

**Dr. Duke's Phytochemical and Ethnobotanical Database**

**Chemicals Found in Piper nigrum**

Activity Count	Chemical	Plant Part	Low PPM	High PPM	StdDev	Reference Citation
67	1,8-CINEOLE	Fruit	--	--		
4	2-UNDECANONE	Fruit	--	--		
6	ACETOPHENONE	Fruit Essent. Oil	--	5000		
19	ACETYL-CHOLINE	Seed	--	23	-1.1887435300844578	
2	ALPHA-HUMULENE	Fruit	--	--		
2	ALPHA-HUMULENE	Leaf Essent. Oil	--	--		
2	ALPHA-HUMULENE	Fruit Essent. Oil	2100	19500	-1	
15	ALPHA-LINOLENIC-ACID	Fruit	2200	2458	-0.03933424045785113	USDA's Ag Handbook 8 and sequelae)
11	ALPHA-PHELLANDRENE	Fruit Essent. Oil	6800	36000	-0.5597624933275978	
11	ALPHA-PHELLANDRENE	Seed Essent. Oil	--	--		
28	ALPHA-PINENE	Fruit	--	3810	0.2759330241103953	
28	ALPHA-PINENE	Essential Oil	--	--		
28	ALPHA-PINENE	Fruit Essent. Oil	45000	94000	0.39522346445492856	
28	ALPHA-PINENE	Seed Essent. Oil	--	--		

Activity Count	Chemical	Plant Part	Low PPM	High PPM	StdDev	Reference Citation
3	ALPHA-SELINENE	Fruit	--	--		
3	ALPHA-SELINENE	Fruit Essent. Oil	--	700		
13	ALPHA-TERPINENE	Fruit	--	--		
13	ALPHA-TERPINENE	Fruit Essent. Oil	--	3000	-0.5711872077128709	
13	ALPHA-TERPINENE	Seed Essent. Oil	--	--		
23	ALPHA-TERPINEOL	Fruit	--	--		
23	ALPHA-TERPINEOL	Fruit Essent. Oil	--	1000	-0.910301229242406	
32	ALPHA-TOCOPHEROL	Resin, Exudate, Sap	--	1000		
32	ALPHA-TOCOPHEROL	Fruit	--	0.054	-1.1207877074947452	Charalambous, G. (Ed.). 1994. Spices, Herbs and Edible Fungi. Elsevier Science B. V. Amsterdam. 764 pp.
1	ALPHA-ZINGIBERENE	Fruit Essent. Oil	--	50100		
3	AR-CURCUMENE	Fruit	--	--		
3	AR-CURCUMENE	Fruit Essent. Oil	--	2600		

Activity Count	Chemical	Plant Part	Low PPM	High PPM	StdDev	Reference Citation
112	ASCORBIC-ACID	Fruit	10	10	-0.2838672355464054	ANON. 1948-1976. The Wealth of India raw materials. Publications and Information Directorate, CSIR, New Delhi. 11 volumes.
7	ASTRAGALIN	Fruit	--	--		
1	BEHENIC-ACID	Fruit	--	--		=ICMR(Indian Council of Medical Research).1976.Medicinal Plants of India.Vol.1.Indian Council of Med. Res.Cambridge Printing Works, New Delhi.487 pp;ICMR.1987.Medicinal Plants of India.Vol.2.Indian Council of Med. Res.Cambr. Printing Works,New Delhi.600pp
20	BENZOIC-ACID	Fruit	--	--		
6	BETA-BISABOLENE	Fruit	--	--		List, P.H. and Horhammer, L., Hager's Handbuch der Pharmazeutischen Praxis, Vols. 2-6, Springer-Verlag, Berlin, 1969-1979.
6	BETA-BISABOLENE	Fruit Essent. Oil	21200	111600	1	
53	BETA-CAROTENE	Fruit	0.114	0.128	-0.1505532074368425	
5	BETA-ELEMENE	Fruit	--	--		List, P.H. and Horhammer, L., Hager's Handbuch der Pharmazeutischen Praxis, Vols. 2-6, Springer-Verlag, Berlin, 1969-1979.
5	BETA-ELEMENE	Fruit Essent. Oil	--	900	-0.8343192281159078	

