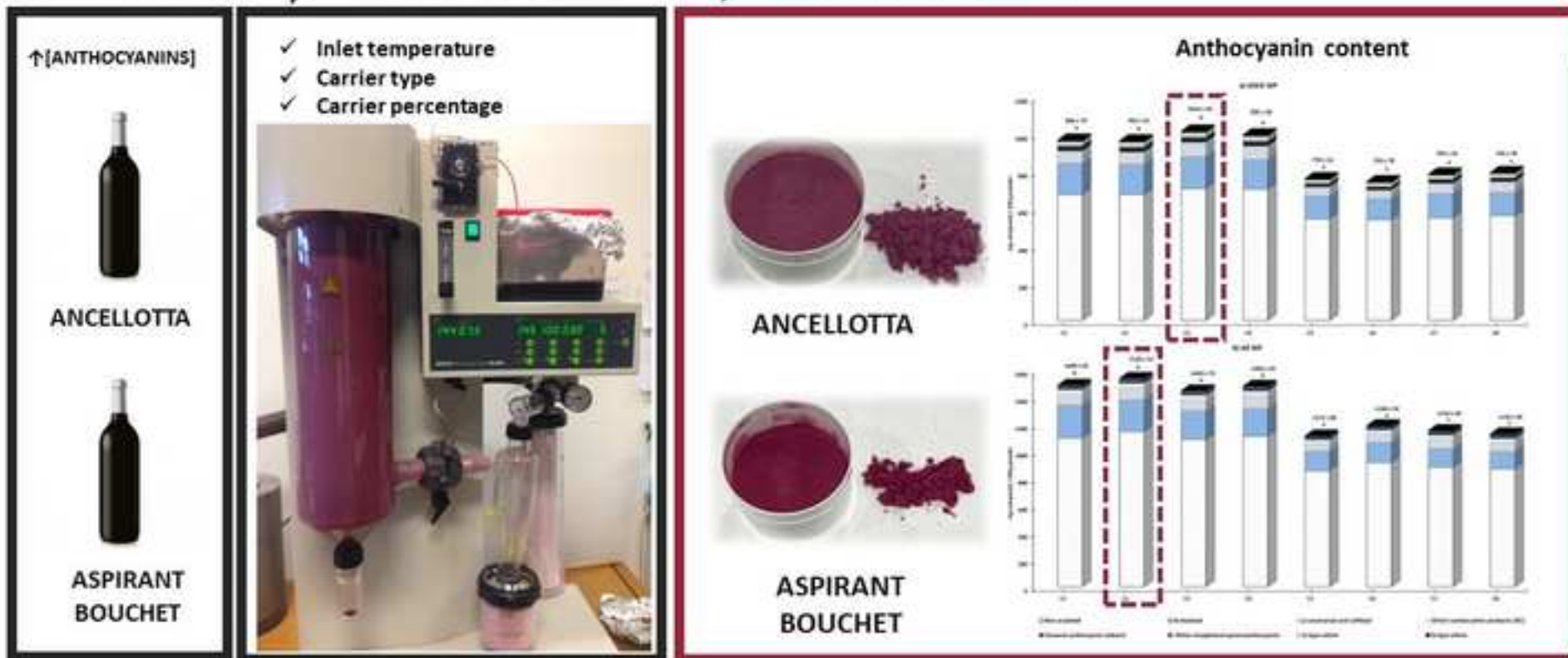
