Electronic Supplementary Material (ESI) for Food & Function.
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Supplementary Table 1: 16S rRNA sequencing sequence of LZU-S-ZCJ strain

LZU-S-ZCJ
TTAGGCGCTGGTTCTAAAGGTTACCCCACCGACTTTGGGTGTTACAAACTCTCATGGTGTGA CGGGCGGTGTGTACAAGGCCCGGGAACGTATTCACCGCGGCATGCTGATCCGCGATTACTA GCGATTCCGACTTCATGTAGGCGAGTTGCAGCCTACAATCCGAACTGAGAATGGCTTTAAG AGATTAGCTTACTCTCGCGAGTTCGCAACTCGTTGTACCATCCATTGTAGCACGTGTGTAGC CCAGGTCATAAGGGGCATGATGATTTGACGTCATCCCCACCTTCCTCCGGTTTGTCACCGGC AGTCTCACCAGAGTGCCCAACTTAATGCTGGCAACTGATAATAAGGGTTGCGCTCGTTGCG GGACTTAACCCAACATCTCACGACACGAGCTGACGACAACCATGCACCACCTGTATCCATGT CCCCGAAGGGAACGTCTAATCTCTTAGATTTGCATAGTATGTCAAGACCTGGTAAGGTTCTT CGCGTAGCTTCGAATTAAACCACATGCTCCACCGCTTGTGCGGGCCCCCGTCAATTCCTTTG AGTTTCAGCCTTGCGGCCGTACTCCCCAGGCGGAATGCTTAATGCGTTAGCTGCAGCACTGA AGGGCGGAAACCCTCCAACACTTAGCATTCATCGTTTACGGTATGGACTACCAGGGTATCTA ATCCTGTTTGCTACCCATACTTTCGAGCCTCAGCGTCAGTTACAGACCAGACAGCCGCCTTC GCCACTGGTGTTCTTCCATATATCTACGCATTTCACCGCTACACATGGAGTTCCACTGTCCTC TTCTGCACTCAAGTTTCCCAGTTTCCGATGCACTTCTTCGGTTGAGCCGAAGGCTTTCACATC AGACTTAAAAAACCGCCTGCGCTCGCTTTACGCCCAATAAATCCGGACAACGCTTGCCACCT ACGTATTACCGCGGCTGCTGGCACGTAGTTAGCCGTGGCTTTCTGGTTAAATACCGTCAATA CCTGAACAGTTACTCTCAGATATGTTCTTCTTTAACAACAGAGTTTTACGAGCCGAAACCCTT CTTCACTCACGCGGCGTTGCTCCATCAGACTTTCGTCCATTGTGGAAGATTCCCTACTGCTGC CTCCCGTAGGAGTTTGGGCCGTGTCTCAGTCCCAATGTGGCCGATTACCCTCTCAGGTCGGC TACGTATCATTGCCATGGTGAGCCGTTACCTCACCATCTAGCTAATACGCCGCGGGACCATC CAAAAGTGATAGCCGAAGCCATCTTTCAAACTCGGACCATGCGGTCCAAGTTGTTATGCGGT ATTAGCATCTGTTTCCAGGTGTTATCCCCCGCTTCTGGGCAGGTTTCCCACGTGTTACTCACC AGTTCGCCACTCACTCAAATGTAAATCATGATGCAAGCACCAATCAATACCAGAGTTCGTCG ACTG

