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SUPPLEMENTARY MATERIAL TO

An effective and facile approach for the determination of bioactive components of *Rheum ribes* in the Kurdish state of Iraq and Siirt region in Turkey

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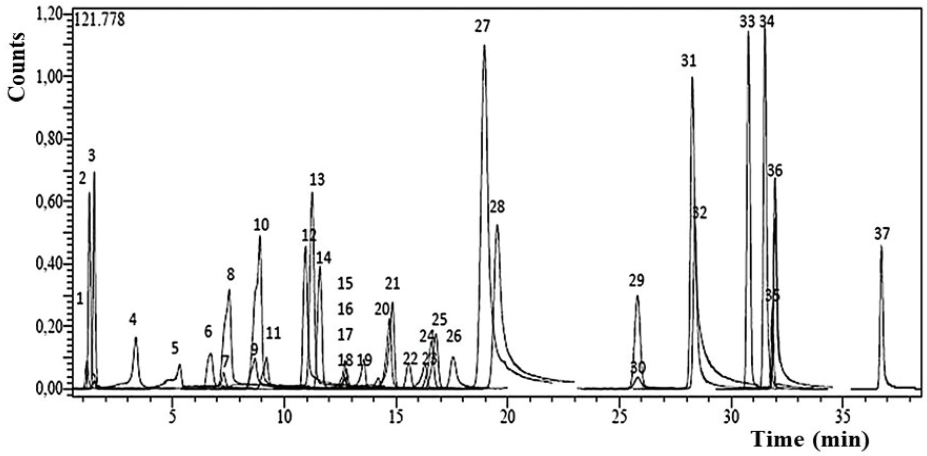

Fig. S-1. UHPLC-ESI-MS/MS chromatogram of standard mixg (1: Coumarin, 2: Hesperidin, 3: P-Coumaric acid, 4: O-Coumaric acid, 5: Gallic acid, 6: Caffeic acid, 7: Vanillic acid, 8: Salicylic acid, 9: Kainic acid, 10: 4-OH-benzoic acid, 11: Ferulic acid, 12: Chlorogenic acid, 13: Rosmarinic acid, 14: Protocatechic acid, 15: Cinnamic acid, 16: Sinapinic acid, 17: Fumaric acid, 18: Vanillin, 19: Pirokatekol, 20: Malic acid, 21: Syringic acid, 22: Hesperetin, 23: Naringenin, 24: Routine, 25: Quercetin, 26: Quercitrin, 27: Apigenin, 28: Krisin, 29: Liquiritigenin, 30: Isocerythrin, 31: Apigetrin, 32: Rhoifolin, 33: Nicotiflorin, 34: Fisetin, 35: Luteolin, 36: Myricetin, 37: Kaempferol).[1,2]

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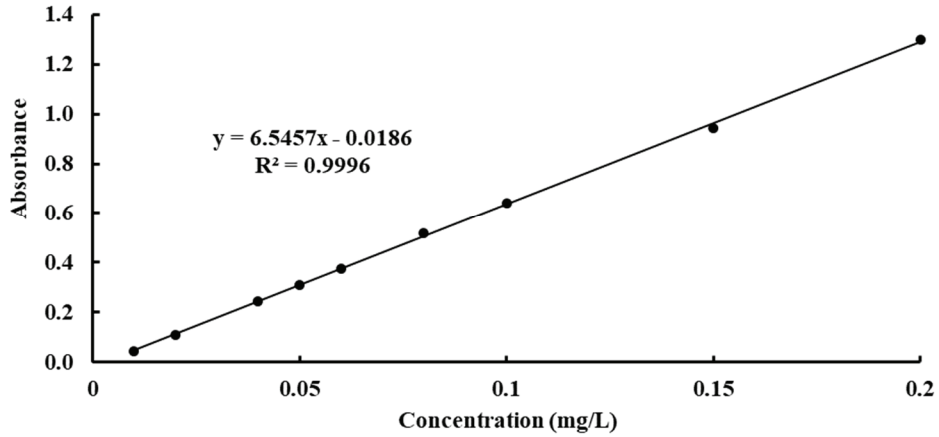

