Table 1 Precision test of the UPLC analysis

Components	intra-day runs (mean ± SD, n=6)		inter-day runs (mean ± SD, n=6)	
	Content (mg/g)	RSD [a] (%)	Content (mg/g)	RSD (%)
Aloe-emodin-8-O-β-D-glucoside	4.422±0.013	2.41	4.397±0.044	1.78
Sennoside B	1.265±0.053	4.77	1.231±0.072	3.98
Rhein-8-O-β-D-glucoside	5.136±0.067	1.25	5.101±0.072	1.03
Sennoside A	3.243±0.039	4.52	3.201±0.054	4.07
Chrysophanol-8-O-β-D-glucoside	4.686±0.077	0.89	4.611±0.024	1.54
Emodin-8-O-β-D-glucoside	3.515±0.103	1.33	3.529±0.076	0.45
Physcion-8-O-β-D-glucoside	2.789±0.065	1.08	2.752±0.043	1.64
Aloe-emodin	1.634±0.097	1.89	1.629±0.088	1.48
Rhein	1.758±0.084	1.92	1.762±0.091	1.73
Emodin	2.037±0.034	2.09	2.052±0.055	1.81
Chrysophanol	1.184±0.022	1.95	1.195±0.076	2.39
Physcion	0.892±0.022	0.96	0.898±0.031	0.83