Supplementary Table 2: 16S rRNA sequencing sequence of LZU-J-TSL6 strain

LZU-J-TSL6
ATCTGTATCTTAGGCGGCTGGTTCCTAAAAGGTTACCCCACCGACTTTGGGTGTTACAAACT CTCATGGTGTGACGGGCGGTGTGTACAAGGCCCGGGAACGTATTCACCGCGGCATGCTGAT CCGCGATTACTAGCGATTCCGACTTCATGTAGGCGAGTTGCAGCCTACAATCCGAACTGAGA ATGGCTTTAAGAGATTAGCTTACTCTCGCGAGTTCGCAACTCGTTGTACCATCCATTGTAGC ACGTGTGTAGCCCAGGTCATAAGGGGCATGATGATTTGACGTCATCCCCACCTTCCTCCGGT TTGTCACCGGCAGTCTCACCAGAGTGCCCAACTTAATGCTGGCAACTGATAATAAGGGTTGC GCTCGTTGCGGGACTTAACCCAACATCTCACGACACGAGCTGACGACAACCATGCACCACCT GTATCCATGTCCCCGAAGGGAACGTCTAATCTCTTAGATTTGCATAGTATGTCAAGACCTGG TAAGGTTCTTCGCGTAGCTTCGAATTAAACCACATGCTCCACCGCTTGTGCGGGCCCCCGTC AATTCCTTTGAGTTTCAGCCTTGCGGCCGTACTCCCCAGGCGGAATGCTTAATGCGTTAGCT GCAGCACTGAAGGGCGGAAACCCTCCAACACTTAGCATTCATCGTTTACGGTATGGACTACC AGGGTATCTAATCCTGTTTGCTACCCATACTTTCGAGCCTCAGCGTCAGTTACAGACCAGAC

AGCCGCCTTCGCCACTGGTGTTCTTCCATATATCTACGCATTTCACCGCTACACATGGAGTTC
CACTGTCCTCTTCTGCACTCAAGTTTCCCAGTTTCCGATGCACTTCTTCGGTTGAGCCGAAGG
CTTTCACATCAGACTTAAAAAACCGCCTGCGCTCGCTTTACGCCCAATAAATCCGGACAACG
CTTGCCACCTACGTATTACCGCGGCTGCTGGCACGTAGTTAGCCGTGGCTTTCTGGTTA

Supplementary Table 3: Primers for detection of relative abundance of Nrf2 signaling genes

Gene Name	Forward Primer	Reverse Primer
Nrf2	TAGATGACCATGAGTCGCTTGC	CCTGTACCTCGTTCAAACCG
HO-1	GATAGAGCGCAACAAGCAGAA	GAAGACCATACCCGGAGTGAC
NQO1	GCGAGAAGAGCCCTGATTGT	AGATGACTCGGAAGGATACTGAAA
GCLC	CATCCTCCAGTTCCTGCACATC	CATCGCCTCCATTCAGTAACAAC
GCLM	TTCGCCTCCGATTGAAGATG	TGGTTACTATTGGGTTTTACCTGTG
GSS	TATTTGACCAGCGTGCCGTAG	AGACCCACCCTGCTCAGTTC
GAPDH	CCTCGTCCCGTAGACAAAATG	TGAGGTCAATGAAGGGGTCGT
ACTB	GTGCTATGTTGCTCTAGACTTCG	CCATACCTTAGGACACCGTA

Supplementary Table 4: Compounds with increased content FAS vs. NFAS

name	Formula	rtmed	MeanFAS	MeanNFAS	POS	NEG
Neoline	C24H39NO6	524.599	0.001586578	0.001306032	Y	N
Racanisodamine	C17H23NO4	519.6525	0.001785591	0.001434867	Y	N
Tazettine	C18H21NO5	428.1515	0.001431508	0.001132922	Y	N
Raloxifene	C28H27NO4S	153.7795	0.025033829	0.014109237	Y	N
3-Formylindole	C9H7NO	383.124	0.020267421	0.016297906	Y	N
Quinoline	C9H7N	240.298	0.005117532	0.003597204	Y	N
Monocrotaline	C16H23NO6	278.7635	0.028128518	0.019784007	Y	N
Dehydrocorydaline	C22H24NO4+	457.396	0.00161241	0.000887804	Y	N
retronecine	C8H13NO2	180.281	0.020322957	0.014926718	Y	N
Harmane	C12H10N2	321.452	0.004033969	0.002442923	Y	N
Demethylcoclaurine hydrochloride	C16H17NO3.HCl	489.131	0.003974182	0.002632527	Y	N
Nonivamide	C17H27NO3	481.328	0.00143364	0.000832406	Y	N
Gelsevirine	C21H24N2O3	178.627	0.0210522	0.014545008	Y	N
Norharman	C11H8N2	281.583	0.061463027	0.037605108	Y	N
Iso-gamma-fagarine	C13H11NO3	228.1355	0.003973703	0.00162455	Y	N
Dihydrocapsaicin	C18H29NO3	500.1465	0.004736244	0.002864603	Y	N
Norisoboldine	C18H19NO4	521.699	0.023686195	0.017931705	Y	N
Desoxypeganine	C11H12N2	287.56	0.003740277	0.001331381	Y	N
Tabersonine	C21H24N2O2	232.95	0.007605873	0.005085537	Y	N
Vincadifformine	C21H26N2O2	221.653	0.003700382	0.001086451	Y	N
3-Furfuryl 2-	C10H9NO3	321.4175	0.008800031	0.006078299	Y	N

