

# Dr. Duke's Phytochemical and Ethnobotanical Databases

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## Chemicals and their Biological Activities in: *Citrus sinensis* (L.) OSBECK (Rutaceae) -- Orange

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### Chemicals

**2'-TRANS-O-FERULOYL-GALACTARIC-ACID** *Pericarp:*

No activity reported.

**2'-TRANS-O-P-COUMAROYL-GALACTARIC-ACID** *Pericarp:*

No activity reported.

**2'-TRANS-O-P-COUMAROYL-GLUCARIC-ACID** *Pericarp:*

No activity reported.

**2,4-TRANS,TRANS-O-FERULOYL-GLUCARIC-ACID** *Pericarp:*

No activity reported.

**2-METHYL-1-PROPANOL** *Fruit Juice 0.07 ppm;*

No activity reported.

**2-TRANS-O-FERULOYL-GLUCARIC-ACID** *Pericarp:*

No activity reported.

**3,3',4,5,6,7,8-HEPTAMETHOXY-FLAVONE** *Fruit:*

No activity reported.

**3-HYDROXY-ETHYL-HEXANOATE** *Fruit:*

No activity reported.

**3-METHYL-BUT-1-ENE** *Essential Oil:*

No activity reported.

**3-METHYL-BUTAN-1-OL** *Fruit:*

No activity reported.

**4-(3-METHYL-2-BUTENOXY)-ISO-NITROSO-ACETOPHENONE** *Pericarp 48 ppm;*

No activity reported.

**5,6-DIHYDRO-BETA-BETA-CAROTEN-3,3',5,6-TETROL** *Fruit Juice:*

No activity reported.

**5,8-EPOXY-5,5',8-TETRAHYDRO-BETA,BETA-CAROTEN-3,3',5',6'-TETROL** *Plant:*

No activity reported.

**5,8-EPOXY-5,8-DIHYDRO-8'-APO-BETA-CAROTEN-3,10-DIOL *Fruit Juice:***

No activity reported.

**6,7-DIMETHOXYCOUMARIN *Bark 162 ppm;***

Analgesic

**ACETIC-ACID *Plant:***

Acidulant; Antibacterial 5,000 ppm; Antiotitic; Antisalmonella; Antivaginitic 1-2%;  
Expectorant; Fungicide; Keratitigenic; Mucolytic; Osteolytic; Perfumery FEMA 6,000-  
40,000 ppm; Pesticide; Protisticide; Spermicide; Ulcerogenic; Verrucolytic

**ALPHA-BERGAMOTENE *Fruit 6 ppm;***

No activity reported.

**ALPHA-CAROTENE *Fruit 0.19 - 1.9 ppm***

Anticancer; Anticancer (Liver); Anticancer (Lung); Anticancer (Skin); Antiproliferant  
10 x beta-carotene; Colorant; Previtamin-A

**ALPHA-COPAENE *Pericarp:***

No activity reported.

**ALPHA-HYDROXY-CAROTENE *Pericarp:***

No activity reported.

**ALPHA-LINOLENIC-ACID *Fruit 70 - 528 ppm***

5-Alpha-Reductase-Inhibitor; Antiaggregant; Antihypertensive; Antiinflammatory  
IC50=42 uM; Antileukotriene-D4; Antimenorrhagic; Antimetastatic; Antiprostaitic;  
Cancer-Preventive; Hypotensive; Immunostimulant 0.12 ml/man/day; Lymphocytogenic  
0.5 ug/ml; Propecic; Prostaglandin-Synthesis-Inhibitor 39.5 g/day/hmn; Vasodilator

**ALPHA-PINENE *Fruit 10 - 60 ppm Plant:***

Allelochemic; Allergenic; Antiacne; Antibacterial; Antifeedant; Antiflu;  
Antiinflammatory 500 mg/kg; Antipneumonic; Antiseptic; Antispasmodic;  
Antistaphylococcic; Antiviral; Cancer-Preventive; Coleoptophile; Expectorant; FLavor  
FEMA 15-150; Herbicide IC50=30 uM; Insecticide 0.82 uM/fly; Insectifuge 50 ppm;  
Insectiphile; Irritant; P450-2B1-Inhibitor IC50=0.087 uM; Perfumery; Pesticide;  
Sedative; Spasmodic; Tranquilizer; Transdermal

**ALPHA-SINESAL *Fruit 3 ppm; Pericarp:***

No activity reported.

