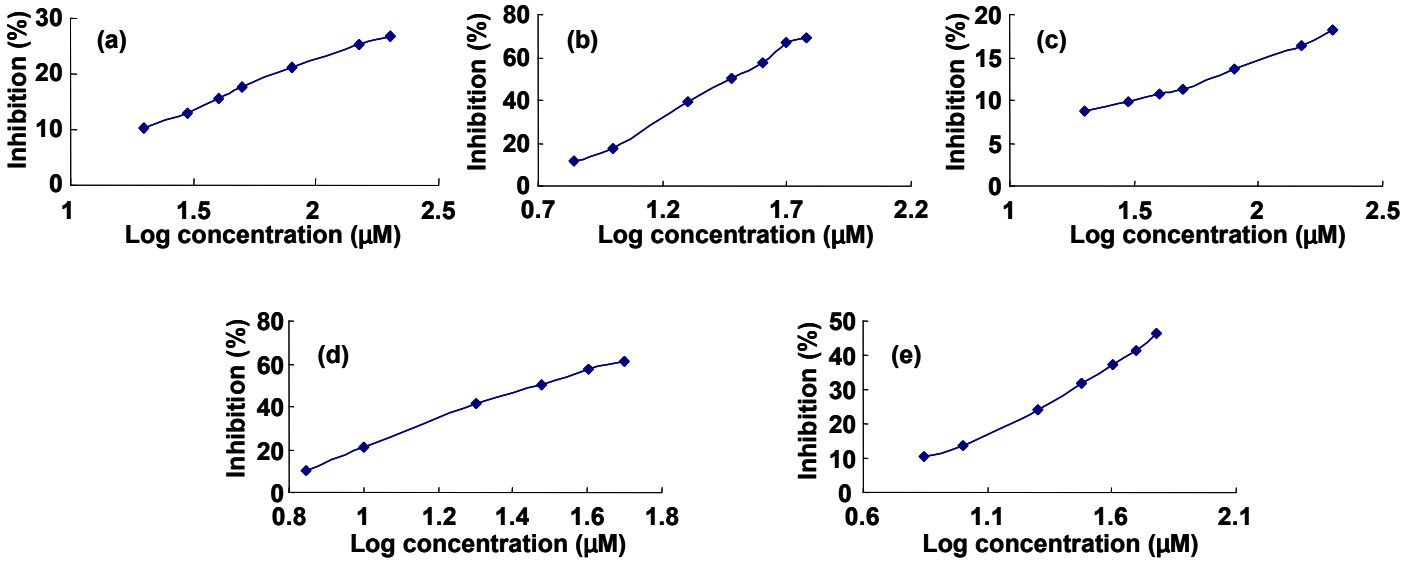
Electronic Supplementary Material (ESI) for Analytical Methods.

Fig. S1 Photograph of the hyphenation of circulated ultrasound-assisted extraction (CUAE), solvent concentration tank (SCT), centrifugal partition chromatography (CPC), and ultra-high performance liquid chromatography (UPLC)/PDA.

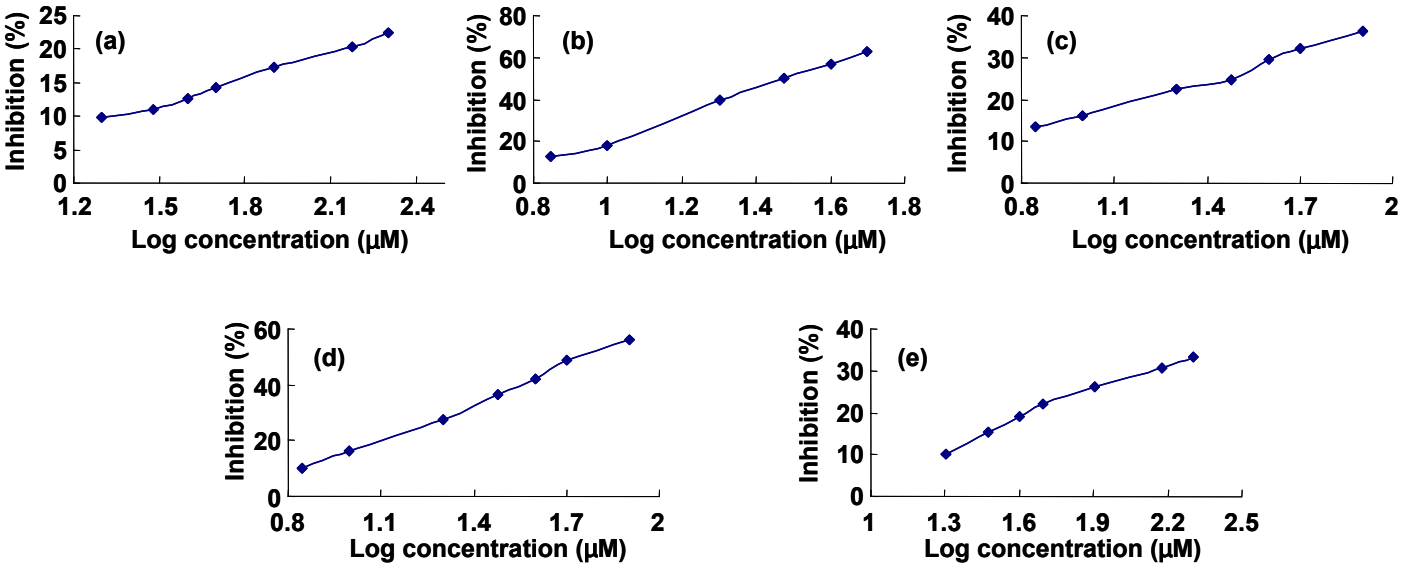
1: circulated ultrasound-assisted extraction (CUAE); 2: pump 1; 3: solvent concentration tank (SCT); 4: mobile phase bottle and the left six-port valve; 5: pump 3; 6: fraction collector; 7: centrifugal partition chromatography (CPC); 8: the right six-port valve; 9: ultra-high performance liquid chromatography couple with PDA detector (UPLC/PDA).

