

A targeted analysis of flavonoids in asparagus using the UPLC-MS technique

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Electronic supplementary material

Supplementary Tables S1–S3

Table S1. The basic information about the individual standard analytes

No.	Name	Molecular formula	Molecular weight	CAS
1	Catechin	C ₁₅ H ₁₄ O ₆	290.27	154–23–4
2	Puerarin	C ₂₁ H ₂₀ O ₉	416.38	3681–99–0
3	L-Epicatechin	C ₁₅ H ₁₄ O ₆	290.27	490–46–0
4	Dihydromyricetin	C ₁₅ H ₁₂ O ₈	320.25	27200–12–0
5	Daidzin	C ₂₁ H ₂₀ O ₉	416.38	552–66–9
6	Vitexin	C ₂₁ H ₂₀ O ₁₀	432.38	3681–93–4
7	Rutin	C ₂₇ H ₃₀ O ₁₆	610.51	207671–50–9
8	Isovitexin	C ₂₁ H ₂₀ O ₁₀	432.38	38953–85–4
9	Cynaroside	C ₂₁ H ₂₀ O ₁₁	448.38	5373–11–5
10	Quercetin-3-glucoside	C ₂₁ H ₂₀ O ₁₂	464.38	482–35–9
11	Taxifolin	C ₁₅ H ₁₂ O ₇	304.25	480–18–2
12	Naringin	C ₂₇ H ₃₂ O ₁₄	580.53	10236–47–2
13	Astragalin	C ₂₁ H ₂₀ O ₁₁	448.38	480–10–4
14	Diosmin	C ₂₈ H ₃₂ O ₁₅	608.54	520–27–4
15	Quercitrin	C ₂₁ H ₂₀ O ₁₁	448.38	522–12–3
16	Genistin	C ₂₁ H ₂₀ O ₁₀	432.38	529–59–9
17	Myricetin	C ₁₅ H ₁₀ O ₈	318.24	529–44–2
18	Fisetin	C ₁₅ H ₁₀ O ₆	286.23	528–48–3
19	Baicalin	C ₂₁ H ₁₈ O ₁₁	446.37	21967–41–9
20	Daidzein	C ₁₅ H ₁₀ O ₄	254.24	486–66–8
21	Liquiritigenin	C ₁₅ H ₁₂ O ₄	256.25	578–86–9
22	Glycitein	C ₁₆ H ₁₂ O ₅	284.26	40957–83–3
23	Luteolin	C ₁₅ H ₁₀ O ₆	286.23	491–70–3
24	Quercetin	C ₁₅ H ₁₀ O ₇	302.24	117–39–5
25	Icariin	C ₃₃ H ₄₀ O ₁₅	676.65	489–32–7
26	Silybin	C ₂₅ H ₂₂ O ₁₀	482.43	22888–70–6
27	Apigenin	C ₁₅ H ₁₀ O ₅	270.24	520–36–5
28	Naringenin	C ₁₅ H ₁₂ O ₅	272.25	480–41–1
29	Genistein	C ₁₅ H ₁₀ O ₅	270.24	446–72–0
30	Kaempferol	C ₁₅ H ₁₀ O ₆	286.24	520–18–3
31	Formononetin	C ₁₆ H ₁₂ O ₄	268.27	485–72–3
32	Chrysin	C ₁₅ H ₁₀ O ₄	254.24	480–40–0
33	Kaempferide	C ₁₆ H ₁₂ O ₆	300.26	491–54–3
34	Biochanin A	C ₁₆ H ₁₂ O ₅	284.26	491–80–5

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Table S2. Standard curve concentration of each substance

