Table 1. Retention time of flavonoid aglycones and internal standard in various feces by HPLC analysis

Compounds	Retention time (min)		
	Rabbit feces	Rat feces	Human feces
Morin	4.8	6.2	10.8
Daidzein	5.1	7.0	11.5
Luteolin	5.8	9.3	14.7
Quercetin	6.2	10.6	15.8
Genistein	9.3	15.2	29.8
Naringenin	9.4	17.1	30.3
Apigenin	9.8	17.2	31.1
Hesperetin	10.2	17.9	32.6
Diosmetin	10.2	18.4	32.9
Kaempferol	10.6	18.5	33.5
Baicalein	11.1	18.7	34.3
Neophellamuretin	22.1	41.6	53.3
Wogonin	26.0	48.3	59.0
5,7-Dimethoxycoumarin	14.8	21.0	36.8

Table 2. Concentrations of hesperetin after incubation of hesperidin with rabbit, rat and human feces at 37℃

Incubation time (h)	Hesperetin (μg/mL)		
	Rabbit feces	Rat feces	Human feces
0	21.4 ± 0.2	5.4 ± 0.1	40.6 ± 2.0
1	39.9 ± 0.4	18.7 ± 0.3	39.1 ± 1.6
2	39.8 ± 1.6	22.4 ± 0.6	37.5 ± 1.1
4	38.2 ± 3.0	26.6 ± 1.4	35.0 ± 1.5
8	38.2 ± 2.2	22.4 ± 1.6	32.5 ± 1.4

Data are expressed as mean ± S.D. (n=3)

Table 3. Concentrations of naringenin after incubation of naringin with rabbit, rat and human feces at 37℃

Incubation time (h)	Naringenin (μg/mL)		
	Rabbit feces	Rat feces	Human feces
0	3.8 ± 0.2	4.0 ± 0.5	10.4 ± 0.4
1	26.8 ± 2.4	21.4 ± 0.6	32.8 ± 2.1
2	24.9 ± 2.3	25.8 ± 0.4	31.7 ± 0.7
4	20.3 ± 1.7	18.8 ± 1.0	27.9 ± 1.0
8	7.5 ± 1.3	10.4 ± 0.3	22.0 ± 1.4

Data are expressed as mean ± S.D. (n=3)

Table 4. Concentrations of quercetin after incubation of rutin with rabbit, rat and human feces at 37℃

Incubation time (h)	Quercetin (μg/mL)		
	Rabbit feces	Rat feces	Human feces
0	31.1 ± 1.6	17.2 ± 0.3	53.9 ± 0.4
1	45.4 ± 0.4	36.4 ± 1.5	51.0 ± 0.5
2	43.0 ± 1.6	32.7 ± 0.7	50.7 ± 0.4
4	39.0 ± 1.0	20.1 ± 1.0	44.2 ± 2.6
8	38.2 ± 1.7	7.6 ± 0.5	33.3 ± 0.2

Data are expressed as mean ± S.D. (n=3)

Table 5. Concentrations of neophellamuretin after incubation of phellamurin with rabbit, rat and human feces at 37℃

Incubation time (h)	Neophellamuretin (μg/mL)		
	Rabbit feces	Rat feces	Human feces
0 h	41.5 ± 1.2	67.2 ± 0.8	64.7 ± 1.2
1 h	0.4 ± 0.1	57.2 ± 0.5	24.4 ± 0.2
2 h	N.D.*	45.1 ± 1.8	9.6 ± 0.7
4 h	N.D.	34.6 ± 1.4	N.D.
8 h	N.D.	16.7 ± 0.3	N.D.

Data are expressed as mean ± S.D. (n=3)

* N.D.= not detected

Table 6. Contents (μg/mL) of metabolites after incubation of daidzin and genistin with rabbit and rat feces at 37℃

	Rabbit fecal flora		Rat fecal flora	
Incubation time (h)	Daidzein	Genistein	Daidzein	Genistein
0	38.2 ± 0.8	61.8 ± 2.1	45.9 ± 0.8	55.3 ± 0.6
1	39.2 ± 0.2	63.1 ± 1.1	44.8 ± 0.7	50.1 ± 0.4
2	39.0 ± 0.4	60.7 ± 1.1	44.2 ± 0.4	35.2 ± 0.4
4	38.3 ± 0.5	58.3 ± 0.1	42.8 ± 0.3	17.0 ± 0.7
8	39.9 ± 0.8	55.7 ± 0.9	39.5 ± 0.2	5.5 ± 0.4

Data are expressed as mean ± S.D. (n=3)

Table 7. Remaining percentages (%) of flavonoid aglycones incubated at 37 ℃ with artificial intestinal juice

Compounds	0 h	1 h	4 h	8 h	24 h
Daidzein	100.0 ± 3.8	97.1 ± 3.4	99.4 ± 2.6	100.4 ± 0.4	103.7 ± 3.7
Genistein	100.0 ± 4.8	99.3 ± 1.5	98.3 ± 1.0	102.2 ± 1.6	102.3 ± 2.2
Hesperetin	100.0 ± 3.3	96.5 ± 2.5	101.7 ± 4.3	103.8 ± 1.7	101.7 ± 3.6
Apigenin	100.0 ± 4.7	97.4 ± 3.4	95.2 ± 6.2	88.6 ± 6.1	95.7 ± 2.1
Wogonin	100.0 ± 1.6	100.2 ± 4.5	98.6 ± 0.4	100.2 ± 1.3	95.3 ± 1.5
Luteolin	100.0 ± 1.4	98.7 ± 1.9	99.1 ± 0.8	100.5 ± 2.7	94.4 ± 1.4
Morin	100.0 ± 6.4	97.7 ± 2.6	98.3 ± 4.3	96.6 ± 2.0	94.3 ± 0.3
Naringenin	100.0 ± 9.0	94.6 ± 3.7	96.1 ± 6.1	95.2 ± 3.6	93.7 ± 3.6
Kaempferol	100.0 ± 4.8	98.8 ± 0.7	97.8 ± 2.2	97.3 ± 1.2	93.1 ± 1.8
Quercetin	100.0 ± 5.7	98.1 ± 3.4	96.0 ± 3.1	92.1 ± 3.5	87.2 ± 0.6
Diosmetin	100.0 ± 6.0	91.3 ± 4.8	88.2 ± 4.2	82.1 ± 5.5	83.6 ± 5.3
Baicalein	100.0 ± 3.5	85.8 ± 5.2	65.2 ± 3.2	53.9 ± 2.7	31.5 ± 1.7
Neophella-muretin	100.0 ± 1.9	101.4 ± 1.1	98.4 ± 4.4	102.9 ± 1.6	101.4 ± 1.9

