Table 2 Detection limit of several flavonoids by HPLC

Flavonoids	Detection limit [pmol]
Daidzin	0.1087
Glycitin	0.1478
Genistin	0.0524
Daidzein	0.0798
Glycitein	0.0385
Genistein	0.0814
Equol	0.5664
Formononetin	0.1929
Biochanin A	0.0763
Flavone	0.0943

Conditions of HPLC are as follows.
Apparatus, HP 1100 series; column, STR ODSII (4.6 mmID×250 mm); column oven temperature, 35°C; Mobile phase, (solvent A) water: phosphoric acid 100:1 (v/v), (solvent B) water: acetonitrile: phosphoric acid 200:800:1 (v/v/v), (linear gradient program) B%: 10 (0 min) → 80 (50–52 min) → 10 (53 min); flow rate, 1.0 mL/min; detector, DAD; monitoring wavelength, 260 nm for daidzein, daidzin, genistein, genistin, glycitein, glycitin, biochanin A, formononetin, 280 nm for equol and flavone.

Table 3 Recoveries of standard solutions of flavonoids from Sep-pak plus $C_{18}{}^{R}$ cartridge

Flavonoids	Spiked amounts [nmol]	Recovery [%] Standard
Daidzin	8.69	102.44±1.21
Glycitin	11.82	106.27±1.49
Genistin	10.47	102.23±1.85
Daidzein	15.95	102.66±2.08
Glycitein	7.70	99.56±1.84
Genistein	16.28	104.20±0.07
Equol	11.33	102.85±1.72
Formononetin	15.42	102.85±1.72
Biochanin A	15.27	103.84±0.98

Data are represented as means±SD (n=3).
Each flavonoid was added onto a Sep-pak plus $C_{18}{}^{R}$ cartridge column preconditioned by 10 mL of methanol followed by 10 mL of distilled water. The column was washed with 10 mL of water followed by 2 mL of 20% methanol and flavonoid was eluted by 2 mL of methanol. Eluate was evaporated and redissolved with 2 mL of water. Each flaonoid was determined by HPLC.

Table 4 Recoveries of flavonoids with or without hydrolysis from soy sauce

Flavonoids	Spiked amounts [nmol/mL]	Recovery [%] Without hydrolysis	With hydrolysis
Daidzin	8.69	90.57±6.94	100.52±8.78
Glycitin	11.82	94.19±6.07	90.82±7.37
Genistin	10.47	108.18±3.71	92.28±9.39
Daidzein	15.95	81.16±7.95	80.86±7.58
Glycitein	7.70	105.23±4.07	66.20±6.08
Genistein	16.28	108.63±2.51	82.67±7.85
Equol	11.33	102.73±4.99	101.93±3.02
Formononetin	15.42	103.52±1.13	80.13±7.06
Biochanin A	15.27	101.33±4.43	68.83±5.56

Data are represented as means±SD (n=3).
(1) Without hydrolysis: To one mL of soy sauce, flavone 94.3 nmol as an internal standard and/or each flavonoid was added. They were added onto a Sep-pak plus $C_{18}{}^{R}$ cartridge column preconditioned with 10 mL of methanol followed by 10 mL of distilled water. The column was washed with 10 mL of water followed by 2 mL of 20% methanol, and the flavonoid was eluted with exactly 2 mL of methanol. Each flaonoid was determined by HPLC.
(2) With hydrolysis: To five mL of soy sauce, flavone 94.3 nmol as an internal standard and/or each flavonoid, ten mL of 10N HCl and forty mL of 95.5% ethanol containing 0.05% BHT as an antioxidant were added. Hydrolysis was performed at 100°C for 3 h. Hydrolysate was cooled to a room temperature and centrifuged at 1,000 *g* for 15 min. Supernatant was adjusted to 50 mL with ethanol, then 10 mL was evaporated under the nitrogen stream and redissolved with 10 mL of water and added onto a Sep-pak plus $C_{18}{}^{R}$ cartridge column preconditioned with methanol and water. The column was washed with 10 mL of water followed by 2 mL of 20% methanol, and the flavonoid was eluted with exactly 2 mL of methanol. Each flaonoid was determined by HPLC.