Activity Count	Chemical	Plant Part	Low PPM	High PPM	StdDev	Reference Citation
3	BETA-PHELLANDRENE	Seed Essent. Oil	--	--		
3	BETA-PHELLANDRENE	Fruit Essent. Oil	--	41000	-0.47230877878271366	
13	BETA-PINENE	Fruit	--	2355	-0.2223943577434541	
13	BETA-PINENE	Essential Oil	--	--		
13	BETA-PINENE	Fruit Essent. Oil	85000	138000	0.9556217102868814	
13	BETA-PINENE	Seed Essent. Oil	--	--		
3	BETA-SELINENE	Fruit	--	--		List, P.H. and Horhammer, L., Hager's Handbuch der Pharmazeutischen Praxis, Vols. 2-6, Springer-Verlag, Berlin, 1969-1979.
3	BETA-SELINENE	Fruit Essent. Oil	--	6400	-1	
47	BETA-SITOSTEROL	Fruit	380	650	0.059781582959947475	Spiller, G. A. 1996 (Spiller, G. A. Ed. 1996. CRC Handbook of Lipids in Human Nutrition. CRC Press. Boca Raton, FL. 233 pp.)
47	BETA-SITOSTEROL	Leaf	--	--		
47	BETA-SITOSTEROL	Stem	--	160	-1.327402794862025	
35	BORNEOL	Fruit	--	--		
35	BORNEOL	Fruit Essent. Oil	--	--		

Activity Count	Chemical	Plant Part	Low PPM	High PPM	StdDev	Reference Citation
4	BORON	Fruit	0.5	18	-0.44149735010956404	Betting on Boron, Unpublished draft by J. A. Duke on file at USDA, draft and papers relating to boron percentages. Includes Internat. Z. Vit. Ern. Forschung 43:1973 (boron).
6	BUTYRIC-ACID	Fruit	--	--		
102	CAFFEIC-ACID	Fruit	--	6	-0.33780275264769194	
28	CALCIUM	Fruit	2700	4989	0.26138541132704457	
2	CAMPESTEROL	Fruit	30	60	-0.14986892201478846	Spiller, G. A. 1996 (Spiller, G. A. Ed. 1996. CRC Handbook of Lipids in Human Nutrition. CRC Press. Boca Raton, FL. 233 pp.)
9	CAMPHENE	Fruit	--	120	-0.3020426178192843	
9	CAMPHENE	Fruit Essent. Oil	1000	1400	-1.0221892865520528	
9	CAMPHENE	Seed Essent. Oil	--	--		
41	CAMPHOR	Fruit	--	--		
37	CARVACROL	Fruit	--	--		
19	CARVONE	Fruit	--	--		
19	CARVONE	Fruit Essent. Oil	--	50	-0.7219111602348719	
31	CARYOPHYLLENE	Seed Essent. Oil	--	--		

Activity Count	Chemical	Plant Part	Low PPM	High PPM	StdDev	Reference Citation
31	CARYOPHYLLENE	Fruit	1000	6000	-0.21726348790373295	
1	CARYOPHYLLENE-ALCOHOL	Fruit Essent. Oil	--	700		
8	CARYOPHYLLENE-OXIDE	Fruit	--	--		Chemical Constituents of Oriental Herbs (3 diff. books)
8	CARYOPHYLLENE-OXIDE	Fruit Essent. Oil	--	9000	1	
3	CEDROL	Fruit Essent. Oil	--	700		
1	CHAVICINE	Fruit	--	--		
7	CHLORINE	Fruit	2700	5100	2.9820406376676973	ANON. 1948-1976. The Wealth of India raw materials. Publications and Information Directorate, CSIR, New Delhi. 11 volumes.
20	CHOLINE	Seed	--	1642	-0.028583716787024864	
24	CHROMIUM	Fruit	3	3.5	-0.01602978329031414	
18	CINNAMIC-ACID	Fruit	--	--		
3	CIS-OCIMENE	Fruit	--	--		
53	CITRAL	Fruit	--	--		List, P.H. and Horhammer, L., Hager's Handbuch der Pharmazeutischen Praxis, Vols. 2-6, Springer-Verlag, Berlin, 1969-1979.

Activity Count	Chemical	Plant Part	Low PPM	High PPM	StdDev	Reference Citation
20	CITRONELLAL	Fruit	--	--		List, P.H. and Horhammer, L., Hager's Handbuch der Pharmazeutischen Praxis, Vols. 2-6, Springer-Verlag, Berlin, 1969-1979.
15	CITRONELLOL	Essential Oil	--	--		
15	CITRONELLOL	Fruit Essent. Oil	--	200	-1	
2	CITRONELLYL-ACETATE	Fruit	--	--		List, P.H. and Horhammer, L., Hager's Handbuch der Pharmazeutischen Praxis, Vols. 2-6, Springer-Verlag, Berlin, 1969-1979.
2	COBALT	Fruit	0.3	0.4	-0.48669151400918487	
12	COPPER	Fruit	9	20	0.5588968590110831	
1	CUPARENE	Fruit Essent. Oil	--	13800		
19	D-LIMONENE	Fruit	--	--		List, P.H. and Horhammer, L., Hager's Handbuch der Pharmazeutischen Praxis, Vols. 2-6, Springer-Verlag, Berlin, 1969-1979.
8	DELTA-3-CARENE	Fruit	500	2000	2.7325194789368674	
9	DELTA-CADINENE	Fruit	--	--		List, P.H. and Horhammer, L., Hager's Handbuch der Pharmazeutischen Praxis, Vols. 2-6, Springer-Verlag, Berlin, 1969-1979.
9	DELTA-CADINENE	Leaf Essent. Oil	--	--		