**ALPHA-TERPINEOL *Fruit 10 - 50 ppm Fruit Juice 0.09 - 1.1 ppm***

ACE-Inhibitor 100 ug/ml (weak activity); Aldose-Reductase-Inhibitor 100 ug/ml;  
Allelopathic; Antiacne; Antibacterial MIC=800-1,600 ug/ml; Anticancer;  
Anticariogenic; Antiinflammatory; Antiproliferant; Antiseptic; Cicatrizant ED50=240  
ug/g mus; FLavor FEMA 5-40; Insecticide 1.29 uM/fly; Interleukin-6-Inhibitor;  
Mosquitofuge > Deet; Motor-Depressant; Nematicide MLC=1 mg/ml; Perfumery;  
Pesticide; Sedative; Termiticide IC100=5 mg/g; Transdermal; Vulnerary ED50=240  
ug/g mus

**ANTHERAXANTHIN *Fruit:***

Colorant

**APIGENIN-7-O-ALPHA-L-RHAMNO-GLUCOSIDE *Leaf:***

No activity reported.

**APOVIOLAXANTH-10'-AL *Pericarp:***

No activity reported.

**ARABAN *Fruit:***

No activity reported.

**ASPARAGINE *Fruit 200 - 1,800 ppm***

Antisickling; Diuretic

**AURAPTENE *Fruit:***

Antiperoxidant; Antisuperoxidogenic; Antitumor (Colon crypts) (*rat*); Antitumor (Mouth); Antitumor (Skin) (*mouse*); Chemopreventive-Inhibitor; Quinone-Reductase-Inducer 100 ppm 400 mg/kg igs rat

**AURAXANTHIN *Fruit 4 ppm;***

No activity reported.

**BERGAPTOL *Fruit:***

No activity reported.

**BETA-APO-8'-CAROTINAL *Pericarp:***

No activity reported.

**BETA-APO-CAROTEN-8-AL *Pericarp:***

No activity reported.

**BETA-CITRAURIN *Pericarp:***

No activity reported.

**BETA-CRYTOXANTHIN *Fruit:***

No activity reported.

**BETA-CUBEBENE *Fruit 10 ppm;***

No activity reported.

**BETA-ELEMENE *Fruit 5 ppm;***

Anticancer (Cervix); Antigliomic; Antiproliferant; Antitumor (Cervix); Apoptotic

**BETA-SINESAL *Fruit 6 ppm; Pericarp:***

No activity reported.

**BETA-ZEACAROTENE *Pericarp:***

No activity reported.

**BETAINE *Fruit 390 - 630 ppm***

Abortifacient; Antigastric; Antihomocystinuric; Antimyotrophic; Bruchiphobe;

Cardioprotective; Diuretic; Emmenagogue; Ethanolytic; Expectorant; Hepatoprotective; Lipotropic; Mucogenic; Pesticide

**BRAYLIN Root:**

No activity reported.