Fig. S-2. The relation between the concentration of phenolic and the absorbance (Gallic acid standard regression)

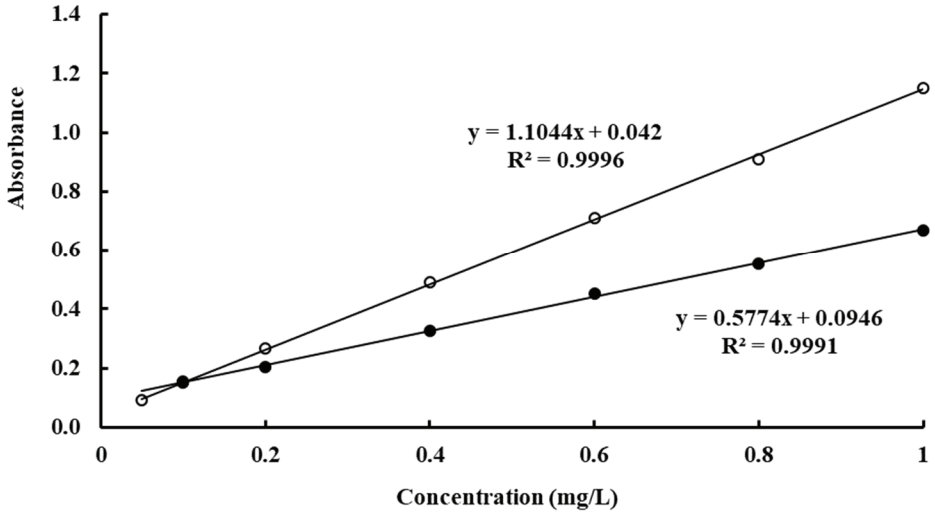

Fig. S-3. Standard regression of total flavonoid (Routine) (-ɵ-) and standard regression of FRAP ($FeSO_4$) (-●-).

