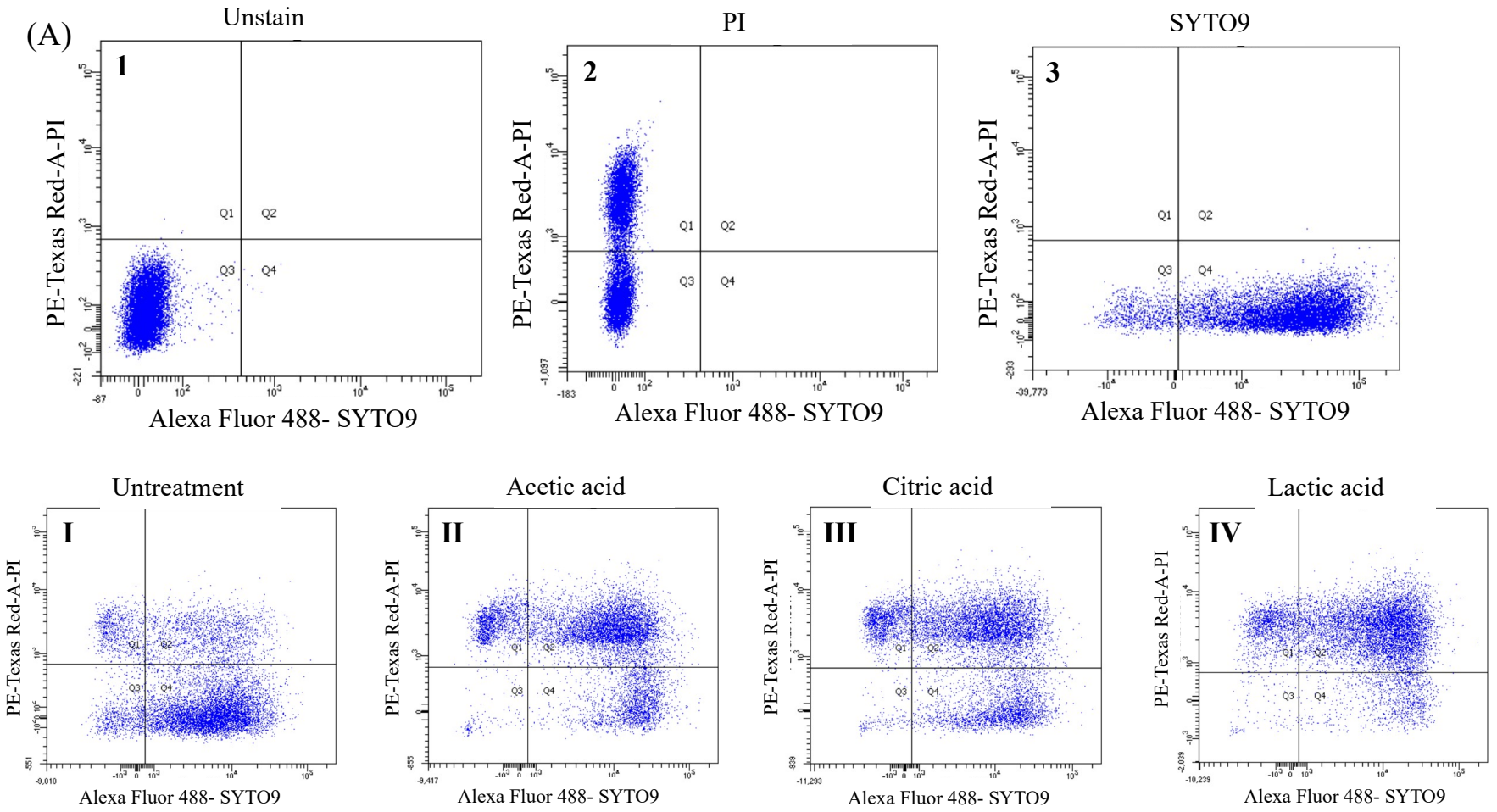
Figure S1. The flow cytometry images of ATCC 13076 (A), ATCC 14028(B) after treatments

Note: I: control; II: acetic acid; III: citric acid; IV: lactic acid； 1-3 decide the baseline; Points in Q1: totally damaged; Q2: partly damaged



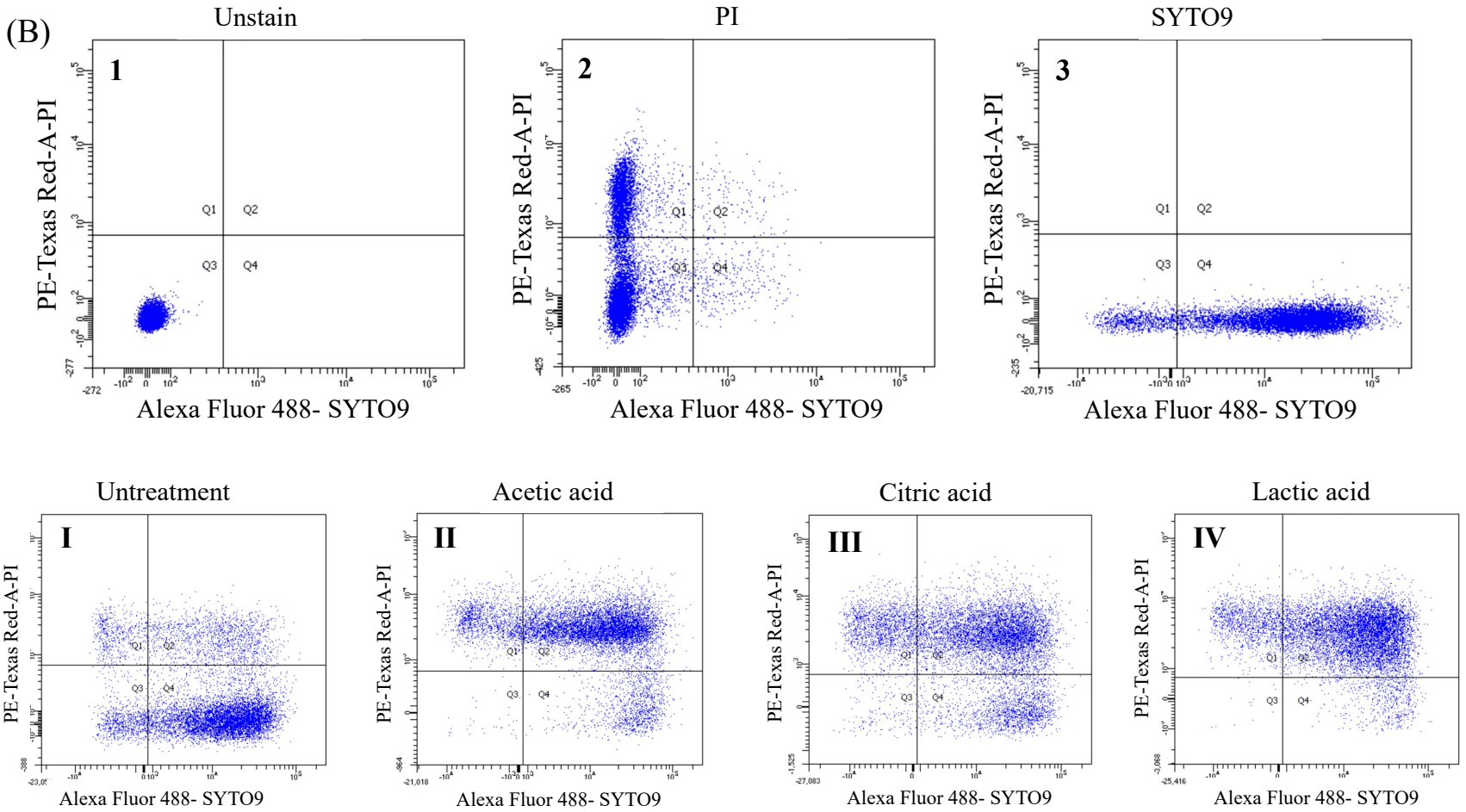
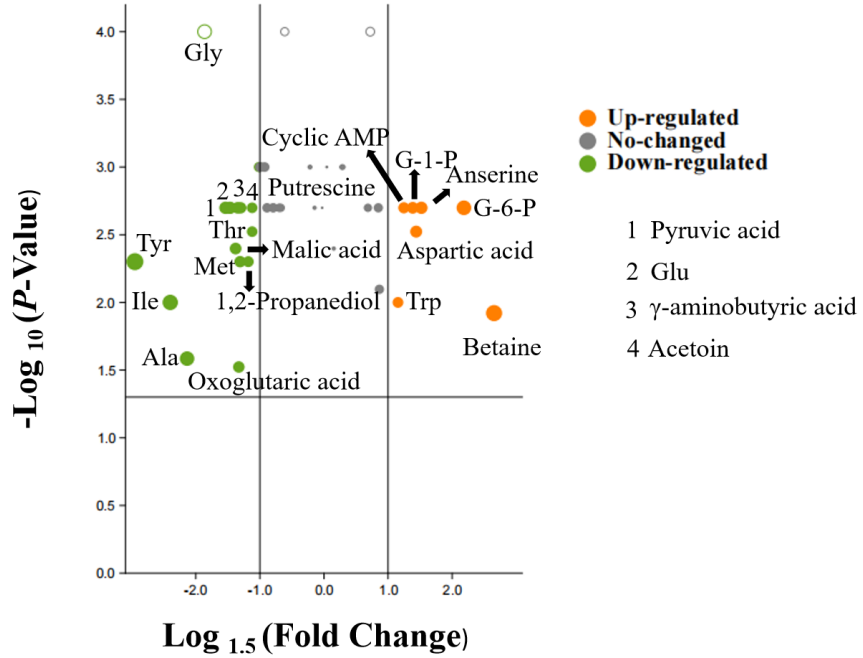

