

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

**Chemicals found in Citrus sinensis**

Activities Count	Chemical	Plant Part	Low PPM	High PPM	StdDev	Refernce Citation
4	4-VINYL-GUAIACOL	Fruit Juice				Jim Duke's personal files.
1	6,7-DIMETHOXYCOUMARIN	Bark		162.0		Jim Duke's personal files.
6	ACETALDEHYDE	Fruit Juice	3.0	15.0	1.0	--
16	ACETIC-ACID	Plant				--
3	ALANINE	Fruit	30.0	3775.0	0.02652939797970876	--
7	ALPHA-CAROTENE	Fruit	0.19	1.9	-0.26808750426637384	--
7	ALPHA-CAROTENE	Pericarp				Jim Duke's personal files.
2	ALPHA-HUMULENE	Fruit	0.0	0.1	-0.5986253681056065	--
15	ALPHA-LINOLENIC-ACID	Fruit	70.0	528.0	-0.913356590105175	USDA's Ag Handbook 8 and sequelae)
11	ALPHA-PHELLANDRENE	Fruit	12.0	14.0	-0.5695870460921888	--
28	ALPHA-PINENE	Fruit Juice		0.22	-0.9999999999999999	--
28	ALPHA-PINENE	Plant				--
28	ALPHA-PINENE	Fruit	35.0	40.0	-0.7083402631126611	--
13	ALPHA-TERPINENE	Fruit	1.0	2.0	-0.44934612100297294	--
23	ALPHA-TERPINEOL	Fruit	2.0	3.0	-0.40604181620664676	--
23	ALPHA-TERPINEOL	Fruit Juice	0.09	1.1	-0.6501250791550391	--
32	ALPHA-TOCOPHEROL	Fruit	4.0	29.0	-0.6752411923996696	--
5	ALUMINUM	Fruit	1.0	165.0	-0.17551933701223474	--
1	ANTHERAXANTHIN	Fruit				--
1	ANTHERAXANTHIN	Tissue Culture				Jim Duke's personal files.
14	ARGININE	Fruit	230.0	4908.0	0.15957250579145005	--
2	ARSENIC	Fruit	0.001	0.154	-0.33956845146287234	--
112	ASCORBIC-ACID	Fruit	500.0	4071.0	-0.03136646807240172	--
2	ASPARAGINE	Fruit	200.0	1800.0	0.3373215168393527	--
3	ASPARTIC-ACID	Fruit	70.0	8607.0	-0.2038383572771155	--
8	AURAPTENE	Fruit				--

Activities Count	Chemical	Plant Part	Low PPM	High PPM	StdDev	Reference Citation
26	BERGAPTEN	Pericarp				Leung, A. Y. and Foster, S. 1995. Encyclopedia of Common Natural Ingredients 2nd Ed. John Wiley & Sons, New York. 649 pp.
53	BETA-CAROTENE	Fruit	1.0	28.0	-0.0966771336129336	--
53	BETA-CAROTENE	Pericarp				Jim Duke's personal files.
2	BETA-CRYPTOXANTHIN	Fruit				--
2	BETA-CRYPTOXANTHIN	Pericarp				Jim Duke's personal files.
5	BETA-ELEMENE	Pericarp Essent. Oil				Jim Duke's personal files.
5	BETA-ELEMENE	Fruit	0.7	1.0	-0.565275335737646	--
2	BETA-MYRCENE	Fruit				Jim Duke's personal files.
13	BETA-PINENE	Fruit	11.0	13.0	-0.29742687330503664	--
47	BETA-SITOSTEROL	Fruit		170.0	-0.570881270243894	Spiller, G. A. 1996 (Spiller, G. A. Ed. 1996. CRC Handbook of Lipids in Human Nutrition. CRC Press. Boca Raton, FL. 233 pp.)
14	BETAINE	Fruit	390.0	630.0	-1.0398613033298902	--
4	BORON	Fruit	1.89	27.5	-0.25022637010687165	--
3	BRASSINOLIDE	Pollen Or Spore				Jim Duke's personal files.
6	BUTYRIC-ACID	Fruit				--
3	CADMIUM	Fruit	0.001	0.138	-0.23805307615553817	--
102	CAFFEIC-ACID	Fruit	2.0	50.0	-0.3296566072538586	--
102	CAFFEIC-ACID	Fruit Juice				Jim Duke's personal files.
62	CAFFEINE	Leaf		6.0	-0.9423311788449318	Jim Duke's personal files.
62	CAFFEINE	Flower		62.0	1.0998533626601497	Jim Duke's personal files.
62	CAFFEINE	Bud		0.3		Jim Duke's personal files.
28	CALCIUM	Fruit	210.0	5615.0	0.4058414049804431	--
2	CAMPESTEROL	Fruit		40.0	-0.31972036696488193	Spiller, G. A. 1996 (Spiller, G. A. Ed. 1996. CRC Handbook of Lipids in Human Nutrition. CRC Press. Boca Raton, FL. 233 pp.)