**CAFFEIC-ACID Fruit 36 - 50 ppm**

Aldose-Reductase-Inhibitor 4 ug/ml (*weak activity*); Allergenic; Analgesic; Antiadenoviral; Antiaggregant; Antiaging; Antiatherogenic; Antibacterial; Anticancer; Anticarcinogenic; Antidepressant; Antiedemic; Antielastase IC50=86 ug/ml (475 uM) IC50=93 um/l; Antiescherichic; Antiflu; Antigonadotropic; Antihemolytic 25 uM; Antihepatoadenomic 200 ppm diet orl mus; Antihepatotoxic; Antiherpetic 50 ug/ml EC50=>50 ug/ml; Antihistaminic; AntiHIV EC50=200 ug/ml; Antihypercholesterolemic; Antihyperthyroid; Antiinflammatory; AntiLegionella; Antileukemic; Antileukotriene; Antimelanogenic; Antimutagenic; Antinitrosaminic; Antiophidic; Antioxidant 1.3 x Vit. E 1/2 BHA 1/3 quercetin 30 mM 50 uM IC57=30 ppm; Antiperoxidant IC35=200 ug/ml IC50=44 uM IC85=100 ug/ml; Antiproliferant; Antiprostaglandin; Antiradicular 1/3 quercetin 10 uM 30 mM IC50=32-35 uM; Antiseptic; Antispasmodic EC50=3.4-15 uM; Antistaphylococcic; Antistomatitic; Antisunburn; Antithiamin; Antithyroid; Antitumor 200 ppm diet orl mus; Antitumor (Skin); Antitumor-Promoter IC42=10 uM; Antiulcerogenic; Antivaccinia; Antiviral IC50=62.5 ug/ml; Anxiolytic; Calcium-Antagonist IC50=1.2 uM rbt; Cancer-Preventive; Carcinogenic 2% (diet); Chemopreventive; Cholagogue; Choloretic; Clastogenic; CNS-Active; Co-carcinogenic; Collagen-Sparing; COX-2-Inhibitor IC32=100 uM; Cytoprotective; Cytotoxic TC50=200 ug/ml; Diuretic; DNA-Active; DNA-Protective; Fungicide MIC=0.4 mg/ml; Hepatocarcinogenic 400 ppm diet orl mus (in the absence of alcohol); Hepatoprotective; Hepatotropic; Histamine-Inhibitor; Immunostimulant; Insectifuge; Leukotriene-Inhibitor; Lipoxygenase-Inhibitor IC27=5 mM IC50=62-148 uM; Lyase-Inhibitor IC50=94-164 uM; Metal-Chelator; Ornithine-Decarboxylase-Inhibitor; Pesticide; Prooxidant; Prostaglandigenic; Sedative 500 mg; Sunscreen IC50=2.5 mg/l IC91=5 mg/l IC98=25 mg/l; Tumorigenic; Vulnerary; Xanthine-Oxidase-Inhibitor IC50=39.21 uM

**CAFFEINE Bud 0.3 ppm; Flower 62 ppm; Leaf 6 ppm;**

(+)-Inotropic; Adenosine-Antagonist; Analeptic 200 scu mus; Analgesic-Synergist; Antiapneic; Antiapoptotic; Antiasthmatic 5-10 mg/kg orl/man; Anticarcinogenic; Anticariogenic; Antidermatitic; Antiemetic; Antifeedant; Antiflu; Antiherpetic; Antihypotensive 250 mg/day/orl/man; Antinarcotic; Antiobesity; Antioxidant; Antirhinitic 140 mg/day/orl/man; Antiserotonergic 40 ipr rat 40 scu rat; Antitumor; Antitumor (Lung); Antivaccinia; Antiviral; Apoptotic; Arrhythmigenic 1,500 mg/man; cAMP-Phosphodiesterase-Inhibitor; Cancer-Preventive; Cardiogenic 10-25 orl dog 65-500 orl cat; Catabolic; cGMP-Phosphodiesterase-Inhibitor; Choloretic; CNS-Stimulant 100 orl mus 30 orl rat; Coronary-Dilator; Diuretic; Energizer 20-200 mg/man; Ergotamine-Enhancer; FLavor FEMA 125; Herbicide; Hypertensive; Hypoglycemic; Insecticide; Lypolytic; Myorelaxant; Neurotoxic; Pesticide; Phosphodiesterase-Inhibitor; Pyrogenic 13.3 mg/kg ipr rbt 15 mg/kg ipr cat 60 mg/day oral hmn; Respirastimulant; Spasmogenic 1,500 mg/man; Stimulant; Tachycardic; Teratogenic 14 orl rat; Topoisomerase-I-Inhibitor 0.1 nM 75 uM; Topoisomerase-II-Inhibitor 99 mM; Vasodilator

