

Supplementary data

Changes in the Content of Free Phenolic Acids in Maize and Sunflower Leaves Treated with Sodium Cholate

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Table S1. Data for the calibration curve of standard phenolic compounds. Their initial concentration was 1 mg mL⁻¹.

Concentration ($\mu\text{g mL}^{-1}$)		Peak area								
		GA	PCA	CHA	PHBA		SA		<i>p</i> -CA	FA
		UV/VIS			UV/VIS	FLD	UV/VIS	FLD	UV/VIS	
1.	0,10	0	1191	17490	0	0	0	0	0	0
2.	0,25	16506	12188	11847	14259	39338	18110	80010	34417	20714
3.	0,50	38143	25312	21193	24373	69014	38634	172866	74290	46833
4.	0,75	53687	35760	28726	37700	103091	51474	232829	107999	60468
5.	1,00	78921	46196	41955	54292	149039	78759	362452	78759	84496
6.	1,25	96178	61781	50661	62295	167203	90253	410781	192996	98198
7.	1,50	118486	72728	57950	73534	206658	101056	470913	233634	118060
8.	2,00	149870	100947	84119	103620	284211	150137	657172	298272	157539
9.	5,00	383359	234767	206881	243681	656867	340932	1592814	730549	398095
10.	7,50	587120	343131	319150	358913	1035953	519220	2378146	1149216	594942
11.	10,00	767621	446218	423750	489121	1320443	675034	3064789	1382326	765495
12.	12,00	863050	569756	502800	564418	1659053	846129	3935207	1746754	956232
13.	14,00	1092828	645087	596890	645977	1877323	913234	4183954	1924625	1136271
14.	16,00	1195261	841671	691910	0	0	1085181	4968566	2101740	1124184

Concentration ($\mu\text{g mL}^{-1}$)		VA		CA+VA	CA
		FLD	UV/VIS (Correction)	UV/VIS	
1.	0,10	0	6230	18840	12610
2.	0,25	388951	15700	41074	25374
3.	0,50	711659	31151	70744	39593
4.	0,75	1036048	46852	103532	56680
5.	1,00	1436010	62303	147306	85003
6.	1,25	1776276	77879	175891	98012
7.	1,50	2063185	93454	214566	121112
8.	2,00	2865624	124606	290208	165602
9.	5,00	6775951	311515	707119	395605
10.	7,50	9922147	467272	1074620	607348
11.	10,00	12484657	623029	1405055	782026
12.	12,00	14871897	747635	1598629	850994
13.	14,00	17048140	872241	1937853	1065612
14.	16,00	18432515	996846	2191070	1194224

Correction		UV/VIS
10,24		623029

Abbreviations: GA—gallic acid, PCA—protocatechuic acid, CHA—chlorogenic acid, PHBA—*p*-hydroxybenzoic acid, CA—caffeic acid, VA—vanillic acid, SA—syringic acid, *p*-CA—*p*-coumaric acid, FA—ferulic acid, UV/VIS—UV/VIS detector (280 nm); FLD—fluorescence detector (350nm).

