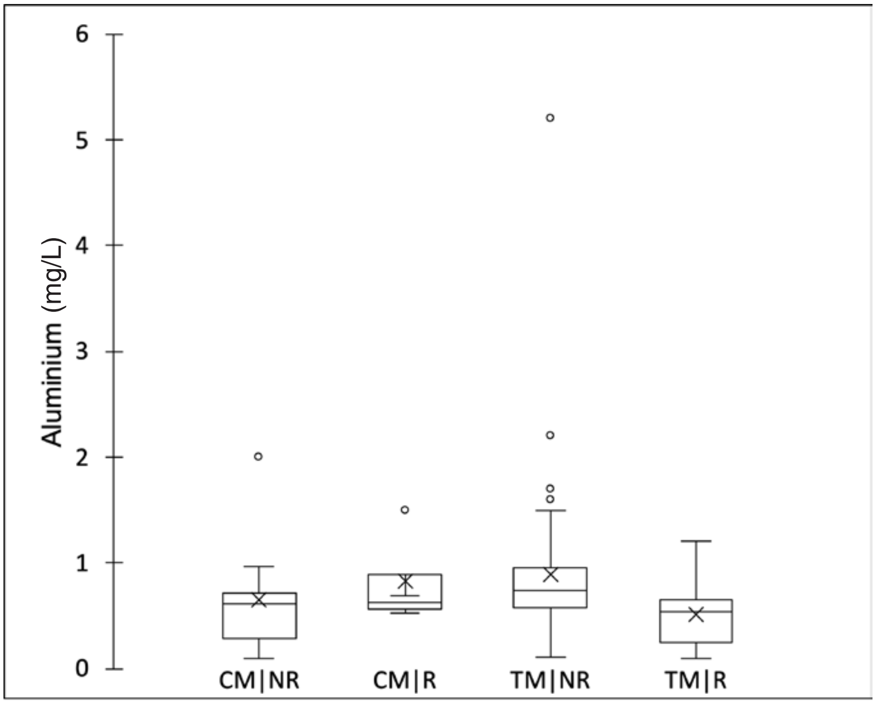
	B[a]	Ca	Mg	Mn	K	Na	Sr	Zn
B								
Ca	-0.248							
Mg	0.005	0.037						
Mn	0.048	0.682**[b]	0.370					
K	-0.036	0.541*	0.067	0.559*				
Na	0.047	0.135	-0.238	-0.079	0.088			
Sr	-0.050	0.386	0.659**	0.408	-0.128	0.022		
Zn	0.014	0.469	0.476	0.644*	0.236	0.299	0.554*	

[a]B: boron, Ca: calcium, Mg: magnesium, Mn: manganese, K: potassium, Na: sodium, Sr: strontium, Zn: zinc.
[b]*, **: significant at $p < 0.05$ and 0.01, respectively.

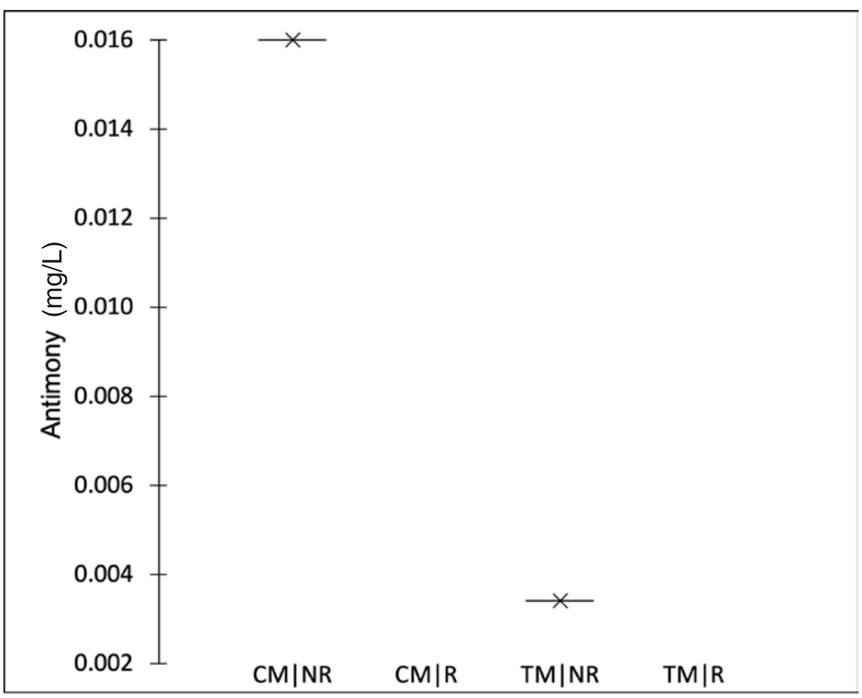
Supplemental Data for:
Charnock HM, Cairns G, Pickering GJ and Kemp BS. 2022. Production method and wine style influence metal profiles in sparkling wines. Am J Enol Vitic 73:162-174. doi: 10.5344/ajev.2022.21051.



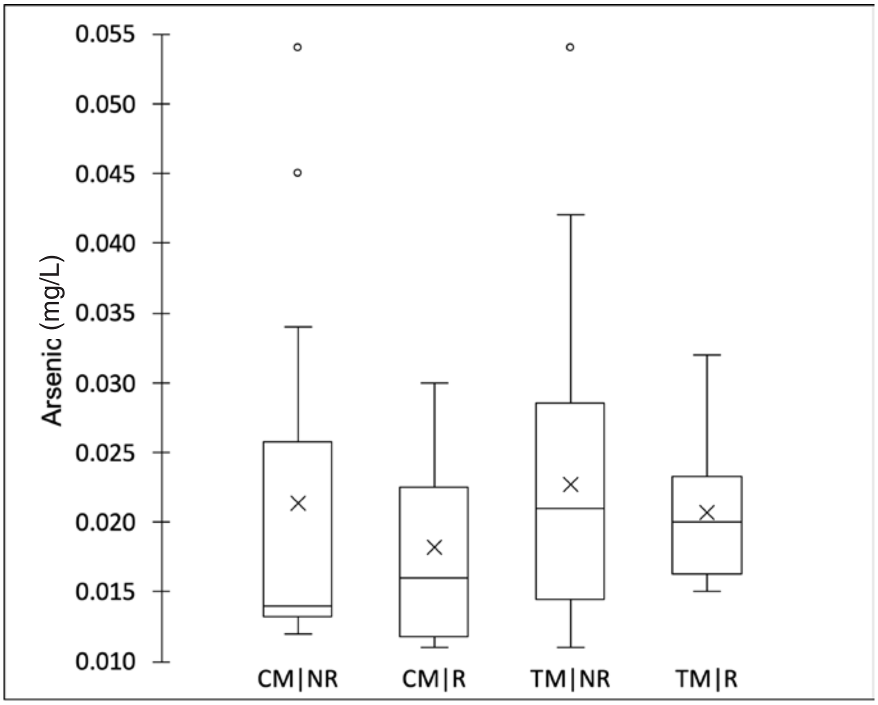
Supplemental Figure 1 Box and whisker plot of all metals with measured amounts greater than the limit of detection (LOD; n = 26) in 73 sparkling wine samples from the Niagara region. The area between the upper and lower edges of the boxes represents the interquartile range from the 25th to the 75th percentile, respectively; the internal horizontal line represents the median, and the cross indicates the mean. Whiskers above and below the boxes extend to the maximum and minimum values, respectively, with calculated outliers identified as open circular data points.