**CAMPESTEROL Fruit:**

Antioxidant IC37=10 uM; Hypocholesterolemic

**CAPRIC-ACID *Fruit*:**

Fungicide; Irritant; Pesticide

**CAPRYLIC-ACID *Fruit*:**

Antiseptic; Candidicide 300 mg/man/12 x/day; Fungicide; Irritant; Pesticide

**CAROTENOIDS *Fruit* 12 - 35 ppm**

No activity reported.

**CARVONE *Fruit* 2 - 10 ppm**

Allergenic; Antiacetylcholinesterase  $IC_{50}=1.4-1.8$  mM; Antiproliferative; Antiseptic 1.5 x phenol; Cancer-Preventive; Candidistat; Carminative; CNS-Stimulant; FLavor FEMA 80-3,000; Fungistat; Insecticide; Insectifuge; Motor-Depressant; Nematicide  $MLC=1$  mg/ml; Perfumery; Pesticide; Sedative; Trichomonicide  $LD_{100}=300$  ug/ml; Vermicide

**CARYOPHYLLENE *Pericarp*:**

Aldose-Reductase-Inhibitor; Allergenic; Analgesic; Antiacne; Antiasthmatic; Antibacterial; Anticariogenic  $MIC=>1,600$  ug/ml; Antidermatitic; Antiedemic; Antifeedant 500 ppm; Antiinflammatory  $IC_{50}=100$  uM; Antileishmanic; Antionychyotic; Antiproliferant; Antispasmodic; Antistaphylococcic; Antistreptococcic; Antitumor; Antiulcer; Candidicide; FLavor FEMA 20-200; Fungicide; Gastroprotective; Insectifuge; Irritant; Larvicide; Mosquitocide; Perfumery; Pesticide; Sedative; Termitifuge

**CITFLAVANONE *Root Bark*:**

No activity reported.

**CITRABASINE *Root Bark* 14 ppm;**

No activity reported.

**CITRACRIDONE-I *Root Bark* 400 ppm;**

No activity reported.

**CITRONELLAL *Fruit* 55 ppm;**

Acaricide; Allergenic; Antibacterial; Antiseptic 3.8 x phenol; Antistaphylococcic; Antistreptococcic; Candidicide; Embryotoxic; FLavor FEMA <1; Fungicide; Insectifuge; Irritant; Motor-Depressant; Mutagenic?; Nematicide  $MIC$  1 mg/ml; P450-2B1-Inhibitor  $IC_{50}=1.56$  uM; Perfumery; Pesticide; Sedative  $ED=1$  mg/kg; Teratogenic

**CITRUNOBIN *Root Bark*:**

No activity reported.

**CITRUSININE-I *Root Bark* 80 ppm;**

No activity reported.

**CITRUSININE-II *Root Bark* 40 ppm;**

No activity reported.

**CITRUSINS *Plant*:**

No activity reported.

**CONIFERIN *Pericarp*:**

Herbicide *IC90-95=1,000 uM*; Pesticide

**CRENULATIN *Root Bark 60 ppm*:**

No activity reported.

**CRYPTOFLAVIN *Pericarp*:**

No activity reported.

**CRYPTOXANTHIN *Fruit*:**

Antimutagenic; Vitamin-A-Activity

**CRYPTOXANTHIN-5,5',6,6'-DIEPOXIDE *Pericarp*:**

No activity reported.

**CYANIDIN-3-GLUCOSIDE *Fruit*:**

No activity reported.

**DEACETYL-NOMILIN *Seed*:**

No activity reported.

