Supplementary Table 1 Physicochemical parameters in litchi juice (LJ) and fermented litchi juice (FLJ)

Basic indicators	LJ	FLJ
Viable count (log CFU/mL)	\	9.25 ± 0.10*
GABA (mg/100 mL)	108 ± 4	125 ± 6*
Total carbohydrate (mg/mL)	194 ± 5	154 ± 6*
Glucose (mg/mL)	90 ± 4	76 ± 1.3*
Fructose (mg/mL)	108 ± 5	90 ± 1.5*
Sucrose (mg/mL)	43.5 ± 0.8	11.9 ± 0.4*
Titratable acid (mg/mL)	1.23 ± 0.03	7.63 ± 0.24*
pH	5.39 ± 0.07	3.70 ± 0.01*
Total phenolics (mg/mL)	0.65 ± 0.12	0.67±0.13
Soluble protein (mg/mL)	1.24 ± 0.02	1.02 ± 0.5

Values are expressed as mean ± SD, n=3; *$p < 0.05$, compared with LJ

Supplementary Table 2 Composition of the experimental diets.

Nutrition component	Ingredient	D12450B		D12492	
		Content (g/kg)	Calories (kcal%)	Content (g/kg)	Calories (kcal%)
Protein	Casein	200	20	200	20
	L-cystine	3		3	
Carbohydrates	Corn starch	315	70	0	20
	Maltodextrin	35		125	
	Sucrose	350		6808	
Fat	Cellulose	50	10	50	60
	Soya-bean oil	25		25	
	Lard oil	20		245	
Others	Mineral	10		10	
	Hydryoxyapetite	13		13	
	Calcium carbonate	5.5		5.5	
	Potassium citrate	16.5		16.5	
	Vitamin	10		10	
	Choline tartrate	2		2	
	Total calories		3.85		5.24

Supplementary Table 3 Representative MS fragments of the major phenolic acids in litchi juice (LJ) and fermented litchi juice (FLJ).

Peak no.	RT (min)	Compound name	Formula	Mass (m/z)	LJ (ng/mL)	FLJ (ng/mL)
1	0.92	Gallic acid	$C_7H_6O_5$	170.02	69.40±0.97	39.62±2.09
2	1.09	Phenylalanine	$C_9H_{11}NO_2$	165.08	36.24±3.44	14.89±5.03
3	1.83	3,4-Dihydroxybenzoic acid	$C_7H_6O_4$	154.03	366.99±14.16	201.33±21.45
4	3.08	Protocatechualdehyde	$C_7H_6O_3$	138.03	428.06±0.14	293.57±36.31
5	3.30	4-Hydroxybenzoic acid	$C_7H_6O_3$	138.03	130.27±15.87	82.09±3.24
6	4.07	Vanillic acid	$C_8H_8O_4$	168.04	49.35±7.89	15.30±1.06
7	4.24	Caffeic acid	$C_9H_8O_4$	180.04	8.14±0.52	8.55±0.34
8	4.44	Syringic acid	$C_9H_{10}O_5$	198.05	16.16±1.83	10.56±0.40
9	5.03	Vanillin	$C_8H_8O_3$	152.05	1.47±0.05	0.83±0.07
10	5.23	p-Hydroxycinnamic acid	$C_9H_8O_3$	164.05	49.72±1.51	29.08±0.40
11	5.38	Syringaldehyde	$C_9H_{10}O_4$	182.06	2.21±0.28	1.73±0.05
12	5.49	Salicylic acid	$C_7H_6O_3$	138.03	246.58±2.50	339.90±5.82
13	5.59	Trans-Ferulic acid	$C_{10}H_{10}O_4$	194.06	11.18±0.42	5.82±0.04
14	5.64	Sinapic acid	$C_{11}H_{12}O_5$	224.07	3.66±0.24	2.27±0.14
15	5.92	Benzoic acid	$C_7H_6O_2$	122.04	246.28±8.20	193.29±4.44
16	7.04	Hydrocinnamic acid	$C_9H_{10}O_2$	150.07	1.34±0.00	2.69±0.45
17	7.15	Trans-Cinnamic acid	$C_9H_8O_2$	148.05	10.92±0.89	5.12±0.07
Total					1677.98	1246.63

Supplementary Table 4 Representative MS fragments of the major flavonoids in litchi juice (LJ) and fermented litchi juice (FLJ).

