



Supplementary Materials: *Piper nigrum* extract inhibits the growth of human colorectal cancer HT-29 cells by inducing p53-mediated apoptosis

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Table S1. Identification results of chemical components in PNE.

No.	tr (min)	Compound	Chemical formula	Type	Peak area %
1	4.89	Piperine	C ₁₇ H ₁₉ NO ₃	Alkaloids	23.0535
2	10.23	Piperolein B	C ₂₁ H ₂₉ NO ₃	Alkaloids	3.3270
3	6.47	Gravelliferone	C ₁₉ H ₂₂ O ₃	Coumarins	2.6384
4	4.50	Piperyline	C ₁₆ H ₁₇ NO ₃	Alkaloids	2.4596
5	17.86	Erucamide	C ₂₂ H ₄₃ NO	Alkaloids	2.1805
6	7.48	Diisobutyl phthalate	C ₁₆ H ₂₂ O ₄	Esters	1.7972
7	15.67	(2E,4E,12Z)-N-(2-methylpropyl)octadeca-2,4,12-trienamide	C ₂₂ H ₃₉ NO	Alkaloids	1.7744
8	16.54	Stearoylglycerol	C ₂₁ H ₄₂ O ₄	Esters	1.6109
9	6.47	Pellitorine	C ₁₄ H ₂₅ NO	Alkaloids	1.3397
10	8.90	Propafenone	C ₂₁ H ₂₇ NO ₃	Phenylpropanoid	1.2255
11	4.83	Piperanine	C ₁₇ H ₂₁ NO ₃	Alkaloids	1.2184
12	13.11	Guineensine	C ₂₄ H ₃₃ NO ₃	Alkaloids	1.0599
13	5.25	Bis(4-ethylbenzylidene)sorbitol	C ₂₄ H ₃₀ O ₆	Alcohols	0.6262
14	3.44	N-trans-Feruloyltyramine	C ₁₈ H ₁₉ NO ₄	Alkaloids	0.4289
15	10.41	(2E,4E)-N-(2-methylpropyl)dodeca-2,4-dienamide	C ₁₆ H ₂₉ NO	Alkaloids	0.2147
16	3.36	Dipropylene glycol dimethyl ether	C ₈ H ₁₈ O ₃	Other	0.2102
17	0.69	Trigonelline	C ₇ H ₇ NO ₂	Alkaloids	0.2016
18	15.27	Oleoyl ethanolamide	C ₂₀ H ₃₉ NO ₂	Alkaloids	0.1710
19	16.37	Diocetyl phthalate	C ₂₄ H ₃₈ O ₄	Esters	0.1708
20	13.44	Dibutyl sebacate	C ₁₈ H ₃₄ O ₄	Esters	0.1629
21	14.91	brachystamide B	C ₂₆ H ₃₇ NO ₃	Alkaloids	0.1214
22	0.67	Asparagine	C ₄ H ₈ N ₂ O ₃	Amino acids	0.1211
23	4.35	3-[(2H-1,3-benzodioxol-5-yl)methyl]-4-[(3,4-dimethoxyphenyl)methyl]oxolan-2-one	C ₂₁ H ₂₂ O ₆	Lignans	0.1137
24	13.93	(2S)-2-[(2R)-7-(2-Methoxyethoxy)-5,8-dimethyl-1,2,3,4-tetrahydro-2-naphthalenyl]-1-(1-piperidiny)-1-propanone	C ₂₃ H ₃₅ NO ₃	Alkaloids	0.1113
25	3.75	Triethylcitrate	C ₁₂ H ₂₀ O ₇	Esters	0.1007
26	0.78	L-Malicacid	C ₄ H ₆ O ₅	Organic acids	0.0958
27	0.66	Choline	C ₅ H ₁₃ NO	Alkaloids	0.0859
28	0.69	Betaine	C ₅ H ₁₁ NO ₂	Alkaloids	0.0786