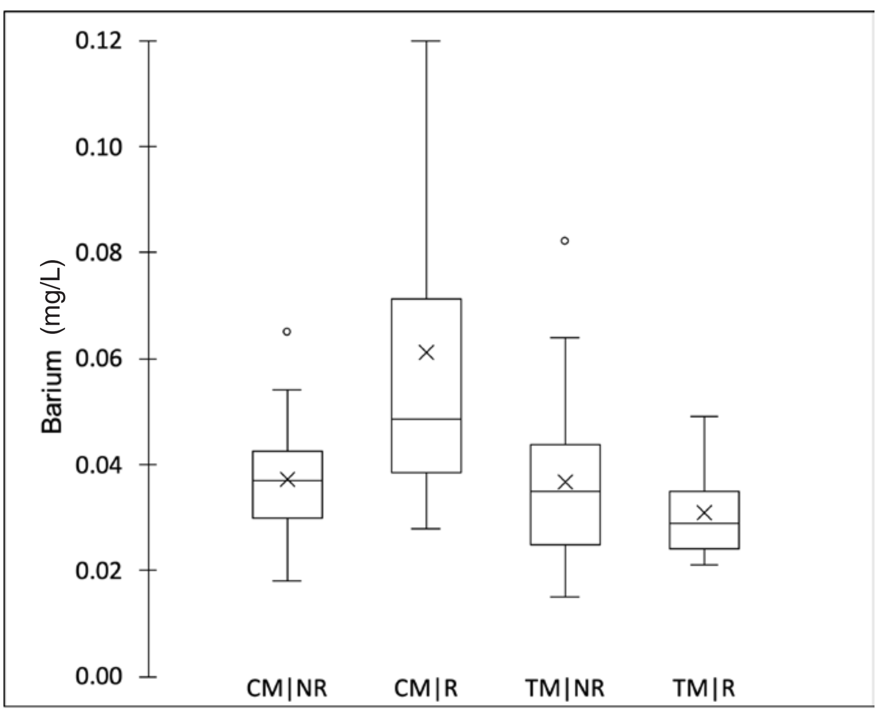
Supplemental Figure 2 Box and whisker plot of aluminum (when present at measured amounts greater than the limit of detection) by production method (CM: Charmat method, TM: traditional method) and wine style (N: non-rosé; R: rosé).



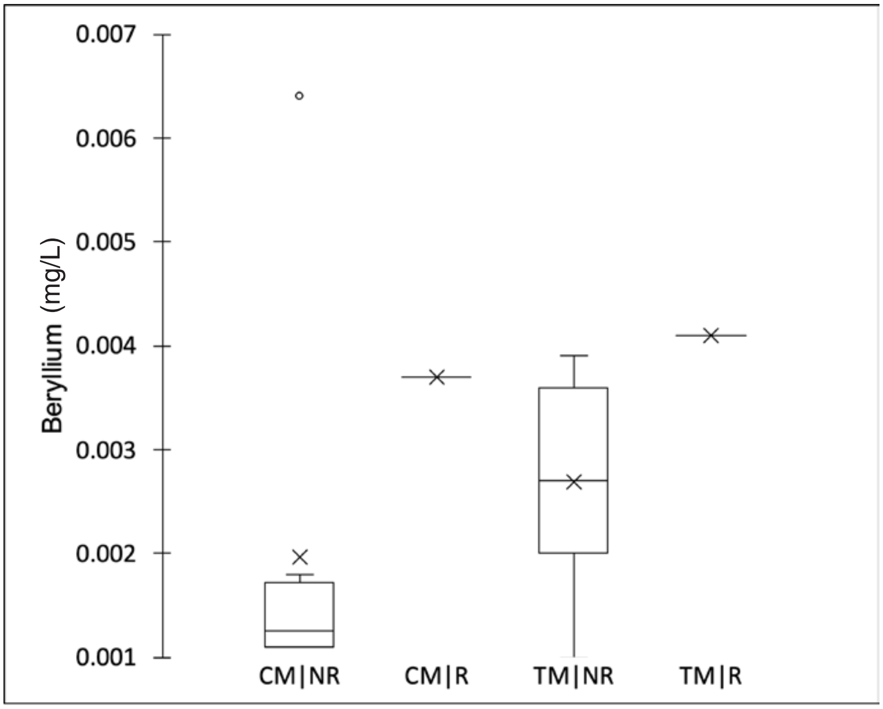
Supplemental Figure 3 Box and whisker plot of antimony (when present at measured amounts greater than the limit of detection) by production method (CM: Charmat method, TM: traditional method) and wine style (N: non-rosé; R: rosé).



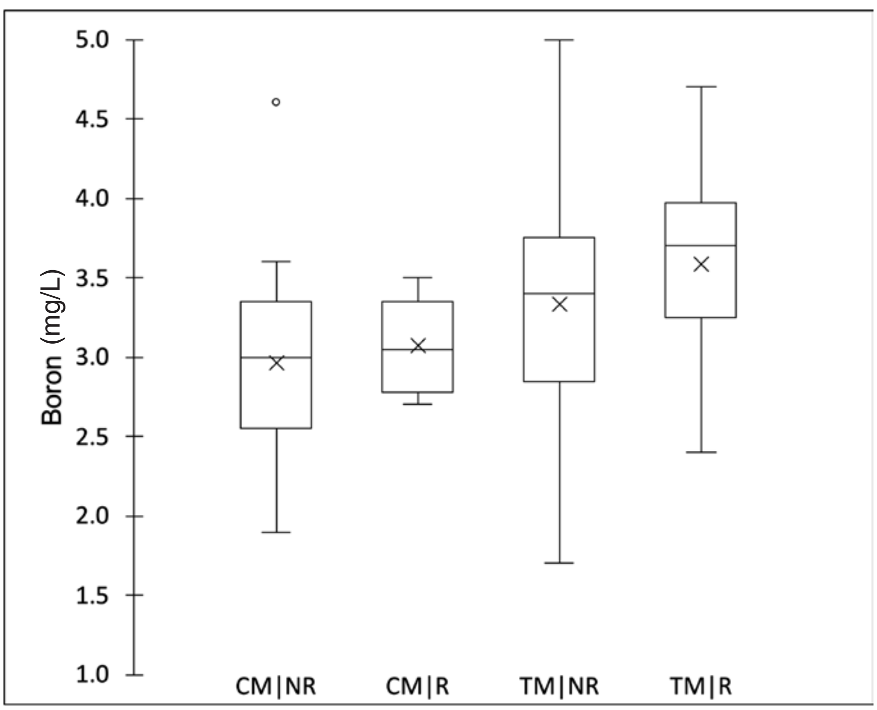
Supplemental Figure 4 Box and whisker plot of arsenic (when present at measured amounts greater than the limit of detection) by production method (CM: Charmat method, TM: traditional method) and wine style (N: non-rosé; R: rosé).