Activities Count	Chemical	Plant Part	Low PPM	High PPM	StdDev	Reference Citation
9	CAMPHENE	Fruit		0.1	-0.35176349319281713	--
3	CAPRIC-ACID	Fruit				--
1	CAPROIC-ACID	Fruit				--
5	CAPRYLIC-ACID	Fruit				--
19	CARVONE	Fruit	2.0	10.0	-0.49999993853473	Lawrence, B.M., Essential Oils 1976-1977, Essential Oils 1978, Essential Oils 1979-1980.
31	CARYOPHYLLENE	Pericarp				--
31	CARYOPHYLLENE	Pericarp Essent. Oil				Jim Duke's personal files.
7	CHLORINE	Fruit	12.0	32.0	-0.6800304631000254	--
1	CHOLESTEROL	Fruit				--
20	CHOLINE	Fruit	70.0	160.0	-0.5734302834278399	--
24	CHROMIUM	Fruit	0.005	0.385	-0.45355683651553846	--
23	CITRIC-ACID	Fruit	5600.0	9800.0	-0.4912433942967182	--
20	CITRONELLAL	Fruit	4.0	5.0	-0.9952774234291415	--
15	CITRONELLOL	Fruit	0.7	1.0	-0.5060981097957616	--
2	CITRONELLYL-ACETATE	Fruit	0.0	0.1	-0.9999999999999998	--
2	COBALT	Fruit	0.001	0.055	-0.5284569584957359	--
2	CONIFERIN	Pericarp				Jim Duke's personal files.
12	COPPER	Fruit	0.44	5.5	-0.569630082366932	--
2	CRYPTOXANTHIN	Fruit				--
2	CYSTINE	Fruit	100.0	755.0	-0.2882040289158333	USDA's Ag Handbook 8 and sequelae)
19	D-LIMONENE	Fruit Juice				Jim Duke's personal files.
1	DELPHINIDIN-3-GLUCOSIDE	Fruit				--
8	DELTA-3-CARENE	Fruit	7.0	9.0	-0.5981394247478974	--
9	DELTA-CADINENE	Pericarp Essent. Oil				Jim Duke's personal files.
9	DELTA-CADINENE	Pericarp				--
34	DIOSMIN	Flower				Jim Duke's personal files.