29	2.46	N-Methylhernagine	C ₂₀ H ₂₃ NO ₄	Alkaloids	0.0777
30	0.69	Gluconicacid	C ₆ H ₁₂ O ₇	Organic acids	0.0762
31	14.74	Bis(2-ethylhexyl)phthalate	C ₂₄ H ₃₈ O ₄	Esters	0.0752
32	7.41	Trilostane	C ₂₀ H ₂₇ NO ₃	Steroids	0.0581
33	16.48	Bis(2-ethylhexyl)adipate	C ₂₂ H ₄₂ O ₄	Esters	0.0549
34	16.19	PheophorbideA	C ₃₅ H ₃₆ N ₄ O ₅	Other	0.0488
35	15.07	Oleamide	C ₁₈ H ₃₅ NO	Alkaloids	0.0466
36	0.74	Adenine	C ₅ H ₅ N ₅	Nucleosides	0.0383
37	0.71	D-(-)-Fructose	C ₆ H ₁₂ O ₆	Saccharides	0.0381
38	0.90	Acetophenone	C ₈ H ₈ O	Other	0.0350
39	2.11	decaffeoylverbascoside	C ₂₀ H ₃₀ O ₁₂	Glycosides	0.0261
40	14.61	Hexadecanamide	C ₁₆ H ₃₃ NO	Alkaloids	0.0253
41	5.39	(3aR,4aS,5R,6S,8S,9aR)-5,6-dihydroxy-4a,8-dimethyl-3-methylenedecahydroazuleno[6,5-b]furan-2(3H)-one	C ₁₅ H ₂₂ O ₄	Esters	0.0247
42	4.02	N-Butylbenzenesulfonamide	C ₁₀ H ₁₅ NO ₂ S	Alkaloids	0.0230
43	11.16	2-Amino-1,3,4-octadecanetriol	C ₁₈ H ₃₉ NO ₃	Alcohols	0.0219
44	0.90	4-Oxoproline	C ₅ H ₇ NO ₃	Amino acids	0.0213
45	1.27	DL-Norleucine	C ₆ H ₁₃ NO ₂	Amino acids	0.0188
46	0.89	L-Pyroglutamicacid	C ₅ H ₇ NO ₃	Amino acids	0.0185
47	3.34	BetulalbusideA	C ₁₆ H ₂₈ O ₇	Glycosides	0.0168
48	14.79	(2E,4E,9Z)-1-(piperidin-1-yl)hexadeca-2,4,9-trien-1-one	C ₂₁ H ₃₅ NO	Alkaloids	0.0155
49	0.68	4-Aminobutyricacid	C ₄ H ₉ NO ₂	Amino acids	0.0154
50	6.33	3,5-di-tert-Butyl-4-hydroxybenzaldehyde	C ₁₅ H ₂₂ O ₂	Phenols	0.0153
51	4.66	Benzophenone	C ₁₃ H ₁₀ O	Other	0.0144
52	3.61	Azelaicacid	C ₉ H ₁₆ O ₄	Organic acids	0.0130
53	0.90	Guanosine	C ₁₀ H ₁₃ N ₅ O ₅	Nucleosides	0.0127
54	8.28	Dodecylsulfate	C ₁₂ H ₂₆ O ₄ S	Organic acids	0.0125
55	0.90	N-Acetyl-DL-glutamicacid	C ₇ H ₁₁ NO ₅	Amino acids	0.0124
56	5.62	methyl3-((1E,3E)-3,5-dimethylhepta-1,3-dien-1-yl)-8-hydroxy-6a,8-dimethyl-6-oxo-6a,8,9,9a-tetrahydro-6H-furo[2,3-h]isochromene-9-carboxylate	C ₂₄ H ₃₀ O ₆	Other	0.0117
57	4.22	Monobutylphthalate	C ₁₂ H ₁₄ O ₄	Esters	0.0116
58	0.68	L-Asparticacid	C ₄ H ₇ NO ₄	Amino acids	0.0109
59	4.98	6-Gingerol	C ₁₇ H ₂₆ O ₄	Phenols	0.0107
60	2.58	Isophthalicacid	C ₈ H ₆ O ₄	Organic acids	0.0107
61	1.69	2-Phenylglycine	C ₈ H ₉ NO ₂	Amino acids	0.0106
62	0.75	Guanine	C ₅ H ₅ N ₅ O	Nucleosides	0.0104
63	0.71	D-Proline	C ₅ H ₉ NO ₂	Amino acids	0.0103
64	12.12	tetradecylhydrogensulphate	C ₁₄ H ₃₀ O ₄ S	Organic acids	0.0094
65	2.82	4-Nitrophenol	C ₆ H ₅ NO ₃	Phenols	0.0089
66	2.11	[(2R,3S,4S,5R,6R)-3,4,5-trihydroxy-6-[2-(3-hydroxy-5-oxoxolan-3-yl)propoxy]oxan-2-yl]methyl(2E)-3-(3,4-dihydroxyphenyl)prop-2-enoate	C ₂₂ H ₂₈ O ₁₂	Glycosides	0.0084
67	4.57	4,5-Dihydropiperlonguminine	C ₁₆ H ₂₁ NO ₃	Alkaloids	0.0084
68	3.42	D-Panthenol	C ₉ H ₁₉ NO ₄	Alcohols	0.0084
69	1.81	Pantothenicacid	C ₉ H ₁₇ NO ₅	Organic acids	0.0081
70	1.72	L-Phenylalanine	C ₉ H ₁₁ NO ₂	Amino acids	0.0078
71	0.78	Pipecolicacid	C ₆ H ₁₁ NO ₂	Amino acids	0.0077
72	2.96	Eriocitrin	C ₂₇ H ₃₂ O ₁₅	Glycosides	0.0067
73	0.95	Succinicacid	C ₄ H ₆ O ₄	Organic acids	0.0066
74	12.26	4-Dodecylbenzenesulfonicacid	C ₁₈ H ₃₀ O ₃ S	Organic acids	0.0065