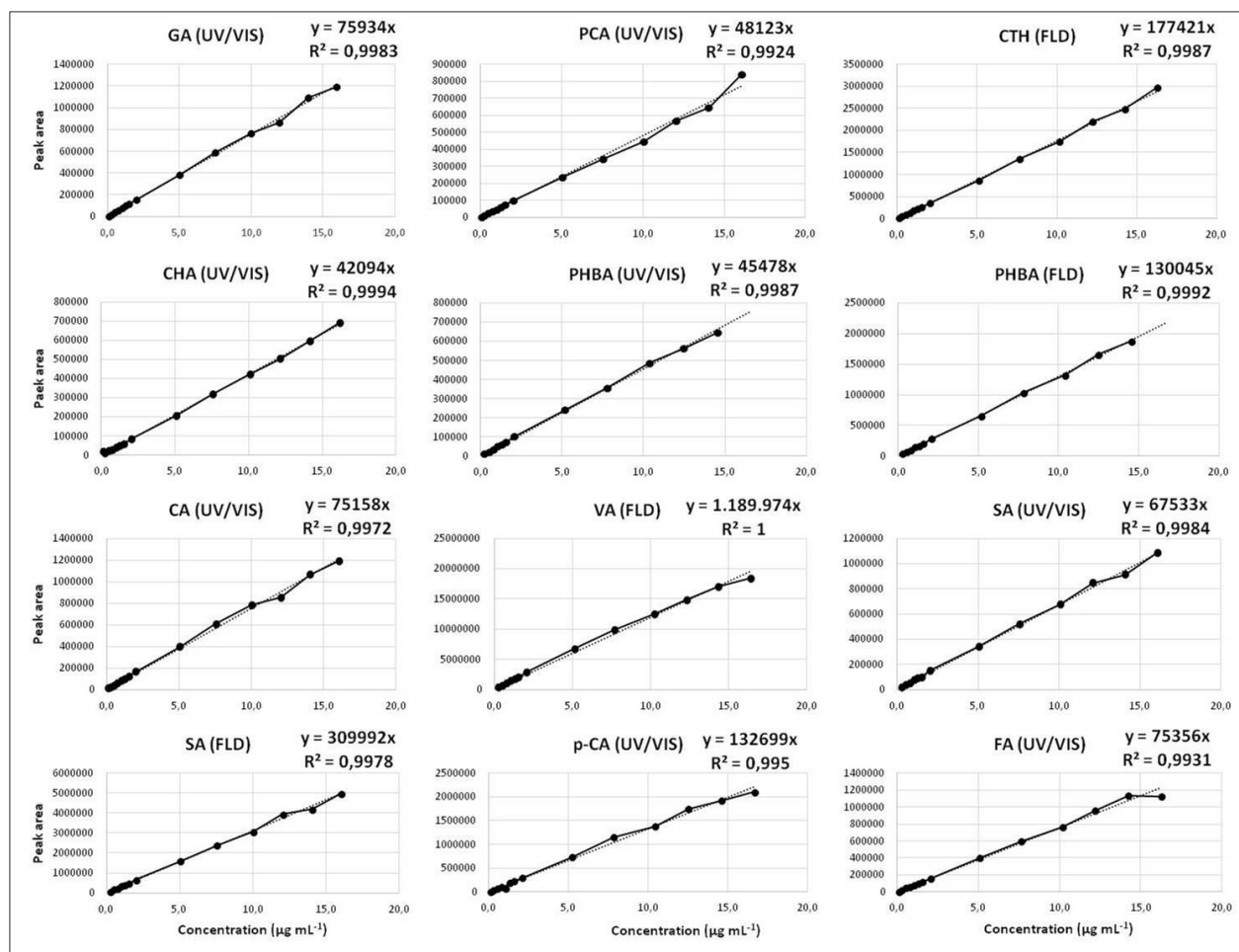


Figure S1: Calibration curves of standard solutions for determining phenolic profiles. **Abbreviations:** GA—gallic acid, PCA—protocatechuic acid, CHA—chlorogenic acid, PHBA—*p*-hydroxybenzoic acid, CA—caffeic acid, VA—vanillic acid, SA—syringic acid, *p*-CA—*p*-coumaric acid, FA—ferulic acid, UV/VIS—UV/VIS detector (280 nm); FLD—fluorescence detector (350nm).

Table S2: Peak areas and concentrations of phenolic compounds in maize leaves from seedlings treated with sodium cholate (20, 40, 60 and 80 mg mL⁻¹). Values are presented as mean ± standard error (*p* < 0.5), and those marked with an asterisk are statistically significantly different from the corresponding control.

MAIZE		GA		PCA		CHA	
Time	Sample	Peak area	Concentration (µg g ⁻¹)	Peak area	Concentration (µg g ⁻¹)	Peak area	Concentration (µg g ⁻¹)
1 day	Control	38450	36.6±9.4	1241408	1875.6±504.8	921155	1712.2±107.1
	20 mg L ⁻¹ NaC	27229	26.7±2.3	1223820	1896.3±440.4	964222	1866.4±104.0
	40 mg L ⁻¹ NaC	30074	27.6±0.8	965803	1396.5±285.1	919114	1711.1±136.7
	60 mg L ⁻¹ NaC	23803	22.7±4.2	1161189	1748.5±378.6	1011916	1871.4±69.1
	80 mg L ⁻¹ NaC	26325	24.8±4.0	997909	1480.7±382.7	958393	1758.2±125.1
3 days	Control	38450	15.6±6.2	521848	771.5±204.6	884367	1598.3±62.4
	20 mg L ⁻¹ NaC	27229	17.8±9.3	515192	758.6±264.4	775718	1277.7±79.0
	40 mg L ⁻¹ NaC	30074	23.1±11.5	813179	1252.3±453.1	829944	1422.5±90.5
	60 mg L ⁻¹ NaC	23803	9.2±9.2	627605	958.8±380.9	852316	1474.2±95.0
	80 mg L ⁻¹ NaC	26325	14.2±7.8	757880	1109.2±290.8	932919	1628.6±16.8