Activities Count	Chemical	Plant Part	Low PPM	High PPM	StdDev	Reference Citation
34	DIOSMIN	Pericarp				--
2	DODECANAL	Fruit	5.0	20.0	0.9948320067476139	Lawrence, B.M., Essential Oils 1976-1977, Essential Oils 1978, Essential Oils 1979-1980.
2	ELEMOL	Root Bark		28200.0		Jim Duke's personal files.
24	ETHANOL	Fruit Juice	64.0	900.0	1.0	--
6	ETHYL-ACETATE	Fruit Juice	0.01	0.58		--
1	ETHYL-BUTYRATE	Fruit Juice	0.08	1.02		--
2	FARNESENE	Fruit	0.0	0.1	-1.0	--
61	FERULIC-ACID	Pericarp	20.0	180.0	1.0	--
61	FERULIC-ACID	Fruit Juice				Jim Duke's personal files.
61	FERULIC-ACID	Fruit	10.0	30.0	-0.7627700713964738	--
15	FIBER	Fruit	3740.0	47000.0	-0.8934118438004772	--
15	FOLACIN	Fruit	0.0	2.0	-0.019192793995839758	USDA's Ag Handbook 8 and sequelae)
8	FRUCTOSE	Fruit		23800.0	-0.555436040816387	--
1	GALACTOSE	Fruit				--
22	GAMMA-AMINOBUTYRIC-ACID	Fruit	40.0	730.0	-0.27868808492512787	--
11	GAMMA-TERPINENE	Fruit	1.0	2.0	-0.6509562680883627	--
11	GAMMA-TERPINENE	Fruit Juice	0.04	0.46	-1.0	--
13	GERANIAL	Fruit	6.0	7.0	-0.9983227361677096	--
35	GERANIOL	Fruit	0.7	1.0	-0.6057972802749785	--
5	GERANYL-ACETATE	Fruit	0.0	0.1	-0.9446827484165164	--
7	GLUCOSE	Fruit		23600.0	-0.644631124988246	--
8	GLUTAMIC-ACID	Fruit	60.0	7097.0	-0.4778760905604569	--
5	GLUTAMINE	Fruit	30.0	630.0	0.1767951575504613	--
12	GLYCINE	Fruit	50.0	7097.0	1.3509995174874219	--
31	HESPERIDIN	Pericarp		63500.0	0.38878029269733505	Jim Duke's personal files.
31	HESPERIDIN	Fruit Juice		110.0		Jim Duke's personal files.

Activities Count	Chemical	Plant Part	Low PPM	High PPM	StdDev	Reference Citation
31	HESPERIDIN	Flower				Jim Duke's personal files.
31	HESPERIDIN	Fruit				Jim Duke's personal files.
5	HEXANAL	Fruit	1.0	2.0		Lawrence, B.M., Essential Oils 1976-1977, Essential Oils 1978, Essential Oils 1979-1980.
5	HEXANAL	Fruit Juice	0.02	0.65		--
3	HEXANOL	Fruit Juice	0.02	0.22		--
7	HISTIDINE	Fruit	180.0	1359.0	-0.24792284510655177	USDA's Ag Handbook 8 and sequelae)
8	HORDENINE	Fruit		0.0		--
1	HYDROXYPROLINE	Leaf				Jim Duke's personal files.
6	IRON	Fruit	1.0	8.0	-0.49575433892938076	--
3	ISOLEUCINE	Fruit	250.0	1888.0	-0.5255451749979052	USDA's Ag Handbook 8 and sequelae)
2	LEUCINE	Fruit	230.0	1136.0	-0.8429441489050677	USDA's Ag Handbook 8 and sequelae)
60	LIMONENE	Fruit	8300.0	9700.0	0.6409395320453212	--
60	LIMONENE	Fruit Juice	1.0	278.0		--
5	LIMONIN	Fruit				--
5	LIMONIN	Seed				Jim Duke's personal files.
5	LIMONIN	Fruit Juice				Jim Duke's personal files.
5	LIMONIN	Twig				Jim Duke's personal files.
5	LIMONIN	Branches				Jim Duke's personal files.
5	LIMONIN	Bark				Jim Duke's personal files.
5	LIMONIN	Root				Jim Duke's personal files.
53	LINALOOL	Fruit Juice	0.15	4.69	1.0000000000000004	--
53	LINALOOL	Fruit	30.0	530.0	-0.43753461385311765	--
27	LINOLEIC-ACID	Fruit	180.0	1359.0	-0.33622644162700344	USDA's Ag Handbook 8 and sequelae)
11	LITHIUM	Fruit	0.108	1.54	0.890343380696948	--
15	LUTEIN	Pericarp				Jim Duke's personal files.