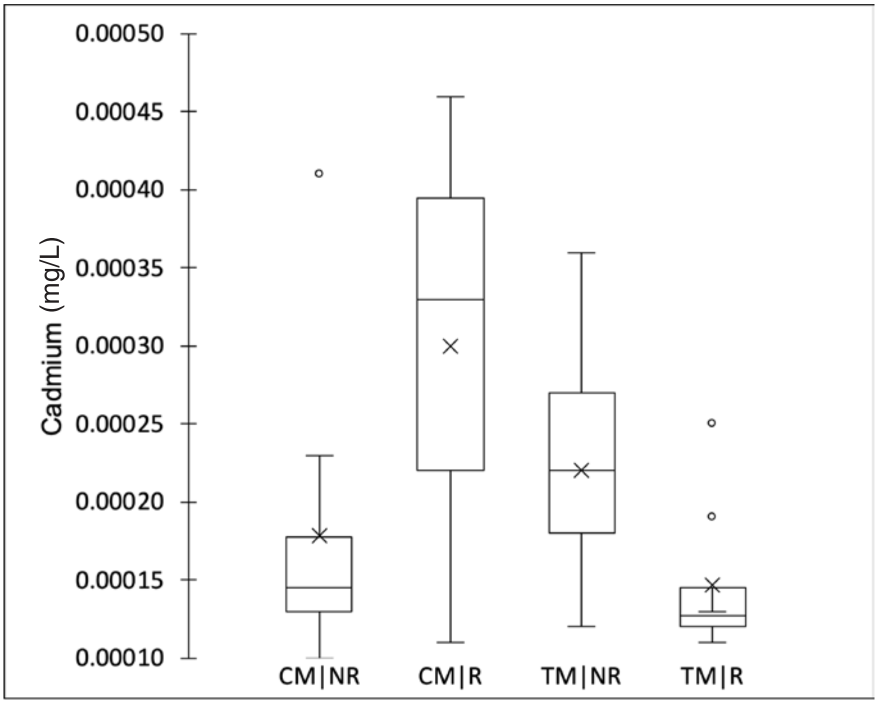
Supplemental Figure 5 Box and whisker plot of barium (when present at measured amounts greater than the limit of detection) by production method (CM: Charmat method, TM: traditional method) and wine style (N: non-rosé; R: rosé).



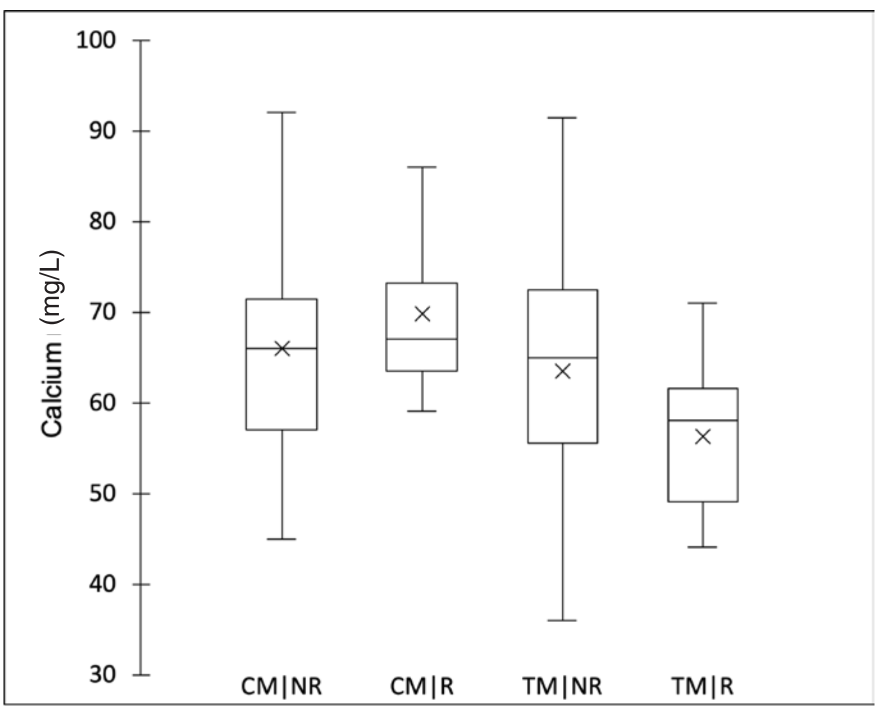
Supplemental Figure 6 Box and whisker plot of beryllium (when present at measured amounts greater than the limit of detection) by production method (CM: Charmat method, TM: traditional method) and wine style (N: non-rosé; R: rosé).



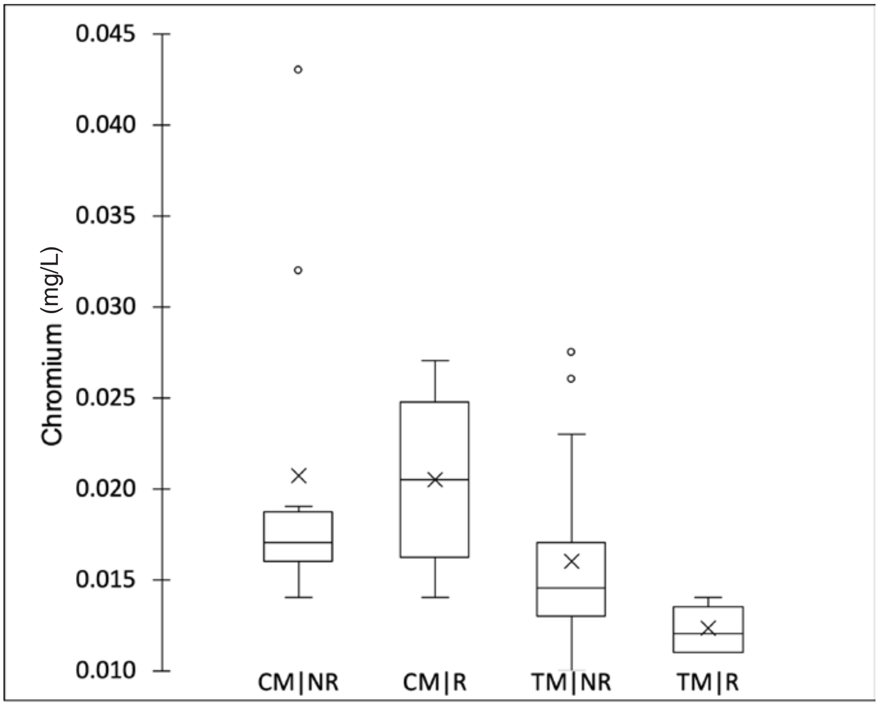
Supplemental Figure 7 Box and whisker plot of boron (when present at measured amounts greater than the limit of detection) by production method (CM: Charmat method, TM: traditional method) and wine style (N: non-rosé; R: rosé).



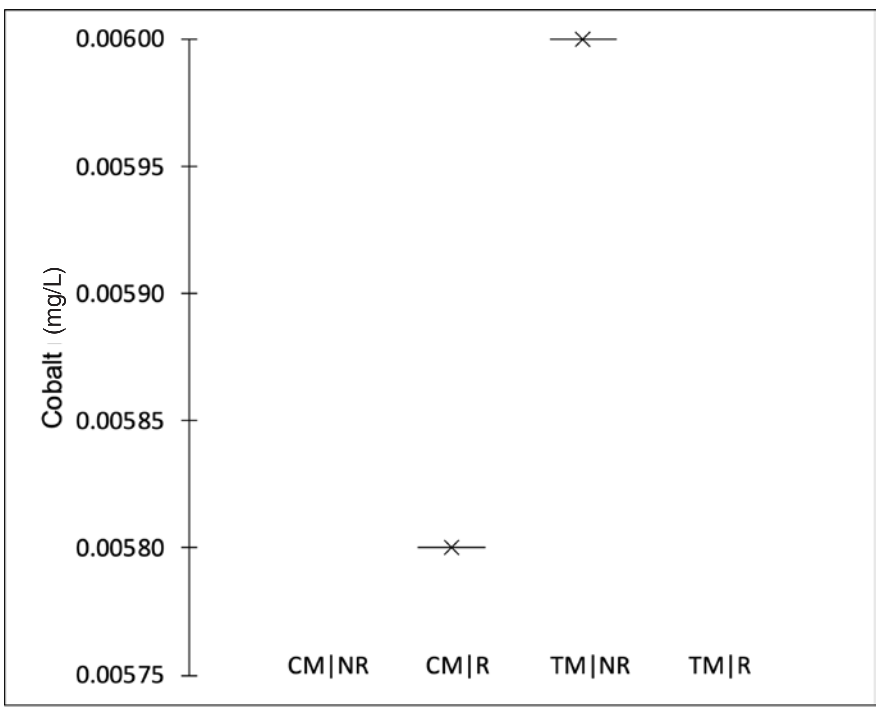
Supplemental Figure 8 Box and whisker plot of cadmium (when present at measured amounts greater than the limit of detection) by production method (CM: Charmat method, TM: traditional method) and wine style (N: non-rosé; R: rosé).