5 days	Control	38450	4.8±4.8	311523	469.7±198.0	785549	1544.3±141.0
	20 mg L ⁻¹ NaC	27229	4.1±2.1	433494	657.8±75.0	799661	1417.4±48.7
	40 mg L ⁻¹ NaC	30074	0.0±0.0	323551	468.1±69.7	889649	1545.8±58.6
	60 mg L ⁻¹ NaC	23803	6.8±0.6	874936	1306.9±13.1*	935492	1637.8±17.0
	80 mg L ⁻¹ NaC	26325	3.2±1.6	594204	885.8±127.5*	919171	1751.5±182.5
7 days	Control	38450	7.1±7.1	364779	547.6±47.5	941892	1745.4±102.2
	20 mg L ⁻¹ NaC	27229	11.5±5.7	415707	603.4±145.2	1006524	1796.0±70.3
	40 mg L ⁻¹ NaC	30074	13.5±1.6	565410	847.3±52.5	976707	1723.7±33.2
	60 mg L ⁻¹ NaC	23803	24.4±3.0*	660548	984.2±55.1*	894425	1561.4±23.1
	80 mg L ⁻¹ NaC	26325	23.5±2.0*	562069	812.1±180.4	970751	1627.7±71.0
Average concentration (treated maize samples)			16.9		1072.9		1629.5
Time	Sample	PHBA		CA		VA	
		Peak area	Concentration (µg g ⁻¹)	Peak area	Concentration (µg g ⁻¹)	Peak area	Concentration (µg g ⁻¹)
1 day	Control	16367	25.6±2.8	8403	26.9±8.2	178098	10.1±2.2
	20 mg L ⁻¹ NaC	19259	27.9±4.3	11563	23.2±5.3	245059	14.2±3.2
	40 mg L ⁻¹ NaC	24592	39.8±2.2*	19960	12.5±3.2	423018	22.9±5.3
	60 mg L ⁻¹ NaC	24254	40.9±2.3*	16650	11.8±2.9	352862	19.6±8.0
	80 mg L ⁻¹ NaC	27247	44.2±1.8*	16546	8.7±4.9*	350671	19.2±7.3
3 days	Control	40246	76.4±15.6	17168	3.1±3.1	657189	36.3±10.2
	20 mg L ⁻¹ NaC	27164	45.6±6.5	15577	6.0±3.4	521811	28.8±10.7
	40 mg L ⁻¹ NaC	16820	29.8±2.6*	10304	11.2±6.0	381491	21.7±9.4
	60 mg L ⁻¹ NaC	15794	15.9±11.1*	26004	5.8±5.4	666762	37.2±9.6
	80 mg L ⁻¹ NaC	7401	12.6±1.4*	19787	4.4±2.5	524873	28.6±6.1
5 days	Control	19811	27.6±9.9	10662	1.3±0.9	279198	15.9±3.3
	20 mg L ⁻¹ NaC	33200	53.0±3.2*	16483	0.3±0.3	424416	24.0±2.0
	40 mg L ⁻¹ NaC	41692	60.4±3.5*	0	0*	452470	24.4±3.8
	60 mg L ⁻¹ NaC	49209	76.2±1.6*	0	0*	753934	42.0±1.2*
	80 mg L ⁻¹ NaC	52658	82.9±6.3*	0	0*	741014	41.2±3.6*
7 days	Control	49049	74.6±5.1	0	0	767747	43.0±12.4
	20 mg L ⁻¹ NaC	12288	25.1±13.7*	21495	2.1±0.4	455547	24.5±5.9
	40 mg L ⁻¹ NaC	13323	19.8±2.8*	23567	3.9±0.5	499463	27.9±1.4
	60 mg L ⁻¹ NaC	8892	16.9±5.0*	18052	10.9±3.3*	382583	21.3±0.3
	80 mg L ⁻¹ NaC	4021	7.6±1.5*	22070	2.9±1.7	602701	32.8±8.5
Average concentration (treated maize samples)			37.4		8.0		26.9
Time	Sample	SA		<i>p</i> -CA		FA	
		Peak area	Concentration (µg g ⁻¹)	Peak area	Concentration (µg g ⁻¹)	Peak area	Concentration (µg g ⁻¹)
1 day	Control	81017	84.0±5.0	51741	25.9±0.6	44240	45.2±7.4
	20 mg L ⁻¹ NaC	78660	83.7±11.9	66133	39.5±6.0	62372	71.7±13.9
	40 mg L ⁻¹ NaC	102627	102.1±16.7	83982	47.0±7.6	56342	59.3±10.6
	60 mg L ⁻¹ NaC	119292	123.0±21.3	94534	59.1±17.8	56435	63.8±14.5
	80 mg L ⁻¹ NaC	86151	87.7±6.2	72088	43.7±9.6	40799	42.7±6.6