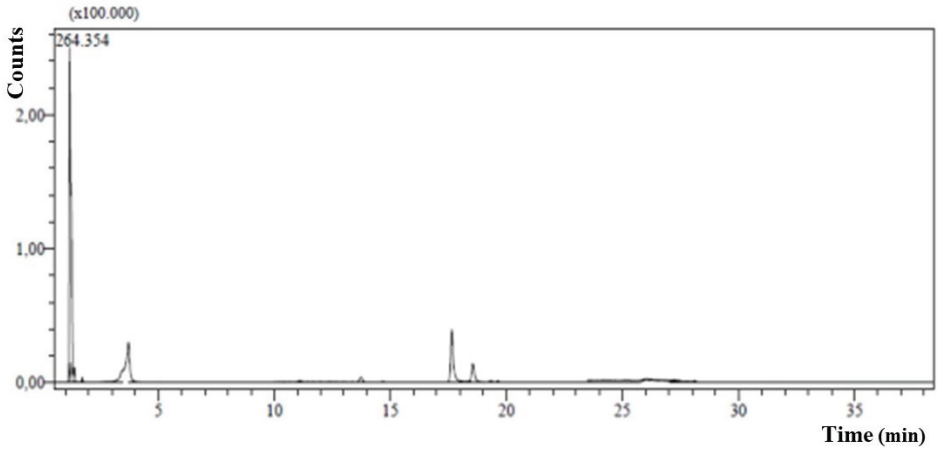

Fig. S-4. The chromatograms of Gara

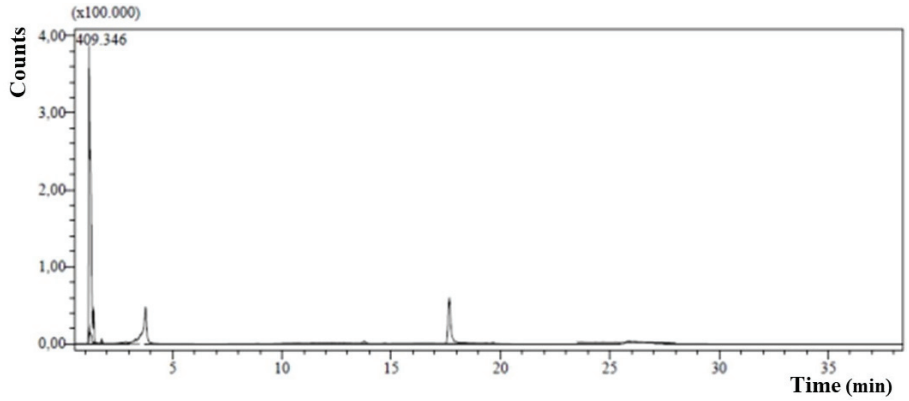

Fig. S-5. The chromatograms of Korajar

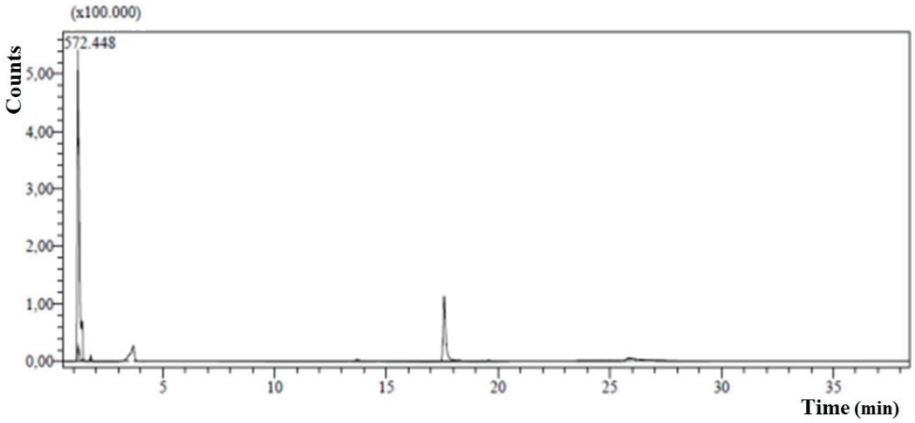

Fig. S-6. The chromatograms of Sor

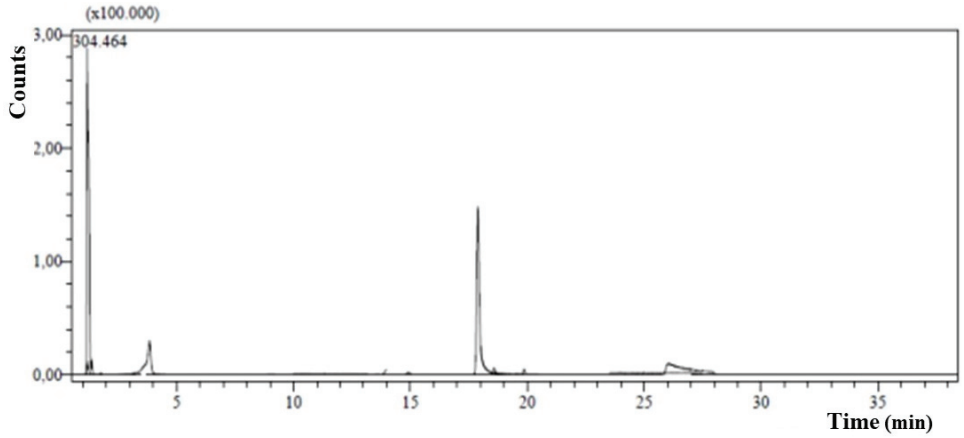

Fig. S-7. The chromatograms of Rash