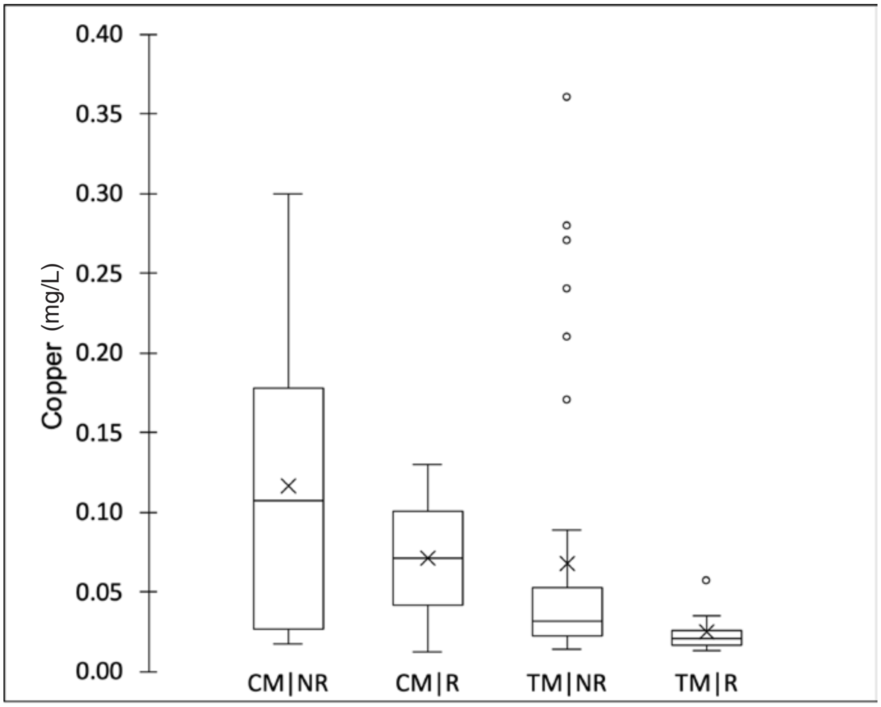
Supplemental Figure 9 Box and whisker plot of calcium (when present at measured amounts greater than the limit of detection) by production method (CM: Charmat method, TM: traditional method) and wine style (N: non-rosé; R: rosé).



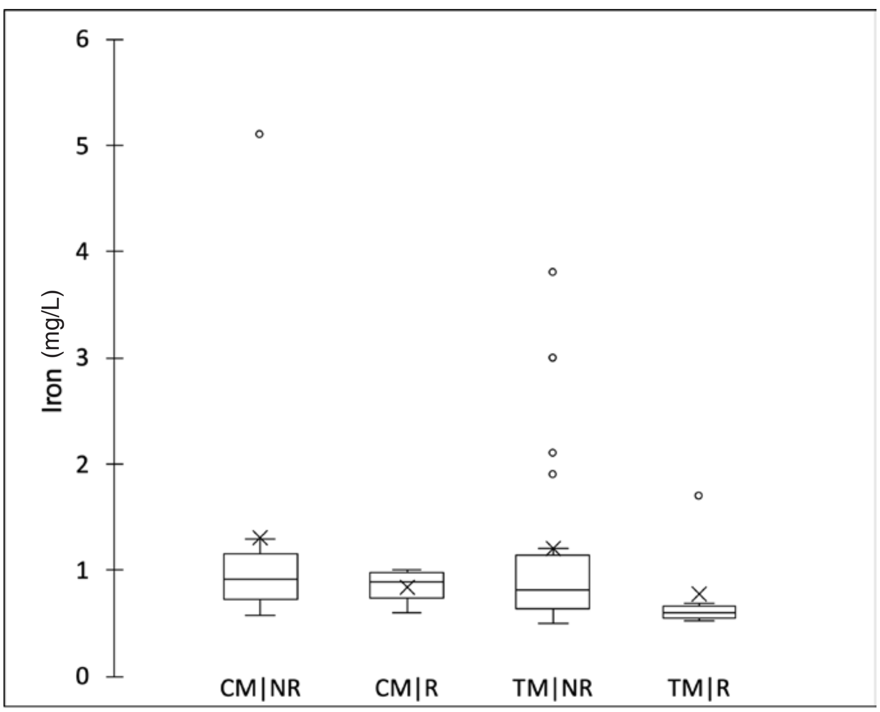
Supplemental Figure 10 Box and whisker plot of chromium (when present at measured amounts greater than the limit of detection) by production method (CM: Charmat method, TM: traditional method) and wine style (N: non-rosé; R: rosé).



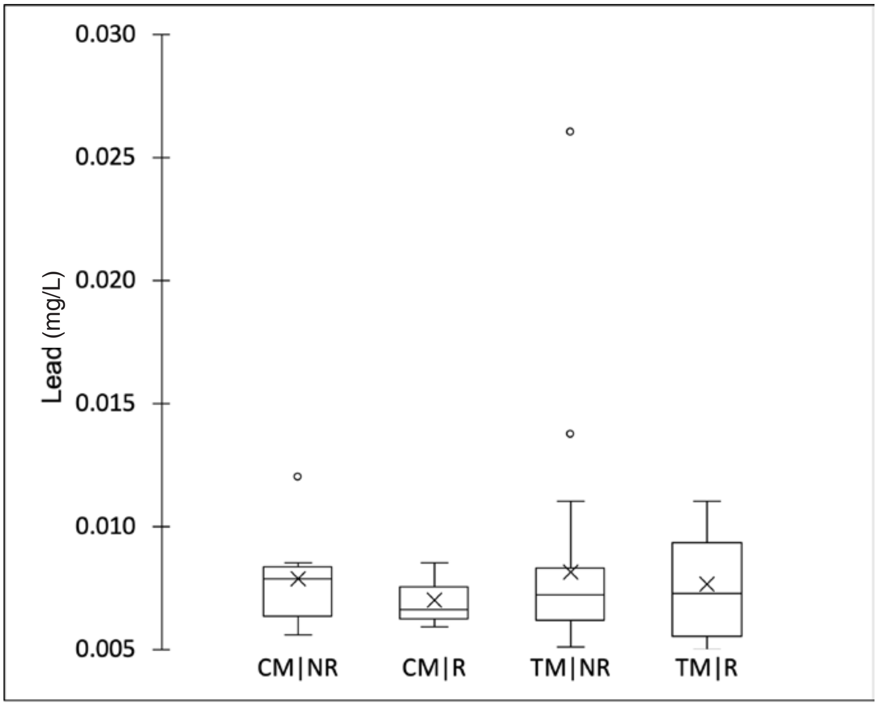
Supplemental Figure 11 Box and whisker plot of cobalt (when present at measured amounts greater than the limit of detection) by production method (CM: Charmat method, TM: traditional method) and wine style (N: non-rosé; R: rosé).