**DECANAL *Fruit 10 - 60 ppm Fruit Juice 0.15 ppm*:**

No activity reported.

**DELPHINIDIN-3-GLUCOSIDE *Fruit*:**

Antioxidant

**DELTA-CADINENE *Pericarp*:**

Aldose-Reductase-Inhibitor; Antiacne; Antibacterial *MIC800 ug/ml*; Anticariogenic; Antistreptococcic; Cytochrome-P450-Inducer; P450-Inducer; Pesticide; Testosterone-Inducer

**DIHYDROKAEMPFEROL-4'-METHYL-ETHER-7-O-RHAMNOSIDE *Fruit*:**

No activity reported.

**DIOSMETIN-7-O-ALPHA-L-RHAMNO-GLUCOSIDE *Leaf*:**

No activity reported.

**DIOSMIN *Pericarp*:**

Anticancer; Anticapillary-Fragility *300 mg/2x/day/woman*; Anticarcinogenic; Anticlastogen; AntiCVI; Anticytotoxic; Antiedemic *50-200 mg/kg/day 600 mg/kg rat*; Antihemorrhoidal *450 mg 2x/day x7days then 1x/day x2months*; Antihistaminic; Antiinflammatory *600 mg/kg rat*; Antileukotriene; Antimelanomic; Antimetastatic; Antimetrorrhagic; Antioxidant; Antiperoxidant; Antiproliferant; Antiprostaglandin; Antiradicular; Antithromboxane; Antiulcer; Chemopreventive; COMT-Inhibitor *200-400 mg/kg ip*; Cyclooxygenase-Inhibitor; Cytoprotective; Diuretic; Hypoglycemic; Lipoxigenase-Inhibitor; MDR-Inhibitor *100 uM*; P450-Inhibitor; Radioprotective; Venoprotective; Venotonic

**DODECANAL *Fruit 5 - 20 ppm***

FLavor *FEMA 1-100*; Irritant

**ELEMOL Root Bark** 28,200 ppm;  
Antiacetylcholinesterase  $IC_{50}=34\text{ ug/ml}$ ; Antiulcer

**EPOXY-NOOTKATONE Pericarp:**  
No activity reported.

**EPOXY-VALENCENE Fruit:**  
No activity reported.

**ETA-CAROTENE Pericarp:**  
No activity reported.

**ETHYL-ACETATE Fruit Juice** 0.01 - 0.58 ppm  
Antispasmodic; Carminative; CNS-Depressant; FLavor *FEMA* 20-1,500; Respirotoxic  
>400 ppm; Stimulant

**ETHYL-BUTYRATE Fruit Juice** 0.08 - 1.02 ppm  
FLavor *FEMA* 30-1,400

**ETHYL-SUBERENOL Root Bark** 700 ppm;  
No activity reported.

**ETROGOL Root:**  
No activity reported.

**FARNESENE Fruit** 2 - 7 ppm  
Pesticide; Pheromone

**FERULIC-ACID Fruit** 10 - 19 ppm  
Allelopathic; Analgesic; Antiaggregant; Antiallergic; Antiarrhythmic; Antibacterial;  
Anticancer (Colon); Anticancer (Forestomach); Anticancer (Liver); Anticancer (Skin);  
Anticarcinogenic; Antidysmenorrhic; Antiestrogenic; Antihepatotoxic; Antiherpetic;  
Antiinflammatory; Antileukemic  $IC_{50}=25-56\text{ ug/ml}$ ; Antimitotic; Antimutagenic;  
Antineoplastic (*Stomach*); Antinitrosaminic; Antioxidant 1/2 *BHA* 1/3 *quercetin* 3,000  
 $\mu\text{M}$   $EC_{50}=9-15\text{ ug/ml}$   $IC_{51}=200\text{ ppm}$ ; Antiradicular  $EC_{50}=9-15\text{ ug/ml}$   $IC_{50}=116-124$   
 $\mu\text{M}$ ; Antiserotonin; Antispasmodic; Antithrombic; Antitumor; Antitumor (Colon);  
Antitumor (Forestomach); Antitumor (Liver); Antitumor (Skin); Antitumor-Promoter  
 $IC_{46}=10\text{ }\mu\text{M}$ ; Antiviral; Arteriodilator; Cancer-Preventive; Candidicide; Cardiac;  
Cholagogue; Choloretic; Fungicide; Hepatoprotective; Hepatotropic; Herbicide;  
Hydrocholoretic; Hypolipidemic; Immunostimulant; Insectifuge; Metal-Chelator;  
Ornithine-Decarboxylase-Inhibitor; Pesticide; Phagocytotic; Preservative;  
Prostaglandigenic; Prostaglandin-Synthesis-Inhibitor 0.58-3.2 mM; Sunscreen;  
Uterosedative 30-100 mg/kg *ivn rat*