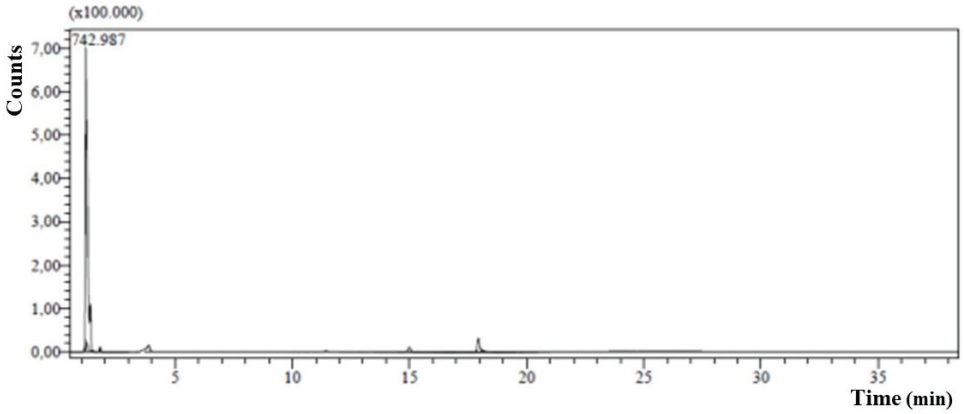

Fig. S-8. The chromatograms of Qalandar

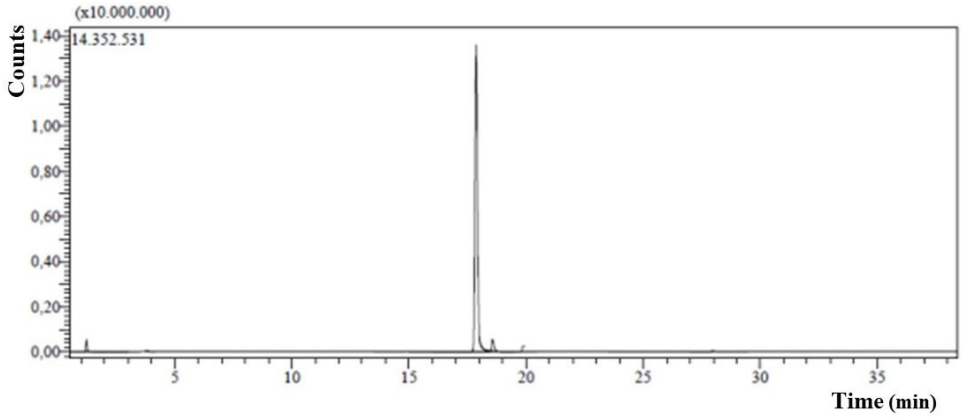

Fig. S-9. The chromatograms of Pervari

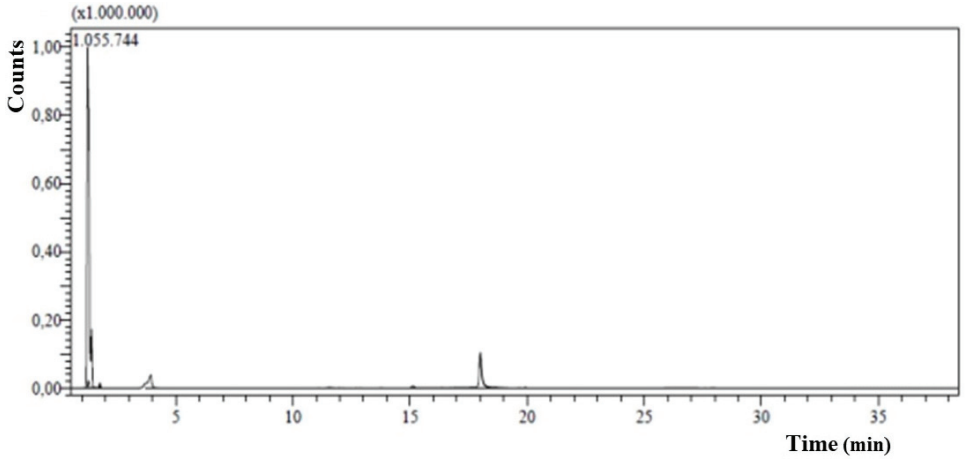

Fig. S-10. The chromatograms of Şirvan

TABLE S-I. Analytical parameters of the LC-MS / MS analysis method[1,2]

