Supplemental Material

Saponins from *Boussingaultia gracilis* prevent obesity and related metabolic impairments in diet-induced obese mice

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Table S1 Main ingredients and energy comparison of experiment diet.

	MD12031(10%)		MD12032(45%)	
	gm%	kcal%	gm%	kcal%
Protein	19.2%	20	24	20
Carbohydrate	67.3%	70	41	35
Fat	4.3%	10	24	45
Total		100		100
kcal/gm	3.85		4.73	
	gm	kcal	gm	kcal
Casein, 80 Mesh	200	800	200	800
L-Cystine	3	12	3	12
Corn Starch	315	1260	72.8	291
Maltodextrin 10	35	140	100	400
Sucrose	350	1400	172.8	691
Cellulose, BW200	50	0	50	0
Soybean Oil	25	225	25	225
Lard	20	180	177.5	1598
Mineral Mix	45	0	45	0
Vitamin Mix	10	40	10	40
Vitamin Mix	2	0	2	0
Total	1055	4057	858.1	4057

Table S2. Experimental sequences of the primers used for qRT-PCR

Genes	Forward primer	Reverse primer	Accession no.
ACC1	GCCTCAGGAGGATTTGCTGT	AGGATCTACCCAGGCCACAT	NM_133360.2
FAS	GGCCCCTCTGTTAATTGGCT	GGATCTCAGGGTTGGGGTTG	NM_007988.3
SCD1	GTACCGCTGGCACATCAACT	AACTCAGAAGCCCAAAGCTCA	NM_009127.4
GAPDH	CCCTTAAGAGGGATGCTGCC	TACGGCCAAATCCGTTCACA	NC_000072.6

ACC1, acetyl-CoA carboxylase 1; FAS, fatty acid synthase; SCD1, stearoyl-CoA desaturase 1; CPT1a, carnitine palmitoyl transferase 1a; GAPDH, glyceraldehyde-3-phosphate dehydrogenase.

Table S3. Potential biomarkers for the therapeutic effects of SBG identified by UPLC-MS

No.	Metabolite Name	Formular	Metabolomic pathway	HMDB
1	Docosahexaenoic acid	$C_{22}H_{32}O_2$	Linoleic Acid Metabolism	0002183
2	2-Hydroxypropanoic acid	$C_4H_8O_3$	Biosynthesis of secondary metabolites	00729
3	PC(20:1(11Z)/14:1(9Z))	$C_{42}H_{80}NO_8P$	Phosphatidylcholine Biosynthesis	0008296
4	Oleic acid	$C_{18}H_{34}O_2$	Unsaturated fatty acid Metabolism	0000207
5	LysoPC(18:1(11Z))	$C_{26}H_{52}NO_7P$	Phosphatidylcholine Biosynthesis	0010385
6	LysoPC(16:0)	$C_{24}H_{50}NO_7P$	Phospholipid Biosynthesis	0010382
7	D-Sorbitol	$C_6H_{14}O_6$	Fructose and Mannose Degradation	0000247
8	Mannitol	$C_6H_{14}O_6$	diuretic and renal diagnostic aid	0000765
9	LysoPC(20:4(8Z,11Z,14Z	$C_{28}H_{50}NO_7P$	Lysophospholipid Metabolism	0010396
10	Arachidonic acid	$C_{20}H_{32}O_2$	Arachidonic Acid Metabolism	0001043
11	L-Valine	$C_5H_{11}NO_2$	Valine, Leucine and Isoleucine	0000883
12	Myoinositol	$C_6H_{12}O_6$	Inositol Metabolism	0000211
13	LysoPE(0:0/18:1(9Z))	$C_{23}H_{46}NO_7P$	Lysophospholipid Metabolism	0011476
14	D-Glutamic acid	$C_5H_9NO_4$	Glutamic acid Metabolism	0003339
15	2-Hydroxybutanoic acid	$C_4H_8O_3$	Propanoate Metabolism	0000008
16	PC(16:1(9Z)/22:5(7Z,10Z	$C_{46}H_{80}NO_8P$	Phosphatidylcholine Biosynthesis	0008024
17	D-Gulose	$C_6H_{12}O_6$	Aldohexose sugar	0012326
18	L-Carnitine	$C_7H_{15}NO_3$	Beta Oxidation of Very Long Chain Fatty	0000062
19	Taurine	$C_2H_7NO_3S$	Taurine and Hypotaurine Metabolism	0000251
20	Adenosine	$C_{10}H_{13}N_5O_4$	Purine Metabolism	0000050
21	Creatine	$C_4H_9N_3O_2$	Glycine and Serine Metabolism	0000064
22	L-Histidine	$C_6H_9N_3O_2$	Histidine Metabolism	0000177
23	Acetoacetic acid	$C_4H_6O_3$	Ketone Body Metabolism	0000060
24	PC(18:0/20:4(8Z,11Z,14Z	$C_{46}H_{80}NO_8P$	Phosphatidylcholine Biosynthesis	0008024

25	1,5-Anhydrosorbitol	$C_6H_{12}O_5$	Short-term glycemic Metabolism	0002712
26	Malic acid	$C_4H_6O_5$	Malate-Aspartate Shuttle	0000744
27	Stearic acid	$C_{18}H_{36}O_2$	Plasmalogen Synthesis	0000827
28	Creatinine-d3	$C_4H_7N_3O$	Creatine phosphate Metabolism	0000562
29	1,2,3-	$C_6H_8O_6$	Biosynthesis of secondary metabolites	0031193
30	L-Proline	$C_5H_9NO_2$	Arginine and Proline Metabolism	0000162
31	Creatinine	$C_4H_7N_3O$	Creatine phosphate Metabolism	0000562
32	LysoPC(18:2(9Z,12Z))	$C_{26}H_{50}NO_7P$	Lysophospholipid Metabolism	0010386
33	8,11,14-Eicosatrienoic	$C_{20}H_{34}O_2$	Alpha Linolenic Acid and Linoleic Acid	0002925
34	Neuraminic acid	$C_9H_{17}NO_8$	Sialic acids Metabolism	0000830
35	Docosapentaenoic acid	$C_{22}H_{34}O_2$	Alpha Linolenic Acid and Linoleic Acid	0006528
36	6-Deoxy-L-altrose	$C_6H_{12}O_5$	Deoxy sugar Synthesis	0000849
37	L-Leucine	$C_6H_{13}NO_2$	Valine, Leucine and Isoleucine	0000687
38	Nonanoic acid	$C_9H_{18}O_2$	Nonanoic acid	0000847
39	Ornithine	$C_5H_{12}N_2O_2$	Arginine and Proline Metabolism	0000214