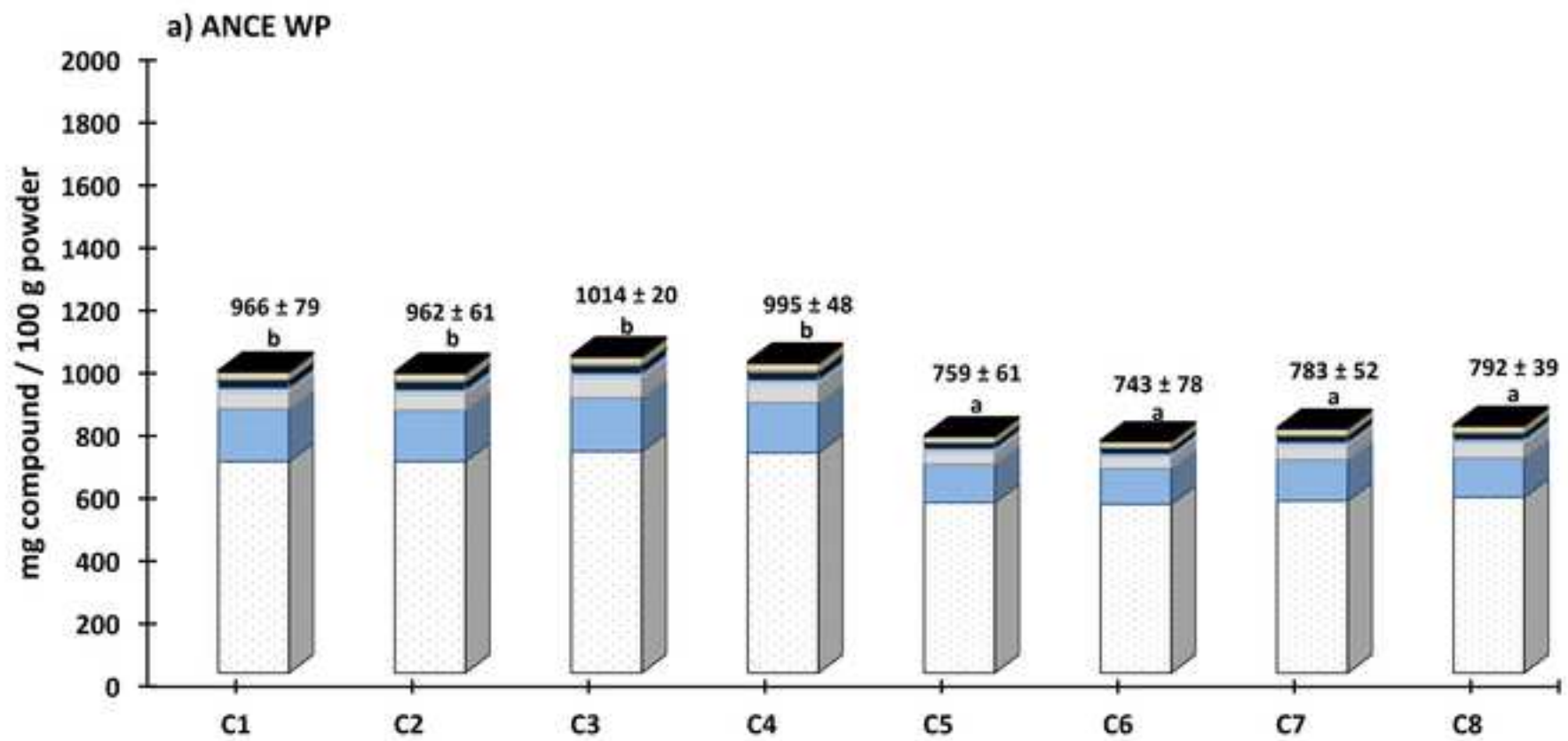
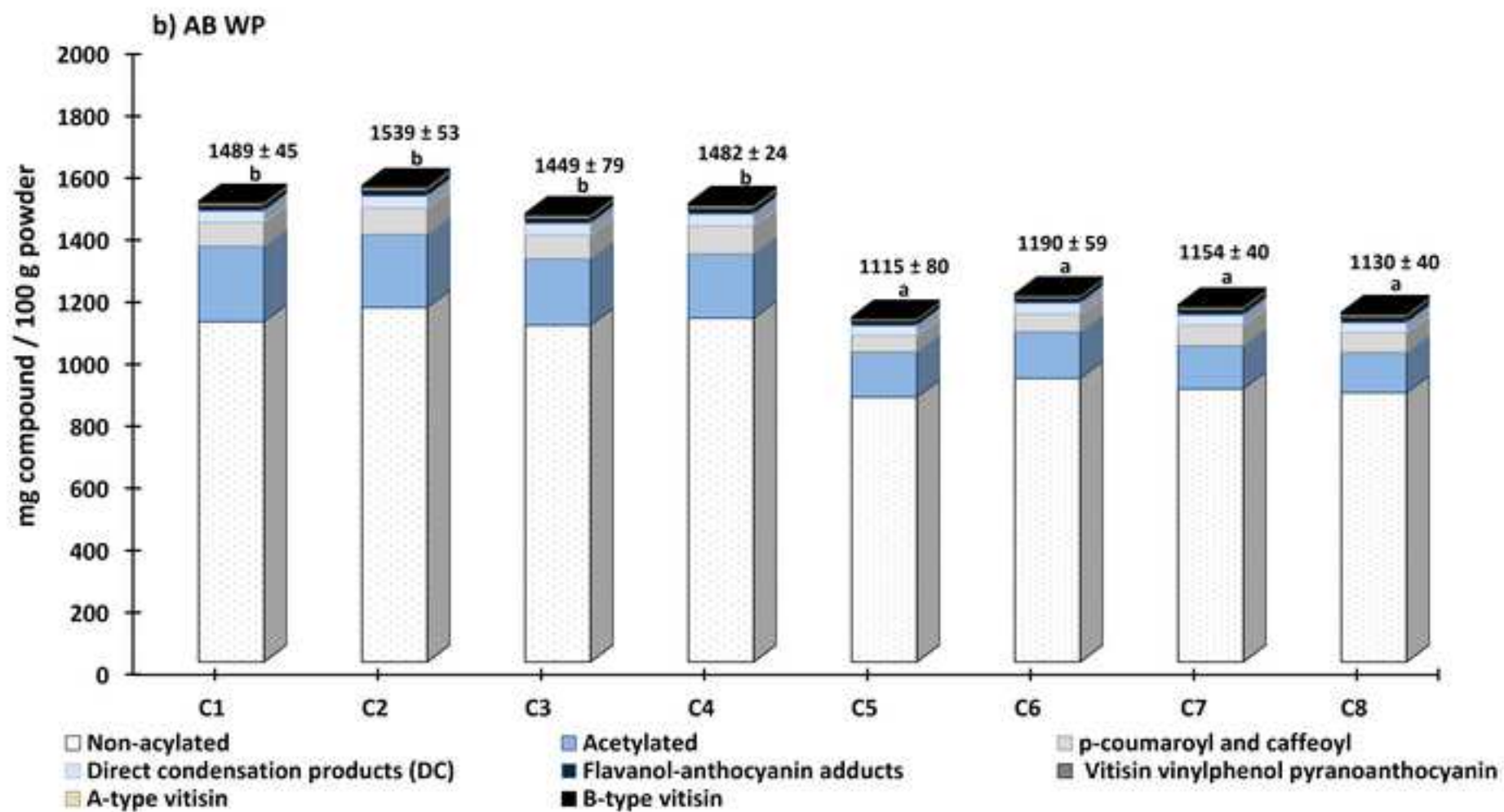