Activities Count	Chemical	Plant Part	Low PPM	High PPM	StdDev	Reference Citation
15	LUTEIN	Fruit	0.0	3.0	-0.575590894746515	--
16	LYCOPENE	Pericarp				Jim Duke's personal files.
4	LYSINE	Fruit	470.0	3548.0	-0.1467119613903352	USDA's Ag Handbook 8 and sequelae)
65	MAGNESIUM	Fruit	98.0	1075.0	-0.4884044378711737	--
15	MALIC-ACID	Fruit	600.0	2000.0	-0.8215787018847368	--
1	MALONIC-ACID	Plant				--
1	MALONIC-ACID	Fruit				--
14	MANGANESE	Fruit	0.0	8.0	-0.3507865335531638	--
3	MANNOSE	Fruit				--
1	MERCURY	Fruit	0.0	0.001	-0.7865389313824043	--
2	METHANOL	Fruit Juice	0.8	80.0	1.0	--
15	METHIONINE	Fruit	200.0	1510.0	0.6791094324753408	USDA's Ag Handbook 8 and sequelae)
2	METHYL-BUTYRATE	Fruit Juice	0.01	0.1		--
2	MOLYBDENUM	Fruit	0.1	0.385	-0.4080774738511709	--
22	MYRCENE	Fruit	130.0	140.0	-0.36272097374914564	--
34	MYRICETIN	Fruit		0.5	-0.7536633445071549	Jim Duke's personal files.
1	N-METHYL-TYRAMINE	Fruit	0.0	2.0	-1.0	--
1	N-METHYL-TYRAMINE	Pericarp				Jim Duke's personal files.
56	NARINGENIN	Pericarp	35000.0	45800.0		Jim Duke's personal files.
12	NARINGIN	Fruit				--
12	NARINGIN	Pericarp				Jim Duke's personal files.
12	NARINGIN	Flower				Jim Duke's personal files.
12	NARINGIN	Fruit Juice				Jim Duke's personal files.
1	NARIRUTIN	Pericarp				Jim Duke's personal files.
1	NARIRUTIN	Fruit Juice				Jim Duke's personal files.
6	NEOHESPERIDIN	Pericarp		28000.0		Jim Duke's personal files.
6	NEOHESPERIDIN	Fruit Juice				Jim Duke's personal files.

Activities Count	Chemical	Plant Part	Low PPM	High PPM	StdDev	Reference Citation
1	NEOHESPERIDIN-DIHYDROCHALCONE	Pericarp				Jim Duke's personal files.
4	NERAL	Fruit	4.0	5.0	-0.8791176720401793	--
10	NEROL	Fruit	0.7	1.0	-0.5477997473775594	--
11	NEROLIDOL	Flower				Jeffery B. Harborne and H. Baxter, eds. 1983. Phytochemical Dictionary. A Handbook of Bioactive Compounds from Plants. Taylor & Frost, London. 791 pp.
5	NERYL-ACETATE	Fruit	0.7	1.0	-0.724098948454428	--
2	NERYL-FORMATE	Fruit		10.0	-1.0	Lawrence, B.M., Essential Oils 1976-1977, Essential Oils 1978, Essential Oils 1979-1980.
39	NIACIN	Fruit	2.0	31.0	-0.39701223426716226	--
3	NICKEL	Fruit	0.01	0.55	-0.6121948588601274	--
8	NOBILETIN	Fruit				--
8	NOBILETIN	Pericarp				Jim Duke's personal files.
8	NOBILETIN	Fruit Juice				Jim Duke's personal files.
2	NOMILIN	Fruit Juice				Jim Duke's personal files.
2	NOMILIN	Seed				Jim Duke's personal files.
2	NOOTKATOL	Fruit				Jim Duke's personal files.
3	NOOTKATONE	Pericarp Essent. Oil				Jim Duke's personal files.
3	NOOTKATONE	Fruit		1.0		Lawrence, B.M., Essential Oils 1976-1977, Essential Oils 1978, Essential Oils 1979-1980.
1	NORDENTATIN	Root Bark		300.0		Jim Duke's personal files.
3	OBACUNONE	Seed				Jim Duke's personal files.
18	OLEIC-ACID	Fruit	20.0	1510.0	-0.4691070855395464	USDA's Ag Handbook 8 and sequelae)
15	OSTHOL	Root				Jim Duke's personal files.
4	OSTHOLE	Root				--