Table 5 Recoveries of flavonoids with or without hydrolysis from soy milk

Flavonoids	Spiked amounts [nmol/mL]	Recovery [%] Without hydrolysis	With hydrolysis
Daidzin	17.38	90.63±9.08	109.87
Glycitin	23.64	83.79±4.60	89.31±1.00
Genistin	20.94	87.51±2.23	84.24
Daidzein	31.90	85.54±7.83	65.03
Glycitein	15.40	92.88±3.97	66.70±3.17
Genistein	32.56	83.03±2.63	91.93
Equol	22.66	88.59±4.28	103.03±8.55
Formononetin	30.84	86.28±3.37	106.97±2.35
Biochanin A	30.54	79.69±4.10	94.81

Data are represented as means±SD (n=3).
(1) Without hydrolysis: To 0.5 mL of soy milk, flavone 94.3 nmol as an internal standard and/or each flavonoid was added. They were added onto a Sep-pak plus $C_{18}{}^{R}$ cartridge column preconditioned with 10 mL of methanol followed by 10 mL of distilled water. The column was washed with 10 mL of water followed by 2 mL of 20% methanol, and the flavonoid was eluted with exactly 2 mL of methanol. Each flaonoid was determined by HPLC.
(2) With hydrolysis: To five mL of soy milk, flavone 94.3 nmol as an internal standard and/or each flavonoid, ten mL of 10N HCl and forty mL of 95.5% ethanol containing 0.05% BHT as an antioxidant were added. Hydrolysis was performed at 100°C for 3 h. Hydrolysate was cooled to a room temperature and centrifuged at 1,000 *g* for 15 min. Supernatant was adjusted to 50 mL with ethanol, then 10 mL was evaporated under the nitrogen stream and redissolved with 10 mL of water and added onto a Sep-pak plus $C_{18}{}^{R}$ cartridge column preconditioned with methanol and water. The column was washed with 10 mL of water followed by 2 mL of 20% methanol, and the flavonoid was eluted with exactly 2 mL of methanol. Each flaonoid was determined by HPLC.

Table 6 Recoveries of flavonoids with or without hydrolysis from soy bean

Flavonoids	Spiked amounts [nmol/g]	Recovery [%] Without hydrolysis	With hydrolysis
Daidzin	434.6	97.25±4.33	94.97±9.19
Glycitin	295.1	94.29±7.96	90.35±4.31
Genistin	523.6	97.28±6.56	96.05±9.04
Daidzein	797.6	106.78±9.75	98.28±8.18
Glycitein	192.4	94.55±1.64	90.47±6.44
Genistein	814.1	112.60±5.98	103.62±5.96
Equol	283.2	103.52±2.44	74.68±0.63
Formononetin	385.4	102.38±2.50	110.47±7.52
Biochanin A	381.7	105.73±4.22	114.14±6.21

Data are represented as means±SD (n=3).
(1) Without hydrolysis: To one g of ground soy bean powder, flavone 943 nmol as an internal standard and/or each flavonoid was added. Flavonoids were extracted with 50 mL of 80% methanol for 24 h after sonification, then centrifuged at 800 *g* for 15 min. The supernatant was adjusted to 50 mL with methanol (extract 1). One mL of the extract 1 was diluted to 10 mL with water and added onto a Sep-pak plus $C_{18}{}^{R}$ cartridge column preconditioned with 10 mL of methanol followed by 10 mL of distilled water. The column was washed with 10 mL of water followed by 2 mL of 20% methanol, and the flavonoid was eluted with exactly 2 mL of methanol. Each flaonoid was determined by HPLC.
(2) With hydrolysis: To one g of ground soy bean powder, flavone 943 nmol as an internal standard and/or each flavonoid, ten mL of 10N HCl and forty mL of 95.5% ethanol containing 0.05% BHT as an antioxidant were added. Hydrolysis was performed at 100°C for 3 h. Hydrolysate was cooled to a room temperature and centrifuged at 1,000 *g* for 15 min. Supernatant was adjusted to 50 mL with ethanol (extract 2). One mL of the extract 2 was diluted to 10 mL with water and added onto a Sep-pak plus $C_{18}{}^{R}$ cartridge column preconditioned with methanol and water. The column was washed with 10 mL of water followed by 2 mL of 20% methanol, and the flavonoid was eluted with exactly 2 mL of methanol. Each flaonoid was determined by HPLC.