(B)
Unstain
PI
SYTO9
1
2
3
PE-Texas Red-A-PI
Alexa Fluor 488- SYTO9
Q1
Q2
Q3
Q4
Untreatment
Acetic acid
Citric acid
Lactic acid
I
II
III
IV

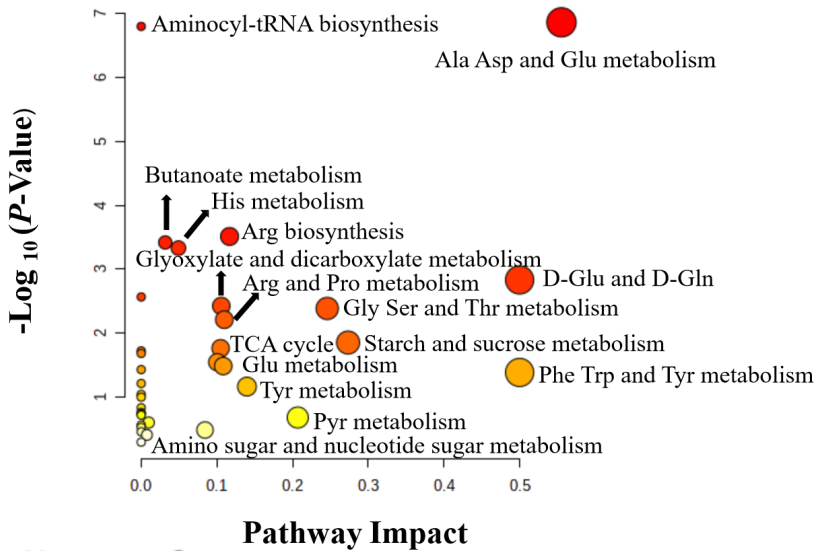
Figure S2. Volcano plots of the control and CA and LA groups (A1-F1); pathway analysis for the control and CA and LA groups (A2-F2). A-C (CA; ATCC 6962, ATCC 13076, ATCC 14028) D-F (LA; ATCC 6962, ATCC 13076, ATCC 14028)

Note: green colour in the volcano plot shows decreased amount after organic acid treatments; orange colour in the volcano plot shows increased amount after the organic acid treatments. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.

(A1)

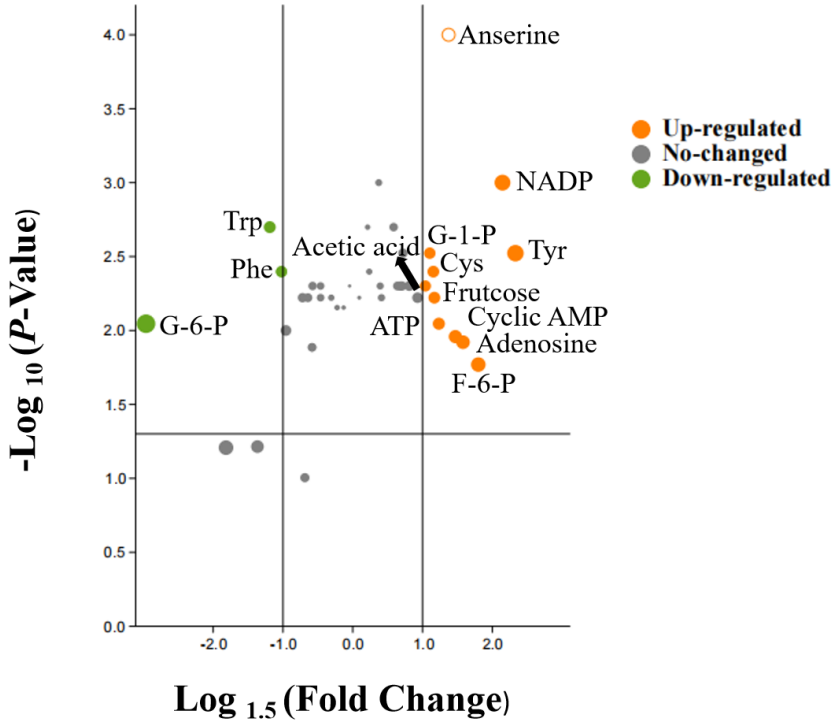


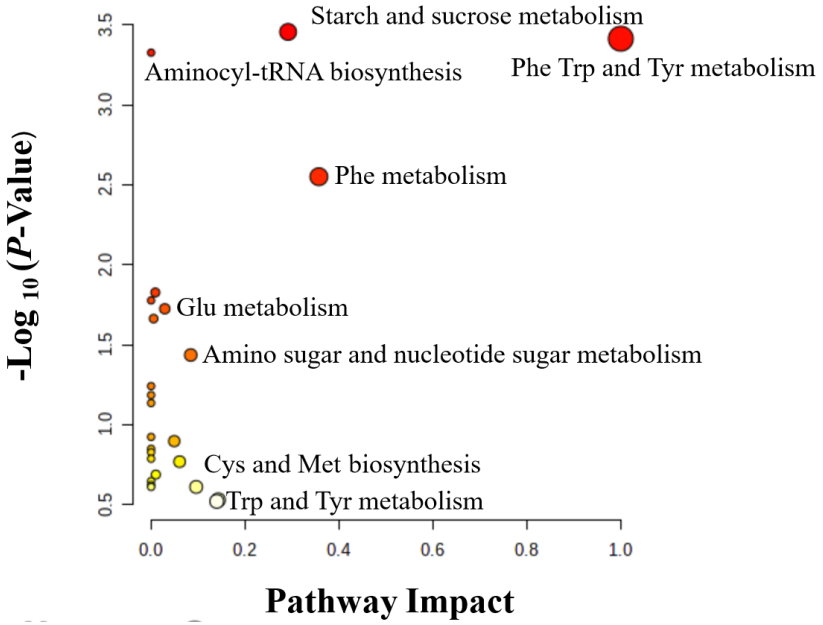
(A2)



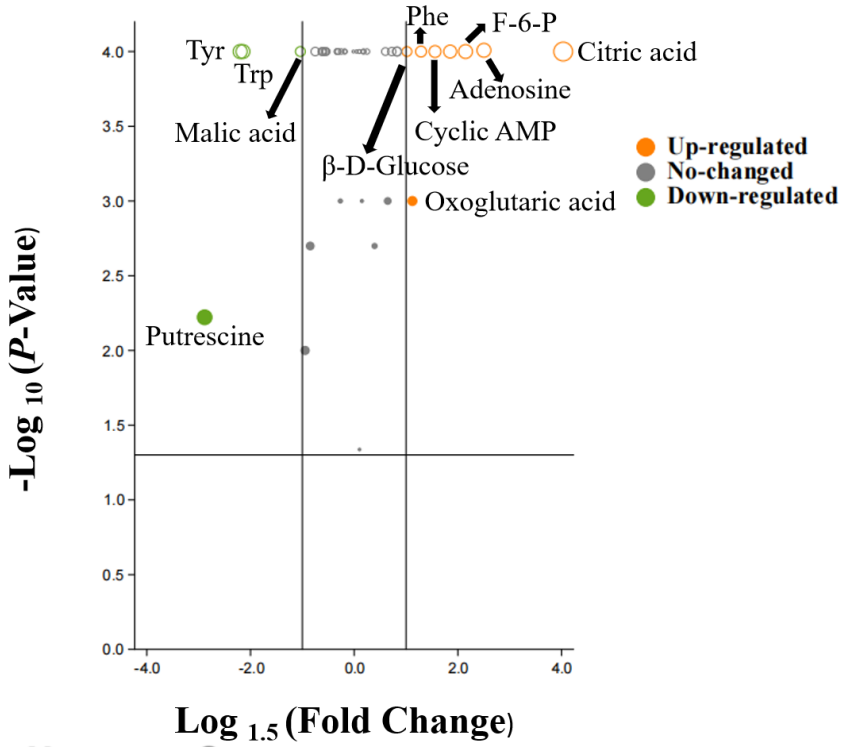
(B1)

(B2)