Activities Count	Chemical	Plant Part	Low PPM	High PPM	StdDev	Reference Citation
9	OXALIC-ACID	Fruit		87.0	-0.3015516499208378	Watt, J.M. and Breyer-Brandwijk, M.G. 1962. The Medicinal and Poisonous Plants of Southern and Eastern Africa. E. & S. Livingstone, Ltd. Edinburg & London. 1457 pp.
25	P-COUMARIC-ACID	Pericarp	5.0	75.0	1.0	--
25	P-COUMARIC-ACID	Fruit Juice				Jim Duke's personal files.
25	P-COUMARIC-ACID	Fruit	5.0	17.0	-0.6943231755501756	--
16	P-CYMENE	Fruit	3590.0	4070.0	-0.04098189676522262	--
13	PALMITIC-ACID	Fruit	130.0	982.0	-0.35024794688904615	USDA's Ag Handbook 8 and sequelae)
2	PALMITOLEIC-ACID	Fruit	30.0	226.0	-0.30412481168854	USDA's Ag Handbook 8 and sequelae)
11	PANTOTHENIC-ACID	Fruit	2.0	19.0	0.05712424299404392	USDA's Ag Handbook 8 and sequelae)
24	PECTIN	Fruit	1300.0	5900.0	-0.5601993872457034	--
24	PECTIN	Pericarp				Jim Duke's personal files.
11	PERILLALDEHYDE	Fruit		2.0	-0.7326583054413682	Lawrence, B.M., Essential Oils 1976-1977, Essential Oils 1978, Essential Oils 1979-1980.
7	PHENYLALANINE	Fruit	310.0	2340.0	-0.34187787905261324	USDA's Ag Handbook 8 and sequelae)
4	PHOSPHORUS	Fruit	136.0	1980.0	-0.3754207541761312	--
5	PHYLLOQUINONE	Fruit		0.001	-0.23285139490462353	--
2	PHYTOSTEROLS	Fruit		240.0	-0.9087217260357541	Spiller, G. A. 1996 (Spiller, G. A. Ed. 1996. CRC Handbook of Lipids in Human Nutrition. CRC Press. Boca Raton, FL. 233 pp.)
14	POTASSIUM	Fruit	1400.0	13772.0	-0.3666795712783593	--
6	PROPIONIC-ACID	Plant				--
8	QUERCETAGETIN	Fruit Juice				Jim Duke's personal files.
176	QUERCETIN	Fruit		3.4	-0.7856446697799095	Jim Duke's personal files.
1	QUINIC-ACID	Fruit				--
15	RIBOFLAVIN	Fruit	0.0	3.0	-0.4303249009534089	--



Activities Count	Chemical	Plant Part	Low PPM	High PPM	StdDev	Reference Citation
87	RUTIN	Pericarp		6100.0		Jim Duke's personal files.
87	RUTIN	Leaf		9000.0	-0.44580487824979076	Jim Duke's personal files.
5	SABINENE	Fruit	11.0	13.0	-0.5315196015036519	--
5	SABINENE	Fruit Juice	0.0	0.15		--
7	SALICYLATES	Fruit	0.0	200.0	0.236750790358027	--
22	SCOPARONE	Bark		162.5		Jim Duke's personal files.
7	SCUTELLAREIN	Fruit				--
7	SCUTELLAREIN	Fruit Juice				Jim Duke's personal files.
60	SELENIUM	Fruit	0.0	0.002	-0.38569128420884563	--
1	SERINE	Fruit	40.0	2410.0	-0.43531280247846904	--
3	SESELIN	Root				Jim Duke's personal files.
4	SILICON	Fruit		2.0	-0.6019449725946585	ACTA AGRIC SCAND SUPPL 22: 1980
3	SILVER	Fruit	0.027	0.055	-0.5875909007853288	--
9	SINAPIC-ACID	Fruit Juice				Jim Duke's personal files.
9	SINAPIC-ACID	Fruit	7.0	19.0	0.784062560233975	--
9	SINAPIC-ACID	Pericarp	45.0	100.0	1.0	--
2	SINENSETIN	Pericarp				Jim Duke's personal files.
2	SINENSETIN	Plant				Jeffery B. Harborne and H. Baxter, eds. 1983. Phytochemical Dictionary. A Handbook of Bioactive Compounds from Plants. Taylor & Frost, London. 791 pp.
2	SINENSETIN	Fruit Juice				Jim Duke's personal files.
2	SINENSETIN	Fruit				--
1	SODIUM	Fruit	0.0	29.0	-0.1812007490262155	--
6	STACHYDRINE	Fruit				--
12	STIGMASTEROL	Fruit		20.0	-0.8951703667819086	Spiller, G. A. 1996 (Spiller, G. A. Ed. 1996. CRC Handbook of Lipids in Human Nutrition. CRC Press. Boca Raton, FL. 233 pp.)