3 days	Control	143400	145.9±25.1	87688	47.8±5.1	36950	32.1±1.9
	20 mg L ⁻¹ NaC	95247	96.6±11.1	86620	44.2±5.0	24861	21.9±5.0
	40 mg L ⁻¹ NaC	75589	79.3±26.9	67661	37.2±6.5	24951	26.0±4.5
	60 mg L ⁻¹ NaC	156253	160.9±45.5	106909	68.2±17.6	44577	48.1±14.8
	80 mg L ⁻¹ NaC	104928	105.4±23.9	70283	42.1±9.1	38627	42.1±8.7
5 days	Control	93737	98.1±16.2	46347	26.6±4.7	23572	24.2±5.7
	20 mg L ⁻¹ NaC	166283	173.4±19.8*	69061	33.0±1.6	32194	28.5±3.2
	40 mg L ⁻¹ NaC	143221	142.5±20.7	95295	44.8±2.6*	36862	29.5±3.4
	60 mg L ⁻¹ NaC	178831	183.6±9.9*	130542	64.3±1.7*	28380	25.7±0.3
	80 mg L ⁻¹ NaC	104982	108.2±26.3	92040	40.4±5.6*	42590	41.5±5.6*
7 days	Control	184144	189.1±51.0	112208	48.4±13.8	45768	36.3±5.3
	20 mg L ⁻¹ NaC	174572	173.2±34.2	100412	56.1±12.1	43805	48.5±14.9
	40 mg L ⁻¹ NaC	222837	229.4±16.6	90302	44.3±1.5	41667	37.6±1.8
	60 mg L ⁻¹ NaC	201370	208.9±53.6	70971	33.6±1.6	54084	51.1±4.5
	80 mg L ⁻¹ NaC	205387	204.2±46.9	69475	33.3±3.7	38439	44.8±12.0
Average concentration (treated maize samples)			141.4		45.7		42.7

Table S3: Peak areas and concentrations of phenolic compounds in sunflower leaves from seedlings treated with sodium cholate (20, 40, 60 and 80 mg mL⁻¹). Values are presented as mean ± standard error ($p < 0.5$), and those marked with an asterisk are statistically significantly different from the corresponding control.