pyrrolecarboxylate						
Adenosine monophosphate	C10H14N5O7P	51.70105	0.376414213	0.199168589	N	Y
L-5-Hydroxytryptophan	C11H12N2O3	100.692	0.256391894	0.045994531	N	Y
Malonic acid	C3H4O4	42.8666	0.179504561	0.098370449	N	Y
3-(4-HYDROXYPHENYL)LACTATE	C9H10O4	164.302	3.070350665	0.055495787	N	Y
Threonic acid	C4H8O5	38.41065	0.361281961	0.200053534	N	Y
Propylparaben	C10H12O3	447.081	1.405906251	0.595578511	N	Y
Acetylvanillin	C10H10O4	150.0745	0.005802463	0.003981545	Y	N
Vanillin	C8H8O3	301.48	0.078039101	0.063158528	Y	N
Polydatin	C20H22O8	462.186	0.003646071	0.002874357	Y	N
Rhaponticin	C21H24O9	301.49	0.001941102	0.001528167	Y	N
Ethylparaben	C9H10O3	344.166	0.002236194	0.001240138	Y	N
2-Hydroxyacetophenone	C8H8O2	336.437	0.016477408	0.005411064	Y	N
CATECHOL	C6H6O2	185.064	0.097836841	0.033847088	N	Y
3',5'-Dimethoxy-4'-hydroxyacetophenone	C10H12O4	278.806	0.12061657	0.04965479	N	Y
Protosappanin B	C16H16O6	268.483	0.017017566	0.001498863	Y	N
Phenol	C18H22O5	566.333	0.007387775	0.004891422	Y	N
Vanillic acid (not validated)	C9H10O4	394.4575	0.013579015	0.003522954	Y	N
Zearalenone	C18H22O5	545.3145	0.004405494	0.002620939	Y	N
Methyl gallate	C8H8O5	111.901	0.102821146	0.021280469	Y	N
Licoflavone A	C20H18O4	326.3415	0.004179013	0.003425839	Y	N
Taxifolin	C15H12O7	74.4497	0.068407263	0.020608685	N	Y
Trehalose	C12H22O11	109.976	0.00760583	0.005071375	N	N
Feselol	C24H30O4	161.622	0.003533082	0.002569968	Y	N
Coumaric acid	C9H8O3	394.867	0.068290107	0.049234723	Y	N
Isofraxidin	C11H10O5	360.459	0.08024157	0.068129832	Y	N
Schizandrin	C24H32O7	524.9875	0.002492788	0.001585027	Y	N
6,7,8-trimethoxychromen-2-one	C12H12O5	472.746	0.027673052	0.020141084	Y	N
Ethyl 4-methoxycinnamate	C12H14O3	1168.145	0.00214101	0.000301875	Y	N
Arctigenin	C21H24O6	582.943	0.002191052	0.001829768	Y	N
Caffeic acid	C9H8O4	238.856	0.01939551	0.014766196	N	Y
Ethyl ferulate	C12H14O4	376.6435	0.229858621	0.13046705	N	Y
DIMETHYLCAFFEIC ACID	C11H12O4	451.618	0.541439289	0.356154627	N	Y
Curcumol	C15H24O2	575.88	0.001449024	0.000298836	Y	N
Deoxynivalenol	C15H20O6	414.891	0.002113195	0.001545405	Y	N
Pseudolaric acid C	C21H26O7	544.8265	0.001579513	0.00075873	Y	N
KOBUSONE	C14H22O2	290.725	0.015096926	0.000195151	Y	N
3,19-Dihydroxyurs-12-ene-23,28-dioic acid	C30H46O6	1168.145	0.009799754	0.001422715	Y	N