[a] RSD(%)=100×SD/mean
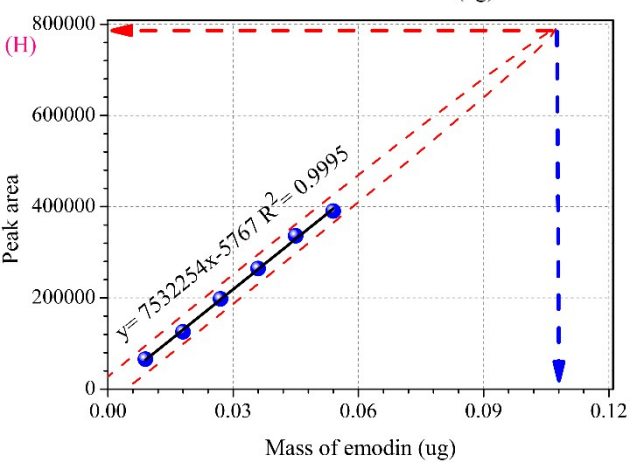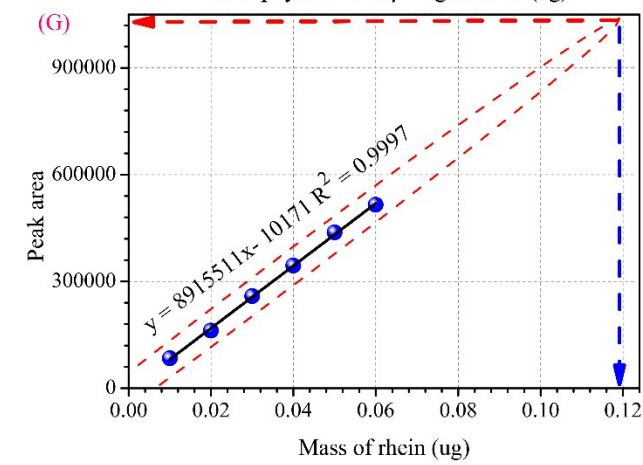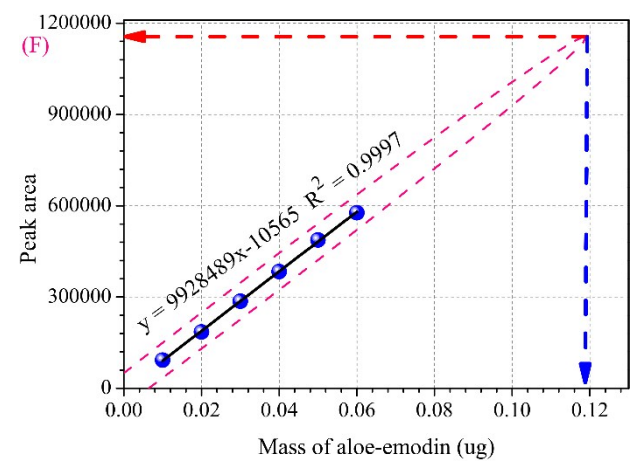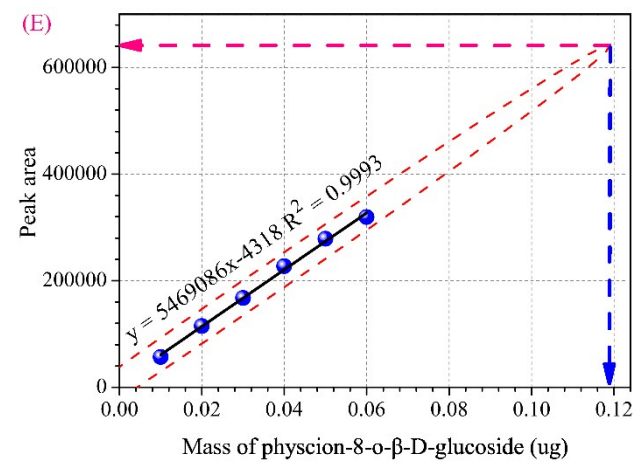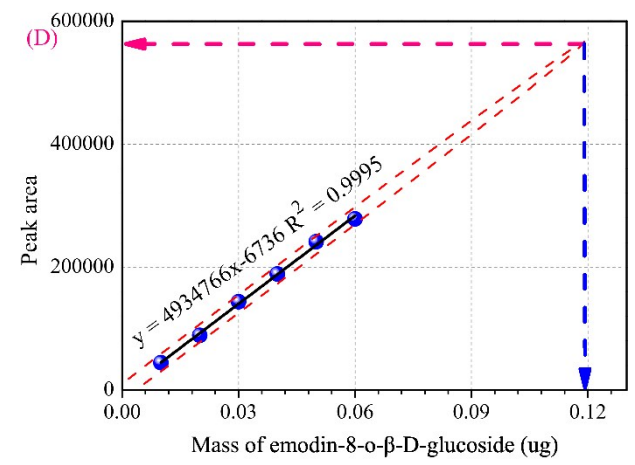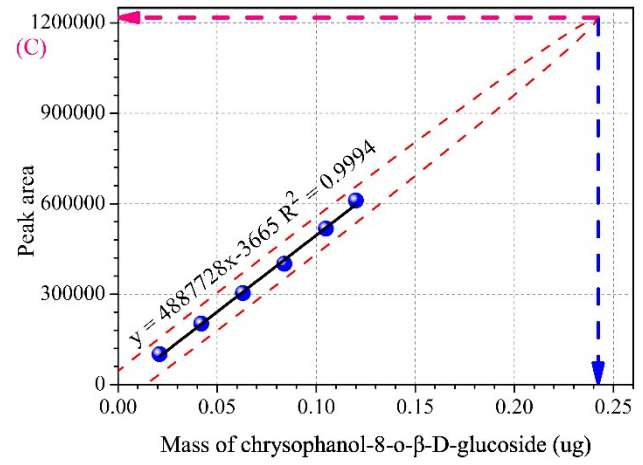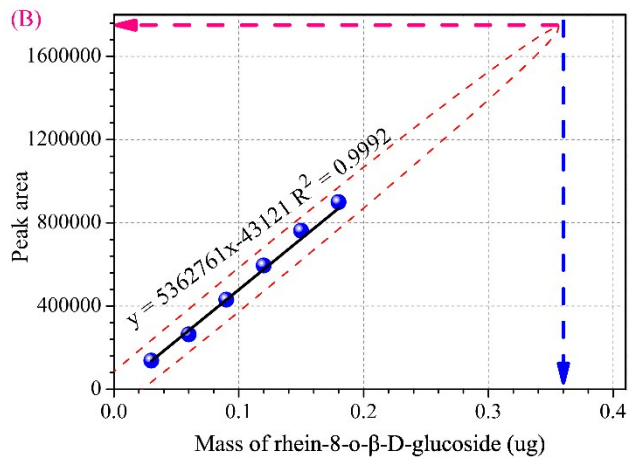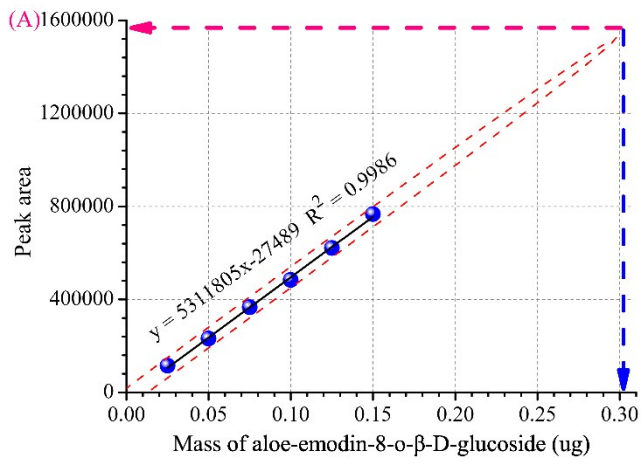
Table 2 Recovery of the UPLC analysis (mean ± SD, n=6)