Data are expressed as mean ± S.D. (n=3)

Table 8. Remaining percentages (%) of flavonoid aglycones incubated at 37 ℃ with rabbit feces

Compounds	0 h	1 h	4 h	8 h	24 h
Wogonin	100.0 ± 3.9	92.8 ± 1.7	80.8 ± 2.7	73.8 ± 5.4	55.0 ± 8.8
Diosmetin	100.0 ± 3.9	89.3 ± 2.5	79.4 ± 4.4	68.7 ± 4.1	42.3 ± 3.3
Hesperetin	100.0 ± 3.1	90.5 ± 3.0	81.3 ± 2.2	67.7 ± 1.1	33.6 ± 2.6
Baicalein	100.0 ± 2.1	60.4 ± 1.2	58.1 ± 1.2	41.5 ± 1.2	22.6 ± 2.4
Morin	100.0 ± 2.5	77.9 ± 1.5	56.9 ± 1.1	41.9 ± 3.2	19.6 ± 5.3
Genistein	100.0 ± 0.7	94.5 ± 1.9	66.8 ± 1.5	67.3 ± 0.7	8.8 ± 0.5
Daidzein	100.0 ± 3.1	94.3 ± 3.8	63.8 ± 7.4	33.0 ± 3.1	4.4 ± 0.8
Quercetin	100.0 ± 3.1	9.8 ± 1.4	1.8 ± 0.2	2.0 ± 0.4	1.6 ± 0.4
Naringenin	100.0 ± 2.8	29.7 ± 6.1	11.7 ± 1.9	1.0 ± 0.4	N.D. [#]
Luteolin	100.0 ± 0.9	6.3 ± 1.8	0.9 ± 0.0	0.6 ± 0.2	N.D.
Kaempferol	100.0 ± 4.1	11.8 ± 5.2	0.9 ± 0.4	0.4 ± 0.2	N.D.
Apigenin	100.0 ± 12.9	N.D.	N.D.	N.D.	N.D.
Neophella-muretin	100.0 ± 5.5	N.D.	N.D.	N.D.	N.D.

Data are expressed as mean ± S.D. (n=3)

[#] N.D.= not detected

Table 9. Remaining percentages (%) of flavonoid aglycones incubated at 37 ℃ with rat feces

Compounds	0 h	1 h	4 h	8 h	24 h
Wogonin	100.0 ± 1.4	97.1 ± 2.4	94.0 ± 6.6	93.4 ± 1.4	90.0 ± 3.6
Diosmetin	100.0 ± 2.4	99.6 ± 2.4	79.4 ± 0.9	67.6 ± 0.6	62.9 ± 2.3
Hesperetin	100.0 ± 2.8	91.4 ± 0.4	75.5 ± 2.0	48.5 ± 2.1	17.0 ± 0.8
Baicalein	100.0 ± 2.3	84.0 ± 4.0	58.8 ± 0.6	55.3 ± 1.5	32.8 ± 0.5
Morin	100.0 ± 1.2	96.2 ± 1.8	90.7 ± 4.8	74.9 ± 0.9	52.8 ± 3.3
Genistein	100.0 ± 3.7	90.3 ± 2.8	55.4 ± 4.3	39.3 ± 1.4	5.9 ± 0.3
Daidzein	100.0 ± 3.2	96.3 ± 2.4	82.8 ± 5.0	70.7 ± 0.5	23.7 ± 0.9
Quercetin	100.0 ± 5.8	67.9 ± 1.0	23.6 ± 1.6	9.6 ± 0.3	4.2 ± 0.4
Naringenin	100.0 ± 3.1	94.1 ± 2.6	55.8 ± 1.5	40.6 ± 2.2	15.8 ± 1.2
Luteolin	100.0 ± 2.3	87.7 ± 2.5	54.9 ± 2.2	33.4 ± 0.7	6.2 ± 0.3
Kaempferol	100.0 ± 2.7	78.7 ± 1.9	9.1 ± 0.1	4.0 ± 0.1	2.0 ± 0.1
Apigenin	100.0 ± 4.6	91.3 ± 2.0	73.0 ± 2.0	35.8 ± 0.9	18.8 ± 0.6
Neophella-muretin	100.0 ± 7.1	52.3 ± 3.1	49.4 ± 3.0	47.4 ± 3.0	44.7 ± 2.6

Data are expressed as mean ± S.D. (n=3)

Table 10. Remaining percentages (%) of flavonoid aglycones incubated at 37 ℃ with human feces

Compounds	0 h	1 h	4 h	8 h	24 h
Wogonin	100.0 ± 6.2	97.4 ± 3.6	97.2 ± 3.7	98.2 ± 4.9	88.7 ± 1.9
Daidzein	100.0 ± 2.2	94.1 ± 2.9	94.1 ± 1.5	87.3 ± 2.0	83.2 ± 2.0
Diosmetin	100.0 ± 6.2	96.2 ± 0.6	88.7 ± 2.2	86.1 ± 1.7	74.3 ± 2.7
Apigenin	100.0 ± 0.5	100.0 ± 0.8	97.8 ± 3.5	88.3 ± 2.7	71.2 ± 1.1
Kaempferol	100.0 ± 4.1	98.1 ± 0.7	92.3 ± 2.2	82.8 ± 1.4	67.4 ± 2.7
Leuteolin	100.0 ± 4.0	94.7 ± 1.6	90.5 ± 2.9	79.9 ± 2.4	61.6 ± 3.0
Naringenin	100.0 ± 0.5	95.5 ± 1.3	91.3 ± 2.3	83.0 ± 1.9	59.5 ± 3.6
Quercetin	100.0 ± 5.8	97.2 ± 3.7	92.1 ± 1.1	81.4 ± 2.5	53.5 ± 1.2
Hesperetin	100.0 ± 1.2	97.8 ± 0.2	93.9 ± 0.8	83.0 ± 0.1	53.4 ± 2.1
Baicalein	100.0 ± 6.7	95.2 ± 4.8	89.5 ± 0.5	68.5 ± 1.1	51.2 ± 0.6
Genistein	100.0 ± 3.4	98.4 ± 2.2	88.7 ± 1.9	69.4 ± 3.3	43.1 ± 0.1
Morin	100.0 ± 1.6	82.2 ± 0.8	82.1 ± 3.4	64.9 ± 4.4	28.0 ± 1.2