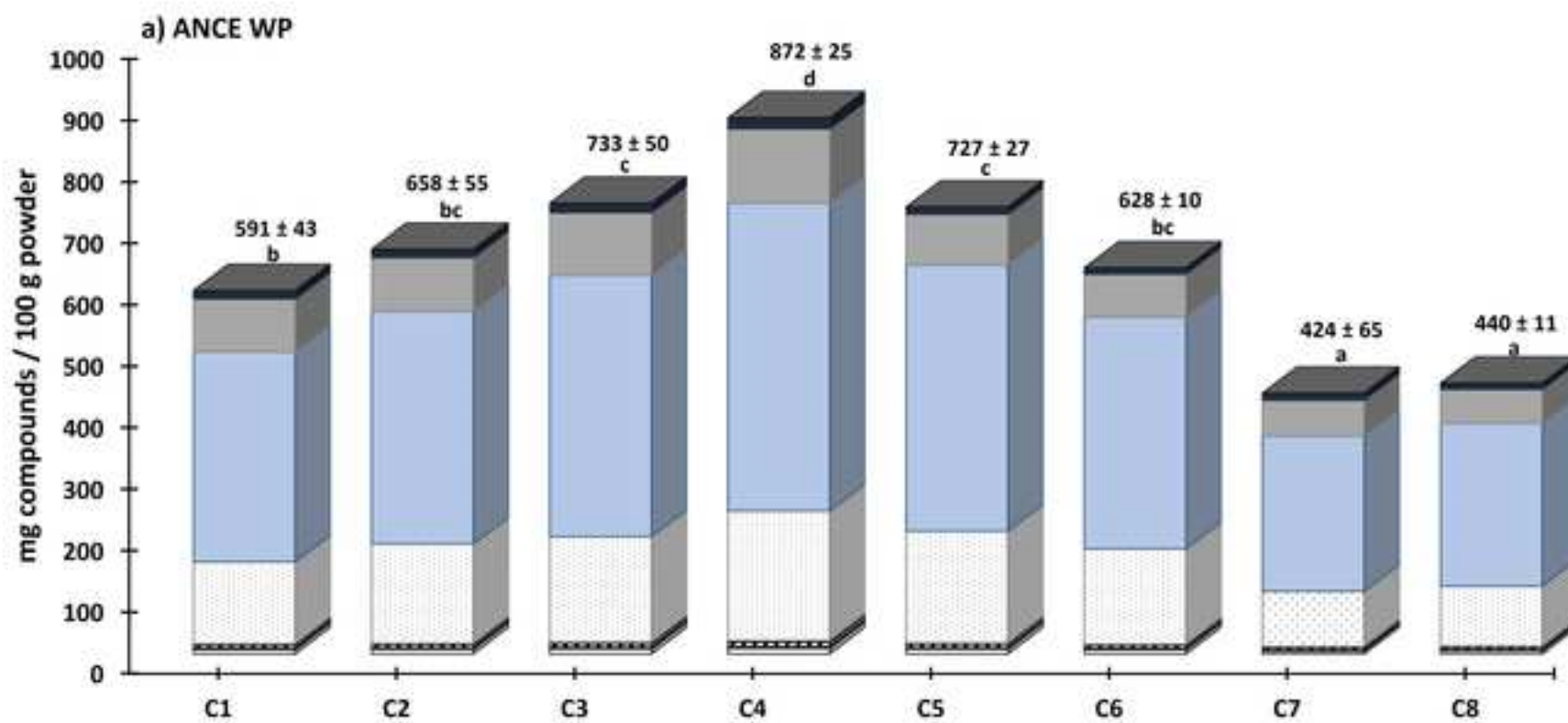