**FERULOYL-PUTRESCINE Fruit** 5 ppm;  
No activity reported.

**FLAVOXANTHIN Pericarp:**  
No activity reported.

**FR Juice:**  
No activity reported.

**GALACTAN *Fruit*:**

No activity reported.

**GALACTURONIC-ACID *Fruit*:**

No activity reported.

**GAMMA-AMINOBUTYRIC-ACID *Fruit* 40 - 730 ppm**

Analeptic; Anticephalagic; Anticerebrotic; Antichoreic 1-32 g/man/day; Anticonvulsant 4,120 mg/kg ipr mus; Antihypertensive 1,000-4,000 mg/man/day; Antiinsomnic; Antilethargic; Antistress; Antitinnitic; Anxiolytic; Cardiovascular 208 ivn dog; CNS-Inhibitor 0.1 mg/kg ivn cat 100 mg/kg ivn dog 2,500 mg/kg scu mus; Diuretic 1,500-4,000 mg/man/day; Hypotensive 1,000-4,000 mg/day; Neuroinhibitor; Neurotoxic to birds; Neurotransmitter; Sedative; Tranquilizer

**GAMMA-TERPINENE *Fruit* 10 ppm; *Fruit Juice* 0.04 - 0.46 ppm**

Acaricide; ACE-Inhibitor 100 ug/ml (weak activity); Aldose-Reductase-Inhibitor 100 ug/ml; Antiacetylcholinesterase IC23=1.2 mM; Antifeedant; Antioxidant; FLavor FEMA 1-40; Insectifuge; Irritant; Perfumery; Pesticide

**GERANIAL *Fruit* 6 - 350 ppm**

Antibacterial; AntiEBV IC50=16 uM; Antiviral; Pesticide

**GERANIOL *Fruit* 50 ppm;**

Allergenic; Anthelmintic; Antibacterial MBC=800 ug/ml MIC=400 ug/ml MIC=64 ug/ml; Anticancer (Pancreas) IC50=265 uM; Anticariogenic MIC=400 ug/ml; Antimelanomic IC50=150 uM/l; Antisalmonella MIC=400 ug/ml; Antiseptic 400-800 ug/ml 7 x phenol MIC=64 ug/ml; Antispasmodic; Antitubercular; Antitumor; Antitumor (Pancreas) IC50=265 uM; Ascaricide; Cancer-Preventive; Candidicide; CNS-Stimulant; Embryotoxic; Emetic 3 x ipecac; Expectorant; FLavor FEMA 1-10; Fungicide IC93=2 mM; Herbicide IC100-2,000 uM; Insectifuge 50 ppm; Insectiphile; Mycobactericide MIC=64 ug/ml; Nematicide IC86=100 ug/ml MLC=1,000 ug/ml; Perfumery; Pesticide; Sedative; Trichomonicide LD100=300 ug/ml

**GERANYL-OXY-PYRANOCOUMARIN *Root*:**

No activity reported.

**GLUCOSAN *Fruit*:**

No activity reported.