Data are expressed as mean ± S.D. (n=3)

Table 11. Degradation slope (r) of flavonoid aglycones incubated at 37 ℃ with rabbit, rat, human feces and artificial intestinal juice

Compounds	Rabbit feces	Rat feces	Human feces	Artificial intestinal juice
Wogonin	-0.0101 (0.9533)	-0.0016 (0.8915)	-0.0019 (0.9381)	-0.0009 (0.8984)
Diosmetin	-0.0147 (0.9921)	-0.0081 (0.8456)	-0.0050 (0.9680)	-0.0024 (0.6789)
Hesperetin	-0.0193 (0.9989)	-0.0320 (0.9961)	-0.0116 (0.9972)	-0.0005 (0.4586)
Baicalein	-0.0252 (0.9533)	-0.0180 (0.9455)	-0.0121 (0.9722)	-0.0193 (0.9689)
Morin	-0.0270 (0.9710)	-0.0117 (0.9916)	-0.0220 (0.9922)	-0.0009 (0.9235)
Genistein	-0.0441 (0.9838)	-0.0507 (0.9988)	-0.0155 (0.9924)	-0.0005 (0.6889)
Daidzein	-0.0572 (0.9990)	-0.0263 (0.9957)	-0.0029 (0.9033)	-0.0009 (0.8768)
Quercetin	-0.0489 (0.6240)	-0.0522 (0.8959)	-0.0115 (0.9993)	-0.0023 (0.9578)
Naringenin	-0.2496 (0.9860)	-0.0323 (0.9774)	-0.0092 (0.9985)	-0.0006 (0.5098)
Luteolin	-0.2424 (0.8579)	-0.0495 (0.9973)	-0.0085 (0.9908)	-0.0010 (0.8542)
Kaempferol	-0.2770 (0.9135)	-0.0639 (0.8281)	-0.0071 (0.9881)	-0.0012 (0.9862)
Apigenin	—*	-0.0302 (0.9577)	-0.0064 (0.9930)	-0.0005 (0.2606)
Neophella-muretin	—*	-0.0082 (0.5634)	—#	0.0003 (0.3574)

* Not detected after one hour*

Not determined

Table 12. Remanence (peak area ratio) of catalpol with heating or with artificial gastric juice

Incubation time (min)	Blank	Heat	Artificial gastric juice
0	0.40 ± 0.01	—*	—*
5	—*	—*	0.07 ± 0.00
10	—*	—*	0.07 ± 0.00
30	—*	—*	0.06 ± 0.00
60	—*	0.39 ± 0.01	0.02 ± 0.00
120	—*	0.39 ± 0.01	0.02 ± 0.00
180	—*	0.39 ± 0.01	0.01 ± 0.00
240	—*	0.38 ± 0.02	0.01 ± 0.00

Data are expressed as mean ± S.D. (n=3)

* Not determined

Table 13. Intraday and interday analytical precision and accuracy of paeoniflorgenin assay in serum (n=3)

Conc. (μg/mL)	Precision		Accuracy	
	Intraday	Interday	Intraday	Interday
	Mean ± S.D. (C.V.%)	Mean ± S.D. (C.V.%)	Relative error (%)	Relative error (%)
12.50	12.21 ± 0.10 (0.8)	12.75 ± 0.48 (3.8)	-2.3	2.0
6.25	6.18 ± 0.13 (2.1)	6.24 ± 0.15 (2.4)	-1.1	-0.1
3.12	3.19 ± 0.03 (1.1)	3.09 ± 0.07 (2.4)	2.1	-1.1
1.56	1.59 ± 0.04 (2.3)	1.55 ± 0.06 (3.9)	1.9	-0.6
0.78	0.75 ± 0.03 (4.1)	0.80 ± 0.04 (4.8)	-4.1	1.8
0.39	0.44 ± 0.02 (4.1)	0.41 ± 0.02 (5.6)	12.3	3.8
0.20	0.21 ± 0.00 (0.9)	0.19 ± 0.01 (7.1)	5.5	-3.5

Table 14. Recovery (%) of paeoniflorgenin from serum (n=3)

Conc. spiked (μg/mL)	Conc. detected in serum	Conc. detected in water	Recovery (Mean ± S.D.)
12.50	12.44	14.04	88.7 ± 3.8
3.12	2.99	3.65	81.9 ± 0.8
0.78	0.88	1.07	82.5 ± 2.0

Table 15. Paeoniflorgenin concentrations (μg/mL) in serum after oral administration of Paeoniae radix decoction to rats (n=6)

Time (min)	1	2	3	4	5	6	Mean ± S.D.
5	7.1	7.8	10.6	5.5	7.8	6.7	7.6 ± 1.7
10	7.0	7.6	9.3	7.6	3.7	4.7	6.7 ± 2.0
30	4.8	8.2	1.5	1.2	3.4	1.5	3.5 ± 2.7
60	2.3	1.6	0.5	0.4	1.5	0.4	1.1 ± 0.8
180	1.9	1.6	0.2	0.4	0.4	0.2	0.8 ± 0.8
300	0.4	0.5	0.3	0.3	0.3	0.2	0.4 ± 0.1
540	0.4	0.5	0.3	0.2	0.3	0.3	0.3 ± 0.1

Table 16. Pharmacokinetic parameters of paeoniflorgenin after oral administration of Paeoniae radix decoction to rats (n=6)