Activity Count	Chemical	Plant Part	Low PPM	High PPM	StdDev	Reference Citation
9	DELTA-CADINENE	Fruit Essent. Oil	--	1200		
2	DIHYDROCARVEOL	Fruit	--	--		
2	DIHYDROCARVEOL	Fruit Essent. Oil	--	100	-1	
2	DIHYDROCARVEOL	Essential Oil	--	--		
3	ELEMENE	Fruit	--	225		
2	ELEMOL	Fruit Essent. Oil	--	1100		
76	EUGENOL	Fruit	--	--		
76	EUGENOL	Leaf Essent. Oil	--	--		
5	EUGENOL-METHYL-ETHER	Leaf Essent. Oil	--	--		
5	EUGENOL-METHYL-ETHER	Fruit Essent. Oil	--	--		
15	FIBER	Fruit	130056	148449	0.06390968642828075	USDA's Ag Handbook 8 and sequelae)
3	FLUORIDE	Fruit	--	3.6	1.4608696696245176	=ICMR(Indian Council of Medical Research).1976.Medicinal Plants of India.Vol.1.Indian Council of Med. Res.Cambridge Printing Works, New Delhi.487 pp;ICMR.1987.Medicinal Plants of India.Vol.2.Indian Council of Med. Res.Cambr. Printing Works,New Delhi.600pp



Activity Count	Chemical	Plant Part	Low PPM	High PPM	StdDev	Reference Citation
22	GABA	Fruit	--	--		ANON. 1948-1976. The Wealth of India raw materials. Publications and Information Directorate, CSIR, New Delhi. 11 volumes.
11	GAMMA-TERPINENE	Fruit	--	--		
11	GAMMA-TERPINENE	Seed Essent. Oil	--	--		
11	GAMMA-TERPINENE	Fruit Essent. Oil	100	11000	-0.34330658093433575	
5	GERANYL-ACETATE	Fruit	--	--		List, P.H. and Horhammer, L., Hager's Handbuch der Pharmazeutischen Praxis, Vols. 2-6, Springer-Verlag, Berlin, 1969-1979.
2	GERMACRENE-D	Fruit Essent. Oil	400	49300		
2	HEXANOIC-ACID	Fruit	--	--		
30	HYPEROSIDE	Fruit	--	--		
12	IODINE	Fruit	0.09	0.09	-0.2902538943414157	ANON. 1948-1976. The Wealth of India raw materials. Publications and Information Directorate, CSIR, New Delhi. 11 volumes.
6	IRON	Fruit	24	407	1.0869711226719216	
1	ISOCARYOPHYLLENE	Fruit	--	--		
1	ISOCARYOPHYLLENE	Fruit Essent. Oil	--	--		

Activity Count	Chemical	Plant Part	Low PPM	High PPM	StdDev	Reference Citation
3	ISOPULEGOL	Fruit	--	--		List, P.H. and Horhammer, L., Hager's Handbuch der Pharmazeutischen Praxis, Vols. 2-6, Springer-Verlag, Berlin, 1969-1979.
22	ISOQUERCITRIN	Fruit	--	--		
75	KAEMPFEROL	Fruit	--	--		Leung, A. Y. and Foster, S. 1995. Encyclopedia of Common Natural Ingredients 2nd Ed. John Wiley & Sons, New York. 649 pp.
2	L-LIMONENE	Fruit	--	--		List, P.H. and Horhammer, L., Hager's Handbuch der Pharmazeutischen Praxis, Vols. 2-6, Springer-Verlag, Berlin, 1969-1979.
7	LAURIC-ACID	Fruit	400	447	-0.44001415319735687	USDA's Ag Handbook 8 and sequelae)
60	LIMONENE	Fruit	1500	8000	0.397130905101767	
60	LIMONENE	Seed Essent. Oil	--	--		
60	LIMONENE	Fruit Essent. Oil	130500	210600	-0.6891296619826244	
53	LINALOOL	Fruit	--	90	-0.5606025868093102	
53	LINALOOL	Fruit Essent. Oil	--	2200	-0.6866142547714452	
7	LINALYL-ACETATE	Fruit	--	--		List, P.H. and Horhammer, L., Hager's Handbuch der Pharmazeutischen Praxis, Vols. 2-6, Springer-Verlag, Berlin, 1969-1979.