Table 7 Recoveries of flavonoids with or without hydrolysis from tofu

Flavonoids	Spiked amounts [nmol/g]	Recovery [%] Without hydrolysis	With hydrolysis
Daidzin	434.6	102.82±0.57	
Glycitin	295.1	102.12±0.92	
Genistin	523.6	100.61±0.28	
Daidzein	797.6	105.77±1.71	
Glycitein	192.4	106.54±3.04	
Genistein	814.1	102.65±1.24	
Equol	283.2	111.01±1.79	
Formononetin	385.4	106.85±1.76	
Biochanin A	381.7	94.09±3.44	

Data are represented as means±SD (n=3).
(1) Without hydrolysis: To one g of crushed tofu, flavone 943 nmol as an internal standard and/or each flavonoid was added. Flavonoids were extracted with 50 mL of 80% methanol for 24 h after sonification, then centrifuged at 800 *g* for 15 min. The supernatant was adjusted to 50 mL with methanol (extract 1). One mL of the extract 1 was diluted to 10 mL with water and added onto a Sep-pak plus $C_{18}{}^{R}$ cartridge column preconditioned with 10 mL of methanol followed by 10 mL of distilled water. The column was washed with 10 mL of water followed by 2 mL of 20% methanol, and the flavonoid was eluted with exactly 2 mL of methanol. Each flaonoid was determined by HPLC.

Table 8 Recoveries of flavonoids with or without hydrolysis from miso

Flavonoids	Spiked amounts [nmol/g]	Recovery [%] Without hydrolysis	With hydrolysis
Daidzin	434.6	100.95±5.94	99.04±9.11
Glycitin	295.1	110.35±1.74	96.85±2.80
Genistin	523.6	105.21±0.11	93.67±6.25
Daidzein	797.6		94.94±0.03
Glycitein	192.4		100.57±0.27
Genistein	814.1		81.90±1.68
Equol	283.2		63.46±2.17
Formononetin	385.4		104.05±1.63
Biochanin A	381.7		91.64±9.17

Data are represented as means±SD (n=3).
(1) Without hydrolysis: To one g of ground miso, flavone 943 nmol as an internal standard and/or each flavonoid was added. Flavonoids were extracted with 50 mL of 80% methanol for 24 h after sonification, then centrifuged at 800 *g* for 15 min. The supernatant was adjusted to 50 mL with methanol (extract 1). One mL of the extract 1 was diluted to 10 mL with water and added onto a Sep-pak plus $C_{18}{}^{R}$ cartridge column preconditioned with 10 mL of methanol followed by 10 mL of distilled water. The column was washed with 10 mL of water followed by 2 mL of 20% methanol, and the flavonoid was eluted with exactly 2 mL of methanol. Each flaonoid was determined by HPLC.
(2) With hydrolysis: To one g of ground miso, flavone 943 nmol as an internal standard and/or each flavonoid, ten mL of 10N HCl and forty mL of 95.5% ethanol containing 0.05% BHT as an antioxidant were added. Hydrolysis was performed at 100°C for 3 h. Hydrolysate was cooled to a room temperature and centrifuged at 1,000 *g* for 15 min. Supernatant was adjusted to 50 mL with ethanol (extract 2). One mL of the extract 2 was diluted to 10 mL with water and added onto a Sep-pak plus $C_{18}{}^{R}$ cartridge column preconditioned with methanol and water. The column was washed with 10 mL of water followed by 2 mL of 20% methanol, and the flavonoid was eluted with exactly 2 mL of methanol. Each flaonoid was determined by HPLC.

Table 9 Contents of phytoestrogen in soy beans and their processed foods (nmol/g fresh weight or nmol/mL)