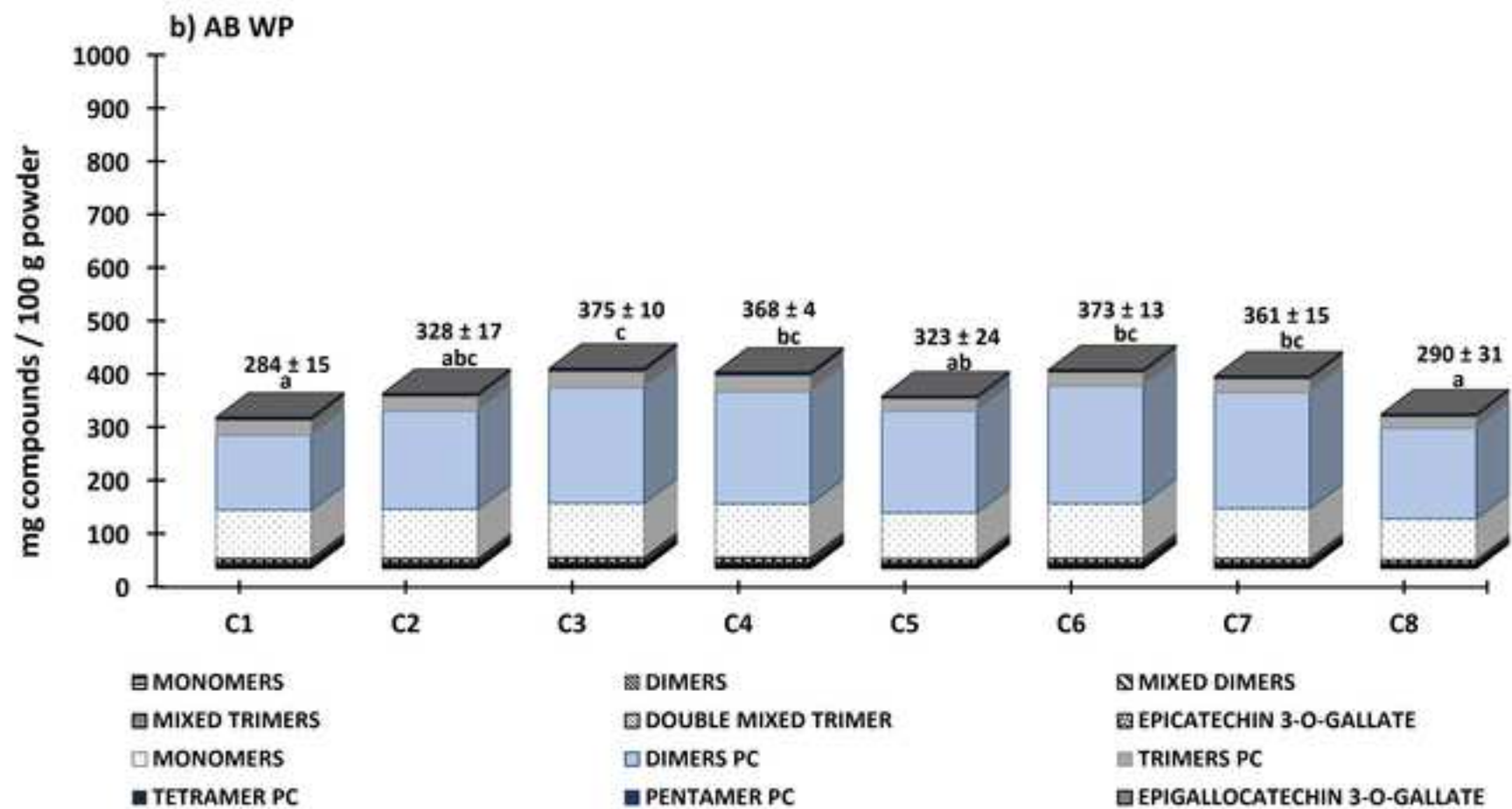
RED WINES → **SPRAY DRYING** → **WINE POWDERS**