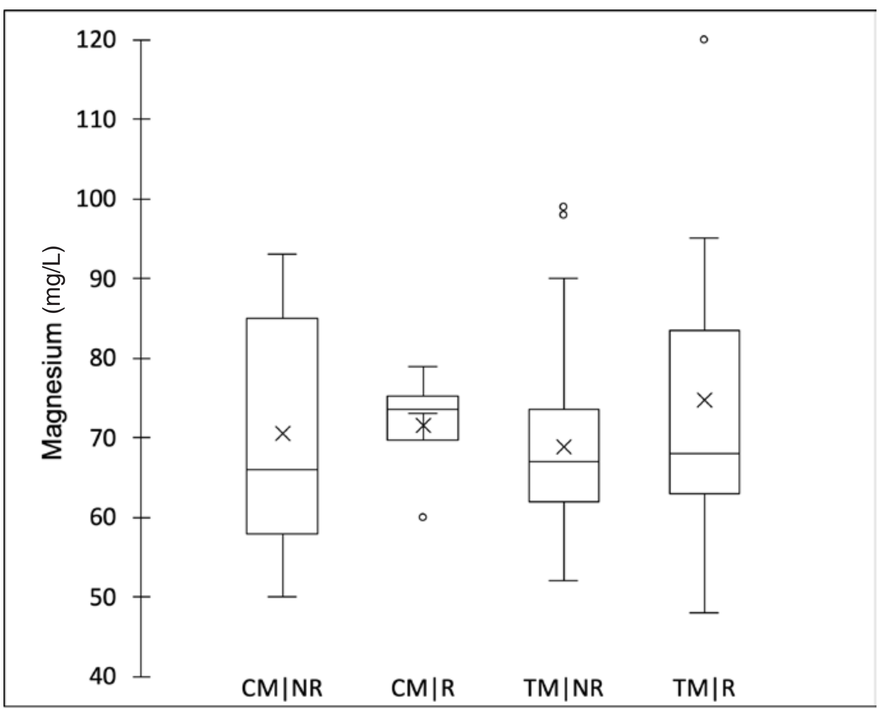
Supplemental Figure 12 Box and whisker plot of copper (when present at measured amounts greater than the limit of detection) by production method (CM: Charmat method, TM: traditional method) and wine style (N: non-rosé; R: rosé).



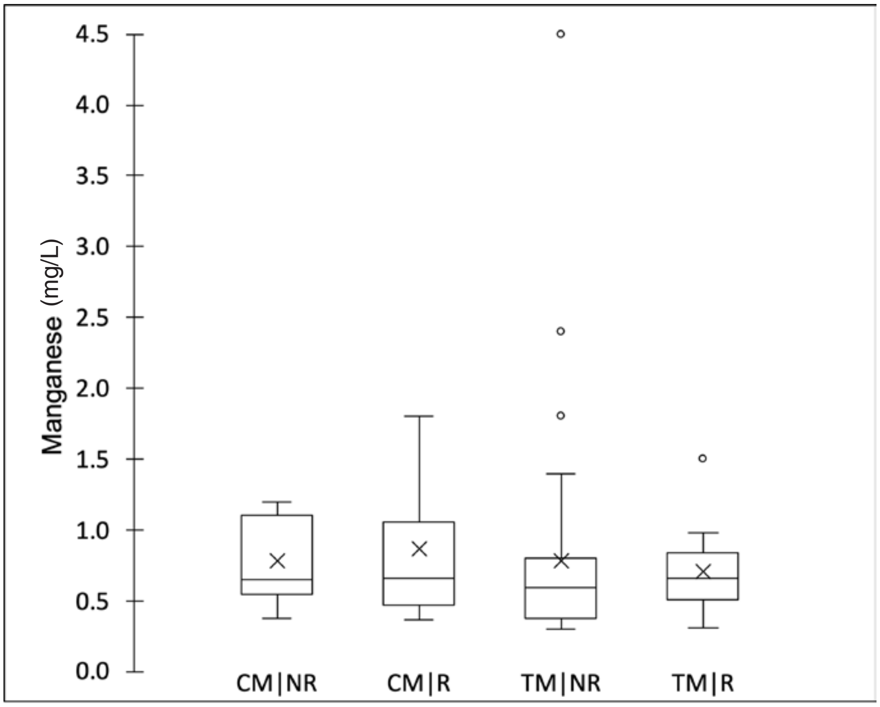
Supplemental Figure 13 Box and whisker plot of iron (when present at measured amounts greater than the limit of detection) by production method (CM: Charmat method, TM: traditional method) and wine style (N: non-rosé; R: rosé).



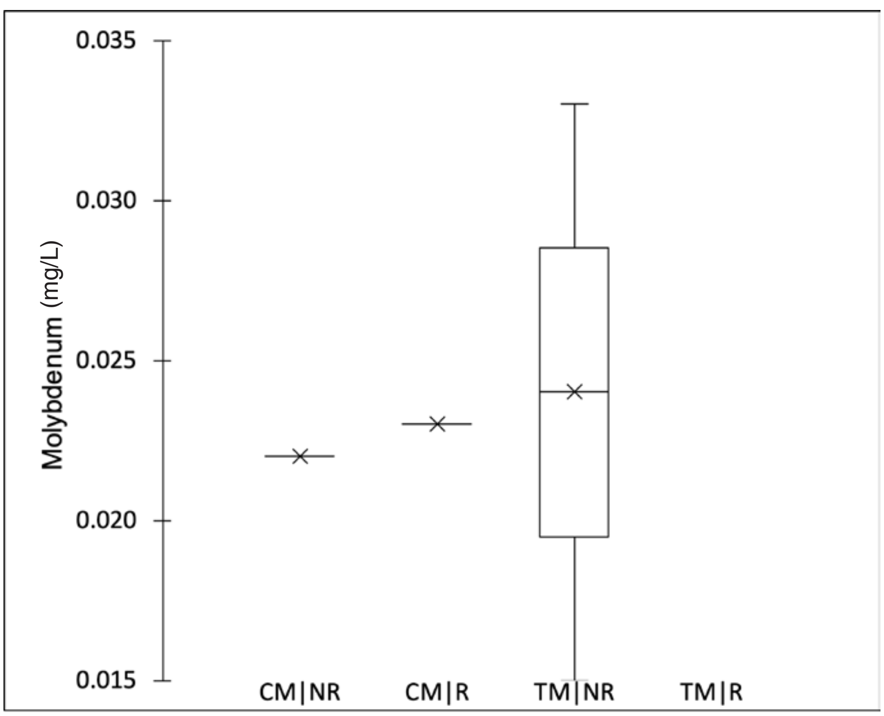
Supplemental Figure 14 Box and whisker plot of lead (when present at measured amounts greater than the limit of detection) by production method (CM: Charmat method, TM: traditional method) and wine style (N: non-rosé; R: rosé).