Sample	Total phytoestrogens						Genuine phytoestrogens					
	Daidzein	Glycitein	Genistein	Equol	Formononetin	Biochanin A	Daidzein	Daidzin	Glycitein	Glycitin	Genistein	Genistin
(1) Soybean [μmol/g]												
大豆(鶴の子大豆, 北海道産)	4476±499	155.5±22.1	3310±352	ND	ND	ND	403.0±31.9	2302±255	16.5±1.0	139.0±23.0	278.8±17.6	1676±138
大豆(米国産)	1669±71	300.7±2.2	1379±345	ND	ND	ND	67.6±2.7	268.7±27.9	26.4±2.1	122.1±0.3	69.2±2.7	288.2±7.9
大豆(米国産)	2845±285	322.6±52.3	2540±184	ND	ND	ND	114.3±14.9	580.6±76.5	31.3±2.5	103.7±9.9	100.3±1.8	580.6±76.5
大豆(カナダ産)	2816±232	213.9±25.1	1500±206	ND	ND	ND	99.4±1.6	533.8±7.9	22.7±1.2	130.7±13.2	81.2±0.9	533.8±7.9
大豆(中国産)	3776±249	511.0±24.8	2677±252	ND	ND	ND	100.9±10.2	898.7±31.3	16.5±1.5	161.9±0.8	71.7±8.8	1010±21
大豆(オーストラリア産)	3083±383	436.0±63.8	2755±194	ND	ND	ND	118.4±6.5	487.5±54.1	27.2±1.3	156.8±3.1	117.1±7.9	643.0±56.4
大豆(中国産, 黒, 小粒)	2459±292	360.3±43.9	2421±299	ND	ND	ND	257.8±39.3	667.7±85.1	39.7±3.7	184.7±25.0	195.6±22.1	844.8±105.5
黒大豆(丹波黒大豆, 丹波産)	1776±228	129.1±42.4	3074±715	ND	ND	ND	111.4±6.7	530.0±51.2	12.1±2.4	66.8±11.2	204.9±9.7	1396±108
黒大豆(韓国産)	2356±236	144.0±22.3	2144±611	ND	ND	ND	566.4±12.2	1336±62	29.7±1.5	114.3±2.6	441.5±4.2	1390±64
青大豆(ひたし豆, 秋田県産)	2557±216	136.4±34.3	2595±170	ND	ND	ND	290.5±33.9	772.7±95.4	19.7±4.5	86.6±22.0	396.2±32.9	1410±112
大豆(カナダ産)	2478±145	156.4±12.0	1239±301	ND	ND	ND	100.4±1.5	450.3±14.2	30.5±0.7	90.4±1.0	76.5±0.5	449.0±20.0
(2) Boiled beans [μmol/g]												
大豆水煮	1063±31	30.0±3.8	1521±71	ND	ND	ND	236.8±33.0	737.0±96.6	5.7±0.6	23.5±1.7	49.6±2.3	1109±75
大豆水煮(国産)	1092±35	78.2±3.5	1582±113	ND	ND	ND	290.3±18.1	736.4±28.5	16.2±0.3	65.9±1.0	235.0±14.5	1138±55
黒豆水煮(北海道産)	1452±37	82.6±1.4	1311±70	ND	ND	ND	180.5±13.9	1117±85	6.8±0.7	69.4±5.1	31.0±0.7	906.3±90.1
(3) Fried beans [μmol/g]												
福豆(節分の豆蒔き用)	3817±357	507.3±66.6	3301±218	ND	ND	ND	2669±329	1148±136	56.0±4.1	225.3±26.8	105.3±0.9	1392±73
(4) Kinako [μmol/g]												
黄粉(原料:大豆)	7254±273	282.1±18.7	4770±204	ND	ND	ND	3571±112	3683±112	61.7±2.4	188.2±7.3	346.8±16.8	3949±126
丹波黒大豆黄粉(原料:丹波黒大豆)	4646±146	350.0±18.2	3071±225	ND	ND	ND	2869±91	1777±62	92.8±2.8	209.6±6.6	401.9±12.2	2214±74
(5) Tofu [μmol/g]												
絹ごし豆腐	294.3±27.7	92.8±7.2	297.1±6.9	ND	ND	ND	35.4±1.0	102.7±3.1	23.2±0.1	64.0±1.0	29.1±0.5	121.6±4.5
木綿豆腐	249.4±11.2	82.7±3.2	309.7±13.7	ND	ND	ND	48.3±1.3	87.1±4.5	24.8±0.6	57.9±1.4	41.8±1.6	119.9±6.4
焼き豆腐	327.1±11.1	101.2±3.6	380.5±12.7	ND	ND	ND	51.2±1.8	115.5±4.8	24.9±0.1	68.5±1.5	41.8±1.1	149.3±5.7
充填豆腐	414.8±10.3	90.3±4.0	415.4±16.8	ND	ND	ND	45.5±1.6	174.8±10.8	22.8±0.4	67.5±2.9	34.7±1.4	195.3±11.5
(6) Kori-dofu [μmol/g]												
凍り豆腐	1220±68	121.3±8.1	1999±75	ND	ND	ND	975.4±35.9	186.2±8.2	82.4±1.7	38.9±0.9	1168±55	635.3±37.4
(7) Okara [μmol/g]												
おから	176.1±13.2	43.0±1.0	178.4±5.3	ND	ND	ND	51.3±0.9	64.1±0.9	19.3±0.3	23.7±0.4	69.1±0.7	54.0±0.5
(8) Age, ganmodoki [μmol/g]												
厚揚げ	422.8±14.1	125.3±4.4	534.4±12.3	ND	ND	ND	106.0±6.5	115.7±9.6	25.3±0.2	57.0±4.2	45.0±0.6	156.3±9.8