**HEPTANAL *Fruit* 3 - 5 ppm**

No activity reported.

**HEPTULOSE *Fruit*:**

No activity reported.

**HESPERIDIN *Pericarp* 40,600 - 63,500 ppm**

Analgesic; Anti-LDL; Antiallergenic; Antibradykinic; Anticapillary-Fragility; AntiDNA; Antiflu; Antihistaminic; Antiinflammatory IC47=50 mg/kg scu IC63=100 mg/kg scu; Antileukotriene; Antioxidant IC50=8 ppm; Antiprostaglandin; AntiRNA; Antistomatitic; Antitriglyceride; Antiulcer 100-150 mg/kg ipr; Antivaccinia; Antiviral; Anxiolytic; Calcium-Antagonist IC50=1.2 uM rbt; Capillariprotective; Catabolic; Choleric; CNS-Depressant 100-150 mg/kg ipr; Cyclooxygenase-Inhibitor;



Hypolipidemic; Lipoygenase-Inhibitor; Pesticide; ProHDL; Vasopressor

**HESPERIDIN-7-O-ALPHA-L-RHAMNO-GLUCOSIDE *Fruit:***

No activity reported.

**HEXANAL *Fruit 1 - 2 ppm Fruit Juice 0.02 - 0.65 ppm***

Antibacterial *MBC=800 ug/ml*; Antisalmonella *MIC=400 ug/ml*; Antiseptic *400-800 ug/ml*; FLavor *FEMA <1-5*; Pesticide

**HEXANOL *Fruit Juice 0.02 - 0.22 ppm***

Antiseptic; FLavor *FEMA 0.2-25*; Pesticide

**HORDENINE *Fruit:***

Antiasthmatic; Antidiarrheic *35 mg/kg scu dog*; Antifeedant; Bronchorelaxant; Cardiotonic *2 mg/cat ivn*; Hepatoprotective; Pesticide; Vasoconstrictor

**HYDROXYPROLINE *Leaf:***

Vulnerary

**ISOCAPROIC-ACID *Fruit:***

No activity reported.

**ISOLUTEIN *Pericarp:***

No activity reported.

**ISOPENTENYL-PSORALENS *Fruit:***

No activity reported.

**ISOPRENE *Essential Oil:***

No activity reported.

**ISORHOIFOLIN *Pericarp:***

No activity reported.

**ISOSAKURANETIN *Fruit:***

No activity reported.

**JASMONIC-ACID *Fruit:***

No activity reported.

**LIMONENE *Fruit 8,300 - 9,700 ppm Fruit Juice 1 - 278 ppm***

Acaricide *LC100=8 uM*; AChE-Inhibitor; Allelochemic; Allergenic *1/20th carene*; Antiacetylcholinesterase *IC22-26=1.2 mM*; Antiadenomic; Antialzheimeran?; Antiasthmatic; Antibacterial; Anticancer; Antiesophagitic; Antifeedant; Antiflu; Antiinflammatory; Antilithic; Antilymphomic; Antimetastatic (Stomach); Antimutagenic; Antiobesity; Antiseptic; Antispasmodic *ED50=0.197 mg/ml*; Antitumor; Antitumor (Breast); Antitumor (Colon); Antitumor (Pancreas); Antitumor (Prostate); Antitumor (Stomach); Antiviral; Apoptotic; Bronchoprotectant; Cancer-Preventive; Candidistat; Chemopreventive; Cholesterolytic; Detoxicant; Enterocontractant; Expectorant; FLavor; Fungiphilic; Fungistat; GST-Inducer; Herbicide *IC50=45 uM*; Histaminic; Immunomodulator; Insecticide *0.37 uM/fly*; Insectifuge; Interleukin-6-Inhibitor; Irritant; Lipolytic; Myorelaxant *50 mg/kg*; Nematicide *IC=100 ug/ml*; NO-

Genic; Ornithine-Decarboxylase-Inhibitor  $\sim 750$  mg/kg (diet); Ozone-Scavenger; P450-Inducer; Peristaltic; Pesticide; Photosensitizer; Sedative  $ED=1-32$  mg/kg; Transdermal

**LIMONEXIC-ACID *Fruit*:**

No activity reported.