Fig. S2 Dose-dependent curves of chlorogenic acid, oleuropein aglycone, dicaffeoylquinic acid, syringin and rutin.



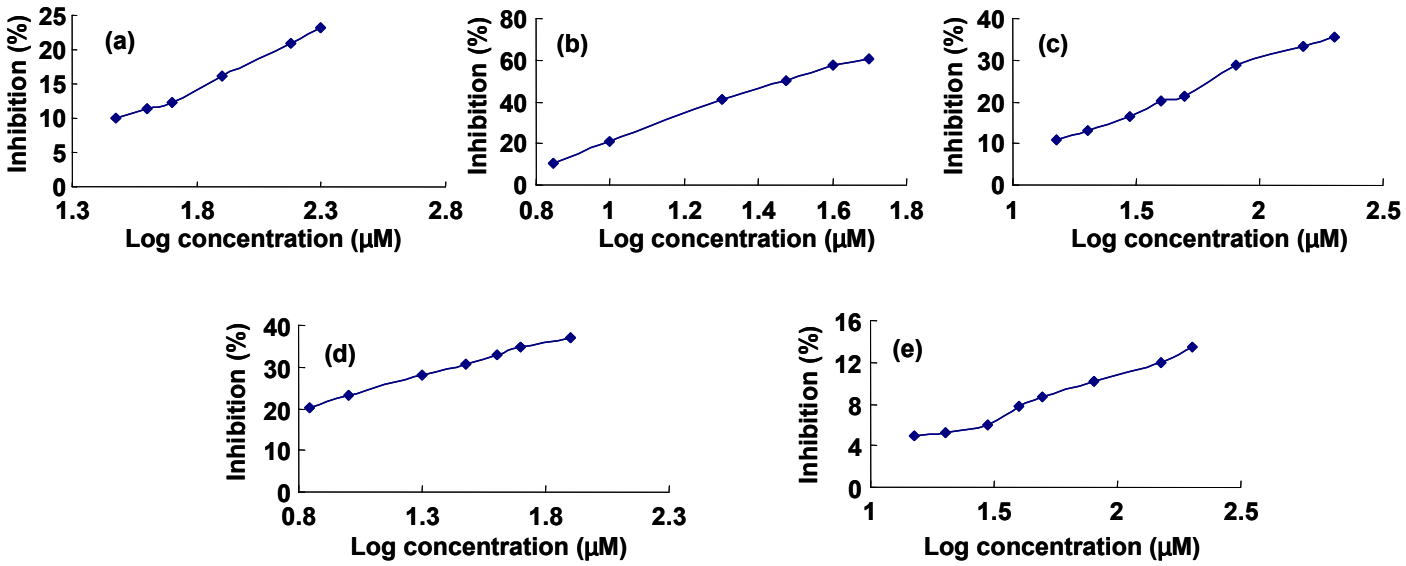
(a) chlorogenic acid, (b) oleuropein aglycone, (c) dicaffeoylquinic acid, (d) syringin and (e) rutin

Fig. S3 Dose-dependent curves of kaempferol–3–*O*–rutinosidem, luteoloside, acteoside, isoacteoside and isoquercetin.