cynaropicrin	C19H22O6	523.6115	0.012137178	0.008226168	Y	N
Shanzhiside methyl ester	C17H26O11	544.793	0.007095601	0.004047407	Y	N
reynosin	C15H20O3	290.1955	0.006183232	0.004223286	Y	N
7-hydroxy-1,4a-dimethyl-9-oxo-7-propan-2-yl-2,3,4,4b,5,6,10,10a-octahydrophenanthrene-1-carboxylic acid	C20H30O4	383.179	0.006951633	0.003448008	Y	N
Camphor	C10H16O	367.2455	0.008594234	0.006458378	Y	N
Dendrobine	C16H25NO2	396.363	0.002134232	0.001486225	Y	N
Pechueloic Acid	C15H20O3	537.815	0.00182203	0.001413615	Y	N
Nardosinone	C15H22O3	600.6285	0.020234708	0.01548458	Y	N
Tauroursodeoxycholic acid	C26H45NO6S	577.564	0.001542953	0.000737425	Y	N
(1R,2R,5S,8R,14R,15R,16S)-16-hydroxy-1,2,14,17,17-pentamethyl-8-(prop-1-en-2-yl)pentacyclo[11.7.0.0^{2},^{10}.0^{5},^{9}.0^{14},^{18}]icosane-5,15-dicarboxylic acid	C30H46O5	1123.925	0.002178287	0.000328504	Y	N
Glabrolide	C30H44O4	1124.19	0.001603491	0.000225799	Y	N
Quillaic acid	C30H46O5	1123.95	0.002909421	0.000401621	Y	N
Hydroxyvalerenic Acid	C15H22O3	600.353	0.001013263	0.000695117	Y	N
(2S,6R,8aS)-6-(2-hydroxypropan-2-yl)-8a-methyl-4-methylidene-1,2,3,4a,5,6,7,8-octahydronaphthalen-2-ol	C15H26O2	367.61	0.003469868	0.002319095	Y	N
Ailanthone	C20H24O7	427.05	0.001542103	0.000885754	Y	N
Pyroglutamic acid (not validated, isomer of 88)	C5H7NO3	53.36585	1.140802718	0.55071441	Y	N
Kynurenine	C10H12N2O3	92.51675	0.013746207	0.00531436	Y	N

Supplementary Table 5: Compounds with decreased content FAS vs. NFAS

name	Formula	rtmed	MeanFAS	MeanNFAS	POS	NEG
1-methoxyindole-3-carbaldehyde	C10H9NO2	203.727	0.009462824	0.012264719	Y	N
Benzamide	C7H7NO	75.8801	0.003474613	0.005626082	Y	N
ROSIGLITAZONE HCl	C18H20ClN3O3S	472.28	0.005839957	0.008344828	Y	N
Stepharine	C18H19NO3	618.891	0.000491203	0.001048078	Y	N
L-Anserine nitrate salt	C10H16N4O3	40.4696	0.003553977	0.012073392	Y	N
Rutaecarpine	C18H13N3O	60.3029	0.00334058	0.013677783	Y	N
Micheliolide	C15H20O3	712.5155	0.000409476	0.000873652	Y	N