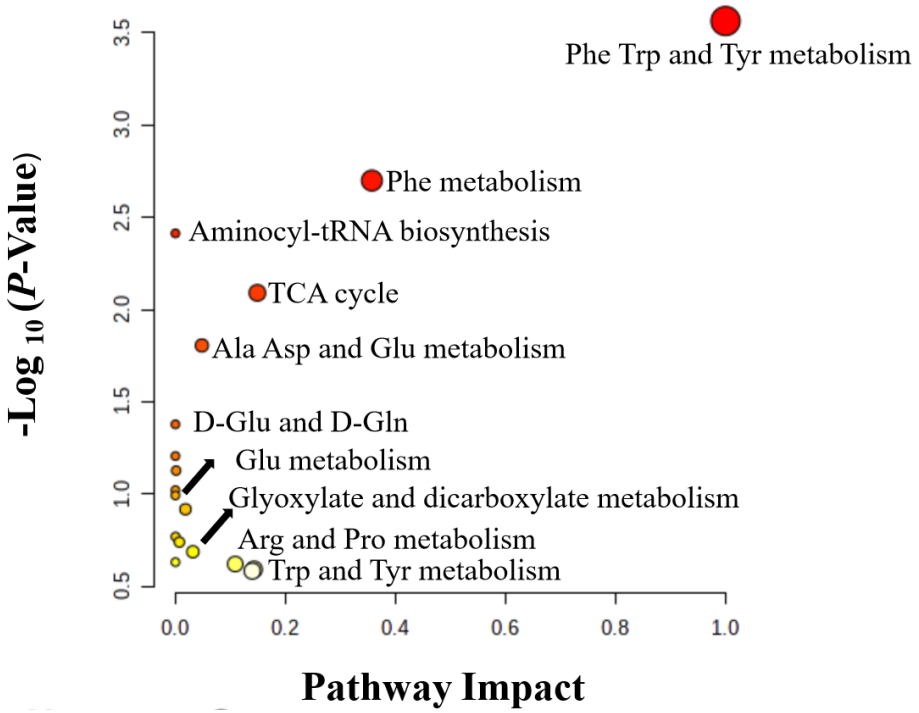

Anserine
NADP
Trp
Acetic acid
G-1-P
Tyr
Phe
Cys
Frutcose
G-6-P
ATP
Cyclic AMP
Adenosine
F-6-P
Up-regulated
No-changed
Down-regulated
-Log 10 (P-Value)
Log 1.5 (Fold Change)


Starch and sucrose metabolism
Aminocyl-tRNA biosynthesis
Phe Trp and Tyr metabolism
Phe metabolism
Glu metabolism
Amino sugar and nucleotide sugar metabolism
Cys and Met biosynthesis
Trp and Tyr metabolism
-Log 10 (P-Value)
Pathway Impact

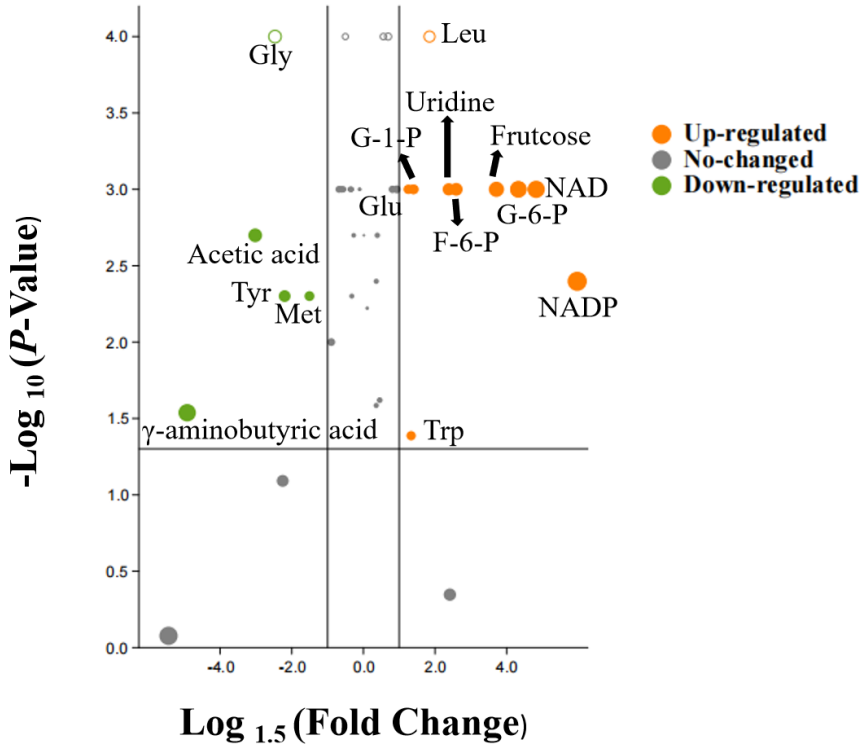
(C1)


Phe
F-6-P
Tyr
Trp
Citric acid
Adenosine
Malic acid
Cyclic AMP
β-D-Glucose
Oxoglutaric acid
Up-regulated
No-changed
Down-regulated
Putrescine
-Log 10 (P-Value)
Log 1.5 (Fold Change)

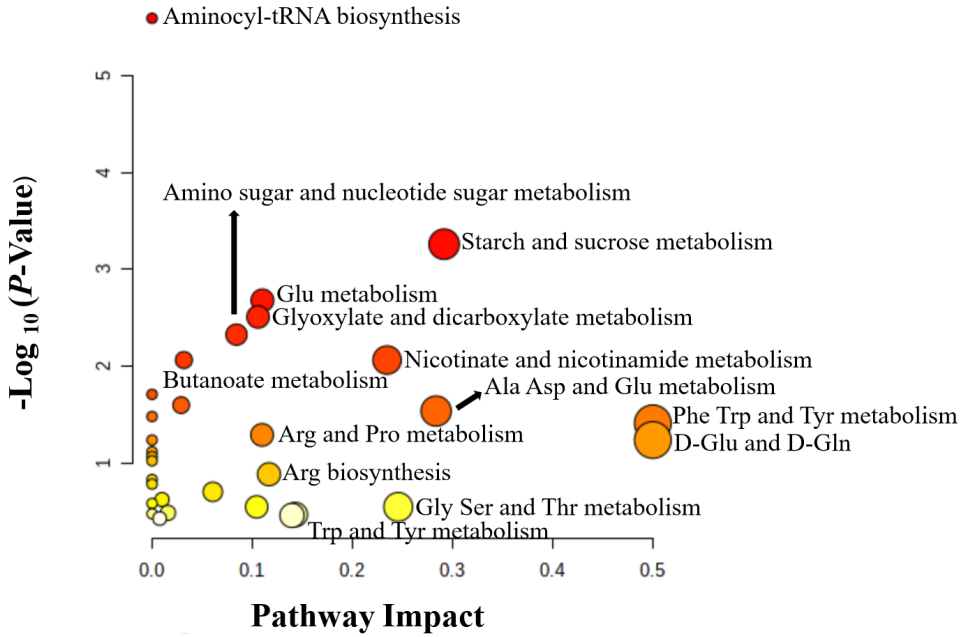
(C2)


Phe Trp and Tyr metabolism
Phe metabolism
Aminocyl-tRNA biosynthesis
TCA cycle
Ala Asp and Glu metabolism
D-Glu and D-Gln
Glu metabolism
Glyoxylate and dicarboxylate metabolism
Arg and Pro metabolism
Trp and Tyr metabolism
-Log 10 (P-Value)
Pathway Impact

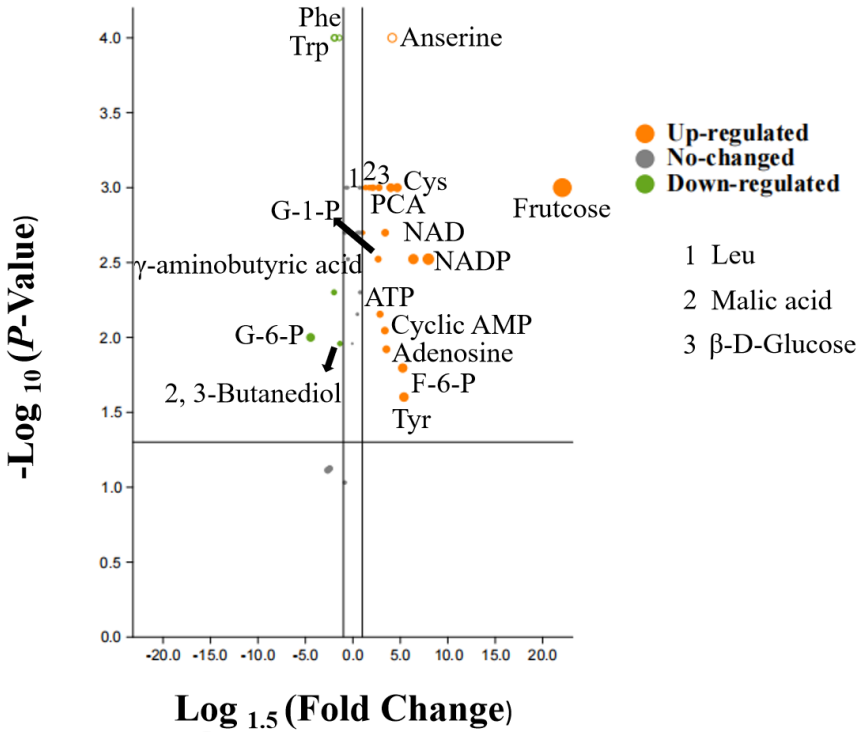
(D1)


Gly
Leu
Uridine
G-1-P
Frutcose
NAD
Glu
G-6-P
F-6-P
Acetic acid
Tyr
Met
NADP
γ-aminobutyric acid
Trp
Up-regulated
No-changed
Down-regulated
-Log 10 (P-Value)
Log 1.5 (Fold Change)