Peak no.	RT (min)	Compound name	Formula	Mass(m/z)	LJ (ng/mL)	FLJ (ng/mL)
1	3.89	Catechin	$C_{15}H_{14}O_6$	290.08	3.56±0.30	17.66±1.18
2	4.76	L-Epicatechin	$C_{15}H_{14}O_6$	290.08	3.61±0.42	393.75±7.80
3	4.77	Dihydromyricetin	$C_{15}H_{12}O_8$	320.05	17.68±0.05	17.92±0.07
4	5.57	Rutin	$C_{27}H_{30}O_{16}$	610.15	2303.92±139.50	2192.30±8.22
5	5.71	Quercetin 3-β-D-glucoside	$C_{21}H_{20}O_{12}$	464.09	2.85±0.33	2.89±0.35
6	5.78	(+)-Dihydroquercetin	$C_{15}H_{12}O_7$	304.06	2.70±0.33	9.73±0.35
7	6.05	Kaempferol-3-O-glucoside	$C_{21}H_{19}O_{11}$	448.10	8.29±0.28	7.00±0.02
8	6.38	(+)-Dihydrokaempferol	$C_{15}H_{12}O_6$	288.06	3.15±0.32	7.85±0.04
9	7.00	Luteolin	$C_{15}H_{10}O_6$	286.05	0.65±0.46	0.77±0.21
10	7.03	Quercetin	$C_{15}H_{10}O_7$	302.04	2.75±0.99	8.94±0.55
11	7.52	Apigenin	$C_{15}H_{10}O_5$	270.05	/	0.48±0.06
12	7.54	Naringenin	$C_{15}H_{12}O_5$	272.07	0.69±0.06	1.13±0.04
13	7.62	Kaempferol	$C_{15}H_{10}O_6$	286.05	0.74±0.39	0.99±0.20
14	7.69	Isorhamnetin	$C_{16}H_{12}O_7$	316.06	2.33±0.67	3.25±0.04
Total					2352.92	2664.65

Supplementary Table 5 HPLC autosampler program for OPA derivatization of GABA

Step	Action	Vial[a]	Volume (μL)
1	Draw	1	10
2	Draw	Sample	2
3	Mix[b]		12
4	Draw	2	0
5	Draw	3	2
6	Mix[c]		14
7	Draw	2	
8	Inject		

[a] Vial 1: borate buffer solution; vial 2: rinse solvent(acetonitrile); vial 3: OPA derivatization reagent.

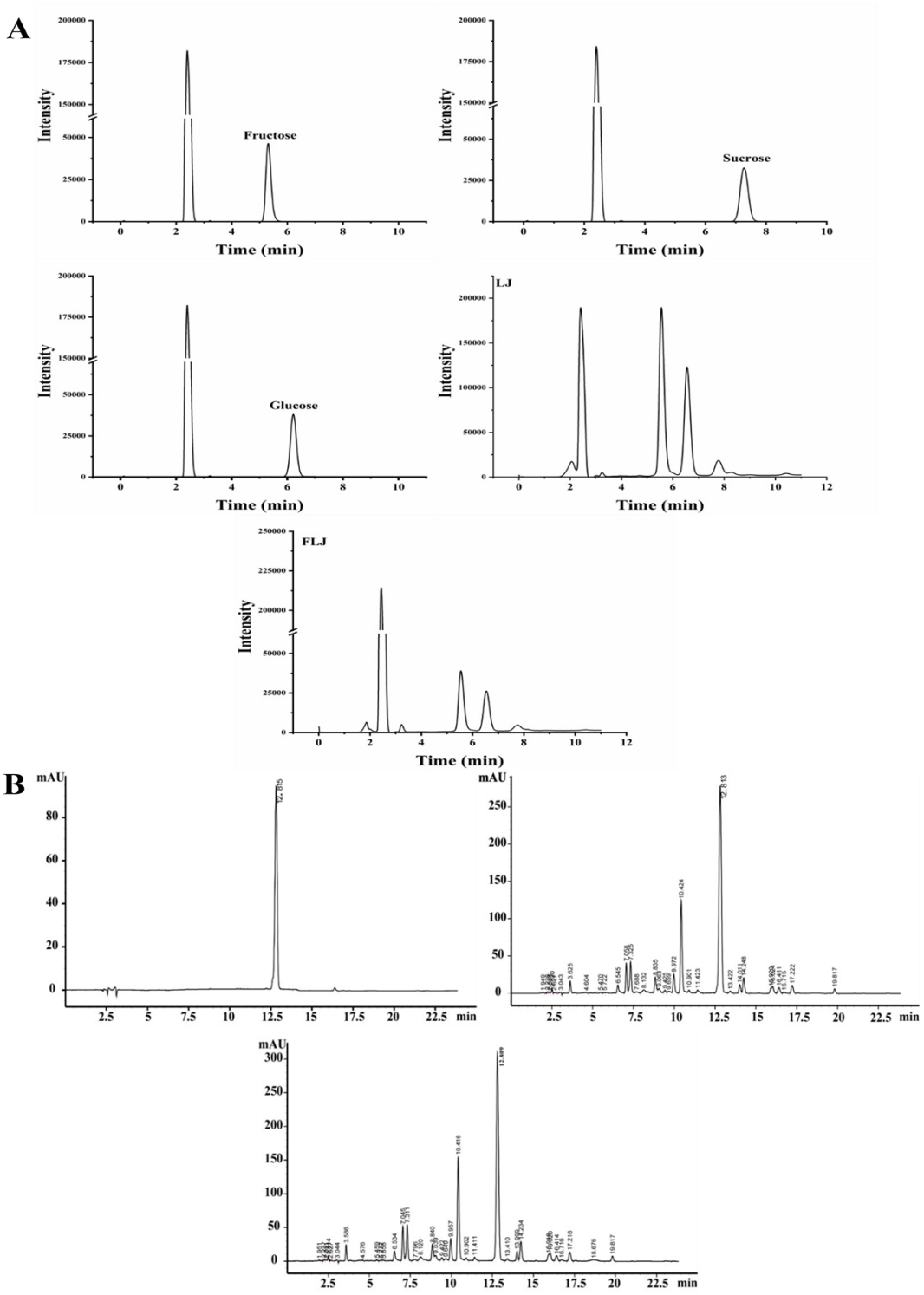
[b] In air; default speed; three times.