Activity Count	Chemical	Plant Part	Low PPM	High PPM	StdDev	Reference Citation
27	LINOLEIC-ACID	Fruit	13200	14750	-0.1472997456034458	USDA's Ag Handbook 8 and sequelae)
65	MAGNESIUM	Fruit	1809	2319	0.08763983825273146	USDA's Ag Handbook 8 and sequelae)
14	MANGANESE	Fruit	19	56	-0.03428079513973251	
5	METHYL-CINNAMATE	Fruit	--	--		List, P.H. and Horhammer, L., Hager's Handbuch der Pharmazeutischen Praxis, Vols. 2-6, Springer-Verlag, Berlin, 1969-1979.
20	METHYL-EUGENOL	Fruit	--	--		
22	MYRCENE	Fruit	--	--		
22	MYRCENE	Fruit Essent. Oil	22300	64000	1.0393197116265955	
22	MYRCENE	Seed Essent. Oil	--	--		
6	MYRISTIC-ACID	Fruit	700	782	-0.23225222845607665	USDA's Ag Handbook 8 and sequelae)
31	MYRISTICIN	Fruit	--	--		
31	MYRISTICIN	Fruit Essent. Oil	--	--		
5	MYRTENAL	Fruit	--	--		
2	MYRTENOL	Fruit	--	--		
2	MYRTENOL	Fruit Essent. Oil	--	2000		
3	N-HENTRIACONTANE	Leaf	--	--		

Activity Count	Chemical	Plant Part	Low PPM	High PPM	StdDev	Reference Citation
3	N-HENTRIACONTANE	Stem	--	110		
2	N-ISOBUTYL-OCTADECA-TRANS-2-TRANS-4-DIENAMIDE	Fruit	--	--		
11	NEROLIDOL	Fruit	--	--		
11	NEROLIDOL	Fruit Essent. Oil	--	--		
39	NIACIN	Fruit	2	14.541	-0.6175885994937399	
3	NICKEL	Fruit	0.7	2.4	-0.04957166517347313	
2	OCIMENE	Seed Essent. Oil	--	--		
2	OCIMENE	Fruit Essent. Oil	--	1000		
18	OLEIC-ACID	Fruit	13700	15309	-0.3627535701002104	USDA's Ag Handbook 8 and sequelae)
9	OXALIC-ACID	Fruit	4000	34000	1.5684920731098055	ANON. 1948-1976. The Wealth of India raw materials. Publications and Information Directorate, CSIR, New Delhi. 11 volumes.
25	P-COUMARIC-ACID	Fruit	--	--		
16	P-CYMENE	Fruit	--	150	-0.5599100466638004	
16	P-CYMENE	Seed Essent. Oil	--	--		
16	P-CYMENE	Fruit Essent. Oil	--	--		
2	P-METHYL-ACETOPHENONE	Fruit	--	--		

Activity Count	Chemical	Plant Part	Low PPM	High PPM	StdDev	Reference Citation
13	PALMITIC-ACID	Fruit	12200	13633	-0.1532986318862056	USDA's Ag Handbook 8 and sequelae)
2	PELLITORINE	Fruit	--	--		
11	PERILLALDEHYDE	Fruit	--	--		List, P.H. and Horhammer, L., Hager's Handbuch der Pharmazeutischen Praxis, Vols. 2-6, Springer-Verlag, Berlin, 1969-1979.
2	PHENYLACETIC-ACID	Fruit	--	--		List, P.H. and Horhammer, L., Hager's Handbuch der Pharmazeutischen Praxis, Vols. 2-6, Springer-Verlag, Berlin, 1969-1979.
2	PHENYLACETIC-ACID	Essential Oil	--	--		
4	PHOSPHORUS	Fruit	700	2040	-0.3571963668725839	
2	PHYTOSTEROLS	Fruit	550	1028	0.10644427802757993	
10	PIPERIDINE	Fruit	606	2700	0.7468101297426346	
10	PIPERIDINE	Seed	--	--		
10	PIPERIDINE	Essential Oil	--	--		
61	PIPERINE	Fruit	5000	90000	1	
61	PIPERINE	Stem	--	1100		
61	PIPERINE	Seed	--	--		
61	PIPERINE	Seed Essent. Oil	--	--		
61	PIPERINE	Root	--	--		