薄揚げ	752.3±33.2	138.1±25.5	1124±57	ND	ND	ND	429.2±24.8	323.0±9.2	28.2±1.3	69.2±1.7	203.9±3.6	483.0±13.0
がんもどき	483.3±3.0	136.8±2.3	708.3±8.9	ND	ND	ND	191.2±5.2	211.0±2.1	37.5±0.1	83.0±1.1	99.5±2.2	315.5±1.4
(9) Fermented soybean (Natto) [μmol/g]												
納豆	1344±40	237.6±2.5	1494±114	ND	ND	ND	240.7±13.3	1098±91	29.9±0.3	207.7±12.2	181.4±7.9	1104±51
黒豆納豆	1272±111	129.4±1.9	1095±66	ND	ND	ND	240.1±10.5	795.6±19.6	26.6±1.0	98.3±8.9	240.1±16.5	737.3±73.8
(10) Miso [μmol/g]												
米味噌	1028±8	143.3±0.7	1296±34	ND	ND	ND	453.5±37.5	428.8±37.3	90.4±5.8	47.8±4.3	465.2±34.5	543.9±46.8
米味噌	1359±39	109.3±1.7	1315±14	ND	ND	ND	1084±10	248.7±2.4	84.2±1.1	25.1±0.7	1135±9	145.6±1.3
白味噌(米味噌)	184.3±7.0	42.2±0.8	313.0±32.6	ND	ND	ND	96.3±2.6	88.0±4.7	19.5±0.6	22.7±0.4	110.1±4.5	178.7±8.4
赤出し味噌(調合味噌)	1105±2	171.2±1.9	1181±110	ND	ND	ND	1046±42	58.7±1.9	151.9±8.9	19.3±0.3	1052±52	128.7±3.1
麹味噌(米味噌)	422.6±19.4	81.0±2.6	612.7±91.1	ND	ND	ND	228.5±24.1	194.1±14.2	40.9±2.3	40.1±0.3	299.6±27.8	313.1±29.7
減塩味噌(米味噌)	728.3±21.4	114.5±4.2	1004±21	ND	ND	ND	468.8±16.0	129.5±12.6	80.2±6.4	32.6±1.7	543.2±10.2	218.7±11.9
麦味噌	315.3±12.2	58.4±3.3	372.0±20.3	ND	ND	ND	185.9±17.5	111.5±9.7	25.1±1.9	32.3±2.2	261.1±14.6	102.8±10.2
豆味噌	1428±13	188.3±2.2	1471±23	ND	ND	ND	1428±128	ND	176.9±2.4	8.95±0.74	1370±20	101.2±2.8
金山寺味噌	195.7±35.3	57.0±4.9	230.5±34.4	ND	ND	ND	102.3±10.4	87.9±6.3	26.9±1.7	30.1±0.7	55.7±3.6	125.2±8.8
(11) Soy sauce [nmol/mL]												
濃い口醤油	24.62±1.87	6.690±0.673	4.768±0	ND	ND	ND	15.323±0.013	6.622±0.006	6.690±0.673	ND	4.768±0	ND
濃い口醤油	35.91±1.84	7.119±0.635	10.48±4.90	ND	ND	ND	28.41±2.49	ND	7.119±0.635	ND	9.731±0.963	ND
丸大豆醤油	28.13±5.08	8.157±0.222	11.64±0.98	ND	ND	ND	23.78±0.47	ND	8.157±0.222	ND	11.35±0.23	ND
薄口醤油	20.66±1.31	4.819±0.086	12.29±1.27	ND	ND	ND	20.66±1.31	ND	4.819±0.086	ND	12.29±1.27	ND
土佐醤油	22.09±1.06	3.728±0.209	8.492±8.986	ND	ND	ND	22.09±1.06	ND	3.728±0.209	ND	7.417±0.372	ND
たまり醤油	24.11±2.08	2.886±1.783	3.711±0.182	ND	ND	ND	20.30±0.68	3.806±0.399	1.864±0.105	ND	3.711±0.182	ND
さしみ醤油	33.62±1.58	9.233±0.349	12.28±0.28	ND	ND	ND	27.37±1.49	6.347±1.312	9.233±0.349	ND	12.28±0.28	ND
丸大豆減塩醤油	30.73±2.74	6.181±0.757	9.037±1.153	ND	ND	ND	15.70±0.83	ND	6.181±0.757	ND	6.947±0.536	ND
(12) Soy milk [nmol/mL]												
豆乳(大豆固形分10%以上)	1053±123	58.55±6.82	1040±82	ND	ND	ND	25.70±1.17	185.0±10.9	2.363±0.137	22.09±1.18	26.26±1.49	210.1±12.4
調整豆乳(大豆固形分7%以上)	299.2±52.1	6.056±0.359	247.0±29.9	ND	ND	ND	6.165±0.021	85.47±1.73	0.748±0.075	3.609±0.081	14.73±0.25	146.7±1.8
豆乳飲料(大豆固形分4%以上)	131.6±6.0	5.333±0.142	137.8±18.7	ND	ND	ND	3.259±0.062	75.00±3.00	0.775±0.047	4.558±0.406	4.849±0.110	133.0±5.0
豆乳(大豆固形分10%以上)	496.6±26.7	57.16±2.52	621.3±32.0	ND	ND	ND	49.36±0.92	175.5±4.2	2.989±0.078	28.74±0.74	17.77±0.20	223.8±4.8
調整豆乳(大豆固形分7%以上)	167.0±1.2	5.761±0.044	290.9±4.2	ND	ND	ND	9.616±0.373	116.2±7.0	ND	5.000±0.334	3.118±0.075	206.0±13.2
豆乳飲料(大豆固形分4%以上)	104.3±6.7	5.307±0.653	194.0±12.9	ND	ND	ND	2.888±0.482	79.04±9.13	ND	5.307±0.653	2.562±0.176	146.0±14.8