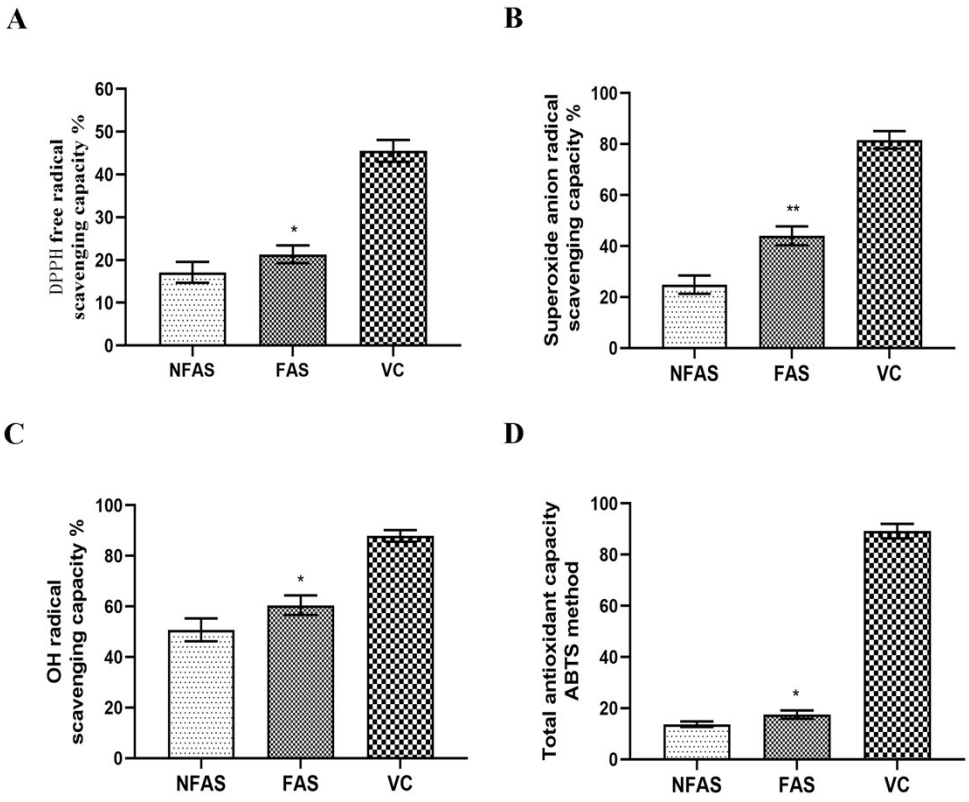
Haplophyllidine	C18H23NO4	70.7897	0.00000172	0.005961409	Y	N
Tubotaiwine	C20H24N2O2	247.776	0.00000172	0.003625349	Y	N
Acetylcorynoline	C23H23NO6	142.64	0.002513261	0.003834171	Y	N
(2E,4E)-5-(1,3-benzodioxol-5-yl)-N-(2-methylpropyl)penta-2,4-dienamide	C16H19NO3	636.3835	0.003859671	0.006370889	Y	N
Guanosine	C10H13N5O5	55.0983	0.052172038	0.527980933	Y	N
Uridine	C9H12N2O6	43.2779	0.073593753	0.238458647	N	Y
trans-Zeatin-riboside	C15H21N5O5	222.245	0.00019704	0.00346457	N	Y
Isoguanosine	C10H13N5O5	55.4166	0.046526946	2.027476505	N	Y
Nicotinic acid	C6H5NO2	279.0315	0.058998487	0.060003022	N	Y
12-oxo-phytodienoic acid	C18H28O3	662.01	0.002677284	0.007864441	Y	N
loganic acid	C16H24O10	279.689	0.00000172	0.025914391	Y	N
gamma-Linolenic acid	C18H30O2	701.4005	0.002468712	0.004371431	Y	N
MALEIC ACID	C4H4O4	43.07225	0.073355023	2.109338287	N	Y
Diffractic acid	C20H22O7	366.185	0.027062022	0.041521603	N	Y
Hinokitiol	C10H12O2	307.13	0.002936361	0.005311342	Y	N
(6R)-4-Methoxy-6-[(E)-2-phenylvinyl]-5,6-dihydro-2H-pyran-2-one	C14H14O3	490.233	0.001427869	0.003343432	Y	N
Combretastatin A4 disodium phosphate	C18H19O8P.2Na	596.944	0.000729473	0.003164574	Y	N
Piceatannol	C14H12O4	577.907	0.003733757	0.007638814	N	Y
Flavanone base +2O, 1MeO	C16H14O5	491.871	0.000720804	0.001130476	Y	N
5-O-Demethylnobiletin	C20H20O8	510.5205	0.003240138	0.008347633	Y	N
Flavanone	C15H12O2	612.0045	0.002026581	0.003398592	Y	N
Flavokawain A	C18H18O5	672.113	0.002344129	0.003609625	Y	N
7-Hydroxy-4'-methoxyflavone	C16H12O4	507.4065	0.004867904	0.009513075	N	Y
Rutin	C27H30O16	354.9415	0.002364348	0.002759073	Y	N
(2R,3R)-3,5-dihydroxy-2-(4-hydroxyphenyl)-7-methoxy-2,3-dihydrochromen-4-one	C16H14O6	479.476	0.013137557	0.028752702	N	Y
Iristectorigenin B	C17H14O7	438.576	0.012261037	0.024008149	N	Y
L-Asarinin	C20H18O6	532.93	0.000855457	0.002116603	Y	N
p-Coumaric acid	C9H8O3	53.78905	0.013325325	0.019284314	Y	N
7-Dehydroxy-4-demethylpodophyllotoxin	C21H20O7	537.7895	0.001172503	0.002018935	Y	N
4-Methyl-6,7-dihydroxycoumarin	C10H8O4	442.957	0.001728081	0.002878361	Y	N