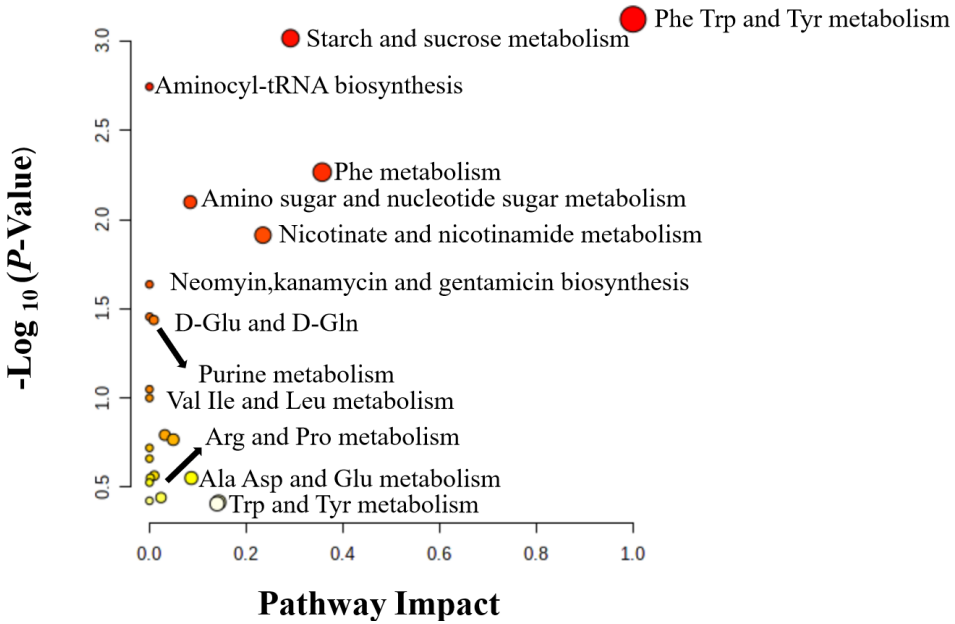
(D2)


Aminocyl-tRNA biosynthesis
Amino sugar and nucleotide sugar metabolism
Starch and sucrose metabolism
Glu metabolism
Glyoxylate and dicarboxylate metabolism
Nicotinate and nicotinamide metabolism
Butanoate metabolism
Ala Asp and Glu metabolism
Phe Trp and Tyr metabolism
D-Glu and D-Gln
Arg and Pro metabolism
Arg biosynthesis
Gly Ser and Thr metabolism
Trp and Tyr metabolism
-Log 10 (P-Value)
Pathway Impact

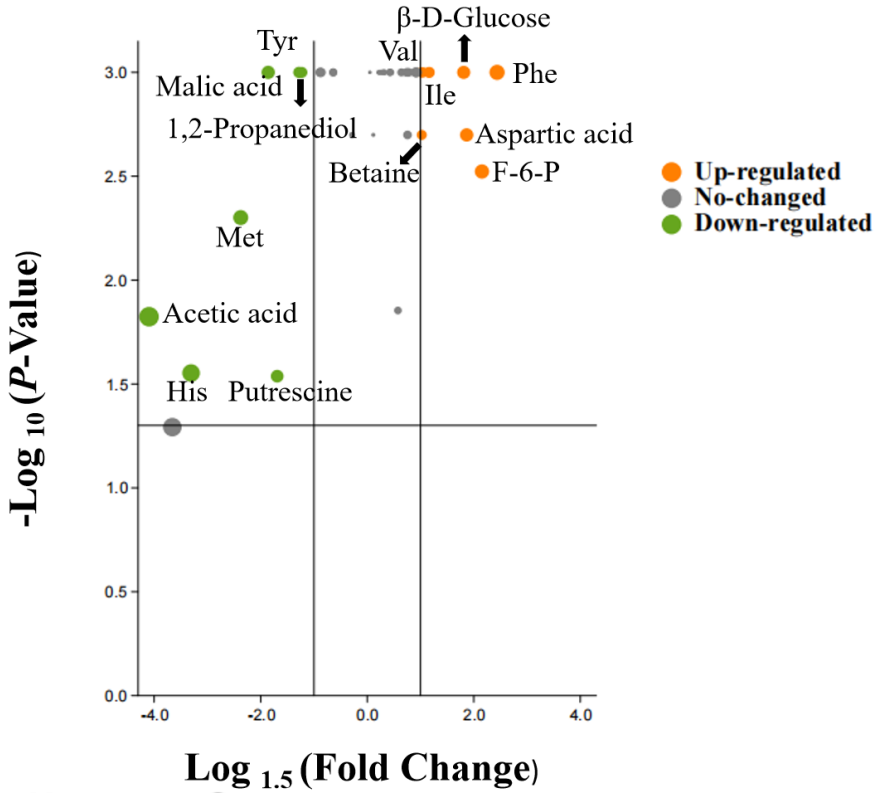
(E1)


Phe
Trp
Anserine
1 2 3 Cys
PCA
Frutcose
G-1-P
NAD
γ-aminobutyric acid
NADP
ATP
Cyclic AMP
G-6-P
Adenosine
2, 3-Butanediol
F-6-P
Tyr
Up-regulated
No-changed
Down-regulated
1 Leu
2 Malic acid
3 β-D-Glucose
-Log 10 (P-Value)
Log 1.5 (Fold Change)

(E2)


Phe Trp and Tyr metabolism
Starch and sucrose metabolism
Aminocyl-tRNA biosynthesis
Phe metabolism
Amino sugar and nucleotide sugar metabolism
Nicotinate and nicotinamide metabolism
Neomyin,kanamycin and gentamicin biosynthesis
D-Glu and D-Gln
Purine metabolism
Val Ile and Leu metabolism
Arg and Pro metabolism
Ala Asp and Glu metabolism
Trp and Tyr metabolism
-Log 10 (P-Value)
Pathway Impact

(F1)


β-D-Glucose
Tyr
Val
Phe
Malic acid
Ile
1,2-Propanediol
Aspartic acid
Betaine
F-6-P
Up-regulated
No-changed
Down-regulated
Met
Acetic acid
His
Putrescine
-Log 10 (P-Value)
Log 1.5 (Fold Change)

(F2)

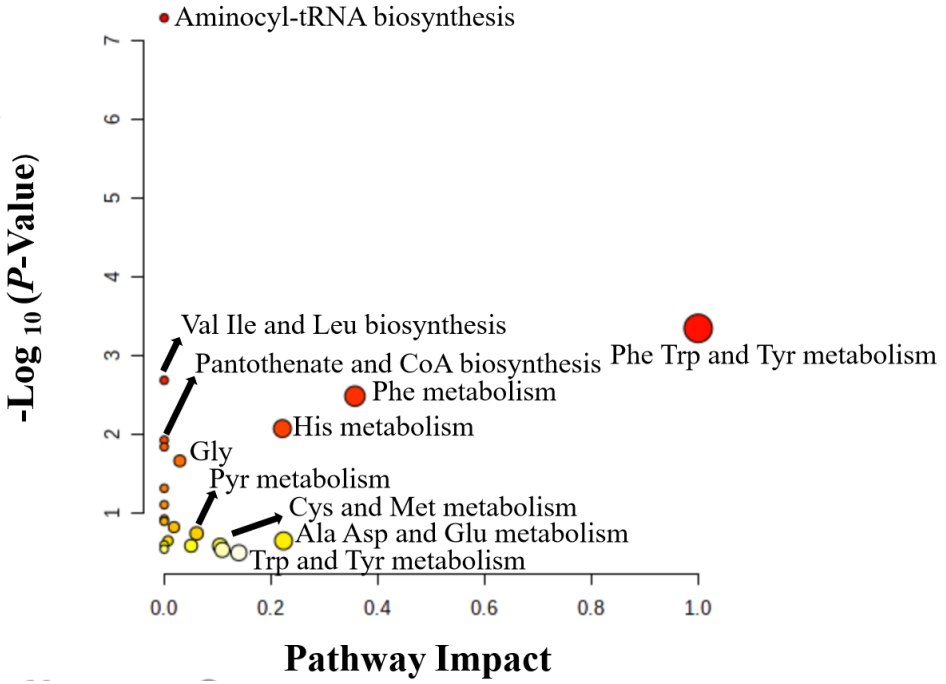

Aminocyl-tRNA biosynthesis
Val Ile and Leu biosynthesis
Pantothenate and CoA biosynthesis
Phe Trp and Tyr metabolism
Phe metabolism
His metabolism
Gly
Pyr metabolism
Cys and Met metabolism
Ala Asp and Glu metabolism
Trp and Tyr metabolism
-Log 10 (P-Value)
Pathway Impact

Figure S3. Three typical ^{1}H NMR spectra of *Salmonella* ATCC 6962, ATCC 13076 and ATCC 14028 extract in control groups. Note: I: ATCC 6962; II: ATCC 13076; ATCC 14028.