Activities Count	Chemical	Plant Part	Low PPM	High PPM	StdDev	Reference Citation
3	SUBAPHYLLIN	Fruit				Jeffery B. Harborne and H. Baxter, eds. 1983. Phytochemical Dictionary. A Handbook of Bioactive Compounds from Plants. Taylor & Frost, London. 791 pp.
3	SUBAPHYLLIN	Leaf				Jeffery B. Harborne and H. Baxter, eds. 1983. Phytochemical Dictionary. A Handbook of Bioactive Compounds from Plants. Taylor & Frost, London. 791 pp.
7	SUCCINIC-ACID	Fruit				--
14	SUCROSE	Fruit		47000.0	-0.41357367622327157	--
14	SULFUR	Fruit	46.0	1000.0	-0.28853428975640755	--
5	SYNEPHRINE	Pericarp				Jim Duke's personal files.
5	SYNEPHRINE	Fruit	15.0	43.0		--
15	TANGERETIN	Pericarp				Jim Duke's personal files.
15	TANGERETIN	Fruit Juice				Jim Duke's personal files.
15	TANGERETIN	Fruit				--
23	TERPINEN-4-OL	Fruit		0.1	-0.358333842321623	--
9	TERPINOLENE	Fruit	1.0	2.0	-0.7498060467737104	--
31	THIAMIN	Fruit	1.0	7.0	0.21342198396383905	--
4	THREONINE	Fruit	150.0	1132.0	-0.7838698402029908	USDA's Ag Handbook 8 and sequelae)
71	THYMOL	Fruit	0.0	0.1	-0.7071067811865474	--
4	TRANS-2-HEXENAL	Pericarp				Leung, A. Y. and Foster, S. 1995. Encyclopedia of Common Natural Ingredients 2nd Ed. John Wiley & Sons, New York. 649 pp.
1	TRANS-2-HEXENOL	Fruit Juice	0.0	0.1		--
29	TRYPTOPHAN	Fruit	90.0	680.0	-0.23921305471754814	USDA's Ag Handbook 8 and sequelae)
11	TYRAMINE	Fruit	0.0	1.0	0.7071067811865478	--
8	TYROSINE	Fruit	160.0	1208.0	-0.501692988706999	USDA's Ag Handbook 8 and sequelae)

Activities Count	Chemical	Plant Part	Low PPM	High PPM	StdDev	Refernce Citation
2	UNDECANAL	Fruit	0.7	1.0	-0.5758305509285185	--
3	VALINE	Fruit	100.0	3020.0	-0.29566746601618277	--
2	VIOLAXANTHIN	Fruit				--
2	VIOLAXANTHIN	Pericarp				Jim Duke's personal files.
2	VIOLAXANTHIN	Tissue Culture				Jim Duke's personal files.
1	XANTHOXYLETIN	Root Bark		24000.0		Jim Duke's personal files.
1	XANTHOXYLETIN	Root				Jim Duke's personal files.
1	XANTHYLETIN	Root Bark		45000.0		Jim Duke's personal files.
1	XANTHYLETIN	Root				Jim Duke's personal files.
3	XYLOSE	Fruit				--
5	ZEAXANTHIN	Fruit		2.0	-1.0	--
5	ZEAXANTHIN	Pericarp				Jim Duke's personal files.
5	ZEAXANTHIN	Tissue Culture				Jim Duke's personal files.
77	ZINC	Fruit	0.9	13.0	-0.5205322406758267	--