Parameters \ No.	1	2	3	4	5	6	Mean ± S.D.
T_{max} (min)	5	30	5	10	5	5	10 ± 10.0
C_{max} (μg/mL)	7.1	8.2	10.6	7.6	7.8	6.7	8.0 ± 1.4
$T_{1/2}$ (min)	122.1	124.6	123.4	128.1	125.9	133.1	126.2 ± 4.0
AUC (μg • min/mL)	760.3	799.8	367.4	305.8	427.9	260.7	487.0 ± 234.3
MRT (min)	135.8	133.8	127.4	136.6	134. 2	145.4	135.5 ± 5.8

Table 17. Remanence (peak area ratio) of paeoniflorgenin after incubation of paeoniflorin with rabbit, rat, pig and human feces at 37℃

Incubation time (h)	Rabbit	Rat	Pig	Human
0	N.D.*	N.D.	N.D.	N.D.
1	$0.2 \pm 0.0_1$ [#]	$0.7 \pm 0.0_2$	N.D.	$0.2 \pm 0.0_1$
2	$0.2 \pm 0.0_0$	$0.8 \pm 0.0_3$	$0.1 \pm 0.0_0$	$0.3 \pm 0.0_1$
4	$0.2 \pm 0.0_0$	$0.8 \pm 0.0_4$	$0.3 \pm 0.0_1$	$0.5 \pm 0.0_1$
8	$0.2 \pm 0.0_1$	$0.8 \pm 0.0_3$	$0.4 \pm 0.0_2$	$0.7 \pm 0.0_4$
12	$0.2 \pm 0.0_1$	0.9 ± 0.1	$0.4 \pm 0.0_1$	$0.7 \pm 0.0_1$
24	$0.2 \pm 0.0_0$	0.9 ± 0.1	$0.5 \pm 0.0_1$	$0.7 \pm 0.0_2$

Data are expressed as mean ± S.D. (n=3)

* N.D.= not detected

[#] The subscript is used to designate one more figure carried except significant figures.

Table 18. Quercetin contents after hydrolysis of onion and Huaimi with 1.2 N HCl in the presence of various amount of vitamin C at 80℃ for 1 h or 2 h (n=3)

Samples	Amount of Vit. C added (mg)	Heating time (h)	Quercetin content (μg/mL)
Onion	–	–	N.D.*
	–	1	25.0 ± 0.6
	–	2	26.1 ± 0.1
	100	2	27.2 ± 0.4
	50	2	28.3 ± 0.1
	50	1	27.7 ± 0.3
	20	2	28.3 ± 0.1
Huaimi	–	–	N.D.*
	20	1	$2.8 \pm 0.0_1$
	20	2	$2.8 \pm 0.0_2$

* N.D.= not detected

Table 19. Intraday and interday analytical precision and accuracy of quercetin in human feces (n=3)

Conc. (μg/mL)	Precision		Accuracy	
	Intraday	Interday	Intraday	Interday
	Mean ± S.D. (C.V.%)	Mean ± S.D. (C.V.%)	Relative error (%)	Relative error (%)
40.0	40.1 ± 0.1 (0.2)	39.9 ± 1.0 (2.6)	0.2	-0.3
20.0	20.0 ± 0.3 (1.7)	20.0 ± 0.9 (4.3)	-0.1	0.1
10.0	10.5 ± 0.2 (1.9)	10.0 ± 0.7 (6.7)	5.2	0.1
5.0	5.2 ± 0.2 (4.4)	5.1 ± 0.4 (7.7)	3.7	1.3
2.5	2.5 ± 0.1 (3.0)	2.5 ± 0.1 (3.4)	-0.9	0.1
1.2	1.2 ± 0.1 (4.3)	1.2 ± 0.1 (6.7)	-4.4	-3.2
0.6	$0.6 \pm 0.0_3$ (4.6)	$0.6 \pm 0.0_3$ (4.9)	-8.6	-5.5
0.3	$0.3 \pm 0.0_1$ (4.4)	$0.3 \pm 0.0_2$ (6.0)	-19.7	-15.7
0.15	$0.1 \pm 0.0_0$ (2.9)	$0.1 \pm 0.0_1$ (6.5)	-11.3	-16.4

Table 20. Intraday and interday analytical precision and accuracy of quercetin in rat feces (n=3)

Conc. (μg/mL)	Precision		Accuracy	
	Intraday	Interday	Intraday	Interday
	Mean ± S.D. (C.V.%)	Mean ± S.D. (C.V.%)	Relative error (%)	Relative error (%)
40.0	40.2 ± 0.1 (0.3)	40.2 ± 1.0 (0.4)	0.5	0.6
20.0	19.8 ± 0.2 (0.8)	19.4 ± 0.3 (1.8)	-1.2	-2.9
10.0	10.0 ± 0.2 (2.5)	9.7 ± 0.3 (2.7)	0.4	-2.7
5.0	$5.1 \pm 0.\ 0_3$ (0.6)	5.1 ± 0.1 (1.1)	1.2	1.2
2.5	2.6 ± 0.1 (1.9)	2.6 ± 0.1 (2.3)	3.5	3.3
1.2	$1.3 \pm 0.\ 0_1$ (1.2)	$1.3 \pm 0.\ 0_4$ (3.4)	1.9	7.0
0.6	$0.7 \pm 0.0_1$ (1.6)	$0.7 \pm 0.0_2$ (3.1)	17.9	17.5
0.3	$0.3 \pm 0.0_2$ (4.7)	$0.4 \pm 0.0_2$ (4.5)	11.7	12.6
0.15	$0.1 \pm 0.0_0$ (1.2)	$0.1 \pm 0.0_1$ (4.5)	-16.2	-19.0

Table 21. Concentrations (μg/mL) of quercetin after incubation of onion juice and Huaimi infusion with human and rat feces