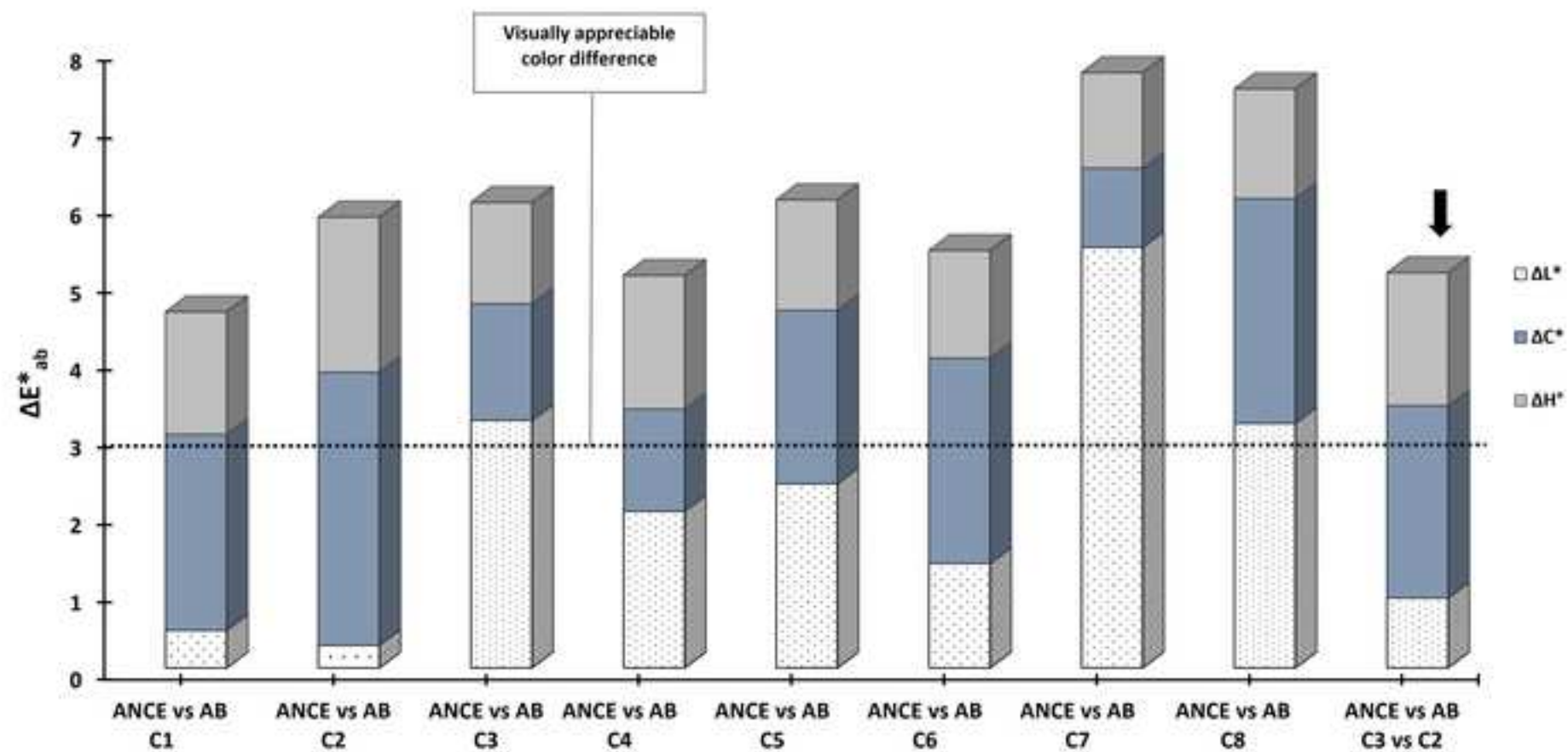












TABLES

Table 1. Drying conditions and physicochemical characteristics of ANCE and AB WP.

Wine	Treatment	Inlet air T (°C)	Carrier type	Carrier % (w/w)	Outlet air T ^a (°C)	Water activity ^a (a _w)	Moisture content ^a (% w/w)	Yield ^a (%)	Anthocyanin retention ^a (%)
ANCE	C1	135	MD:GA	8	70 ± 3 b	0.17 ± 0.002 d	4.92 ± 0.03 c	41 a	98 ± 8 e
	C2	145	MD:GA	8	78 ± 3 e	0.16 ± 0.002 b	4.51 ± 0.10 b	46 b	98 ± 6 e
	C3	135	MD _{DE10}	8	69 ± 2 ab	0.19 ± 0.002 e	4.45 ± 0.05 b	62 cd	100 ± 2 f
	C4	145	MD _{DE10}	8	73 ± 1 cd	0.14 ± 0.001 a	3.66 ± 0.06 a	61 c	100 ± 5 f
	C5	135	MD:GA	10	67 ± 1 a	0.18 ± 0.002 e	5.29 ± 0.24 d	65 e	92 ± 7 b
	C6	145	MD:GA	10	75 ± 1 d	0.18 ± 0.002 d	3.92 ± 0.05 a	63 d	90 ± 9 a
	C7	135	MD _{DE10}	10	68 ± 1 a	0.16 ± 0.002 c	3.85 ± 0.16 a	62 cd	94 ± 6 c
	C8	145	MD _{DE10}	10	72 ± 1 c	0.15 ± 0.002 b	3.91 ± 0.15 a	69 f	96 ± 5 d
AB	C1	135	MD:GA	8	66 ± 1 ab	0.20 ± 0.001 f	4.59 ± 0.09 d	63 d	98 ± 3 g
	C2	145	MD:GA	8	69 ± 1 d	0.13 ± 0.003 a	3.95 ± 0.00 bc	61 c	100 ± 4 h
	C3	135	MD _{DE10}	8	67 ± 1 bc	0.17 ± 0.002 e	4.38 ± 0.10 cd	56 a	95 ± 5 e
	C4	145	MD _{DE10}	8	71 ± 1 f	0.16 ± 0.003 d	3.62 ± 0.02 ab	62 cd	97 ± 2 f
	C5	135	MD:GA	10	66 ± 0 a	0.23 ± 0.002 g	4.41 ± 0.02 cd	62 cd	86 ± 6 a
	C6	145	MD:GA	10	70 ± 1 e	0.14 ± 0.002 b	3.28 ± 0.05 a	58 b	92 ± 5 d
	C7	135	MD _{DE10}	10	67 ± 1 c	0.17 ± 0.001 e	3.58 ± 0.07 ab	71 f	89 ± 3 c
	C8	145	MD _{DE10}	10	71 ± 1 f	0.15 ± 0.001 c	3.85 ± 0.33 b	67 e	87 ± 3 b