Code no	Analytes	RT[a]	Mother ion (m/z)[b]	Fragment ions collision energy (eV)	Ion model	Calibration equation	R^{2c}	RSD (%)[d]		Linearity range	LOD/LOQ[e]	Recovery (%)		U[f]
								Same day	Diff. days	(µg/L)	(µg/L)	Same day	Diff. days	
1	Quinic acid	1.13	190.95	85.3–93.3	Neg	y = 41.06 × + 10671	0.996	0.00259	0.00274	250–10000	75.8/79.4	1.00288	0.98778	0.0082
2	Malic acid	1.23	133.00	115.2–71.3	Neg	y = 316.95 × −42041	0.999	0.00477	0.00527	250–10000	55.3/67.5	1.01266	0.99836	0.0113
3	Fumaric acid	1.48	115.00	71.4	Neg	y = 64.99 × −11592	0.997	0.00536	0.00460	100–5000	28.1/34.5	0.99748	0.99867	0.0124
4	Gallic acid	3.00	168.85	125.2–79.2	Neg	y = 226.76 × + 38152	0.998	0.01601	0.01443	250–10000	95.5/106.9	1.00004	1.00454	0.0282
5	Protocatechuic acid	4.93	152.95	108.3	Neg	y = 297.75 × + 30590	0.995	0.01236	0.01296	100–5000	28.2/31.4	0.99404	1.01070	0.0411
6	Pyrocatechol	6.48	109.00	108.35–91.3	Neg	y = 30.61 × + 14735	0.996	0.01313	0.01339	1000–20000	261.1/278.4	0.99987	0.99936	0.0235
7	Chlorogenic acid	7.13	353.15	191.2	Neg	y = 781.36 × −18697	0.998	0.00058	0.00076	25–1000	6.2/8.1	1.00806	0.99965	0.0069
8	4-OH-benzoic acid	7.39	136.95	93.3–65.3	Neg	y = 409.03 × + 112079	0.998	0.01284	0.01538	250–10000	33.2/38.1	0.99662	1.00058	0.0289
9	Vanillic acid	8.57	166.90	152.3–108.3	Neg	y = 35.84 × −12097	0.999	0.00528	0.00619	1000–20000	122.2/139.7	1.00093	1.04095	0.0508
10	Caffeic acid	8.80	178.95	135.2–134.3	Neg	y = 3963.32 × + 178156	0.998	0.01454	0.01469	25–1000	18.4/22.4	1.00917	0.98826	0.0354
11	Syringic acid	9.02	196.95	182.2–167.3	Neg	y = 42.33 × −52547	0.996	0.01049	0.01345	1000–20000	212.5/233.3	0.99922	0.99977	0.0238
12	Vanillin	10.87	151.00	136.3–92.2	Neg	y = 446.10 × + 70934	0.998	0.00696	0.00793	250–10000	44.3/53.1	0.99679	0.99611	0.0280
13	Salicylic acid	11.16	136.95	93.3–65.3	Neg	y = 5286.26 × + 309192	0.989	0.01016	0.01242	25–1000	5.0/6.5	1.00989	0.99013	0.0329
14	p-Coumaric acid	11.53	162.95	119.3–93.3	Neg	y = 3199.20 × + 13002	0.992	0.01820	0.01727	25–1000	7.3/9.1	1.00617	1.01224	0.0516
15	Rutin	12.61	609.05	300.1–271.1	Neg	y = 561.91 × −16879	0.997	0.00473	0.00624	25–1000	5.5/6.5	1.00994	0.98017	0.0159