Components	Amount detected in sample Rh01 (C_{sam}, mg)	Added amount (C_{add}, mg)	Amount detected in the mixture of sample Rh01 and added component (C_{det}, mg)	Recovery (%)
Aloe-emodin-8-O-β-D-glucoside	2.211	2.235	4.381 ± 0.042	97.09 ± 1.17
Sennoside B	0.633	0.624	1.231± 0.064	94.83 ± 4.12
Rhein-8-O-β-D-glucoside	2.568	2.544	5.016 ± 0.094	96.23 ± 3.05
Sennoside A	1.622	1.618	3.141± 0.097	93.88 ± 4.59
Chrysophanol-8-O-β-D-glucoside	2.383	2.378	4.689 ± 0.102	96.97 ± 2.98
Emodin-8-O-β-D-glucoside	1.758	1.744	3.511 ± 0.089	100.52 ± 3.57
Physcion-8-O-β-D-glucoside	1.395	1.385	2.762 ± 0.015	98.70 ± 2.59
Aloe-emodin	0.817	0.822	1.631 ± 0.037	99.03 ± 2.76
Rhein	0.879	0.886	1.761 ± 0.083	99.55 ± 1.37
Emodin	1.019	1.028	2.055 ± 0.084	100.78 ± 3.19
Chrysophanol	0.592	0.601	1.199 ± 0.027	100.74 ± 1.97
Physcion	0.446	0.452	0.905 ± 0.046	101.55 ± 3.25

Table 3 Analyzing results of 24 samples by QAMS (mg/g, mean, n = 3)