75	2.17	Indole-3-acrylicacid	C ₁₁ H ₉ NO ₂	Organic acids	0.0063
76	0.88	Uridine	C ₉ H ₁₂ N ₂ O ₆	Nucleosides	0.0058
77	10.66	5-OxoETE	C ₂₀ H ₃₀ O ₃	Organic acids	0.0056
78	6.99	Mono(2-ethylhexyl)phthalate	C ₁₆ H ₂₂ O ₄	Organic acids	0.0047
79	0.92	D-(+)-Malicacid	C ₄ H ₆ O ₅	Organic acids	0.0044
80	10.66	12,13-dihydroxy-9-octadecenoicacid	C ₁₈ H ₃₄ O ₄	Organic acids	0.0039
81	3.68	4-Methoxycinnamaldehyde	C ₁₀ H ₁₀ O ₂	Phenylpropanoid	0.0035
82	2.58	2-(3,4-Dihydroxyphenyl)-5-hydroxy-4-oxo-4H-chromen-7-yl6-O-(6-deoxy-alpha-L-mannopyranosyl)-beta-D-glucopyranoside	C ₂₇ H ₃₀ O ₁₅	Glycosides	0.0034
83	1.66	3-Hydroxymandelicacid	C ₈ H ₈ O ₄	Organic acids	0.0034
84	1.57	Salsoline	C ₁₁ H ₁₅ NO ₂	Alkaloids	0.0031
85	0.88	L-citramalicacid	C ₅ H ₈ O ₅	Organic acids	0.0030
86	1.91	Protocatechuicacid	C ₇ H ₆ O ₄	Phenols	0.0025
87	16.31	Elaidicacid	C ₁₈ H ₃₄ O ₂	Organic acids	0.0025
88	2.79	N-Acetyl-D-alloisoleucine	C ₈ H ₁₅ NO ₃	Amino acids	0.0022
89	4.39	(+)-trans-C75	C ₁₄ H ₂₂ O ₄	Esters	0.0021
90	3.40	9-(2,3-dihydroxypropoxy)-9-oxononanoicacid	C ₁₂ H ₂₂ O ₆	Organic acids	0.0020
91	1.66	Gentisicacid5-O-β-D-glucopyranoside	C ₁₃ H ₁₆ O ₉	Glycosides	0.0020
92	2.27	osmanthusideH	C ₁₉ H ₂₈ O ₁₁	Glycosides	0.0019
93	15.37	17-Octadecynoicacid	C ₁₈ H ₃₂ O ₂	Organic acids	0.0018
94	1.89	Vanillylalcohol	C ₈ H ₁₀ O ₃	Phenols	0.0017
95	14.42	16-Hydroxyhexadecanoicacid	C ₁₆ H ₃₂ O ₃	Organic acids	0.0016
96	6.04	perfluorooctane-1-sulfonicacid	C ₈ HF ₁₇ O ₃ S	Organic acids	0.0010
97	4.68	Dodecanedioicacid	C ₁₂ H ₂₂ O ₄	Organic acids	0.0008