16	Ferulic acid	12.62	192.95	178.3	Neg	y = 80.45 × −31782	0.997	0.00708	0.00619	250–10000	36.6/42.0	0.99987	1.00289	0.0494
17	Sinapinic acid	12.66	222.95	208.3–149.2	Neg	y = 141.96 × −73294	0.992	0.01446	0.01517	250–10000	78.7/86.1	1.00164	0.99962	0.0281
18	Hesperidin	12.67	610.90	303.1–465.1	Poz	y = 1340.27 × −43769	0.998	0.00945	0.01126	25–1000	3.4/4.2	1.01733	1.01263	0.0262
19	Isoquercitrin	13.42	463.00	300.1–271.1	Neg	y = 803.23 × + 4981	0,999	0.00682	0.00515	25–1000	5.4/6.3	1.00594	1.00722	0.0133
20	Rosmarinic acid	14.54	359.00	161.2–197.2	Neg	y = 909.67 × −201692	0.994	0.02014	0.01751	100–5000	6.6/8.8	0.99206	1.03431	0.0713
21	Nicotiflorin	14.68	593.05	285.1–255.2	Neg	y = 498.38 × + 79274	0,991	0.00737	0.00875	100–5000	22.4/25.5	1.02558	1.00970	0.0276
22	o-Coumaric acid	15.45	162.95	119.4–93.3	Neg	y = 1219.34 × −10915	0.999	0.02730	0.02566	25–1000	24.4/31.1	0.98344	0.99061	0.0513
23	Rhoifolin	16.11	577.05	269.2–211.1	Neg	y = 237.15 × + 11887	0,999	0.00747	0.01528	100–5000	23.1/27.9	1.01046	1.01739	0.0941
24	Quercitrin	16.41	447.15	301.1–255.1	Neg	y = 339.39 × + 38910	0.999	0.01528	0.02320	100–5000	22.0/25.2	0.99726	1.00620	2.0079
25	Apigetrin	16.59	431.00	268.2–239.2	Neg	y = 1775.55 × + 91121	0,993	0.01797	0.01607	25–1000	5.4/6.1	1.01394	1.00419	0.0597
26	Coumarin	17.40	147.05	91.0–103.2	Poz	y = 33.64 × −89700	0.994	0.01306	0.01239	1000–20000	208.4/228.4	0.99947	1.00081	0.0237
27	Myricetin	18.72	317.00	179.2–151.3	Neg	y = 583.55 × + 205727	0,999	0.00652	0.00711	250–10000	53.2/57.2	0.99982	1.00042	0.0126
28	Fisetin	19.30	284.95	135.2–121.3	Neg	y = 547.46 × + 274791	0,991	0.00557	0.00820	250–10000	54.4/61.4	0.99877	1.00031	0.0148
29	Cinnamic acid	25.61	147.00	103.15–77.3	Neg	y = 9.06 × −12403	0.996	0.00648	0.00816	5000–20000	821.8/859.7	1.00051	0.99927	0.0143
30	Liquiritigenin	25.62	254.95	119.3–135.1	Neg	y = 2384.96 × + 59141	0,996	0.01849	0.01738	25–1000	5.5/6.6	1.00333	0.99957	0.0341
31	Quercetin	28.17	300.90	151.2–179.2	Neg	y = 1198.48 × + 480562	0.990	0.01589	0.01360	100–5000	23.3/28.9	0.98470	1.00103	0.0543
32	Luteolin	28.27	284.75	133.2–151.2	Neg	y = 3272.65 × + 150557	0,997	0.00575	0.00696	25–1000	5.4/6.5	1.00772	0.99524	0.0174
33	Naringenin	30.68	270.95	151.2–119.3	Neg	y = 4315.1 × + 178410	0.995	0.02054	0.02019	25–1000	5.4/6.4	0.99883	1.01002	0.0521
34	Apigenin	31.43	268.95	117.3–151.2	Neg	y = 4548.36 × + 295252	0.990	0.02304	0.02204	25–1000	5.4/6.3	1.01444	1.01331	0.0650
35	Hesperetin	31.76	300.95	164.2–136.2	Neg	y = 876.67 × + 48916	0.997	0.03209	0.02605	25–1000	5.6/6.9	0.98850	0.99435	0.0562
36	Kaempferol	31.88	284.75	255.1–117.3	Neg	y = 26.29 × + 87558	0,992	0.01436	0.01070	1000–20000	206.6/214.3	0.99971	0.99851	0.0209
37	Chrysin	36.65	252.95	143.3–119.4	Neg	y = 2032.13 × + 95593	0,993	0.00490	0.00630	25–1000	5.4/6.2	1.00338	1.00437	2.0083

[a]RT: Retention time, [b]Master ion (*m/z):* Molecular ions of standard compounds (m/z rate), [c]R^2: Determination coefficient, [d]RSD: Relative standard deviation, [e]LOD/LOQ (µg/L): Detection limit/ Assignment limit, [f] U (%): 95% Relative standard uncertainty at confidence level (k=2)). [1,2]

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2. M. A. Yilmaz, A. Ertas, I. Yener, M. Akdeniz, O. Cakir, M. Altun, I. Demirtas, M. Boga, H. Temel, *J. Pharm. Biomed. Anal.* **154** (2018) 413.