	Human feces		Rat feces	
Incubation time (h)	Onion	Huaimi	Onion	Huaimi
0	22.3 ± 0.2	11.0 ± 0.2	31.9 ± 2.3	15.9 ± 0.4
1	20.5 ± 0.2	12.8 ± 0.6	25.0 ± 2.3	10.2 ± 0.6
2	17.2 ± 0.7	1.6 ± 0.1	6.7 ± 0.6	$0.6 \pm 0.0_4$
4	11.9 ± 0.9	$0.5 \pm 0.0_3$	$0.8 \pm 0.0_4$	$0.3 \pm 0.0_1$
8	5.7 ± 0.4	$0.4 \pm 0.0_1$	$0.4 \pm 0.0_2$	$0.2 \pm 0.0_1$
12	5.1 ± 0.4	$0.2 \pm 0.0_2$	$0.2 \pm 0.0_1$	$0.2 \pm 0.0_1$
24	2.7 ± 0.1	$0.2 \pm 0.0_1$	$0.1 \pm 0.0_1$	N.D.*

Data are expressed as mean ± S.D. (n=3)

* N.D.= not detected

Table 22. Peak area ratios of quercetin (to internal standard) after incubation of quercetin sulfates with various substances

Incubation time (h)	Artificial intestinal juice	β-Glucuronidase	Rat feces	Human feces
0	N.D. [#]	—	2.2 ± 0.1 ***	2.6 ± 0.2 ***
1	—	—	$0.1 \pm 0.0_1$	N.D.
4	—	$0.7 \pm 0.0_4$	—	—

Data are expressed as mean ± S.D. (n=3)

[#] N.D.= not detected

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ compared with β-Glucuronidase.

Table 23. The concentration ranges, regression equations and their correlation coefficients of anthaquinones in rubarb

Constituents	Concentration (μg/mL)	Regression equation	r^2
Aloe-emodin	0.3 ~ 20.0	Y=0.094X-0.013	0.9993
Rhein	0.6 ~ 40.0	Y=0.093X-0.034	0.9995
Emodin	0.6 ~ 20.0	Y=0.077X-0.026	0.9995
Chysophenol	0.9 ~ 30.0	Y=0.072X-0.027	0.9989

Table 24. Intraday and interday analytical precision and accuracy of aloe-emodin in rat feces (n=3)

Conc. (μg/mL)	Precision		Accuracy	
	Intraday	Interday	Intraday	Interday
	Mean ± S.D. (C.V.%)	Mean ± S.D. (C.V.%)	Relative error (%)	Relative error (%)
20.0	20.1 ± 0.1 (0.5)	20.3 ± 0.1 (0.6)	0.4	1.6
10.0	9.5 ± 0.1 (0.9)	9.7 ± 0.1 (1.0)	-5.0	-2.9
5.0	4.8 ± 0.1 (1.9)	5.0 ± 0.1 (2.5)	-3.2	0.3
2.5	$2.5 \pm 0.0_0$ (0.0_2)	2.5 ± 0.1 (4.0)	-0.4	-0.5
1.2	$1.4 \pm 0.0_0$ (0.1)	1.4 ± 0.1 (5.7)	8.0	9.6
0.6	$0.7 \pm 0.0_0$ (0.1)	$0.7 \pm 0.0_1$ (0.8)	15.8	17.0
0.3	$0.4 \pm 0.0_0$ (0.7)	$0.4 \pm 0.0_0$ (0.9)	17.2	19.0

Table 25. Intraday and interday analytical precision and accuracy of rhein in rat feces (n=3)

Conc. (μg/mL)	Precision		Accuracy	
	Intraday	Interday	Intraday	Interday
	Mean ± S.D. (C.V.%)	Mean ± S.D. (C.V.%)	Relative error (%)	Relative error (%)
40.0	40.5 ± 0.1 (0.2)	40.2 ± 0.3 (0.8)	1.2	0.5
20.0	19.5 ± 0.1 (0.3)	19.3 ± 0.1 (0.4)	-2.7	-3.3
10.0	$10.0 \pm 0.0_4$ (0.4)	9.8 ± 0.1 (1.5)	-0.5	-2.5
5.0	$5.0 \pm 0.0_1$ (0.3)	4.8 ± 0.1 (2.4)	-0.7	-3.3
2.5	$2.7 \pm 0.0_4$ (1.6)	2.8 ± 0.1 (3.0)	6.4	10.6
1.2	$1.4 \pm 0.0_2$ (1.6)	1.5 ± 0.1 (3.8)	13.2	17.8
0.6	$0.7 \pm 0.0_0$ (0.4)	$0.7 \pm 0.0_1$ (1.1)	19.8	19.8

Table 26. Intraday and interday analytical precision and accuracy of emodin in rat feces (n=3)

Conc. (μg/mL)	Precision		Accuracy	
	Intraday	Interday	Intraday	Interday
	Mean ± S.D. (C.V.%)	Mean ± S.D. (C.V.%)	Relative error (%)	Relative error (%)
20.0	20.2 ± 0.1 (0.4)	20.1 ± 0.1 (0.6)	1.1	0.4
10.0	$9.8 \pm 0.0_4$ (0.4)	9.7 ± 0.1 (1.0)	-2.2	-3.4
5.0	$5.0 \pm 0.0_1$ (0.1)	5.0 ± 0.1 (1.2)	-0.4	-0.6
2.5	$2.4 \pm 0.0_2$ (0.7)	$2.5 \pm 0.0_4$ (1.5)	-3.4	-0.9
1.2	$1.3 \pm 0.0_0$ (0.3)	$1.4 \pm 0.0_1$ (0.3)	7.5	8.1
0.6	$0.7 \pm 0.0_0$ (0.3)	$0.7 \pm 0.0_0$ (0.4)	18.6	19.5

Table 27. Intraday and interday analytical precision and accuracy of chrysophanol in rat feces (n=3)

Conc. (μg/mL)	Precision		Accuracy	
	Intraday	Interday	Intraday	Interday
	Mean ± S.D. (C.V.%)	Mean ± S.D. (C.V.%)	Relative error (%)	Relative error (%)
30.0	30.1 ± 0.2 (0.6)	30.6 ± 0.3 (1.0)	0.4	1.9
15.0	14.0 ± 0.1 (0.9)	14.4 ± 0.3 (2.4)	-6.5	-3.9
7.5	$7.6 \pm 0.0_2$ (0.3)	7.5 ± 0.1 (1.2)	0.7	-0.4
3.8	$3.9 \pm 0.0_4$ (0.9)	3.8 ± 0.1 (1.5)	3.5	1.0
1.9	$1.9 \pm 0.0_2$ (1.1)	1.8 ± 0.1 (5.4)	3.5	-3.7
0.9	$1.0 \pm 0.0_1$ (1.4)	$1.0 \pm 0.0_1$ (1.5)	10.9	7.6