Cinnamic acid	C9H8O2	729.274	0.00000172	0.004745612	Y	N
(9-hydroxy-8,8-dimethyl-2-oxo-9,10-dihydropyrano[2,3-f]chromen-10-yl) (Z)-2-methylbut-2-enoate	C19H20O6	660.2535	0.003787321	0.006948418	Y	N
Coniferyl aldehyde	C10H10O3	393.741	0.00974279	0.023113564	Y	N
Ferulic acid	C10H10O4	192.515	0.044151688	0.051243751	Y	N
Fraxin	C16H18O10	248.6105	0.003554859	0.004495442	Y	N
coniferin	C16H22O8	328.6995	0.420208933	0.567635379	N	Y
columbianetin	C14H14O4	559.404	0.069170425	0.093671914	N	Y
Wikstromol	C20H22O7	530.21	0.066116788	0.118234438	N	Y
5-[6-(3-hydroxy-4-methoxyphenyl)-1,3,3a,4,6,6a-hexahydrofuro[3,4-c]furan-3-yl]-2-methoxyphenol	C20H22O6	625.8335	0.04121861	0.068826995	N	Y
trans-4-Coumaric acid	C9H8O3	315.245	0.025595167	0.50299409	N	Y
sweroside	C16H22O9	232.4555	0.009002392	0.011890281	Y	N
[(1R,3aR,5R,5aR,8aR,9aR)-1,5,8a-trimethyl-2,8-dioxo-3a,4,5,5a,9,9a-hexahydro-1H-azuleno[6,5-b]furan-9-yl] acetate	C17H22O5	665.0785	0.007463551	0.009104265	Y	N
Obacunone	C26H30O7	575.965	0.020485251	0.025938691	Y	N
Linderalactone	C15H16O3	624.284	0.003331763	0.004063932	Y	N
Ginkgolide K	C20H22O9	298.748	0.001715824	0.003469484	Y	N
Cantharidin	C10H12O4	222.476	0.002870417	0.003369385	Y	N
Levistilide A	C24H28O4	760.4765	0.002694216	0.005468379	Y	N
(1R,2R,4S,7R,8S,12R)-7-(furan-3-yl)-1,8,12,17,17-pentamethyl-3,6,16-trioxapentacyclo[9.9.02,4.02,8.012,18]icos-13-ene-5,15,20-trione	C26H30O7	711.583	0.000469773	0.001277933	Y	N
Cryptotanshinone	C19H20O3	729.6605	0.000236277	0.001332392	Y	N
Columbin	C20H22O6	615.024	0.001646087	0.002956387	Y	N
Deoxyandrographolide	C20H30O4	709.31	0.00142067	0.00235429	Y	N
Ursolic acid	C30H48O3	640.355	0.000531784	0.001723569	Y	N
1,4a-dimethyl-9-oxo-7-propan-2-yl-3,4,10,10a-tetrahydro-2H-phenanthrene-1-carboxylic	C20H26O3	257.417	0.000143047	0.002413729	Y	N