Mean ± SD (mg/L, n=3). T, temperature; MD, maltodextrin DE10; GA, gum arabic; MD:GA, 50% maltodextrin DE10 with 50% gum arabic. Different letters in the same column for each parameter indicate significant differences among treatments in the same wine variety according to the Tukey HSD test ($p < 0.05$).

Table 2. Anthocyanin profile by HPLC-DAD-MS of ANCE and AB wine (mg L⁻¹).

Compounds	ANCE wine (mg L ⁻¹) ^a		AB wine (mg L ⁻¹) ^a	
Delphinidin-3-glucoside	146.88	± 7.05	147.32	± 9.23
Cyanidin-3-glucoside	11.64	± 0.51	33.64	± 1.85
Petunidin-3-glucoside	108.12	± 4.70	133.32	± 8.63
Peonidin-3-glucoside	33.17	± 0.66	250.90	± 16.10
Malvidin-3-glucoside	393.00	± 17.86	639.07	± 38.73
Malvidin-3,5-diglucoside	2.86	± 0.13	3.16	± 0.30
Total non-acylated	695.67	± 30.58	1207.41	± 74.52
Delphinidin-3-(acetyl)-glucoside	37.43	± 1.69	43.48	± 3.56
Cyanidin-3-(acetyl)-glucoside	9.33	± 0.21	18.08	± 0.72
Petunidin-3-(acetyl)-glucoside	34.64	± 1.76	43.29	± 2.53
Peonidin-3-(acetyl)-glucoside	15.49	± 2.02	57.72	± 2.99
Malvidin-3-(acetyl)-glucoside	89.54	± 5.69	150.62	± 10.21
Total acetylated	186.43	± 6.94	313.19	± 18.80
Cyanidin-3-(p-coumaroyl)-glucoside	6.38	± 0.63	7.08	± 0.23
Petunidin-3-(p-coumaroyl)-glucoside	13.82	± 1.07	10.01	± 1.06
Peonidin-3-(p-coumaroyl)-glucoside		ND	20.13	± 1.46
Malvidin-3-(p-coumaroyl)-glucoside-cis	4.83	± 0.30	5.96	± 0.91
Malvidin-3-(p-coumaroyl)-glucoside-etil-(E)C		ND	5.13	± 0.52
Malvidin-3-(p-coumaroyl)-glucoside	40.49	± 6.42	40.14	± 4.53
Peonidin-3-(caffeoyl)-glucoside			5.23	± 1.38
Malvidin-3-(caffeoyl)-glucoside	6.12	± 0.77	4.91	± 0.87
Total p-coumaroyl and caffeoyl	71.64	± 8.01	98.60	± 9.53
DC-Delphinidin-3-glucoside- (E)GC	0.88	± 0.06	1.56	± 0.13
DC-Delphinidin-3-glucoside- C	0.72	± 0.05	1.35	± 0.07
DC-Petunidin-3-glucoside- (E)GC	1.47	± 0.06	2.01	± 0.18
DC -Malvidin- 3-glucoside-GC	3.50	± 0.14	4.38	± 0.21
DC-Petunidin-3-glucoside-C	2.62	± 0.04	5.35	± 0.29
DC-Cyanidin-3-glucoside- (E)C		ND	2.74	± 0.46
DC-Peonidin-3-glucoside-C		ND	6.62	± 0.34
DC-Malvidin-3-glucoside- C	3.85	± 0.29	11.59	± 0.53
DC-Peonidin-3-glucoside-(E)C		ND	3.02	± 0.07
Total direct condensation products (DC)	13.05	± 0.17	38.61	± 0.82
Malvidin-3-glucoside-ethyl-EC	6.34	± 0.45		ND
Malvidin-3-glucoside-ethyl- C	5.38	± 0.45	5.95	± 0.66
Malvidin-3-glucoside-ethyl- C	6.11	± 0.20	7.14	± 0.72
Malvidin-3-glucoside-ethyl-EC	6.42	± 0.22	6.93	± 0.60
Total flavanol-anthocyanin adducts	24.25	± 0.32	20.02	± 0.81
Vitisin-vinylcatechol-Peonidin-3-glucoside	4.91	± 0.39		ND
Vitisin-vinylphenol-Peonidin-3-glucoside	3.40	± 0.39	4.11	± 0.55
Vitisin-vinylphenol-Malvidin-3-glucoside	3.96	± 0.17	3.58	± 1.01
Vitisin-vinylguayacol-Malvidin-3-glucoside	1.44	± 0.09	1.70	± 0.39
Vitisin-vinylphenol-Malvidin-3-acetylglucoside	1.45	± 0.16	1.83	± 0.70
Vitisin-vinylphenol-Malvidin-3-coumaroylglucoside	0.91	± 0.17		ND