[c] In air; default speed; fifteen times.

Supplementary Table 6 HPLC gradient elution program for determination of GABA

Time/min	Mobile phase/%	
	A	B
0	90	10
20	55	45
25	90	10

Notes: solvent A: 25 mM sodium acetate, pH 5.9, solvent B: 100% acetonitrile



Supplementary Figure 1. HPLC analysis of monosaccharides (A) and GABA (B) in litchi juice (LJ) and fermented litchi juice (FLJ).

Supplementary methods:

1. Chromatography and MS

1.1 Chemicals and reagents

Methanol, acetonitrile, acetic acid was purchased from ANPEL. All solvents were of LC-MS grade. Sodium hydroxide, hydrochloric acid, ethyl acetate was purchased from Sinopharm which were AR Grade. And ultra-pure water in-house prepared using a Milli-Q water purification system (Millipore, Bedford, MA, USA).

1.2 Sample preparation and extraction

Samples were treated with 2 mL of 4 M aqueous NaOH. The mixed solution was hydrolyzed at 40 °C for 2 h in a gas bath with shaking and protection from light. The pH value was adjusted to 2 by adding 4 M aqueous HCl. The mixture was shaken with 2 mL of n-hexane at room temperature for 20 min to remove the n-hexane layer. Ethyl acetate (2 × 2 mL) was used to extract the aqueous layer, and the mixed extracts were concentrated to nearly dry on a rotary evaporator at 35 °C under reduced pressure. Before analysis, the residue was dissolved in 200 μl of 50% methanol/water and transferred to insert-equipped vials.

1.3 UPLC Conditions

The sample extracts were analyzed using an UPLC– Orbitrap-MS system (UPLC, Vanquish; MS, QE). The analytical conditions were as follows, UPLC: column, Waters ACQUITY UPLC HSS T3(1.8 μm, 2.1 mm*50 mm); column temperature, 40 ℃; flow rate, 0.3 mL/min; injection volume, 2μL; solvent system, water (0.1% acetic acid): acetonitrile (0.1% acetic acid); gradient program, 90:10 V/V at 0 min, 90:10 V/V at 2.0 min, 40:60 V/V at 6.0 min, 40:60 V/V at 8.0 min, 90:10 V/V at 8.1 min, 90:10 V/V at 12.0 min.

1.4 QE

HRMS data were recorded on a Q Exactive hybrid Q–Orbitrap mass spectrometer equipped with a heated ESI source (Thermo Fisher Scientific) utilizing the Full MS acquisition methods. The ESI source parameters were set as follows: spray voltage, -2.8 kV; sheath gas pressure, 40 arb; aux gas pressure, 10 arb; sweep gas pressure, 0 arb; capillary temperature, 320 ℃; and aux gas heater temperature, 350 ℃.

1.5 Data analysis and interpretation

Data were acquired on the Q-Exactive using Xcalibur 4.1 (Thermo Scientific), and processed using TraceFinder™4.1 Clinical (Thermo Scientific). Quantified data were output into Excel format.

2. Measurement of GABA contents

GABA contents were determined by HPLC (Agilent Technologies 1260 Infinity II, Santa Clara, CA, USA) equipped with a Zorbax SB-C18 column (4.6 mm × 250 mm, 5 μm, Nacalai Tesque, Japan), using the method described by Moret et al. (2005) with some modification. The samples of fermented litchi juice were centrifuged at 10,000×g for 10 min. The resulting supernatants were filtered through a membrane filter (0.22 μm) and the filtrate was used for HPLC analysis. Pre-column derivatization of samples was performed using the Agilent automated derivatization protocol with O-phthalaldehyde (OPA, Sigma Chemical Industries, Ltd., Saint Louis, MO, USA), and boric acid (pH 10.4) serving as buffer. Use of the Agilent automatic derivatization injection program (Supplementary Table S5) was as follows: 10 μL of boric acid buffer and 2 μL of the sample were combined and mixed 3 times, the injection needle was washed for 3 s with acetonitrile, 2 μL of the OPA derivatization reagent was added, the injection needle was rewashed for 3 s with acetonitrile, and the 14 μL volume consisting of sample, buffer and derivation reagent was mixed 15 times. Sample separation was accomplished using a gradient program (Supplementary Table S6) consisting of mobile phase [solvent A: 25 mM sodium acetate, pH 5.9, solvent B: 100% acetonitrile] with a flow rate of 1 mL/min in a column held at 40 °C. The OPA derivatives of GABA were detected by a UV detector at 323 nm. The GABA contents were quantified based on integrated peak area in comparison with standard curves prepared from known concentrations of GABA standard.