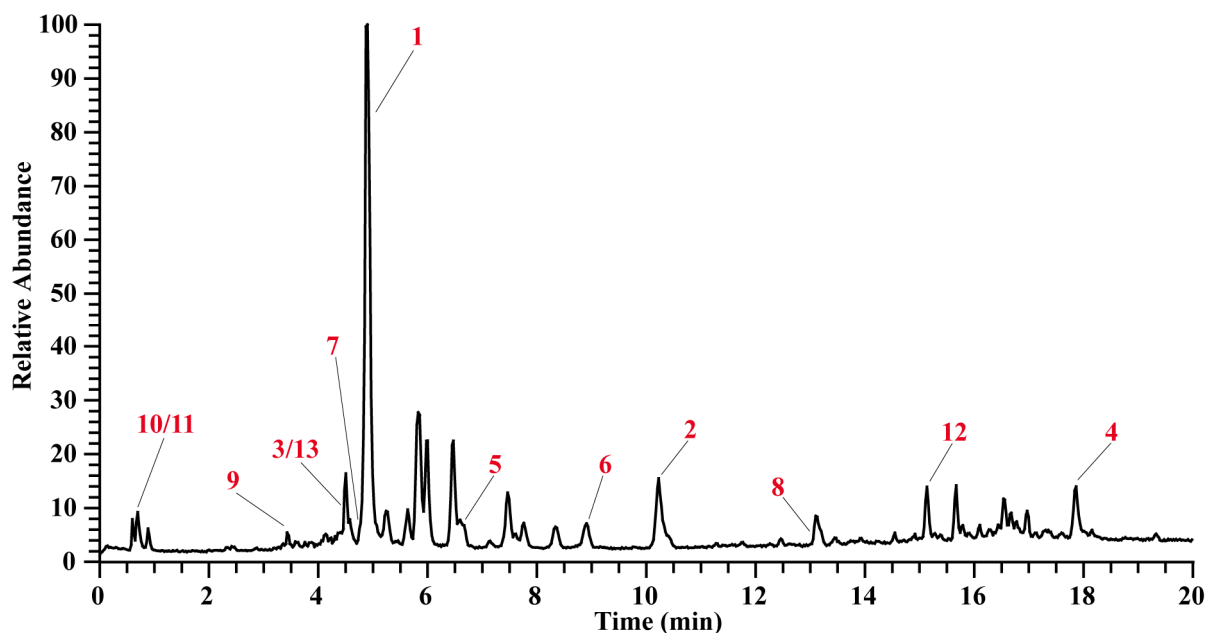


Figure S1. Total ions current (TIC) of the main pharmacological active compounds in PNE.