Values are means±SD for 3 trial.

Table 10 Compositions of phytoestrogens (% of total)

Sample	Total phytoestrogens (with hydrolysis)						Genuine phytoestrogens (without hydrolysis)						
	Daidzein	Glycitein	Genistein	Equol	Formononetin	Biochanin A	Daidzein	Daidzin	Glycitein	Glycitin	Genistein	Genistin	Aglycone [%]
(1) Soybean													
大豆(鶴の子大豆, 北海道産)	56.36	1.96	41.68	0	0	0	5.07	28.99	0.21	1.75	3.51	21.1	8.79
大豆(米国産)	39.82	7.18	32.9	0	0	0	1.61	6.41	0.68	2.91	2.07	6.88	4.36
大豆(米国産)	49.84	5.65	44.5	0	0	0	2	10.17	0.55	1.82	1.76	10.17	4.31
大豆(カナダ産)	62.16	4.72	33.11	0	0	0	2.19	11.78	0.5	2.89	1.79	11.78	4.48
大豆(中国産)	54.22	7.34	38.44	0	0	0	1.45	12.9	0.24	2.32	1.03	14.5	2.72
大豆(オーストラリア産)	49.14	6.95	43.91	0	0	0	1.89	7.77	0.43	2.5	1.87	10.25	4.19
大豆(中国産, 黒, 小粒)	46.92	6.88	46.2	0	0	0	4.92	12.74	0.76	3.52	3.73	16.12	9.41
黒大豆(丹波黒大豆, 丹波産)	35.67	2.59	61.73	0	0	0	2.24	10.64	0.24	1.34	4.12	28.04	6.6
黒大豆(韓国産)	50.73	3.1	46.17	0	0	0	12.2	28.77	0.64	2.46	9.51	29.93	22.35
青大豆(ひたし豆, 秋田県産)	48.35	2.58	49.07	0	0	0	5.49	14.61	0.37	1.64	7.49	26.66	13.35
大豆(カナダ産)	63.97	4.04	31.99	0	0	0	2.59	11.63	0.79	2.33	1.98	11.59	5.36
(2) Boiled beans													
大豆水煮	40.67	1.15	58.19	0	0	0	9.06	28.19	2.18	0.9	1.9	42.43	13.14
大豆水煮(国産)	39.68	2.84	57.48	0	0	0	10.55	26.76	0.59	2.39	8.54	41.35	19.68
黒豆水煮(北海道産)	51.03	2.9	46.07	0	0	0	6.34	39.25	0.24	2.44	1.09	31.85	7.67
(3) Fried beans													
福豆(節分の豆蒔き用)	50.06	6.65	43.29	0	0	0	35	15.06	0.73	2.95	1.38	18.26	37.11
(4) Kinako													
黄粉(原料:大豆)	58.95	2.29	38.76	0	0	0	29.02	29.93	0.5	1.53	2.82	32.09	32.34
丹波黒大豆黄粉(原料:丹波黒大豆)	57.59	4.34	38.07	0	0	0	35.56	22.03	1.15	2.6	4.98	27.45	41.69
(5) Tofu													
絹ごし豆腐	43.01	13.56	43.42	0	0	0	5.17	15.01	3.39	9.35	4.25	17.77	12.81
木綿豆腐	38.85	12.89	48.25	0	0	0	7.53	13.57	3.86	9.02	6.51	18.68	17.9
焼き豆腐	40.44	12.51	47.05	0	0	0	6.33	14.28	3.08	8.47	5.17	18.46	14.58
充填豆腐	45.06	9.81	45.13	0	0	0	4.94	18.99	2.48	7.33	3.77	21.22	11.19
(6) Kori-dofu [μ mol/g]													