(a) kaempferol–3–*O*–rutinosidem, (b) luteoloside, (c) acteoside, (d) isoacteoside and (e) isoquercetin

Fig. S4 Dose-dependent curves of astragalin, syringopicroside, ligstroside, oleuropein and syringopicroside aglycone.



(a) astragalin, (b) syringopicroside, (c) ligstroside, (d) oleuropein and (e) syringopicroside aglycone

Table S1. Ultra-high performance liquid chromatography (UPLC)/PDA peak area of the compounds of the centrifugal partition chromatography (CPC) fractions 18–54 and the activities of the fractions.

Fraction [a]	UPLC/PDA peak area (mAu/s)					activities ± S.D. (n = 3)	The functions
	luteoloside	isoquercetin	astragalin	isoacteoside	acteoside		
18	15547	–	–	–	–	24.56 % ± 2.65 %	log 15547 • x_7 = 24.56%[b]
19	23521	–	–	–	–	26.21 % ± 2.21 %	log 23521 • x_7 = 26.21 %
21	33565	1654	–	–	–	30.92 % ± 2.46 %	log 33565 • x_7 + log 1654 • x_8= 30.92 %
22	29378	8998	–	–	–	31.33 % ± 3.16 %	log 29378 • x_7 + log 8998• x_8= 31.33 %
23	23732	19225	–	–	–	32.08 % ± 3.21 %	log 23732 • x_7 + log 19225 • x_8= 32.08 %
24	13034	33365	–	–	–	31.00 % ± 2.96 %	log 13034 • x_7 + log 33365 • x_8= 31.00 %
25	8554	36413	–	–	–	30.04 % ± 2.67 %	log 8554 • x_7 + log 36413 • x_8= 30.04 %
26	6332	31554	–	–	–	28.14 % ± 2.85 %	log 6332 • x_7 + log 31554 • x_8= 28.14 %
27	1445	20223	–	–	–	24.56 % ± 2.46 %	log 1445 • x_7 + log 20223 • x_8= 24.56 %
28	596	8545	–	–	–	22.50 % ± 2.13 %	log 596 • x_7 + log 8545 • x_8= 22.50 %
32	–	–	19665	565	–	14.85 % ± 2.24 %	log 19665 • x_9 + log 565 • x_{10} = 14.85 %
33	–	–	22565	1022	–	15.38 % ± 2.03 %	log 22565 • x_9 + log 1022 • x_{10} = 15.38 %
34	–	–	18554	6552	–	18.75 % ± 2.06 %	log 18554 • x_9 + log 6552 • x_{10} = 18.75 %
35	–	–	9954	10221	–	20.02 % ± 1.96 %	log 9954 • x_9 + log 10221 • x_{10} = 20.20 %
36	–	–	6521	28251	–	21.21 % ± 2.64 %	log 6521 • x_9 + log 28251 • x_{10} = 21.21 %
37	–	–	1225	40445	–	21.48 % ± 2.87 %	log 1225 • x_9 + log 40445 • x_{10} = 21.48 %
38	–	–	685	47998	–	21.94 % ± 2.36 %	log 685 • x_9 + log 47998 • x_{10} = 21.94 %
40	–	–	–	54738	–	19.47% ± 2.25 %	log 54738 • x_{10} = 19.47 %
41	—	–	–	55445	–	19.05% ± 2.51 %	log 55445 • x_{10} = 19.05 %
42	–	–	–	54665	–	20.12% ± 2.27 %	log 54665 • x_{10} = 20.12%
43	–	–	–	52544	–	19.11% ± 2.68 %	log 52544 • x_{10} = 19.11 %
44	–	–	–	50022	–	18.75% ± 2.55 %	log 50022 • x_{10} = 18.75 %
45	–	–	–	48541	–	18.45% ± 2.31 %	log 48541 • x_{10} = 18.45 %
46	–	–	–	42155	–	18.10 % ± 2.29 %	log 42155 • x_{10} = 18.10 %
49	–	–	–	34312	520	23.12 % ± 2.65 %	log 34312 • x_{10} + log 520 • x_{11} = 23.12 %
50	–	–	–	25221	3545	24.61 % ± 2.65 %	log 25221 • x_{10} + log 3545 • x_{11} = 23.12 %
51	–	–	–	16866	9331	24.44 % ± 2.14 %	log 16866 • x_{10} + log 9331 • x_{11} = 23.12 %
52	–	–	–	10021	10011	22.89 % ± 2.29 %	log 10021 • x_{10} + log 10011 • x_{11} = 23.12 %
53	–	–	–	8875	3995	21.71 % ± 2.45 %	log 8875 • x_{10} + log 3995 • x_{11} = 23.12 %
54	–	–	–	7532	823	17.99 % ± 1.95 %	log 7532 • x_{10} + log 823 • x_{11} = 17.99 %

[a] Since the analysis error of the compound with peak areas less than 500 was relatively large, the fractions that contain the compounds with a peak area less than 500 were omitted.
[b] x_7–x_{11}: the tyrosinase inhibition ability coefficients of luteoloside, isoquercetin, astragalin, isoacteoside, and acteoside, respectively.