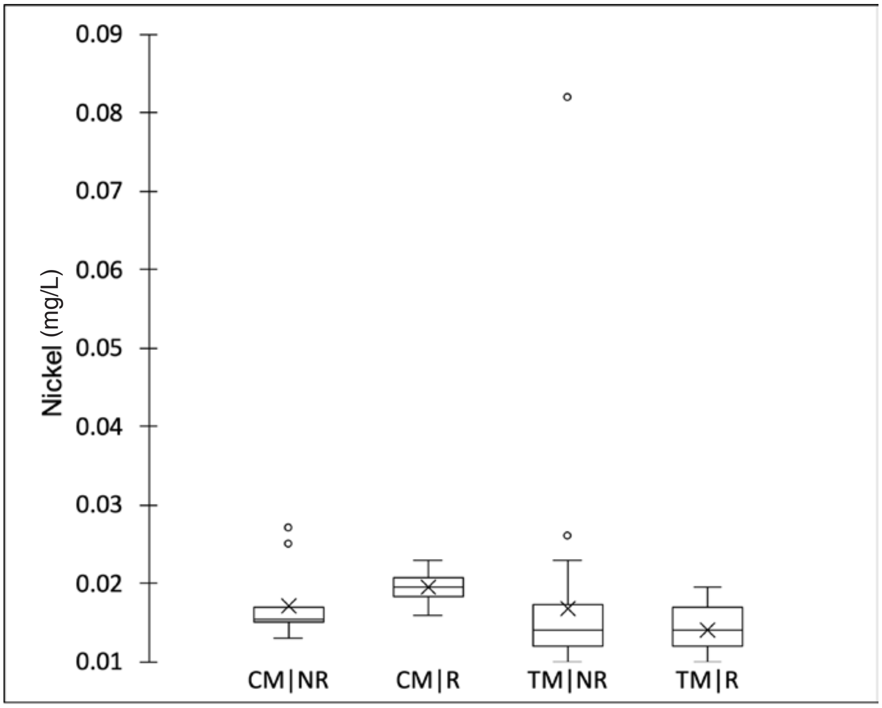
Supplemental Figure 15 Box and whisker plot of magnesium (when present at measured amounts greater than the limit of detection) by production method (CM: Charmat method, TM: traditional method) and wine style (N: non-rosé; R: rosé).



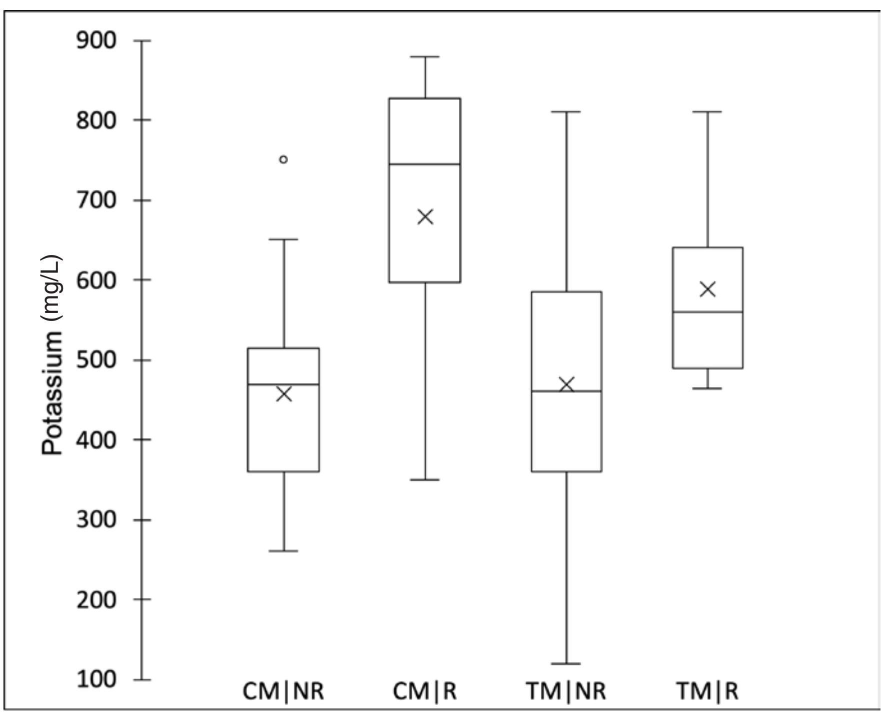
Supplemental Figure 16 Box and whisker plot of manganese (when present at measured amounts greater than the limit of detection) by production method (CM: Charmat method, TM: traditional method) and wine style (N: non-rosé; R: rosé).



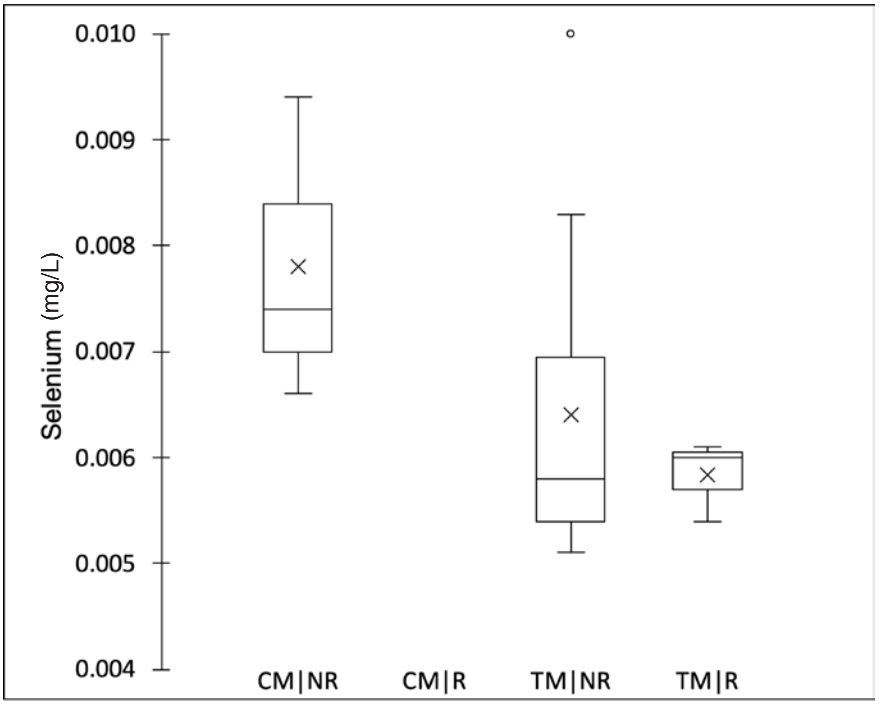
Supplemental Figure 17 Box and whisker plot of molybdenum (when present at measured amounts greater than the limit of detection) by production method (CM: Charmat method, TM: traditional method) and wine style (N: non-rosé; R: rosé).



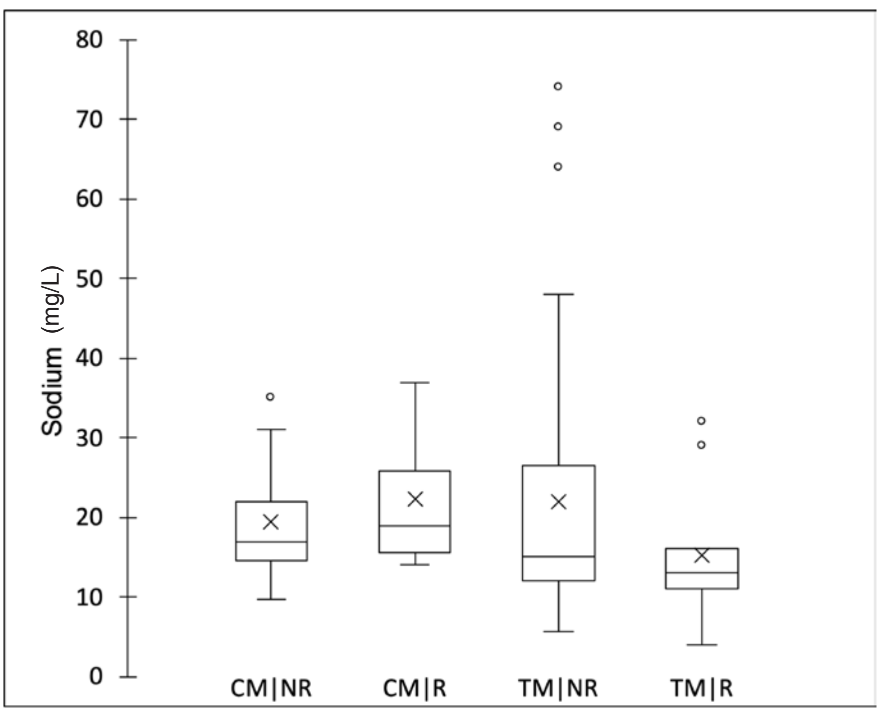
Supplemental Figure 18 Box and whisker plot of nickel (when present at measured amounts greater than the limit of detection) by production method (CM: Charmat method, TM: traditional method) and wine style (N: non-rosé; R: rosé).