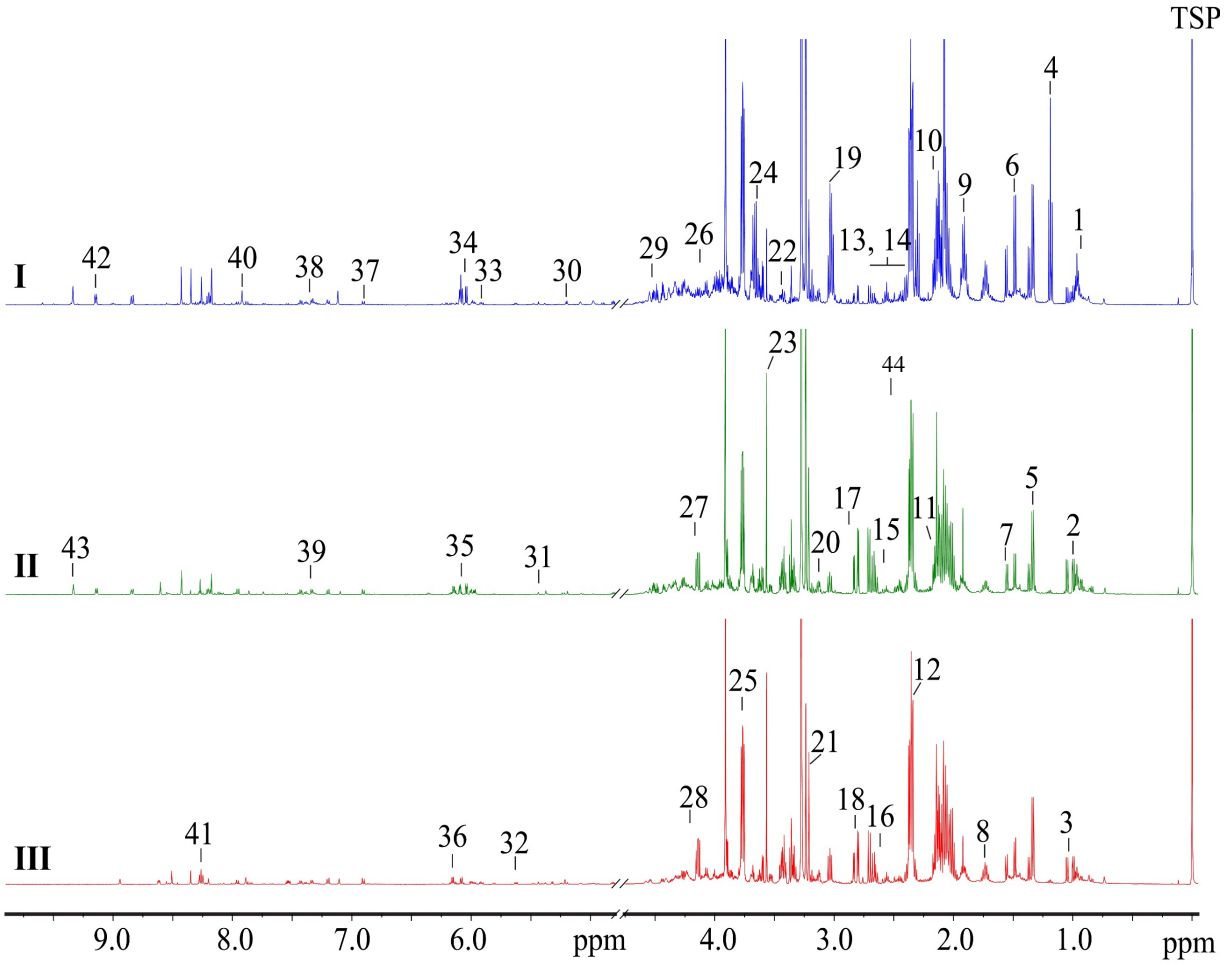


Figure S4. Nine typical ^{1}H NMR spectra of three *Salmonella. enterica* strains extraction after different organic acids treatments. Note: I: ATCC 6962; II: ATCC 13076; III: ATCC 14028. 1: acetic acid 2: citric acid 3: lactic acid

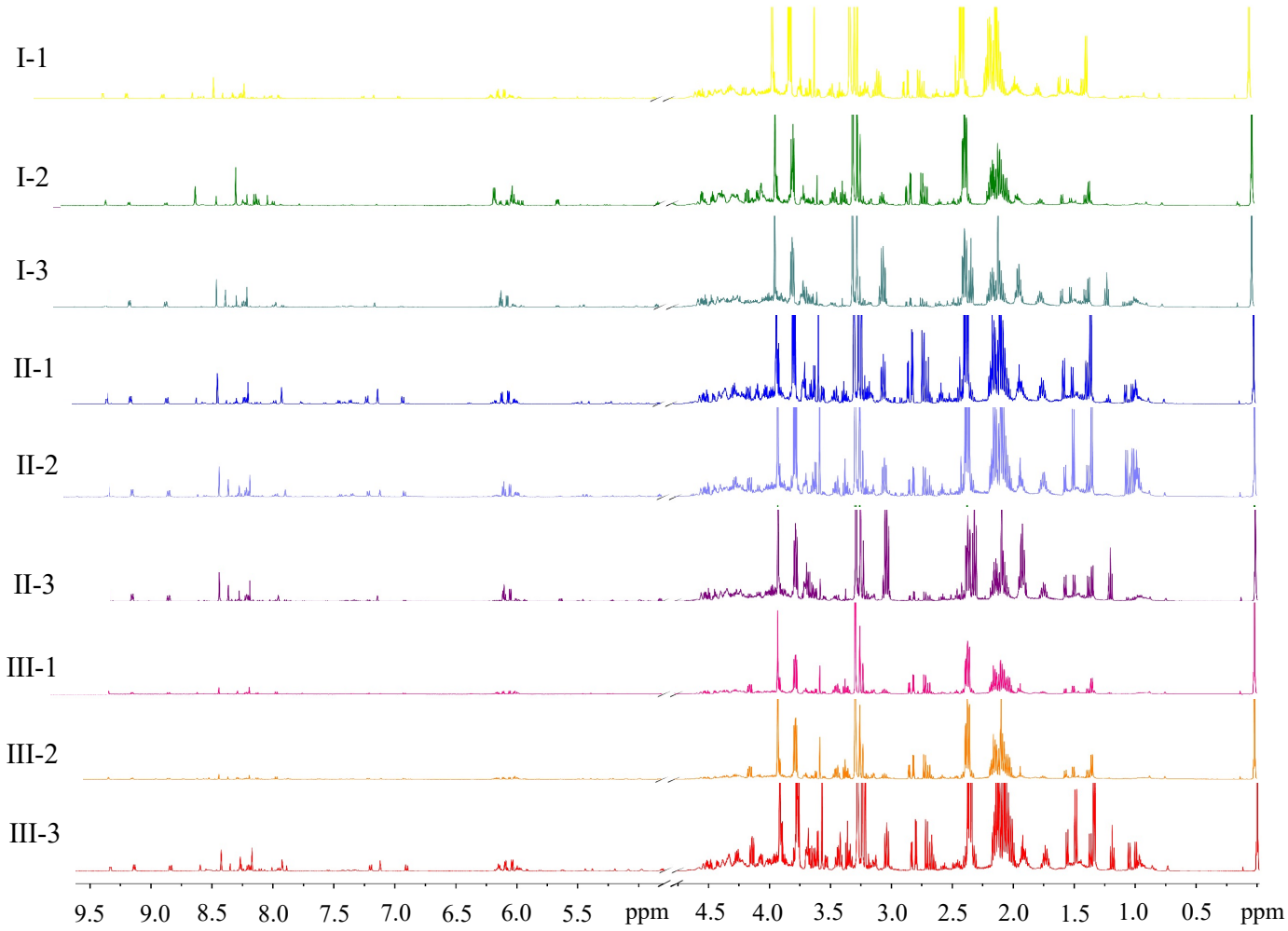


Table S1. Metabolites identified in *Salmonella*.

	Metabolites	Assignments	1H chemical shifts (ppm)	13C chemical shifts (ppm)
1	Isoleucine	αCH; βCH; γCH2; γ'CH3; δCH3	**3.65 (d); 1.97 (m); 1.45 (m); 0.98 (d); 0.92 (t)**	**62.65; 37.79; 26.88;17.52; 13.97**
2	Leucine	αCH; βCH2; γCH; δCH3; δ'CH3	**3.75 (m); 1.70(m); 1.71 (m); 0.95(t); 0.94 (t)**	**55.80; 42.26; 23.77; 24.76; 23.98**
3	Valine	αCH; βCH; γCH3; γ'CH3	**3.58 (d); 2.26(m); 1.01 (d); 1.01 (d)**	**64.12; 32.18; 18.80; 19.48**
4	Ethanol	αCH2; βCH3	**3.66 (m); 1.19 (t)**	**60.22; 18.93**
5	Lactic acid	αCH; βCH3	**4.10 (q);1.31 (d)**	**70.81;21.87**
6	Alanine	αCH; βCH3	**3.77 (q); 1.50 (d)**	**53.60; 19.02**
7	Threonine	αCH; βCH; γCH3	**3.57(d); 4.24 (m); 1.31(d)**	**62.82; 68.77; 21.89**
8	Putrescine	αCH2; βCH2	**3.04 (t); 1.75 (m)**	**41.11; 26.93**
9	Acetic acid	CH3	**1.91(s)**	**26.08**
10	Methionine	αCH; βCH2; γCH2; SCH3	**3.85 (dd); 2.17(m); 2.63 (t); 2.10 (m)**	**56.45; 33.36; 31.79; 16.22**
11	Acetoin	αCH3; αCH; βCH3	**2.22(s); 4.41 (q); 1.37 (d)**	**28.02; 75.96; 21.04**
12	Glutamate	αCH; βCH2; γCH2	**3.76 (m); 2.04 (m); 2.34 (m)**	**57.35; 32.69; 36.21**
13	Succinic acid	CH2	**2.38 (s)**	**37.02**
14	Pyroglutamic acid	αCH; βCH2; γCH2;γ'CH	**4.16(dd); 2.49(m); 2.38 (m); 2.01(m)**	**60.96; 28.05; 32.39; 28.32**
15	Pyruvic acid	CH3	**2.35 (s)**	**29.84**
16	Anserine	αCH; βCH2; CH3; NCHC; NCHN; β'CH2; β'CH2N	**4.49 (dd); 3.05 (d); 3.77 (s); 7.11 (s); 8.29 (s); 2.66 (m); 3.22 (m)**	**56.02; 27.95; 35.12; 122.58; 138.18; 35.06; 28.28**
17	Cysteine	NCH; SCH2	**3.84 (dd); 3.05(m)**	**58.74; 28.01**
18	Aspartic acid	αCH; βCH2; γCH2	**3.90 (dd); 2.79 (dd); 2.71(m)**	**54.99; 39.44;39.34**
19	Oxoglutaric acid	αCH2; βCH2	**2.99 (m); 2.43 (t)**	**38.92; 33.21**
20	γ-aminobutyric acid	αCH2; βCH2; γCH2	**2.28 (t); 1.90 (m); 3.13 (t)**	**39.27; 26.33; 41.99**
21	Betaine	CH3; CH2	**3.26 (s); 3.90 (s)**	**55.60; 68.98**
22	1,2-Propanediol	C1H2; C2H; C3H3	**3.46(dd); 3.81(m); 1.06 (d)**	**69.33; 71.17; 21.17**
23	Glycine	CH2	**3.56 (s)**	**44.36**
24	2, 3-Butanediol	CH; CH3	**3.65 (m); 1.17 (d)**	**74.76;20.23**