Table S2. Ultra-high performance liquid chromatography (UPLC)/PDA peak area of the compounds of the centrifugal partition chromatography (CPC) fractions 57–99 and the activities of the fractions.

fraction [a]	UPLC/PDA peak area (mAu/s)					activities (n=3)	the functions
	isoacteoside	syringopicroside	ligstroside	oleuropein	syringopicroside aglycone		
57	1821	1654	–	–	–	29.35 % ± 2.29 %	log 1821 • x_{10} + log 1654 • x_{12}= 29.35 % [b]
58	984	3198	–	–	–	29.22 % ± 2.45 %	log 984 • x_{10} + log 3198 • x_{12}= 29.32 %
59	565	5725	–	–	–	29.84 % ± 2.82 %	log 565 • x_{10} + log 5725 • x_{12}= 29.84 %
70	–	29664	–	–	–	23.45 % ± 2.84 %	log 29664 • x_{12}= 23.45 %
64	–	35223	–	–	–	23.25 % ± 2.75 %	log 35223 • x_{12}= 23.25 %
65	–	42554	–	–	–	23.60 % ± 2.94 %	log 42554 • x_{12}= 23.60 %
66	–	49854	–	–	–	23.95 % ± 2.75 %	log 49854 • x_{12}= 23.95 %
69	–	56221	–	–	–	24.15 % ± 2.68 %	log 56221 • x_{12}= 24.15 %
70	–	58225	–	–	–	24.51 % ± 2.33 %	log 58225 • x_{12}= 24.51 %
71	–	63221	–	–	–	24.33 % ± 2.45 %	log 63221 • x_{12}= 24.33 %
72	–	64574	–	–	–	24.85 % ± 2.16 %	log 64574 • x_{12}= 24.85 %
73	–	62221	–	–	–	24.22 % ± 2.25 %	log 62221 • x_{12}= 24.22 %
74	–	60221	–	–	–	23.65 % ± 2.34 %	log 60221 • x_{12}= 23.65 %
75	–	58665	–	–	–	23.55 % ± 2.41 %	log 58665 • x_{12}= 23.55 %
76	–	52336	–	–	–	22.84 % ± 2.18 %	log 52336 • x_{12}= 22.84 %
77	–	42114	–	–	–	22.06 % ± 1.94 %	log 42114 • x_{12}= 22.06 %
78	–	28223	–	–	–	21.22 % ± 2.27 %	log 28223 • x_{12}= 21.22 %
79	–	18545	–	–	–	21.39 % ± 2.21 %	log 18545 • x_{12}= 21.39 %
82	–	11021	685	–	–	26.15 % ± 2.54 %	log 11021 • x_{12} + log 685 • x_{13} = 26.15 %
83	–	8458	854	–	–	25.68 % ± 2.92 %	log 8458 • x_{12} + log 854 • x_{13} = 25.68 %
88	–	5556	1321	–	552	35.54 % ± 3.05 %	log 5556 • x_{12} + log 1321 • x_{13} + log 552 • x_{15} = 35.54 %
89	–	4221	1822	–	568	35.21 % ± 3.11 %	log 4221 • x_{12} + log 1822 • x_{13} + log 568 • x_{15} = 35.21 %
90	–	3021	4552	–	985	36.15 % ± 2.98 %	log 3021 • x_{12} + log 4552 • x_{13} + log 985 • x_{15} = 36.15 %
96	–	865	9665	1021	2654	39.71 % ± 3.45 %	log 865 • x_{12} + log 9665 • x_{13} + log 1021 • x_{14} + log 2654 • x_{15} = 39.71 %
97	–	665	10313	2554	2221	40.23 % ± 3.27 %	log 665 • x_{12} + log 10313 • x_{13} + log 2554 • x_{14} + log 2221 • x_{15} = 40.23 %
98	–	632	9752	4328	1254	40.71 % ± 2.98 %	log 632 • x_{12} + log 9752 • x_{13} + log 4328 • x_{14} + log 1254 • x_{15} = 40.71 %

[a] Since the analysis error of the compound with peak areas less than 500 was relatively large, the fractions that contain the compounds with a peak area less than 500 were omitted.

[b] x_{10}, x_{12}–x_{15}: the tyrosinase inhibition ability coefficients of isoacteoside, syringopicroside, ligstroside, oleuropein, and syringopicroside aglycone, respectively.