SUNFLOWER		GA		PCA		CHA	
Time	Sample	Peak area	Concentration (µg g ⁻¹)	Peak area	Concentration (µg g ⁻¹)	Peak area	Concentration (µg g ⁻¹)
1 day	Control	0	0	0	0	211444	359.7±10.1
	20 mg L ⁻¹ NaC	0	0	0	0	82146	135.2±14.6*
	40 mg L ⁻¹ NaC	0	0	0	0	26043	42.1±21.4*
	60 mg L ⁻¹ NaC	0	0	0	0	7668	9.4±1.3*
	80 mg L ⁻¹ NaC	0	0	2471	2.4±0.3*	5876	6.1±0.5*
3 days	Control	0	0	0	0	28233	44.2±5.0
	20 mg L ⁻¹ NaC	0	0	1699	1.7±0.3*	23975	39.3±9.7
	40 mg L ⁻¹ NaC	0	0	2498	2.5±0.2*	16166	22.4±7.2
	60 mg L ⁻¹ NaC	0	0	2408	2.4±0.3*	9733	13.9±4.2*
	80 mg L ⁻¹ NaC	3219	2.1±1.2*	1854	1.9±0.2*	5498	6.9±0.3*
5 days	Control	8314	5.3±0.1	3368	3.4±0.7	12701	16.1±0.0
	20 mg L ⁻¹ NaC	7805	5.0±0.5	2192	2.2±0.5	7687	10.4±1.5*
	40 mg L ⁻¹ NaC	6018	3.8±0.3*	3463	3.5±0.1	8256	11.3±0.6*
	60 mg L ⁻¹ NaC	7668	4.8±0.5	4655	4.6±0.5	9835	13.5±1.6
	80 mg L ⁻¹ NaC	6697	4.2±0.4	4174	4.1±0.8	7980	9.4±1.7*
7 days	Control	7017	4.4±0.3	2594	2.5±0.6	21146	29.2±1.8
	20 mg L ⁻¹ NaC	5395	3.5±0.5	3982	4.0±1.0	40601	57.5±31.8
	40 mg L ⁻¹ NaC	8175	5.0±0.4	3737	3.6±0.3	70267	61.5±17.8
	60 mg L ⁻¹ NaC	6791	4.3±0.2	4719	4.7±0.9	28177	42.4±6.2
	80 mg L ⁻¹ NaC	7447	4.8±0.8	4839	4.8±0.5*	14089	19.7±1.6
Average concentration (treated sunflower samples)			4.2		3.3		31.3