25	Glutamine	αCH; βCH_2; γCH_2	**3.76 (t); 2.12 (m);** 2.43 (m)	**57.18; 29.07;** 34.07
26	Fructose	C_1H_2; C_2H; C_3H; C_4H; C_6H_2	**3.98 (m); 3.88 (m); 3.83 (m);** 3.79 (d); 3.69 (d)	**65.90; 65.76; 83.27;** 65.45; 65.93
27	Fructose-6-phosphate	C_1H_2; C_2H; C_3H; C_4H; C_6H_2	**4.10 (m); 4.08(m); 4.09** (t); 3.97 (m); **3.85 (m)**	**78.02; 78.08; 82.28**; 69.44; **66.48**
28	Malic acid	αCH; βCH_2	**4.28 (dd);** 2.66 (dd)	**73.73;** 45.34
29	β-D-Glucose	C_1H; C_2H; C_3H; C_4H; C_5H; C_6H_2	**4.63 (d); 3.44 (m); 3.46 (m); 3.52 (m); 3.70 (m); 3.89(dd)**	**98.22; 78.84; 74.74; 74.38; 75.25; 63.64**
30	α-D-Glucose	C_1H; C_2H; C_3H; C_4H; C_5H; C_6H_2	**5.21 (d); 3.67 (m); 3.81 (m);** 3.33 (m); 3.93 (m); **3.86(dd)**	**94.88; 73.81; 773.22;** 68.84; 75.35**; 59.15**
31	Glucose-6-phosphate	C_1H; C_2H; C_3H; C_4H; C_5H; C_6H_2	**5.22 (d)**; **3.56 (m); 3.72 (t); 3.56 (m); 3.96 (m); 3.98 (m)**	**94.71; 71.27; 75.64; 74.11; 73.26; 65.90**
32	Glucose-1-phosphate	C_1H; C_2H; C_3H; C_4H; C_5H; C_6H_2	**5.45 (dd); 3.47 (m); 3.76 (m); 3.38 (t); 3.92 (m); 3.86 (m)**	**96.33; 75.52; 75.27; 73.15; 74.82; 63.62**
33	Uridine	C_1H; C_2H; C_3H; C_4H; C_5H_2; ^1C_1H; ^1C_2H	**5.90 (d); 4.34 (t); 4.22 (t); 4.12 (m);** 3.91 (dd); **7.87 (d);** 5.88 (d)	**92.05; 76.77; 72.39; 87.06;** 63.54; **144.68;** 104.49
34	ADP	C_1H; C_2H; C_3H; C_4H; C_5H_2; N^1CHN; N^2CHN	**5.94 (m); 4.57(d); 4.23 (d); 4.08 (m);** 4.11 (d)**; 8.54 (s); 8.29 (s)**	**87.43; 73.45; 70.68; 65.72;** 83.94; 140.42**; 148.382**
35	Cyclic AMP	C_1H; C_2H; C_3H; C_4H; C_5H_2; N^1CHN; N^2CHN	**6.13 (s); 4.75 (d);** 4.54(dd); **4.34 (dd);** 4.33(s); **8.17 (s); 8.19 (s)**	**94.22; 79.05; 69.42**; 74**.99;** 69.10; **155.09; 142.51**
36	Adenosine	C_1H; C_2H; C_3H; C_4H; C_5H_2; N^1CHN; N^2CHN	**6.03 (d);** 4.73 (t)**; 4.40 (m); 4.28 (m);** 3.90 (dd)**; 8.36 (s); 8.18 (s)**	**91.27; 76.43; 76.43; 88.10;** 64.05; **142.97; 155.02**
37	Tyrosine	C_1H; C_2H_2; C_4H; C_5H	**3.94 (dd);** 3.17 (dd); **7.20 (d); 6.89 (d)**	**58.54;** 37.84**; 133.79;118.51**
38	Tryptophan	C_1H; C_2H_2; NC_4H; C_6H; C_7H; C_8H; C_9H	**4.05 (dd);** 3.46(s); 3.31 (dd); 7.31(d); **7.53 (d); 7.27 (s); 7.18 (m); 7.53(m)**	**58.08;** 29.43; 29.31**; 127.22; 114.85 124.28; 122.29; 114.85**
39	Phenylalanine	C_1H; C_2H_2; C_4H; C_5H; C_6H	**3.97(m); 3.28 (m); 7.36 (m); 7.42 (m); 7.31 (m)**	**59.02; 39.65; 130.30; 132.50; 133.01**
40	Histidine	αCH; βCH_2; NCHC; NCHN	**4.01 (dd); 3.20(d); 7.13 (s); 8.03 (s)**	**57.94; 29.20; 119.60; 138.43**
41	ATP	C_1H; C_2H; C_3H; C_4H; C_5H_2; N^1CHN; N^2CHN	**6.14 (d);** 4.81 (d); **4.65 (t); 4.38 (m);** 4.30 (m); **8.54 (s); 8.24 (s)**	**90.04;** 76.89**; 74.19; 86.85;** 67.57**; 142.52; 155.47**
42	NAD	C_1H; C_2H; C_3H; C_5H; N^1CHN; N^2CHN	**9.33 (d); 8.19 (s); 8.86 (d); 9.20 (s);** 8.12 (d)**; 8.41 (s)**	**142.17; 131.14; 147.31; 145.80;** 155.32; **142.53**
43	NADP	C_1H; C_2H; C_3H; C_5H; N^1CHN; N^2CHN	9.09 (d); 8.17 **(s);** 8.77 (d)**; 9.27 (s); 8.17 (d); 8.41(s)**	144.41; 142.48; 148.75; **142.70; 131.49; 142.48**
44	Citric acid	αCH; βCH_2	**2.66 (d); 2.52 (d)**	**48.25;48.71**

Note: Bold chemical shifts indicate an identified peak in the 2D spectra.

Table S2.Fold changes of metabolites in three strains after Acetic acid treatments

Metabolites	ATCC 6962	ATCC 13076	ATCC 14028
Isoleucine	0.27±0.09^{c}	1.12±0.16^{b}	0.96±0.54^{a}
Leucine	1.24±0.07^{b}	1.48±0.21^{a}	1.08±0.05^{b}
Valine	0.96±0.18^{b}	1.46±0.20^{a}	1.16±0.05^{a}
Ethanol	0.89±0.07^{b}	0.71±0.11^{c}	1.23±0.01^{a}
Lactic acid	0.51±0.04^{c}	0.73±0.11^{b}	1.11±0.024^{a}
Alanine	1.25±0.06^{a}	1.43±0.27^{a}	1.32±0.23^{a}
Threonine	0.50±0.03^{c}	0.68±0.11^{b}	1.19±0.02^{a}
Putrescine	0.67±0.11^{a}	0.58±0.10^{a}	0.54±0.16^{a}
Acetic acid	0.78±0.06^{c}	3.41±0.58^{a}	1.69±0.03^{b}
Succinic acid	0.46±0.05^{c}	0.90±0.14^{b}	0.40±0.01^{a}
Anserine	0.66±0.07^{c}	0.99±0.06^{a}	0.91±0.07^{b}
Methionine	0.49±0.07^{b}	0.63±0.19^{a}	0.64±0.56^{b}
Cysteine	1.67±0.01^{c}	3.38±0.54^{a}	1.45±0.04^{b}
Aspartic acid	1.88±0.17^{a}	1.61±0.26^{a}	1.72±0.07^{a}
Oxoglutaric acid	0.77±0.04^{a}	1.72±0.37^{a}	0.96±0.72^{a}
Betaine	2.65±0.77^{a}	1.49±0.16^{b}	1.94±0.44^{a}
γ-aminobutyric-acid	0.32±0.04^{b}	0.56±0.11^{a}	0.25±0.15^{b}
1,2-Propanediol	0.60±0.06^{b}	0.66±0.12^{ab}	0.79±0.08^{a}
Glycine	0.50±0.04^{c}	3.39±0.54^{a}	1.49±0.22^{b}
Citric acid	1.40±0.24^{a}	1.75±0.39^{a}	1.49±0.35^{a}
NADP	0.88±0.40^{b}	7.54±0.07^{a}	0.81±0.06^{b}
NAD	0.79±0.06^{b}	3.38±0.49^{a}	0.81±0.06^{b}
ATP	1.14±0.19^{b}	3.52±0.59^{a}	1.04±0.06^{b}
ADP	0.95±0.15^{b}	1.64±0.25^{a}	1.14±0.09^{b}
Histidine	0.66±0.07^{a}	0.48±0.07^{b}	0.60±0.02^{a}
Phenylalanine	2.207±0.22^{b}	0.67±0.10^{c}	2.37±0.02^{a}
Tyrosine	0.23±0.01^{b}	14.29±1.21^{a}	0.53±0.05^{b}
Adenosine	2.67±0.20^{a}	1.34±0.23^{b}	1.94±0.07^{c}
G-1-P	1.55±0.17^{b}	3.27±0.48^{a}	1.45±0.16^{b}
G-6-P	2.61±0.25^{a}	0.06±0.01^{c}	1.61±0.06^{b}
β-D-Glucose	0.89±0.13^{c}	2.33±0.31^{a}	1.66±0.02^{b}
α-D-Glucose	1.24±0.11^{b}	2.35±0.37^{a}	1.43±0.08^{b}
Malic acid	0.77±0.12^{b}	0.69±0.06^{b}	1.39±0.22^{a}
F-6-P	1.72±0.21^{b}	6.21±1.41^{a}	2.10±0.05^{b}
Glutamine	0.65±0.07^{b}	1.33±0.20^{a}	0.78±0.03^{b}
Fructose	1.33±0.13^{b}	3.20±0.50^{a}	1.34±0.08^{b}