Table 28. Concentrations (μg/mL) of aloe-emodin, rhein, emodin and chrysophanol after incubation of rubarb decoction with rat feces

Incubation time (h)	Aloe-emodin	Rhein	Emodin	Chrysophanol
0	9.4 ± 0.3	19.0 ± 0.3	9.1 ± 0.3	12.5 ± 0.3
1	$3.7 \pm 0.0_3$	8.7 ± 0.3	5.1 ± 0.1	7.9 ± 0.5
3	1.4 ± 0.1	3.2 ± 0.2	2.1 ± 0.1	4.2 ± 0.3
6	$0.8 \pm 0.0_3$	$2.1 \pm 0.0_1$	1.3 ± 0.1	$2.4 \pm 0.0_4$
9	1.7 ± 0.1	2.3 ± 0.1	1.4 ± 0.1	1.9 ± 0.1
12	$0.8 \pm 0.0_3$	1.8 ± 0.1	1.0 ± 0.1	$1.6 \pm 0.0_4$
24	$0.8 \pm 0.0_4$	$1.4 \pm 0.0_4$	$1.0 \pm 0.0_1$	1.4 ± 0.1

Data are expressed as mean ± S.D. (n=3)

Table 29. Remaining percentages (%) of aloe-emodin, rhein, emodin and chrysophanol after incubation with rat feces at 37℃, respectively

Incubation time (h)	Aloe-emodin	Rhein	Emodin	Chrysophanol
0	100.0 ± 1.7	100.0 ± 4.4	100.0 ± 1.0	100.0 ± 1.9
1	46.1 ± 0.9	44.7 ± 0.5	57.8 ± 1.5	46.7 ± 3.0
3	17.5 ± 1.0	17.4 ± 0.3	28.6 ± 2.3	19.7 ± 0.6
6	15.9 ± 0.8	9.4 ± 0.2	14.7 ± 0.7	20.4 ± 1.0
9	14.5 ± 0.3	8.3 ± 0.4	12.0 ± 0.5	19.1 ± 1.2
12	11.1 ± 0.5	7.7 ± 0.6	10.0 ± 0.5	16.3 ± 0.6
24	8.0 ± 0.3	5.5 ± 0.1	7.3 ± 0.5	14.3 ± 0.8

Data are expressed as mean ± S.D. (n=3)

Table 30. Remaining percentages (%) of aloe-emodin, rhein, emodin and chrysophanol after incubation of their mixture at 37℃ with rat feces

Incubation time (h)	Aloe-emodin	Rhein	Emodin	Chrysophanol
0	100.0 ± 1.0	100.0 ± 1.0	100.0 ± 3.1	100.0 ± 2.9
1	41.4 ± 2.2	40.8 ± 0.7	56.8 ± 1.5	61.0 ± 1.0
3	17.7 ± 1.0	15.7 ± 0.9	25.0 ± 0.4	32.5 ± 1.3
6	17.3 ± 0.8	9.8 ± 0.7	19.1 ± 1.2	30.0 ± 1.3
9	14.2 ± 0.5	7.3 ± 0.4	14.5 ± 0.5	25.1 ± 1.3
12	13.5 ± 0.3	6.6 ± 0.4	14.4 ± 0.2	22.4 ± 1.3
24	10.4 ± 0.5	3.8 ± 0.3	8.6 ± 0.6	17.5 ± 0.9

Data are expressed as mean ± S.D. (n=3)

Table 31. Intraday and interday analytical precision and accuracy of rhein in rabbit feces (n=3)

Conc. (μg/mL)	Precision		Accuracy	
	Intraday	Interday	Intraday	Interday
	Mean ± S.D. (C.V.%)	Mean ± S.D. (C.V.%)	Relative error (%)	Relative error (%)
5.0	5.2 ± 0.3 (5.8)	5.3 ± 0.3 (5.4)	+3.8	+5.9
2.5	2.2 ± 0.1 (4.8)	2.3 ± 0.1 (5.8)	-10.3	-6.5
1.2	$1.1 \pm 0.0_1$ (1.0)	1.4 ± 0.1 (6.7)	-14.1	+13.5
0.6	$0.6 \pm 0.\ 0_3$ (4.8)	$0.6 \pm 0.\ 0_4$ (6.8)	+8.7	+11.7
0.3	$0.3 \pm 0.0_2$ (4.8)	$0.3 \pm 0.0_2$ (6.1)	+5.7	-1.1

Table 32. Intraday and interday analytical precision and accuracy of rhein in rat feces (n=3)

Conc. (μg/mL)	Precision		Accuracy	
	Intraday	Interday	Intraday	Interday
	Mean ± S.D. (C.V.%)	Mean ± S.D. (C.V.%)	Relative error (%)	Relative error (%)
30.0	29.8 ± 0.4 (1.3)	29.6 ± 0.3 (1.1)	-0.7	-1.4
20.0	20.7 ± 0.2 (0.9)	20.6 ± 0.1 (0.5)	+3.6	+3.2
10.0	9.5 ± 0.1 (0.9)	9.5 ± 0. 0_4 (0.4)	-4.6	-5.0
5.0	5.3 ± 0.0_4 (0.7)	5.3 ± 0.1 (0.9)	+6.3	+5.7
2.5	2.6 ± 0.1 (3.3)	2.5 ± 0.0_4 (1.5)	+2.8	+1.9
1.2	1.2 ± 0.1 (4.1)	1.1 ± 0.1 (4.4)	-5.4	-9.6
0.6	0.6 ± 0.0_3 (5.2)	0.6 ± 0.0_4 (7.0)	-2.3	-9.0

Table 33. Concentrations (μg/mL) of rhein after incubation of sennosides A (SN-A) and B (SN-B) with rabbit and rat feces