Total Vitisin vinylphenol pyranoanthocyanins	16.08	±	1.12	11.23	±	2.59
Vitisin A-Delphinidin--3-glucoside	4.57		0.05			ND
Vitisin A-Petunidin--3-glucoside	10.22	±	0.63			ND
Vitisin A-Petunidin-3-acetylglucoside	2.89	±	0.19			ND
Vitisin A-Malvidin-3-acetylglucoside	7.39	±	0.14	8.40	±	0.58
Total A-type vitisin	25.07	±	0.65	8.40	±	0.58
Vitisin B-Petunidin-3-glucoside	4.85	±	0.40			ND
Vitisin B-Malvidin-3-glucoside	5.57	±	0.20	9.11	±	0.20
Total B-type vitisin	10.43	±	0.35	9.11	±	0.20
Total anthocyanins	1042.61	±	45.58	1709.14	±	103.00

^aMean ± SD (mg/L, n=3). EGC, epigallocatechin; GC, gallocatechins; C, catechin. ND, non-detected

Table 3. Anthocyanin profile by HPLC-DAD-MS of treatments C3 ANCE and C2 AB WP (mg/100 g WP).

Compounds	ANCE WP		AB WP	
	135°C 8% MD _{DE10}		145°C 8% MD:GA	
	(mg/ 100 g) ^a		(mg / 100 g) ^a	
Delphinidin-3-glucoside	139.91	± 2.59	138.40	± 4.05
Cyanidin-3-glucoside	10.39	± 0.25	29.23	± 0.99
Petunidin-3-glucoside	102.70	± 2.75	125.83	± 3.19
Peonidin-3-glucoside	32.89	± 0.45	229.58	± 6.05
Malvidin-3-glucoside	418.35	± 9.03	615.73	± 16.41
Malvidin-3,5-diglucoside	2.38	± 0.09	3.41	± 0.57
Total non-acylated	706.61	± 15.16	1142.17	± 31.25
Delphinidin-3-(acetyl)-glucoside	32.76	± 0.51	30.83	± 1.45
Cyanidin-3-(acetyl)-glucoside	6.71	± 0.43	11.84	± 0.50
Petunidin-3-(acetyl)-glucoside	35.61	± 0.46	29.59	± 2.74
Peonidin-3-(acetyl)-glucoside	13.37	± 0.72	37.12	± 2.20
Malvidin-3-(acetyl)-glucoside	82.98	± 0.86	125.66	± 4.72
Total acetylated	171.43	± 2.98	235.04	± 11.61
Cyanidin-3-(p-coumaroyl)-glucoside	4.28	± 0.12	4.61	± 0.60
Petunidin-3-(p-coumaroyl)-glucoside	10.40	± 0.28	7.07	± 1.04
Peonidin-3-(p-coumaroyl)-glucoside		ND	19.42	± 3.92
Malvidin-3-(p-coumaroyl)-glucoside-cis	5.62	± 0.31	5.97	± 0.78
Malvidin-3-(p-coumaroyl)-glucoside-etil-(E)C		ND	3.73	± 0.27
Malvidin-3-(p-coumaroyl)-glucoside	36.87	± 2.42	26.31	± 4.57
Peonidin-3-(caffeoyl)-glucoside			13.59	± 0.70
Malvidin-3-(caffeoyl)-glucoside	8.02	± 0.32	4.46	± 0.33
Total p-coumaroyl and caffeoyl	65.19	± 3.45	85.16	± 12.22
DC-Delphinidin-3-glucoside- (E)GC	0.77	± 0.02	1.59	± 0.03
DC-Delphinidin-3-glucoside- C	0.63	± 0.05	1.33	± 0.06
DC-Petunidin-3-glucoside- (E)GC	1.08	± 0.04	2.12	± 0.01
DC -Malvidin- 3-glucoside-GC	3.58	± 0.17	4.66	± 0.03
DC-Petunidin-3-glucoside-C	1.74	± 0.06	5.11	± 0.52
DC-Cyanidin-3-glucoside- (E)C		ND	3.34	± 0.11
DC-Peonidin-3-glucoside-C		ND	4.97	± 0.72
DC-Malvidin-3-glucoside- C	2.38	± 0.10	12.43	± 0.80
DC-Peonidin-3-glucoside-(E)C		ND	3.05	± 0.07
Total direct condensation products (DC)	10.18	± 0.447	38.59	± 2.34
Malvidin-3-glucoside-ethyl-EC	9.51	± 0.38		ND
Malvidin-3-glucoside-ethyl- C	3.98	± 0.16	5.10	± 0.31
Malvidin-3-glucoside-ethyl- C	3.78	± 0.16	4.89	± 0.24
Malvidin-3-glucoside-ethyl-EC	3.74	± 0.72	4.62	± 0.30
Total flavanol-anthocyanin adducts	21.01	± 1.43	14.61	± 0.85
Vitisin-vinylcatechol-Peonidin-3-glucoside	2.89	± 0.25		ND
Vitisin-vinylphenol-Peonidin-3-glucoside	1.99	± 0.10	3.29	± 0.43
Vitisin-vinylphenol-Malvidin-3-glucoside	2.78	± 0.16	2.91	± 0.41
Vitisin-vinylguayacol-Malvidin-3-glucoside	1.03	± 0.07	2.83	± 0.26
Vitisin-vinylphenol-Malvidin-3-acetylglucoside	0.84	± 0.02	1.68	± 0.33
Vitisin-vinylphenol-Malvidin-3-coumaroylglucoside	0.52	± 0.03		ND