Note：The mean of different letters in the same row is significantly different ($P < 0.05$).

Table S3. Fold changes of metabolites in three strains after Citric acid treatments

Metabolites	ATCC 6962	ATCC 13076	ATCC 14028
Isoleucine	0.38±0.07^{c}	0.87±0.23^{a}	0.89±0.26^{b}
Leucine	1.31±0.17^{a}	1.25±0.13^{a}	1.28±0.14^{a}
Glutamate	0.55±0.45^{c}	1.17±0.13^{b}	0.81±0.15^{a}
Ethanol	0.92±0.07^{b}	0.71±0.11^{c}	0.78±0.13^{a}
Lactic acid	0.67±0.45^{b}	0.55±0.07^{c}	0.78±0.01^{a}
Alanine	0.42±0.12^{c}	0.95±0.12^{b}	0.68±0.12^{a}
Threonine	0.65±0.03^{b}	0.52±0.02^{c}	0.80±0.16^{a}
Putrescine	0.59±0.15^{a}	0.19±0.09^{b}	0.31±0.16^{ab}
Acetic acid	1.32±0.09^{a}	0.60±0.33^{b}	0.88±0.01^{c}
Succinic acid	0.55±045^{b}	0.53±0.31^{b}	1.02±0.02^{a}
Anserine	0.69±0.05^{c}	0.52±0.03^{a}	0.93±0.04^{b}
Pyroglutamic acid	0.75±0.06^{b}	2.34±0.31^{a}	1.07±0.03^{b}
Pyruvic acid	0.54±0.04^{c}	0.67±0.09^{b}	0.80±0.03^{a}
Acetoin	0.58±0.04^{b}	0.59±0.07^{b}	0.75±0.02^{a}
Oxoglutaric acid	0.58±0.18^{b}	1.41±0.66^{a}	1.58±00.07^{c}
Betaine	2.93±0.57^{a}	0.29±0.12^{b}	0.36±0.51^{b}
γ-aminobutyric-acid	0.59±0.05^{b}	0.42±0.07^{b}	1.04±0.40^{a}
1,2-Propanediol	0.62±0.07^{b}	0.58±0.12^{a}	0.71±0.05^{c}
Glycine	0.47±0.01^{b}	0.88±0.32^{c}	0.67±0.09^{a}
Citric acid	1.06±0.11^{c}	1.80±0.23^{b}	1.22±0.03^{a}
NADP	1.42±0.25^{b}	7.15±0.46^{a}	1.74±0.02^{c}
NAD	1.18±0.07^{b}	3.54±0.48^{a}	1.14±0.02^{b}
ATP	1.34±0.04^{b}	3.10±0.52^{a}	1.69±0.05^{b}
ADP	1.69±0.25^{a}	1.15±0.20^{a}	1.39±0.33^{a}
Histidine	0.73±0.06^{b}	0.39±0.04^{c}	0.90±0.04^{a}
Phenylalanine	1.35±0.11^{b}	1.49±0.05	1.88±0.04^{a}
Tyrosine	0.30±0.04^{b}	0.47±0.81^{a}	0.41±0.08^{b}
Tryptophan	1.59±0.28^{a}	0.34±0.03^{a}	0.42±0.07^{b}
G-1-P	1.12±0.07^{b}	2.75±0.25^{a}	1.30±0.06^{b}
Uridine	0.76±0.06^{b}	0.75±0.10^{a}	0.88±0.19^{b}
Tyrosine	0.30±0.04^{b}	8.47±0.81^{a}	0.41±0.08^{b}
Cyclic AMP	1.64±0.13^{b}	3.84±0.70^{a}	2.12±0.06^{b}
Adenosine	2.11±0.03^{b}	1.99±0.06^{b}	1.78±0.04^{a}
Malic acid	0.57±0.06^{b}	1.24±0.13^{a}	0.67±0.02^{b}
F-6-P	1.75±0.14^{b}	5.20±1.19^{a}	2.38±0.08^{b}
Fructose	1.41±0.11^{b}	2.92±0.38^{a}	1.27±0.03^{b}
Methionine	0.45±0.07^{b}	0.39±0.09^{a}	0.48±0.05^{c}
Cysteine	1.78±0.01^{c}	2.88±0.32^{a}	1.34±0.02^{b}
Aspartic acid	1.80±0.16^{b}	1.44±0.18^{a}	1.40±0.03^{b}

Note：The mean of different letters in the same row is significantly different ($P < 0.05$).

Table S4. Fold changes of metabolites in three strains after Lactic acid treatments

Metabolites	ATCC 6962	ATCC 13076	ATCC 14028
Isoleucine	1.40±0.21^{b}	1.30±0.16^{a}	1.60±0.09^{b}
Leucine	2.14±0.07^{a}	1.68±0.05^{b}	1.02±0.05^{c}
Ethanol	0.87±0.05^{b}	0.80±0.07^{b}	1.35±0.08^{a}
Lactic acid	0.86±0.04^{b}	0.73±0.11^{b}	1.18±0.08^{a}
Threonine	0.86±0.04^{b}	0.71±0.05^{c}	1.20±0.08^{a}
Methionine	0.54±0.06^{b}	0.24±0.09^{a}	0.38±0.05^{c}
Acetic acid	0.29±0.02^{b}	0.37±0.11^{a}	0.19±0.04^{b}
Succinic acid	0.80±0.04^{a}	0.71±0.40^{a}	0.45±0.08^{a}
Anserine	0.88±0.10^{b}	5.37±0.09^{a}	0.89±0.06^{b}
Cysteine	1.87±0.06^{c}	6.67±0.40^{a}	1.61±0.09^{b}
Pyruvic acid	0.64±0.04^{c}	0.59±0.09^{b}	0.72±0.03^{a}
Acetoin	0.67±0.04^{a}	0.63±0.07^{a}	0.71±0.02^{a}
Oxoglutaric acid	0.59±0.40^{b}	1.18±0.09^{a}	0.22±0.12^{b}
Betaine	3.88±3.55^{a}	0.37±0.19^{b}	1.51±0.11^{c}
γ-aminobutyric-acid	0.14±0.04^{b}	0.45±0.05^{a}	0.23±0.09^{b}
1,2-Propanediol	0.69±0.12^{a}	0.58±0.10^{a}	0.61±0.03^{a}
Glycine	0.37±0.01^{c}	6.67±0.40^{b}	1.51±0.09^{a}
Citric acid	1.51±0.44^{a}	1.29±0.10^{a}	1.36±0.11^{a}
NADP	11.27±1.16^{b}	25.14±2.52^{a}	1.77±0.04^{c}
NAD	7.07±0.34^{b}	13.25±1.21^{a}	1.75±0.02^{c}
ATP	1.39±0.09^{b}	3.19±0.46^{a}	1.02±0.05^{b}
Adenosine	1.42±0.02^{b}	1.50±0.03^{b}	1.31±0.06^{a}
ADP	1.04±0.14^{b}	1.54±0.12^{a}	1.05±0.08^{b}
Histidine	0.96±0.05^{a}	0.49±0.04^{b}	0.26±0.07^{c}
Phenylalanine	2.98±0.11^{a}	2.78±0.03^{c}	2.68±0.16^{b}
Tyrosine	0.45±0.03^{b}	5.24±0.23^{a}	0.57±0.04^{b}
Tryptophan	1.72±0.62^{a}	0.56±0.17^{b}	0.70±0.07^{b}
Glutamine	1.66±0.04^{b}	2.27±0.11^{a}	0.69±0.04^{c}
β-D-Glucose	2.17±0.09^{c}	3.06±0.12^{b}	2.08±0.12^{a}
α-D-Glucose	1.25±0.04^{b}	5.07±0.30^{a}	1.53±0.07^{b}
Cyclic AMP	1.75±0.13^{c}	3.23±0.09^{a}	2.64±0.06^{b}
Malic acid	2.40±0.14^{b}	0.40±0.14^{a}	0.48±0.02^{a}
F-6-P	2.86±0.11^{b}	8.42±1.88^{a}	2.39±0.22^{b}
Fructose	4.51±0.22^{b}	7.94±0.50^{a}	1.40±0.08^{c}
Aspartic acid	5.79±0.24^{a}	3.97±0.26^{b}	2.14±0.16^{c}

Note：The mean of different letters in the same row is significantly different ($P < 0.05$).