	Rabbit feces		Rat feces	
Incubation time (h)	SN-A	SN-B	SN-A	SN-B
0.5	N.D.*	N.D.	$1.3 \pm 0.0_3$	$1.5 \pm 0.0_4$
1	0.6 ± 0.1	0.6 ± 0.1	$1.9 \pm 0.0_3$	1.8 ± 0.1
3	1.0 ± 0.1	2.2 ± 0.2	3.8 ± 0.1	3.8 ± 0.1
5	3.8 ± 0.4	3.3 ± 0.3	$4.1 \pm 0.0_4$	4.3 ± 0.2
7	3.1 ± 0.5	2.3 ± 0.3	2.3 ± 0.1	2.4 ± 0.2
24	$1.1 \pm 0.0_3$	$0.9 \pm 0.0_2$	$1.0 \pm 0.0_4$	1.0 ± 0.1

Data are expressed as mean ± S.D. (n=3)

* N.D.= not detected

Table 34. Remaining percentages (%) of rhein incubated at 37℃ with rabbit and rat feces

Incubation time (h)	Rabbit feces	Rat feces
0	100.0 ± 1.4	100.0 ± 2.0
1	58.9 ± 0.8	34.8 ± 1.3
3	24.1 ± 6.8	11.5 ± 3.5
6	6.3 ± 12.1	7.8 ± 8.7
9	2.4 ± 5.3	5.9 ± 4.0
24	2.3 ± 1.8	5.6 ± 12.5

Data are expressed as mean ± S.D. (n=3)

Table 35. The concentration ranges, regression equations and their correlation coefficients of flavonoids in Scutellariae Radix

Constituents	Concentration (μg/mL)	Regression equation	r^2
Baicalein	3.1 ~ 200.0	Y=0.017X-0.016	0.9996
Wogonin	0.9 ~ 60.0	Y=0.032X+0.022	0.9995

Table 36. Intraday and interday analytical precision and accuracy of baicalein in rat feces (n=3)

Conc. (μg/mL)	Precision		Accuracy	
	Intraday	Interday	Intraday	Interday
	Mean ± S.D. (C.V.%)	Mean ± S.D. (C.V.%)	Relative error (%)	Relative error (%)
200	197.5 ± 1.1 (0.5)	194.4 ± 2.3 (1.2)	-1.3	-2.8
100	101.0 ± 0.1 (0.1)	101.4 ± 0.6 (0.5)	1.0	1.4
50	51.4 ± 0.3 (0.6)	51.5 ± 0.5 (1.0)	2.8	2.9
25.0	24.8 ± 0.2 (0.6)	24.5 ± 0.4 (1.7)	-0.9	-2.0
12.5	$11.2 \pm 0.0_2$ (0.2)	11.2 ± 0.2 (1.7)	-10.8	-10.4
6.2	$5.5 \pm 0.0_4$ (0.8)	5.7 ± 0.2 (3.3)	-11.5	-8.2
3.1	2.9 ± 0.1 (1.9)	2.9 ± 0.1 (4.5)	-5.6	-8.0

Table 37. Intraday and interday analytical precision and accuracy of wogonin in rat feces (n=3)

Conc. (μg/mL)	Precision		Accuracy	
	Intraday	Interday	Intraday	Interday
	Mean ± S.D. (C.V.%)	Mean ± S.D. (C.V.%)	Relative error (%)	Relative error (%)
60.0	58.3 ± 0.3 (0.5)	59.0 ± 0.9 (1.4)	-2.9	-1.6
30.0	30.7 ± 0.2 (0.7)	30.8 ± 0.1 (0.3)	2.4	2.7
15.0	16.0 ± 0.2 (1.2)	15.8 ± 0.4 (2.4)	6.7	5.1
7.5	7.8 ± 0.1 (1.8)	7.7 ± 0.2 (2.5)	3.5	2.1
3.8	3.5 ± 0.1 (2.0)	3.5 ± 0.1 (1.8)	-7.8	-7.7
1.9	1.6 ± 0.1 (3.5)	1.6 ± 0.1 (4.2)	-14.2	-12.6
0.9	$0.8 \pm 0.0_1$ (1.9)	$0.8 \pm 0.0_2$ (2.8)	-15.5	-15.1

Table 38. Concentrations (μg/mL) of baicalein and wogonin after incubation of S, SFW or HTS decoctions with rat feces

Constituents	Incubation time	S	SFW	HTS
Baicalein	0 h	109.4 ± 4.3	122.6 ± 5.2	98.8 ± 3.4
	1 h	101.1 ± 5.4	107.5 ± 6.1	100.0 ± 2.0
	3 h	87.2 ± 2.9	114.5 ± 6.0	85.7 ± 3.8
	6 h	86.4 ± 4.7	75.3 ± 2.2	75.0 ± 3.0
	9 h	79.8 ± 1.1	71.2 ± 1.3	80.4 ± 2.4
	12 h	61.2 ± 1.7	76.3 ± 2.5	58.4 ± 2.8
	24 h	36.3 ± 1.8	43.0 ± 1.5	49.5 ± 2.5
	36 h	29.3 ± 0.7	27.8 ± 0.9	33.3 ± 1.6
	48 h	16.0 ± 0.5	16.0 ± 0.5	19.5 ± 0.8
Wogonin	0 h	17.5 ± 0.7	19.4 ± 0.7	18.3 ± 0.1
	1 h	16.6 ± 1.2	18.7 ± 0.9	18.4 ± 0.7
	3 h	15.4 ± 0.6	16.8 ± 0.3	15.2 ± 1.0
	6 h	8.7 ± 0.4	9.0 ± 0.5	8.6 ± 0.2
	9 h	2.9 ± 0.2	3.8 ± 0.2	3.5 ± 0.2
	12 h	2.5 ± 0.1	1.7 ± 0.1	3.1 ± 0.1
	24 h	$2.9 \pm 0.0_3$	3.1 ± 0.2	3.1 ± 0.1
	36 h	3.9 ± 0.2	3.4 ± 0.1	$3.9 \pm 0.2^{\dagger}$
	48 h	4.0 ± 0.1	3.6 ± 0.2	4.1 ± 0.1

Data are expressed as mean ± S.D. (n=3)

S: Scutellariae Radix; SFW: Scutellariae Radix fried with wine; and HTS: honey-treated Scutellariae Radix.