凍り豆腐	36.52	3.63	59.84	0	0	0	29.2	5.57	2.47	1.16	34.97	19.02	66.64
(7) Okara													
おから	44.3	10.82	44.88	0	0	0	12.91	13.61	4.86	5.96	17.38	13.58	35.15
(8) Age, ganmodoki													
厚揚げ	39.06	11.58	49.37	0	0	0	9.79	10.69	2.34	5.27	4.16	14.44	16.29
薄揚げ	37.35	6.86	55.8	0	0	0	21.31	16.04	1.4	3.44	10.12	23.98	32.83
がんもどき	36.38	10.3	53.32	0	0	0	14.39	13.28	2.82	6.25	7.49	23.75	24.7
(9) Fermented soybean (Natto)													
納豆	43.7	7.73	48.58	0	0	0	7.83	35.7	0.97	6.75	5.9	35.9	14.7
黒豆納豆	50.95	5.18	43.86	0	0	0	9.62	31.87	1.07	3.94	9.62	29.53	20.31
(10) Miso													
米味噌	41.66	5.81	52.53	0	0	0	18.38	17.38	3.66	1.94	18.85	22.04	40.85
米味噌	48.83	3.93	47.25	0	0	0	38.95	8.94	3.03	0.9	40.78	5.23	82.76
白味噌(米味噌)	34.16	7.82	58.02	0	0	0	17.85	16.31	3.61	4.21	20.41	33.12	41.87
赤出し味噌(調合味噌)	44.98	6.97	48.06	0	0	0	42.57	2.39	6.18	0.79	42.82	5.24	91.57
麹味噌(米味噌)	37.86	7.26	54.89	0	0	0	20.47	17.39	3.66	3.59	26.84	28.05	50.99
減塩味噌(米味噌)	39.44	6.2	54.36	0	0	0	25.38	7.01	4.34	1.77	29.41	11.73	59.13
金山寺味噌	40.5	11.8	47.7	0	0	0	21.17	18.19	5.57	6.23	11.53	25.91	38.27
(11) Soy sauce													
濃い口醤油	68.24	18.54	13.22	0	0	0	42.47	18.54	18.54	0	13.22	0	74.23
濃い口醤油	67.11	13.3	19.59	0	0	0	53.09	0	13.3	0	18.19	0	84.59
丸大豆醤油	58.69	17.02	24.29	0	0	0	49.61	0	17.02	0	23.68	0	90.31
薄口醤油	54.7	12.76	32.54	0	0	0	54.7	0	12.76	0	32.54	0	100
土佐醤油	64.38	10.87	24.75	0	0	0	64.38	0	10.87	0	21.62	0	96.87
たまり醤油	78.51	9.4	12.08	0	0	0	66.1	12.39	6.07	0	12.08	0	84.25
さしみ醤油	60.98	16.75	22.27	0	0	0	49.65	11.51	16.75	0	22.27	0	88.67
丸大豆減塩醤油	66.88	13.45	19.67	0	0	0	34.17	0	13.45	0	15.12	0	62.74
(12) Soy milk													
豆乳(大豆固形分10%以上)	48.94	2.72	48.34	0	0	0	1.19	8.6	0.11	1.03	1.22	9.77	2.52
調整豆乳(大豆固形分7%以上)	54.18	1.1	44.73	0	0	0	1.12	15.48	0.14	0.65	2.67	26.56	3.93
豆乳飲料(大豆固形分4%以上)	47.9	1.94	50.16	0	0	0	1.19	27.3	0.28	1.66	1.76	48.41	3.23
(13) Yuba													
乾燥湯葉	37.84	7.84	54.32	0	0	0	7.16	26.41	1.01	5.95	5.53	38.25	13.7
生湯葉	38.46	8.72	52.82	0	0	0	11.32	18.89	2.33	5.63	11.22	25.75	24.87

Values are means for 3 trial.