acid						
Lindenenol	C15H18O2	712.5155	0.000789569	0.002406192	Y	N
Ginsenoside Ro	C48H76O19	640.4975	0.021662722	0.068307443	N	Y
Arenobufagin	C24H32O6	594.916	0.004972134	0.016695996	N	Y
Gibberellin A4&A7	C19H22O5	585.922	0.002476271	0.041279601	N	Y
aucubin	C15H22O9	226.0215	0.00382046	0.006035	Y	N
Cinobufagin	C26H34O6	542.654	0.000889549	0.002826073	Y	N
D-ASPARTATE	C4H7NO4	37.375	0.744578918	0.923191296	N	Y
Arginine	C6H14N4O2	99.892	0.513406414	0.622791867	Y	N
L-Glutamic Acid	C5H9NO4	41.6904	0.179368712	0.238583083	Y	N
Aspartic acid	C4H7NO4	41.67545	0.025572859	0.036774924	Y	N
Tyrosine	C9H11NO3	52.082	0.256553313	0.328146375	Y	N
Homoserine	C4H9NO3	41.1104	0.013992456	0.018074989	Y	N

Supplementary Table 6: Compounds of fecal metabolites

name	BFAS/FAS	HMDB	Class
Uric acid	↓	HMDB0000289	Imidazopyrimidines
Ethyl tetradecanoate	↓	HMDB0034153	Fatty Acyls
(1R,2S,3R)-2-Acetyl-4(5)-(1,2,3,4-tetrahydroxybutyl)imidazole	↓	HMDB0029756	Organooxygen compounds
myo-Inositol	↓	HMDB0000211	Organooxygen compounds
LysoPA(18:1(9Z)/0:0)	↓	HMDB0007855	Glycerophospholipids
LysoPA(16:0/0:0)	↓	HMDB0007853	Glycerophospholipids
Nervonic acid	↓	HMDB0002368	Fatty Acyls
Erucic acid	↓	HMDB0002068	Fatty Acyls
Allose	↓	HMDB0001151	Organooxygen compounds
Mesna	↓	HMDB0003745	Organic sulfonic acids and derivatives
D-Glucurono-6,3-lactone	↓	HMDB0006355	Furofurans
Pelargonic acid	↑	HMDB0000847	Fatty Acyls
Saccharin	↑	HMDB0029723	Benzothiazoles
Cyclamic acid	↑	HMDB0031340	Sulfamic acid derivatives
3b-Hydroxy-5-cholenoic acid	↑	HMDB0000308	Steroids and steroid derivatives
Xanthoxylin	↑	HMDB0029645	Organooxygen compounds



Supplementary Figure 1: The antioxidant activity of FAS/NFAS *in vitro*. (A) DPPH free radical scavenging rate, (B) Superoxide anion scavenging rate, (C) Hydroxyl radical scavenging rate, (D) Total antioxidant capacity (ABTS method). All data are expressed as mean ± SD. * $p < 0.05$ and ** $p < 0.01$: significantly different compared with NFAS. (FAS: fermented Angelica Sinensis, NFAS: non-fermented Angelica Sinensis, VC: vitamin C)