Table S5. List of metabolic pathway analysis for screened metabolites in ATCC 6962

Treatments	Metabolite set	Total	Hits	Raw *P*
Acetic acid	Aminoacyl-tRNA biosynthesis	48	9	0.000000
	Histidine metabolism	16	4	0.000017
	Glycine, serine and threonine metabolism	33	4	0.000334
	Starch and sucrose metabolism	18	3	0.000809
	beta-Alanine metabolism	21	3	0.001292
	Glutathione metabolism	28	3	0.003033
	Alanine, aspartate and glutamate metabolism	28	3	0.003033
	Arginine biosynthesis	14	2	0.009539
	Pantothenate and CoA biosynthesis	19	2	0.017357
	Neomycin, kanamycin and gentamicin biosynthesis	2	1	0.021822
	Glycolysis / Gluconeogenesis	26	2	0.031535
	Porphyrin and chlorophyll metabolism	30	2	0.041138
	Phenylalanine, tyrosine and tryptophan biosynthesis	4	1	0.043196
	Glyoxylate and dicarboxylate metabolism	32	2	0.046309
	Cysteine and methionine metabolism	33	2	0.048981
Citric acid	Aminoacyl-tRNA biosynthesis	48	5	0.000323
	Glutathione metabolism	28	4	0.000414
	Alanine, aspartate and glutamate metabolism	28	4	0.000414
	Nicotinate and nicotinamide metabolism	15	3	0.000879
	Phenylalanine, tyrosine and tryptophan biosynthesis	4	2	0.001033
	Starch and sucrose metabolism	18	3	0.001536
	Glycolysis / Gluconeogenesis	26	3	0.004564
	Phenylalanine metabolism	10	2	0.007372
	Amino sugar and nucleotide sugar metabolism	37	3	0.012389
	Arginine biosynthesis	14	2	0.014428
	Butanoate metabolism	15	2	0.016513
	Histidine metabolism	16	2	0.018719
	Neomycin, kanamycin and gentamicin biosynthesis	2	1	0.026922
	Citrate cycle (TCA cycle)	20	2	0.028688
	beta-Alanine metabolism	21	2	0.031451
Lactic acid	Aminoacyl-tRNA biosynthesis	48	11	0.000000
	Alanine, aspartate and glutamate metabolism	28	4	0.000275
	Glyoxylate and dicarboxylate metabolism	32	4	0.000467
	Histidine metabolism	16	3	0.000792
	Phenylalanine, tyrosine and tryptophan biosynthesis	4	2	0.000842
	Glycolysis / Gluconeogenesis	26	3	0.003400
	Valine, leucine and isoleucine biosynthesis	8	2	0.003817
	Glutathione metabolism	28	3	0.004218
	Phenylalanine metabolism	10	2	0.006045
	Amino sugar and nucleotide sugar metabolism	37	3	0.009328
	Arginine biosynthesis	14	2	0.011871

Starch and sucrose metabolism	18	2	0.019384
Pantothenate and CoA biosynthesis	19	2	0.021507
beta-Alanine metabolism	21	2	0.026030
Galactose metabolism	27	2	0.041650
Porphyrin and chlorophyll metabolism	30	2	0.050506

Table S6. List of metabolic pathway analysis for screened metabolites in ATCC 13076

Treatments	Metabolite set	Total	Hits	Raw *P*
Acetic acid	Alanine, aspartate and glutamate metabolism	28	6	0.000000
	Aminoacyl-tRNA biosynthesis	48	7	0.000000
	Arginine biosynthesis	14	3	0.000307
	Butanoate metabolism	15	3	0.000381
	Histidine metabolism	16	3	0.000466
	D-Glutamine and D-glutamate metabolism	6	2	0.001464
	Valine, leucine and isoleucine biosynthesis	8	2	0.002699
	Glyoxylate and dicarboxylate metabolism	32	3	0.003732
	Glycine, serine and threonine metabolism	33	3	0.004079
	Arginine and proline metabolism	38	3	0.006111
	Starch and sucrose metabolism	18	2	0.013886
	Citrate cycle (TCA cycle)	20	2	0.017038
	beta-Alanine metabolism	21	2	0.018719
	Neomycin, kanamycin and gentamicin biosynthesis	2	1	0.020545
	Glycolysis / Gluconeogenesis	26	2	0.028112
	Glutathione metabolism	28	2	0.032306
	Porphyrin and chlorophyll metabolism	30	2	0.036734
	Phenylalanine, tyrosine and tryptophan biosynthesis	4	1	0.040694
Citric acid	Starch and sucrose metabolism	18	3	0.000350
	Phenylalanine, tyrosine and tryptophan biosynthesis	4	2	0.000386
	Aminoacyl-tRNA biosynthesis	48	4	0.000472
	Phenylalanine metabolism	10	2	0.002815
	Purine metabolism	65	3	0.014896
	Neomycin, kanamycin and gentamicin biosynthesis	2	1	0.016709
	Glycolysis / Gluconeogenesis	26	2	0.018845
	Glutathione metabolism	28	2	0.021712
	Amino sugar and nucleotide sugar metabolism	37	2	0.036660
Lactic acid	Phenylalanine, tyrosine and tryptophan biosynthesis	4	2	0.000273
	Phenylalanine metabolism	10	2	0.001999
	Aminoacyl-tRNA biosynthesis	48	3	0.003864
	Citrate cycle (TCA cycle)	20	2	0.008117
	Alanine, aspartate and glutamate metabolism	28	2	0.015655
	D-Glutamine and D-glutamate metabolism	6	1	0.041899

Table S7. List of metabolic pathway analysis for screened metabolites in ATCC 14028

Treatments	Metabolite set	Total	Hits	Raw *P*
Acetic acid	Aminoacyl-tRNA biosynthesis	48	6	0.000003
	Starch and sucrose metabolism	18	3	0.000549
	Glutathione metabolism	28	3	0.002079
	Glyoxylate and dicarboxylate metabolism	32	3	0.003075
	Amino sugar and nucleotide sugar metabolism	37	3	0.004679
	Butanoate metabolism	15	2	0.008538
	Nicotinate and nicotinamide metabolism	15	2	0.008538
	Neomycin, kanamycin and gentamicin biosynthesis	2	1	0.019267
	Glycolysis / Gluconeogenesis	26	2	0.024852
	Alanine, aspartate and glutamate metabolism	28	2	0.028584
	Porphyrin and chlorophyll metabolism	30	2	0.032529
	Phenylalanine, tyrosine and tryptophan biosynthesis	4	1	0.038188
	Arginine and proline metabolism	38	2	0.050279
Citric acid	Phenylalanine, tyrosine and tryptophan biosynthesis	4	2	0.000754
	Starch and sucrose metabolism	18	3	0.000963
	Aminoacyl-tRNA biosynthesis	48	4	0.001802
	Phenylalanine metabolism	10	2	0.005427
	Amino sugar and nucleotide sugar metabolism	37	3	0.007986
	Nicotinate and nicotinamide metabolism	15	2	0.012234
	Neomycin, kanamycin and gentamicin biosynthesis	2	1	0.023098
	Glycolysis / Gluconeogenesis	26	2	0.035115
	Purine metabolism	65	3	0.036599
Lactic acid	Aminoacyl-tRNA biosynthesis	48	7	0.000000
	Phenylalanine, tyrosine and tryptophan biosynthesis	4	2	0.000450
	Valine, leucine and isoleucine biosynthesis	8	2	0.002058
	Phenylalanine metabolism	10	2	0.003273
	Histidine metabolism	16	2	0.008461
	Pantothenate and CoA biosynthesis	19	2	0.011871
	beta-Alanine metabolism	21	2	0.014428
	Glycolysis / Gluconeogenesis	26	2	0.021761

Table S8. Loading plot table derived from principal component analysis.

Metabolite	**PC1**	**PC2**
Adenosine	-0.021	0.021
Cyclic AMP	-0.016	0.018
PCA	-0.027	0.015
Acetic acid	-0.012	0.010
G-1-P	-0.007	0.097
GABA	-0.012	0.107
Tyr	-0.002	0.005
ATP	0.006	0.228
Ethanol	0.007	0.150
α-D-Glucose	0.008	0.104
β-D-Glucose	0.006	0.119
ADP	0.012	0.078
Glu	0.012	0.007
1,2-Propanediol	0.007	0.073
Uridine	0.066	-0.009
Phe	0.004	-0.001
Thr	0.333	-0.003
Pyruvic acid	0.013	0.048
Anserine	0.075	0.009
Succinic acid	0.104	0.010
Ilu	0.066	-0.009
Gln	0.122	-0.026
His	0.068	-0.009
G-6-P	0.045	-0.016
Acetoin	0.146	-0.008
Lactic acid	0.289	-0.009