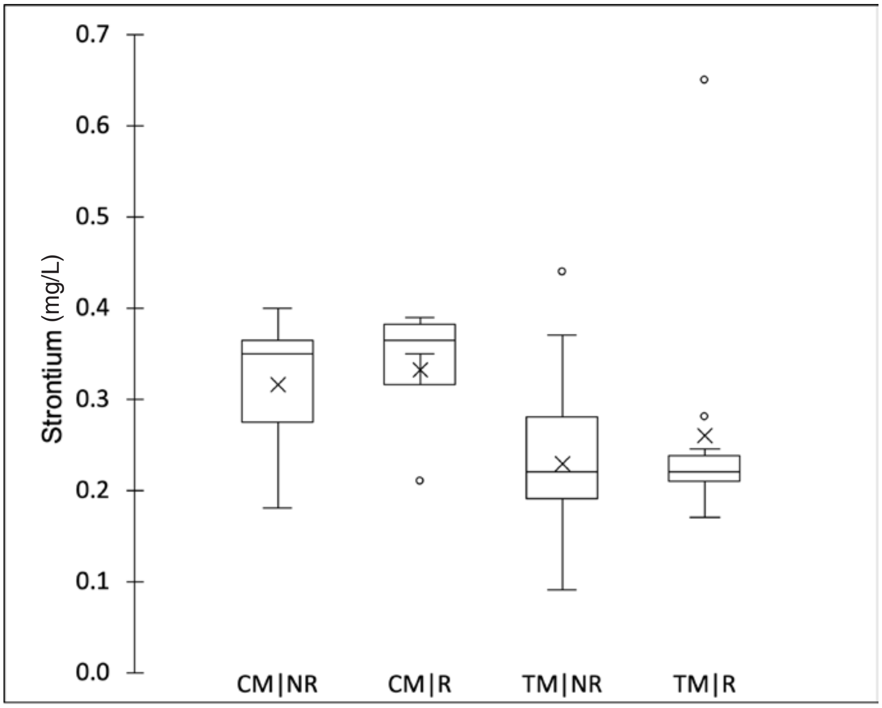
Supplemental Figure 19 Box and whisker plot of potassium (when present at measured amounts greater than the limit of detection) by production method (CM: Charmat method, TM: traditional method) and wine style (N: non-rosé; R: rosé).



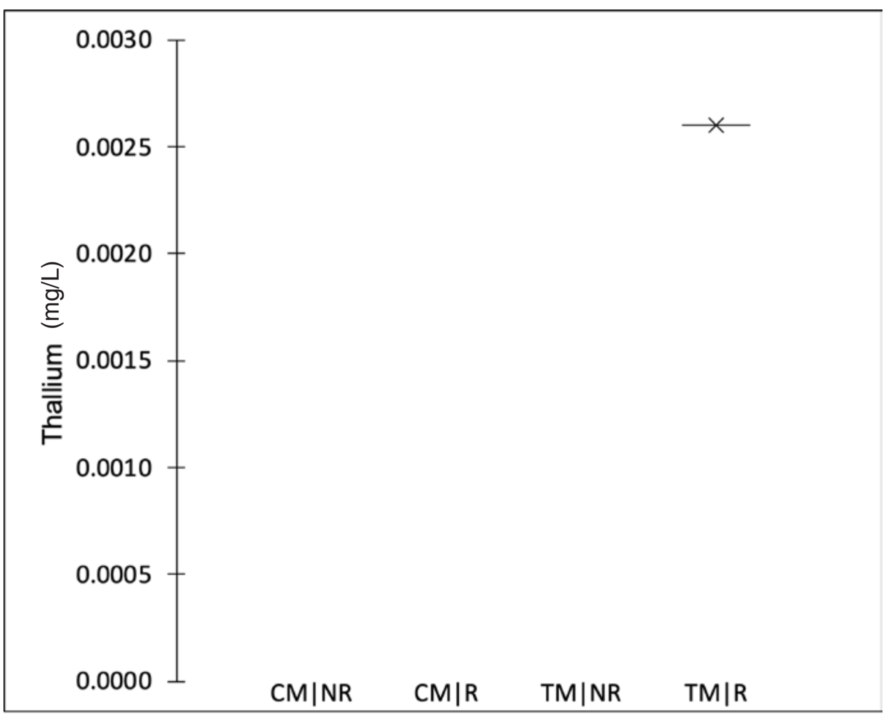
Supplemental Figure 20 Box and whisker plot of selenium (when present at measured amounts greater than the limit of detection) by production method (CM: Charmat method, TM: traditional method) and wine style (N: non-rosé; R: rosé).



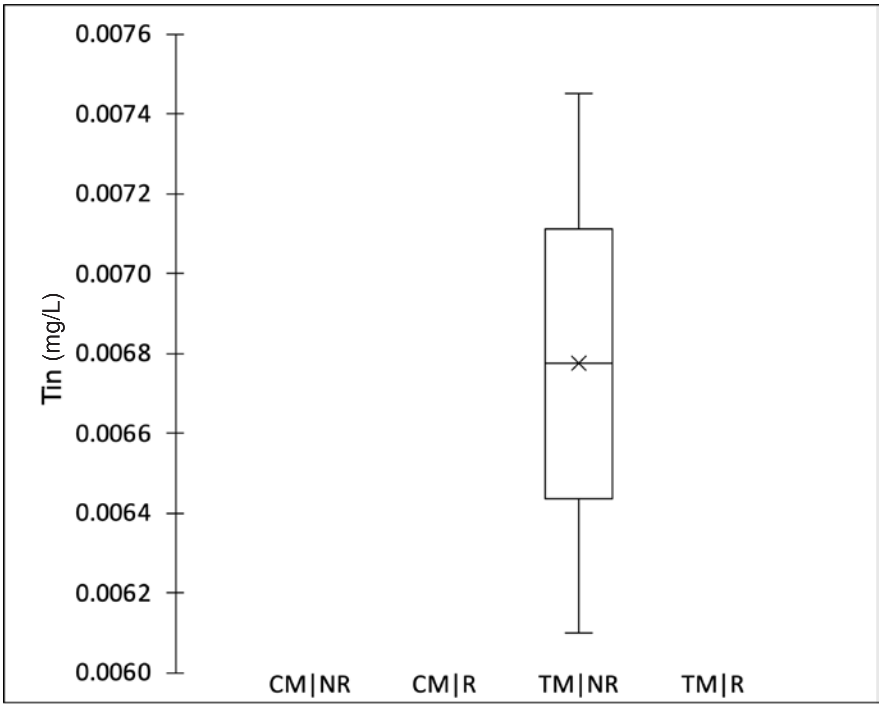
Supplemental Figure 21 Box and whisker plot of sodium (when present at measured amounts greater than the limit of detection) by production method (CM: Charmat method, TM: traditional method) and wine style (N: non-rosé; R: rosé).