No.	Name	Standard curve concentration (ng mL ⁻¹)									
		1	2	3	4	5	6	7	8	9	10
1	Catechin	800	400	200	100	50	20	10	–	–	–
2	Puerarin	100	50	25	12.5	6.25	2.5	1.25	–	–	–
3	L-Epicatechin	400	200	100	50	25	10	–	–	–	–
4	Dihydromyricetin	400	200	100	50	25	10	5	2	1	–
5	Daidzin	100	50	25	12.5	6.25	2.5	1.25	0.5	–	–
6	Vitexin	400	200	100	50	25	10	5	2	1	–
7	Rutin	200	100	50	25	12.5	5	2.5	1	0.5	–
8	Isovitexin	400	200	100	50	25	10	5	2	1	0.4
9	Cynaroside	200	100	50	25	12.5	5	2.5	1	–	–
10	Quercetin-3glucoside	200	100	50	25	12.5	5	2.5	1	0.5	–
11	Taxifolin	100	50	25	12.5	6.25	2.5	1.25	–	–	–
12	Naringin	400	200	100	50	25	10	5	2	–	–
13	Astragalin	400	200	100	50	25	10	5	2	1	–
14	Diosmin	200	100	50	25	12.5	5	2.5	1	0.5	–
15	Quercitrin	200	100	50	25	12.5	5	2.5	1	–	–
16	Genistin	100	50	25	12.5	6.25	2.5	1.25	0.5	0.25	–
17	Myricetin	800	400	200	100	50	20	10	4	–	–
18	Fisetin	800	400	200	100	50	20	10	4	2	0.8
19	Baicalin	400	200	100	50	25	10	5	2	–	–
20	Daidzein	–	–	–	–	25	10	5	2	1	0.4
21	Liquiritigenin	200	100	50	25	12.5	5	2.5	1	–	–
22	Glycitein	40	20	10	5	2.5	1	0.5	0.2	–	–
23	Luteolin	200	100	50	25	12.5	5	2.5	1	0.5	–
24	Quercetin	400	200	100	50	25	10	5	2	1	–
25	Icariin	100	50	25	12.5	6.25	–	–	–	–	–
26	Silybin	200	100	50	25	12.5	5	2.5	1	–	–
27	Apigenin	40	20	10	5	2.5	1	–	–	–	–
28	Naringenin	200	100	50	25	12.5	5	2.5	1	–	–
29	Genistein	200	100	50	25	12.5	5	2.5	1	–	–
30	Kaempferol	800	400	200	100	50	20	10	4	–	–
31	Formononetin	20	10	5	2.5	1.25	0.5	0.25	0.1	0.05	0.02
32	Chrysin	100	50	25	12.5	6.25	2.5	1.25	0.5	–	–
33	Kaempferide	100	50	25	12.5	6.25	2.5	1.25	0.5	0.25	0.1
34	Biochanin A	20	10	5	2.5	1.25	0.5	0.25	0.1	0.05	–

Table S3. The flavonoid contents through the conversion in asparagus tips and shoots

No.	Name	RT (min)	Shoot 1	Shoot 2	Shoot 3	Shoot 4	Shoot 5	Shoot 6	Tip 1	Tip 2	Tip 3	Tip 4	Tip 5	Tip 6
1	Catechin	2.64	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2	Puerarin	2.94	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3	L-Epicatechin	3.06	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4	Dihydromyricetin	3.25	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
5	Daidzin	3.25	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6	Vitexin	3.49	0.05	ND	0.05	0.05	ND	0.06	0.19	0.09	0.18	0.20	0.10	0.18
7	Rutin	3.43	142.90	183.28	133.53	212.98	149.85	216.65	481.78	463.22	472.33	486.11	468.25	471.30
8	Isovitexin	3.49	0.05	0.02	0.04	0.03	0.01	0.03	0.20	0.11	0.20	0.20	0.09	0.15
9	Cynaroside	3.6	0.21	0.07	0.34	0.24	0.10	0.49	0.23	0.08	0.26	0.29	0.19	0.21
10	Quercetin-3-glucoside	3.55	0.54	0.37	0.34	0.52	0.46	0.60	8.08	7.89	6.94	8.27	9.40	6.24
11	Taxifolin	3.8	ND	ND	ND	ND	ND	ND	0.18	0.13	0.21	0.26	0.18	0.15
12	Naringin	3.8	ND	ND	ND	ND	ND	ND	0.40	0.32	0.38	0.32	0.34	0.32
13	Astragalin	3.8	0.03	ND	0.07	0.08	0.05	0.05	0.09	0.04	0.07	0.15	0.07	0.09
14	Diosmin	3.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
15	Quercitrin	3.81	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
16	Genistin	3.86	0.07	0.06	0.24	0.22	0.07	0.18	0.02	0.01	0.02	0.04	0.03	0.04
17	Myricetin	4.11	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
18	Fisetin	4.11	0.02	0.04	ND	ND	0.03	ND	ND	ND	ND	ND	0.03	ND
19	Baicalin	4.23	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
20	Daidzein	4.47	ND	ND	ND	ND	ND	ND	0.06	0.11	0.03	0.03	0.05	0.07
21	Liquiritigenin	4.66	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
22	Glycitein	4.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
23	Luteolin	4.66	0.05	0.03	0.07	0.07	0.05	0.06	0.03	0.02	0.02	0.03	0.11	0.04
24	Quercetin	4.72	0.12	0.17	0.15	0.20	0.15	0.39	5.55	3.00	2.81	3.89	3.63	6.61
25	Icariin	4.67	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
26	Silybin	5.32	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
27	Apigenin	5.58	ND	ND	0.06	0.05	0.02	0.04	ND	ND	ND	ND	0.04	ND
28	Naringenin	5.64	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
29	Genistein	5.63	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
30	Kaempferol	5.84	ND	ND	ND	ND	ND	ND	0.09	ND	ND	ND	ND	ND
31	Formononetin	6.74	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
32	Chrysin	7.17	ND	0.02	0.02	0.04	0.02	0.01	ND	ND	ND	ND	ND	ND
33	Kaempferide	7.23	0.003	0.004	0.003	ND	0.002	ND	ND	ND	ND	ND	ND	ND
34	Biochanin A	7.23	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Note: ND – not detected