Activity Count	Chemical	Plant Part	Low PPM	High PPM	StdDev	Reference Citation
61	PIPERINE	Leaf Essent. Oil	--	--		
61	PIPERINE	Leaf	--	--		
61	PIPERINE	Seed Oil	--	--		
61	PIPERINE	Shoot	--	--		
7	PIPERITONE	Fruit Essent. Oil	--	400	-1	
2	PIPERONAL	Fruit	--	--		
2	PIPERONAL	Essential Oil	--	--		
14	POTASSIUM	Fruit	11718	15077	-0.251221490492334	USDA's Ag Handbook 8 and sequelae)
1	PYRROLIDINE	Seed	--	--		
176	QUERCETIN	Fruit	--	--		Leung, A. Y. and Foster, S. 1995. Encyclopedia of Common Natural Ingredients 2nd Ed. John Wiley & Sons, New York. 649 pp.
44	QUERCITRIN	Fruit	--	--		
18	RHAMNETIN	Fruit	--	--		Leung, A. Y. and Foster, S. 1995. Encyclopedia of Common Natural Ingredients 2nd Ed. John Wiley & Sons, New York. 649 pp.
15	RIBOFLAVIN	Fruit	0.4	2.827	-0.4731582297112136	
87	RUTIN	Fruit	--	--		
5	SABINENE	Fruit	1500	10000	2.605271050216115	

Activity Count	Chemical	Plant Part	Low PPM	High PPM	StdDev	Reference Citation
5	SABINENE	Fruit Essent. Oil	85000	204000	0.47619676977008224	
5	SABINENE	Seed Essent. Oil	--	--		
29	SAFROLE	Fruit	--	--		
29	SAFROLE	Fruit Essent. Oil	--	--		
7	SALICYLATES	Fruit	10	65	-0.1503568703758442	
1	SODIUM	Fruit	320	627	-0.1244930806267503	USDA's Ag Handbook 8 and sequelae)
5	STARCH	Fruit	280000	490000	0.4063516312545475	ANON. 1948-1976. The Wealth of India raw materials. Publications and Information Directorate, CSIR, New Delhi. 11 volumes.
8	STEARIC-ACID	Fruit	--	--		=ICMR(Indian Council of Medical Research).1976.Medicinal Plants of India.Vol.1.Indian Council of Med. Res.Cambridge Printing Works, New Delhi.487 pp;ICMR.1987.Medicinal Plants of India.Vol.2.Indian Council of Med. Res.Cambr. Printing Works,New Delhi.600pp
12	STIGMASTEROL	Fruit	140	210	1.7404035436813556	Spiller, G. A. 1996 (Spiller, G. A. Ed. 1996. CRC Handbook of Lipids in Human Nutrition. CRC Press. Boca Raton, FL. 233 pp.)

Activity Count	Chemical	Plant Part	Low PPM	High PPM	StdDev	Reference Citation
14	SULFUR	Fruit	1750	5760	3.0243404637527247	ANON. 1948-1976. The Wealth of India raw materials. Publications and Information Directorate, CSIR, New Delhi. 11 volumes.
23	TERPINEN-4-OL	Fruit	--	--		List, P.H. and Horhammer, L., Hager's Handbuch der Pharmazeutischen Praxis, Vols. 2-6, Springer-Verlag, Berlin, 1969-1979.
23	TERPINEN-4-OL	Fruit Essent. Oil	--	1900	-0.669433558721516	
9	TERPINOLENE	Fruit	--	--		
9	TERPINOLENE	Seed Essent. Oil	--	--		
9	TERPINOLENE	Fruit Essent. Oil	--	1000	-0.7286391135831505	
5	TERPINYL-ACETATE	Fruit	--	--		List, P.H. and Horhammer, L., Hager's Handbuch der Pharmazeutischen Praxis, Vols. 2-6, Springer-Verlag, Berlin, 1969-1979.
31	THIAMIN	Fruit	0.5	1.644	-0.4778065908058602	
1	TRANS-CARVEOL	Fruit	--	--		
1	TRANS-CARVEOL	Fruit Essent. Oil	--	100	-1	
2	TRANS-PINOCARVEOL	Fruit	--	--		
2	TRANS-PINOCARVEOL	Seed Essent. Oil	--	--		



Activity Count	Chemical	Plant Part	Low PPM	High PPM	StdDev	Reference Citation
8	UBIQUINONE	Fruit	--	--		List, P.H. and Horhammer, L., Hager's Handbuch der Pharmazeutischen Praxis, Vols. 2-6, Springer-Verlag, Berlin, 1969-1979.
77	ZINC	Fruit	11.2	35.7	0.16241717653889182	