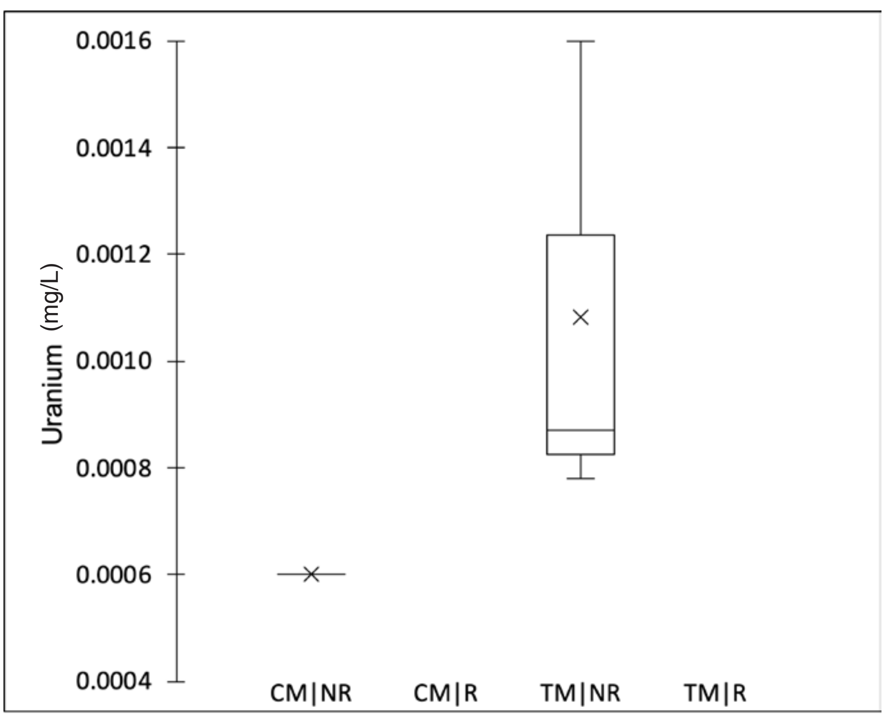
Supplemental Figure 22 Box and whisker plot of strontium (when present at measured amounts greater than the limit of detection) by production method (CM: Charmat method, TM: traditional method) and wine style (N: non-rosé; R: rosé).



Supplemental Figure 23 Box and whisker plot of thallium (when present at measured amounts greater than the limit of detection) by production method (CM: Charmat method, TM: traditional method) and wine style (N: non-rosé; R: rosé).

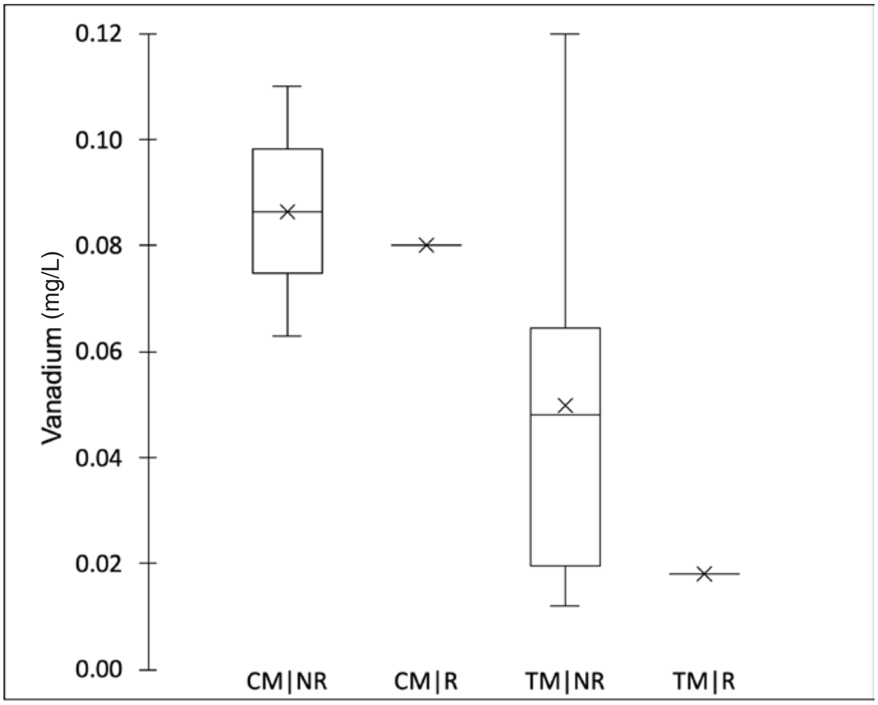


Supplemental Figure 24 Box and whisker plot of tin (when present at measured amounts greater than the limit of detection) by production method (CM: Charmat method, TM: traditional method) and wine style (N: non-rosé; R: rosé).

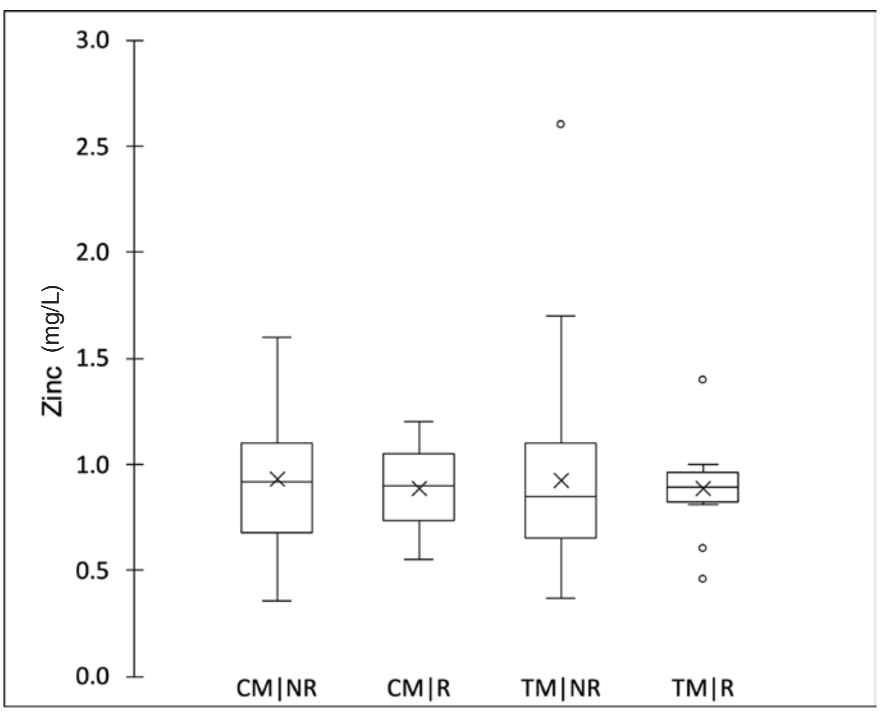


Supplemental Figure 25 Box and whisker plot of uranium (when present at measured amounts greater than the limit of detection) by production method (CM: Charmat method, TM: traditional method) and wine style (N: non-rosé; R: rosé).

Supplemental Data for:
Charnock HM, Cairns G, Pickering GJ and Kemp BS. 2022. Production method and wine style influence metal profiles in sparkling wines. Am J Enol Vitic 73:162-174. doi: 10.5344/ajev.2022.21051.



Supplemental Figure 26 Box and whisker plot of vanadium (when present at measured amounts greater than the limit of detection) by production method (CM: Charmat method, TM: traditional method) and wine style (N: non-rosé; R: rosé).



Supplemental Figure 27 Box and whisker plot of zinc (when present at measured amounts greater than the limit of detection) by production method (CM: Charmat method, TM: traditional method) and wine style (N: non-rosé; R: rosé).