Total Vitisin vinylphenol pyranoanthocyanins	10.04	±	0.62	10.71	±	1.43
Vitisin A-Delphinidin--3-glucoside	3.33	±	0.14			ND
Vitisin A-Petunidin--3-glucoside	12.11	±	0.46			ND
Vitisin A-Petunidin-3-acetylglucoside	2.36	±	0.26			ND
Vitisin A-Malvidin-3-acetylglucoside	5.09	±	0.20	4.78	±	0.52
Total A-type vitisin	22.90	±	1.05	4.78	±	0.52
Vitisin B-Petunidin-3-glucoside	3.02	±	0.16			ND
Vitisin B-Malvidin-3-glucoside	3.82	±	0.16	4.48	±	0.58
Total B-type vitisin	6.84	±	0.32	4.48	±	0.58
Total anthocyanins	1014.21	±	20.25	1539.27	±	53.44

^a Mean ± SD (mg/L, n=3). EGC, epigallocatechin; GC, gallocatechins; C, catechin. ND, non-detected. MD, maltodextrin DE10; GA, gum arabic; MD:GA, 50% maltodextrin DE10 with 50% gum arabic.

Table 4. Tristimulus parameters were determined for ANCE and AB WP.

Wine	Treatment	L* ^a			C* ^a			H (°) ^a			WI ^a						
ANCE	C1	22	±	0.6	a	24	±	0.5	abc	351	±	0.3	e	18	±	0.5	a
	C2	26	±	0.8	bc	25	±	0.4	bcd	349	±	0.3	bc	22	±	0.6	bc
	C3	26	±	0.5	bc	26	±	0.1	d	350	±	0.3	d	22	±	0.4	bc
	C4	25	±	1.0	b	25	±	0.6	cd	350	±	0.1	cd	21	±	0.7	b
	C5	30	±	0.8	d	25	±	0.6	cd	348	±	0.3	ab	25	±	0.5	e
	C6	27	±	1.0	bc	23	±	0.2	a	348	±	0.6	a	23	±	0.9	cd
	C7	30	±	1.0	d	25	±	0.5	cd	349	±	0.1	ab	25	±	0.8	e
	C8	28	±	0.7	cd	24	±	0.2	ab	349	±	0.1	bc	24	±	0.6	de
AB	C1	20	±	0.4	a	28	±	0.3	ab	357	±	0.1	d	16	±	0.3	a
	C2	24	±	1.0	bc	29	±	0.3	b	356	±	0.3	cd	19	±	0.8	bc
	C3	22	±	1.1	ab	29	±	0.9	ab	356	±	0.0	c	17	±	1.3	ab
	C4	21	±	2.1	ab	28	±	1.3	ab	356	±	0.5	c	17	±	1.5	ab
	C5	26	±	0.4	c	29	±	0.2	ab	355	±	0.1	ab	20	±	0.3	c
	C6	24	±	0.9	bc	27	±	1.1	a	354	±	0.5	a	19	±	1.2	bc
	C7	23	±	1.3	abc	28	±	0.8	ab	355	±	0.2	bc	18	±	0.9	bc
	C8	23	±	0.2	ab	28	±	0.4	ab	356	±	0.1	cd	18	±	0.0	abc

^a Mean ± SD (mg/L, n=3). Color properties CIELAB system: L*, brightness; C*, chroma; H°, hue angle; WI, whiteness index. Different letters in the same column for each parameter indicate significant differences among treatments in the same wine variety according to the Tukey HSD test ($p < 0.05$).