Time	Sample	PHBA		CA		VA	
		Peak area	Concentration ($\mu\text{g g}^{-1}$)	Peak area	Concentration ($\mu\text{g g}^{-1}$)	Peak area	Concentration ($\mu\text{g g}^{-1}$)
1 day	Control	58616	18.6 \pm 3.2	17707	22.5 \pm 1.5	375272	13.9 \pm 0.7
	20 mg L ⁻¹ NaC	77244	29.5 \pm 1.4*	18734	22.0 \pm 2.1	397037	15.1 \pm 0.7
	40 mg L ⁻¹ NaC	78101	25.7 \pm 2.4	18764	7.1 \pm 2.2*	397668	14.8 \pm 1.1
	60 mg L ⁻¹ NaC	80675	26.9 \pm 1.2*	16449	8.3 \pm 1.6*	348616	13.0 \pm 0.7
	80 mg L ⁻¹ NaC	98084	32.3 \pm 2.5*	15010	9.8 \pm 2.4*	318113	11.7 \pm 1.2
3 days	Control	74712	21.5 \pm 1.0	15149	11.0 \pm 0.8	321050	12.0 \pm 0.5
	20 mg L ⁻¹ NaC	100565	38.1 \pm 0.0*	19597	12.9 \pm 0.8	415333	15.5 \pm 0.1
	40 mg L ⁻¹ NaC	114882	44.5 \pm 5.5*	21910	11.4 \pm 0.4	464336	17.5 \pm 1.2*
	60 mg L ⁻¹ NaC	87960	31.5 \pm 2.7	24171	6.1 \pm 2.3*	512272	19.2 \pm 2.3*
	80 mg L ⁻¹ NaC	102665	33.7 \pm 2.7*	19620	7.1 \pm 1.3	415809	15.8 \pm 0.5
5 days	Control	99291	33.9 \pm 0.9	18100	8.2 \pm 1.7	383603	14.5 \pm 0.6
	20 mg L ⁻¹ NaC	113894	42.9 \pm 0.0	25300	13.8 \pm 3.8	536192	20.2 \pm 2.1*
	40 mg L ⁻¹ NaC	126405	49.9 \pm 2.5*	20062	12.6 \pm 1.6	425184	16.0 \pm 0.7
	60 mg L ⁻¹ NaC	137661	49.5 \pm 6.3*	16411	13.0 \pm 0.9	347797	13.0 \pm 0.4
	80 mg L ⁻¹ NaC	141688	53.0 \pm 3.8*	19350	10.8 \pm 0.1	410097	15.1 \pm 0.5
7 days	Control	122622	38.9 \pm 4.2	17983	13.5 \pm 4.0	381114	14.0 \pm 0.5
	20 mg L ⁻¹ NaC	145885	56.2 \pm 10.0	12836	17.4 \pm 2.3	272028	10.3 \pm 3.4
	40 mg L ⁻¹ NaC	183570	74.5 \pm 5.3*	22479	17.0 \pm 4.9	476402	17.3 \pm 1.8
	60 mg L ⁻¹ NaC	157527	57.4 \pm 4.4	18695	12.9 \pm 1.4	396202	14.6 \pm 1.4
	80 mg L ⁻¹ NaC	155990	62.0 \pm 2.9*	18325	8.9 \pm 1.8	388375	14.7 \pm 2.3
Average concentration (treated sunflower samples)			44.2		11.9		15.2
Time	Sample	SA		<i>p</i> -CA		FA	
		Peak area	Concentration ($\mu\text{g g}^{-1}$)	Peak area	Concentration ($\mu\text{g g}^{-1}$)	Peak area	Concentration ($\mu\text{g g}^{-1}$)
1 day	Control	287242	42.4 \pm 3.3	75718	34.7 \pm 9.6	92088	73.2 \pm 18.0
	20 mg L ⁻¹ NaC	299578	45.2 \pm 4.4	33458	14.5 \pm 3.3	64129	50.9 \pm 11.6
	40 mg L ⁻¹ NaC	244170	36.3 \pm 4.2	43639	19.8 \pm 9.2	37121	25.5 \pm 5.7*
	60 mg L ⁻¹ NaC	216439	32.1 \pm 7.5	6060	1.6 \pm 0.4*	32768	21.7 \pm 2.2*
	80 mg L ⁻¹ NaC	208496	30.2 \pm 8.2	6401	2.0 \pm 0.1*	17257	13.6 \pm 3.5*
3 days	Control	336792	50.4 \pm 4.5	12881	5.7 \pm 1.8	27794	20.7 \pm 4.1
	20 mg L ⁻¹ NaC	359902	53.6 \pm 1.7	9385	4.2 \pm 1.3	27437	22.9 \pm 7.2
	40 mg L ⁻¹ NaC	344575	51.6 \pm 5.4	9177	2.9 \pm 0.6	22712	14.6 \pm 2.3
	60 mg L ⁻¹ NaC	290101	43.3 \pm 2.1	7370	2.4 \pm 0.2	16514	11.3 \pm 1.5
	80 mg L ⁻¹ NaC	267927	40.5 \pm 6.9	6302	1.1 \pm 1.1	19001	12.9 \pm 1.7
5 days	Control	314415	47.2 \pm 3.5	5208	1.6 \pm 0.2	10658	7.7 \pm 1.3
	20 mg L ⁻¹ NaC	406431	60.6 \pm 9.0	4070	1.3 \pm 0.3	19904	13.6 \pm 1.6
	40 mg L ⁻¹ NaC	382803	57.1 \pm 7.0	2785	0.5 \pm 0.4	19984	14.2 \pm 2.1
	60 mg L ⁻¹ NaC	309013	46.0 \pm 5.4	3213	0.9 \pm 0.2	16793	12.0 \pm 2.3
	80 mg L ⁻¹ NaC	325161	47.7 \pm 0.8	6139	0.9 \pm 1.0	25770	18.3 \pm 3.3*

7 days	Control	355351	51.8±1.8	12000	4.4±0.9	22776	13.5±2.0
	20 mg L⁻¹ NaC	342667	51.7±9.7	13475	4.9±1.2	49431	36.0±11.6
	40 mg L⁻¹ NaC	372662	53.9±5.6	3186	1.1±0.0*	10706	6.7±1.2
	60 mg L⁻¹ NaC	327207	48.2±6.6	4227	1.4±0.0*	15628	10.9±3.2
	80 mg L⁻¹ NaC	312541	46.8±5.9	2299	0.4±0.4*	14720	10.0±1.1
Average concentration (treated sunflower samples)			37.5		3.7		18.4