Table 39. Remaining percentages (%) of GA and 3-dehydroGA after incubation of glycyrrhizin or licorice decoction incubated at 37℃ with rat feces

	Glycyrrhizin		Licorice decoction	
Incubation time (h)	GA	3-dehydroGA	GA	3-dehydroGA
0	$0.8 \pm 0.0_3$	N.D.*	$0.4 \pm 0.0_1$	N.D.
1	1.7 ± 0.1	N.D.	$0.9 \pm 0.0_2$	N.D.
2	$1.7 \pm 0.0_1$	N.D.	$0.8 \pm 0.0_1$	N.D.
4	3.4 ± 0.1	$0.1 \pm 0.0_1$	$0.7 \pm 0.0_2$	N.D.
8	3.3 ± 0.1	$0.3 \pm 0.0_2$	$0.6 \pm 0.0_2$	N.D.
12	$2.8 \pm 0.0_1$	$0.4 \pm 0.0_1$	$0.6 \pm 0.0_2$	$0.1 \pm 0.0_0$
24	$2.8 \pm 0.0_2$	$0.5 \pm 0.0_2$	$0.7 \pm 0.0_2$	$0.1 \pm 0.0_0$

Data are based on peak area ratios and expressed as mean ± S.D. (n=3)

* N.D.= not detected

Table 40. Remaining percentages (%) of GA and 3-dehydroGA after incubation of glycyrrhizin or licorice decoction incubated at 37℃ with pig feces

	Glycyrrhizin		Licorice decoction	
Incubation time (h)	GA	3-dehydroGA	GA	3-dehydroGA
0	$0.3 \pm 0.0_2$	N.D.*	$0.1 \pm 0.0_0$	N.D.
1	$0.6 \pm 0.0_2$	N.D.	$0.2 \pm 0.0_1$	N.D.
2	$0.6 \pm 0.0_2$	N.D.	$0.2 \pm 0.0_1$	N.D.
4	$0.9 \pm 0.0_2$	N.D.	$0.2 \pm 0.0_2$	N.D.
8	1.4 ± 0.1	$0.2 \pm 0.0_2$	$0.6 \pm 0.0_3$	$0.1 \pm 0.0_0$
12	2.4 ± 0.2	$0.4 \pm 0.0_4$	$0.6 \pm 0.0_2$	$0.1 \pm 0.0_1$
24	2.5 ± 0.4	$0.1 \pm 0.0_1$	$0.7 \pm 0.0_2$	N.D.

Data are based on peak area ratios and expressed as mean ± S.D. (n=3)

* N.D.= not detected

Table 41. Remaining percentages (%) of GA and 3-dehydroGA after incubation of glycyrrhizin or licorice decoction incubated at 37℃ with human feces

	Glycyrrhizin		Licorice decoction	
Incubation time (h)	GA	3-dehydroGA	GA	3-dehydroGA
0	$0.2 \pm 0.0_0$	N.D.*	N.D.	N.D.
1	$1.2 \pm 0.0_4$	N.D.	$0.4 \pm 0.0_1$	N.D.
2	2.4 ± 0.1	N.D.	$0.6 \pm 0.0_2$	N.D.
4	$3.2 \pm 0.0_3$	N.D.	$0.7 \pm 0.0_1$	N.D.
8	3.3 ± 0.1	N.D.	$0.6 \pm 0.0_2$	N.D.
12	3.4 ± 0.1	N.D.	$0.7 \pm 0.0_3$	N.D.
24	$3.3 \pm 0.0_4$	N.D.	$0.7 \pm 0.0_1$	N.D.

Data are based on peak area ratios and expressed as mean ± S.D. (n=3)

* N.D.= not detected

Table 42. Remaining percentages (%) of 18ß-glycyrrhetinic acid after incubation of licorice decoction alone and with honey, fructose or glucose in rat feces

Incubation time (h)	Blank	Honey	Fructose	Glucose
0	$0.4 \pm 0.0_1$	$0.3 \pm 0.0_2$	$0.3 \pm 0.0_2$	$0.2 \pm 0.0_1$
1	$0.8 \pm 0.0_2$	$0.8 \pm 0.0_1$	$0.8 \pm 0.0_2$	$0.9 \pm 0.0_4$
2	$0.7 \pm 0.0_4$	$0.9 \pm 0.0_4$	$0.8 \pm 0.0_3$	$1.0 \pm 0.0_1$
4	$0.8 \pm 0.0_2$	$0.8 \pm 0.0_4$	$0.8 \pm 0.0_3$	$0.9 \pm 0.0_3$
8	$0.7 \pm 0.0_4$	$0.8 \pm 0.0_3$	$0.8 \pm 0.0_3$	$0.9 \pm 0.0_1$
12	$0.6 \pm 0.0_1$	$0.8 \pm 0.0_3$	$0.9 \pm 0.0_4$	$0.9 \pm 0.0_3$
24	$0.6 \pm 0.0_2$	$0.7 \pm 0.0_4$	$0.9 \pm 0.0_2$	$0.9 \pm 0.0_4$

Data are based on peak area ratios and expressed as mean ± S.D. (n=3)

Table 43. Remaining percentages (%) of 3-dehydroglycyrrhetinic acid after incubation of licorice decoction alone and with honey, fructose or glucose in rat feces

Incubation time (h)	Blank	Honey	Fructose	Glucose
0	N.D*	N.D	N.D	N.D
1	N.D	N.D	N.D	N.D
2	N.D	N.D	N.D	N.D
4	$0.1 \pm 0.0_0$	N.D	N.D	N.D
8	$0.1 \pm 0.0_0$	N.D	N.D	$0.01 \pm 0.0_0$
12	$0.2 \pm 0.0_1$	N.D	N.D	$0.01 \pm 0.0_0$
24	$0.1 \pm 0.0_0$	N.D	N.D	$0.02 \pm 0.0_0$

Data are based on peak area ratios and expressed as mean ± S.D. (n=3)

* N.D.= not detected