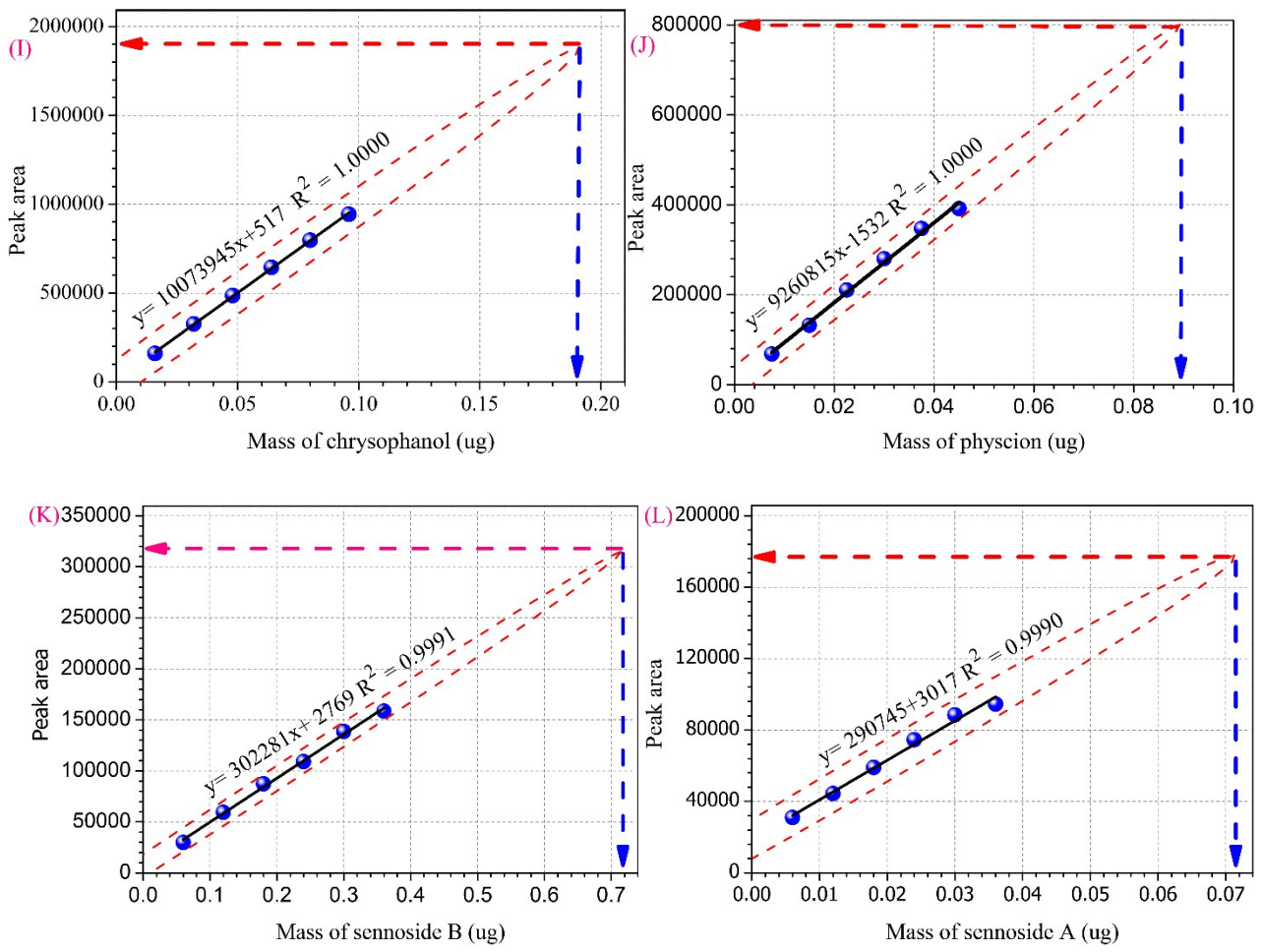| Samples	(1)	(11)	(2)	(12)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Rh01	4.418	0.603	5.142	1.117	4.677	3.508	2.767	1.631	1.746	1.188	2.037	0.899
Rh02	4.921	0.769	4.592	0.931	3.992	3.201	1.929	1.927	1.433	1.351	1.874	1.247
Rh03	5.019	0.937	4.367	0.808	4.033	2.912	2.416	1.344	1.821	1.837	1.945	1.349
Rh04	5.366	0.533	4.602	1.215	4.617	3.229	2.817	1.568	1.698	1.012	1.768	1.068
Rh05	4.619	0.826	3.887	1.443	3.771	2.307	2.462	1.378	1.422	1.449	1.533	0.774
Rh06	4.037	0.718	4.764	1.196	2.832	3.485	1.897	1.802	1.383	0.975	2.004	1.325
Rh07	3.823	0.905	3.416	1.735	4.011	4.255	2.404	1.113	1.006	1.403	1.707	0.741
Rh08	5.108	0.832	4.029	1.656	3.846	3.374	2.571	1.209	0.784	1.128	1.363	0.998
Rh09	1.238	0	1.337	0.241	2.661	1.325	1.012	2.987	2.353	1.903	2.723	1.722
Rh10	1.104	0.203	1.215	0.129	1.133	1.867	0.901	2.889	3.014	3.019	2.606	1.837
Rh11	0.112	0.284	0.673	0.108	1.008	1.258	0.317	1.926	2.483	2.883	1.681	1.949
Rh12	0.674	0	1.307	0	1.325	0.819	0.703	2.034	2.059	2.776	1.489	1.631
Rh13	0.962	0.102	1.433	0.073	1.748	0.991	0.481	1.741	1.994	2.193	2.034	1.574
Rh14	0.896	0.199	0.665	0.191	0.972	1.205	0.117	2.109	2.765	1.764	1.738	1.688
Rh15	1.022	0.028	0.843	0.087	1.034	0.502	0.899	2.337	2.303	2.655	1.804	1.912
Rh16	1.334	0	0.976	0.105	2.187	0.643	0.476	1.191	1.492	1.908	2.209	1.303
Rh17	2.695	0.112	2.954	0.415	3.017	2.443	1.712	1.845	1.917	2.364	2.824	1.014
Rh18	3.417	0.208	2.695	0.727	1.803	2.023	1.388	2.176	2.433	2.037	3.019	1.472
Rh19	2.709	0	2.527	0.088	2.066	2.168	1.629	1.703	2.082	1.883	2.346	1.077
Rh20	1.673	0.189	1.981	0.572	1.605	1.714	1.002	2.034	1.499	2.459	1.746	1.402
Rh21	1.988	0.409	1.735	0.194	2.179	1.809	1.149	1.309	2.327	2.618	1.858	0.978
Rh22	2.314	0.388	2.067	0.449	1.901	0.781	1.302	1.573	2.402	1.764	2.559	2.013
Rh23	2.479	0.297	0.762	0.091	0.886	1.014	0.823	0.964	1.624	2.393	1.473	1.643
Rh24	3.006	0.443	1.659	0.103	1.006	1.447	0.764	1.742	1.738	2.405	2.544	1.589

(A) y = 5311805x-27489 R² = 0.9986

(B) y = 5362761x-43121 R² = 0.9992

(C) y = 4887728x-3665 R² = 0.9994

(D) y = 4934766x-6736 R² = 0.9995

(E) y = 5469086x-4318 R² = 0.9993

(F) y = 9928489x-10565 R² = 0.9997

(G) y = 8915511x- 10171 R² = 0.9997

(H) y= 7532254x-5767 R² = 0.9995

Mass of aloe-emodin-8-o-β-D-glucoside (ug)

Mass of rhein-8-o-β-D-glucoside (ug)

Mass of chrysophanol-8-o-β-D-glucoside (ug)

Mass of emodin-8-o-β-D-glucoside (ug)

Mass of physcion-8-o-β-D-glucoside (ug)

Mass of aloe-emodin (ug)

Mass of rhcin (ug)

Mass of emodin (ug)

Figure 1. The linear relationship between the concentration of each analyte anthraquinone derivative UPLC injection and peak area, the red dotted line represent the 95% confidence ellipses of each component.