Table 11 Japanese daily intake of phytoestrogens from soy bean and soybean-derived processed foods

	Daily intake [mg/day]			
	Daidzein	Glycitein	Genistein	Total
Miso	2.537	0.403	3.197	6.137
Tofu	3.264	1.04	3.8	8.104
Tofu-derived processed foods	1.162	0.296	1.661	3.119
Soybean and other soybean-derived processed foods	5.051	0.537	4.805	10.39
Total	12.01	2.276	13.46	27.75

Table 12 Comparison of the flavonoid contents in several foods cited from several references

Sample		Present study (as aglycon) [μg/g fresh weight]	Takamatsu (1997) 3) (aglycon+glucoside) [μg/g]	Toda et al. (1997) 13) (aglycon+glycosides) [μg/g]	Pettersson et al. (1984) 14) (as aglycon) [μg/g]	Dwyer et al. (1994) 15) (as aglycon) [μg/g]	Wang et al. (1994) 16) (as aglycon) [μg/g]	Franke et al. (1994) 17) (as aglycon) [μg/g]	Nguyenle et al. (1995) 18) (aglycon+glucoside) [μg/g]	Franke et al. (1998) 20) (as aglycon) [μg/g]
Soy bean	n	11	?		1		3	4		4
	Daidzein	700 (424-1138)	983		706		462 (240-600)	846 (676-1007)		913
	Glycitein	74.2 (36.7-145)	not determined		not determined		89.3 (79-107)	not determined		114
	Genistein	630 (335-894)	885		1000		777 (648-954)	1107 (940-1382)		763
Boiled beans	n	3		18				1		
	Daidzein	306 (270-369)		199 (160-247)				68.5		
	Glycitein	18.2 (8.5-23.5)		43 (29-60)				not determined		
	Genistein	398 (354-428)		395 (356-445)				69.4		
Roated beans	n	1					1	1		1
	Daidzein	970					563	848		786
	Glycitein	144					193	not determined		168
	Genistein	892					869	1106		889
Kinako	n	2	?	3						
	Daidzein	1513 (1181-1844)	1140	1097						
	Glycitein	89.8 (80.2-99.5)	not determined	0						
	Genistein	1060 (830-1289)	682	1492						
Tofu	n	4	2?	11		9	1	1	1	4
	Daidzein	81.6 (63.4-105)	113 (80-145)	180 (151-220)		82.3 (57.3-117)	146	113	224	139
	Glycitein	26.2 (23.5-28.8)	not determined	73 (66-80)		not determined	29	not determined	not determined	17
	Genistein	94.9 (80.3-112)	130 (105-154)	257 (225-294)		206 (159-306)	162	166	334	141
Kori-dofu	n	1	?					1		
	Daidzein	310	105					225		
	Glycitein	34.5	not determined					not determined		
	Genistein	540	190					227		
Okara	n	1								
	Daidzein	44.8								
	Glycitein	12.2								
	Genistein	48.2								
Age, ganmodoki	n	3		6						
	Daidzein	141 (107-191)		262 (118-336)						
	Glycitein	37.8 (35.6-39.3)		56 (0-168)						
	Genistein	213 (144-304)		377 (317-412)						
Natto	n	2	?	25						
	Daidzein	333 (323-342)	466	441 (319-587)						
	Glycitein	52.3 (36.8-67.5)	not determined	192 (128-319)						
	Genistein	350 (296-404)	432	642 (569-810)						
Miso	n	7	?	14			1			
	Daidzein	183 (46.9-346)	235	140 (88-235)			79			
	Glycitein	29.3 (12.0-40.7)	not determined	16 (0-27)			38			
	Genistein	230 (62.3-355)	221	217 (166-278)			177			
Soy sauce	n	8	?	4						
	Daidzein	6.31 (2.87-9.13)	13	8 (7-8)						
	Glycitein	1.37 (0.53-1.92)	not determined	1						
	Genistein	1.88 (0.79-2.83)	3	7 (4-11)						
Soy milk	n	3 [μg/mL]		3			2 (soy drink)		2	3
	Daidzein	126 (33.5-268)		140			7.0 (6.8-7.2)		18 (16-20)	81
	Glycitein	6.63 (1.52-16.6)		17			not determined		not determined	not determined
	Genistein	128 (37.2-281)		200			21.0 (20.2-21.7)		32.5 (28-37)	78
Yuba	n	2 (dried and raw)	? (dried)							
	Daidzein	460 (161-759)	863							
	Glycitein	108 (40.9-176)	not determined							
	Genistein	697 (236-1158)	906							

Values are the average and the values in parentheses are the range.