**LIMONIN *Fruit*:**

Anticataleptic; Antifeedant; Antileukemic  $IC_{50}=>10$  ug/ml; Antimalarial  $IC_{50}=>100$  ug/ml; Pesticide

**LIMONOATE-A-RING-LACTONE *Fruit*:**

No activity reported.

**LINALOL *Fruit* 30 - 530 ppm *Fruit Juice* 0.15 - 4.69 ppm**

No activity reported.

**LOCHNOCARPOL-A *Root*:**

No activity reported.

**LUTEIN *Fruit* 3 ppm;**

Antiatherosclerotic; Anticancer (Breast); Antimaculitic; Antinycctalopic; Antioxidant; Antiproliferant; Antiradicular; Antiretinitic Optometry; Antitumor (Breast); Antitumor (Colon); Colorant; Prooxidant 5-40 ug/g; Quinone-Reductase-Inducer 2.5 ug; Retinoprotectant Optometry; Ubiquitot

**LUTEOLIN-7-O-ALPHA-L-RHAMNO-GLUCOSIDE *Fruit*:**

No activity reported.

**LUTEOLIN-7-O-BETA-D-RUTINOSIDE *Leaf*:**

No activity reported.

**LUTEOXANTHINS *Fruit* 6 ppm;**

No activity reported.

**MALIC-ACID *Fruit* 600 - 2,000 ppm**

Antiatherosclerotic; Antibacterial; Antifibromyalgic 300 mg 3x/day; Antioxidant Synergist; Antiseborrheic; Antiseptic; Antitubercular; Antitumor; Bacteristat; Bruchiphobe; Hemopoietic; Laxative?; Mycobactericide; Pesticide; Sialogogue

**MALONIC-ACID *Plant*:**

Irritant

**MANNOSE *Fruit*:**

Antiadhesive; Anticystitic 0.25-1 tsp 3-4 x/day orl man; AntiUTI

**MERANZINE *Fruit*:**

No activity reported.

**METHANOL *Fruit Juice* 0.8 - 80 ppm**

Antidote =Sodium-bicarbonate; AntiHIV  $EC_{50}=<20$  ug/ml

**METHYL-BUTYRATE *Fruit Juice* 0.01 - 0.1 ppm**

FLavor *FEMA 20-100*; Perfumery

**MEVALONIC-ACID *Fruit 0.5 ppm; Pericarp 6 ppm;***  
No activity reported.

**MUTATOCHROME *Fruit:***  
No activity reported.

**MUTATOXANTHIN *Fruit 2 ppm;***  
No activity reported.

**MYRCENE *Fruit 69 - 210 ppm***  
ACE-Inhibitor *100 ug/ml*; Aldose-Reductase-Inhibitor; Allergenic; Analgesic;  
Antibacterial; Anticonvulsant; Antimutagenic; Antinitrosaminic; Antinociceptive *10-20 mg/kg ipr mus 20-40 mg/kg scu mus*; Antioxidant; Antispasmodic; Chemopreventive;  
FLavor *FEMA 0.5-9*; Fungicide; Hypothermic; Insectifuge; Irritant; Myorelaxant *100-200 mg/kg*; P450-2B1-Inhibitor *IC50=0.14 uM*; Perfumery; Pesticide

**N-METHYL-TYRAMINE *Fruit 2 ppm;***  
Cancer-Preventive

**NARINGENIN *Pericarp 35,000 - 45,800 ppm***  
11B-HSD-Inhibitor; Aldose-Reductase-Inhibitor *1 ug/ml 100 uM IC25=1 uM IC78=10 uM*; Acetylcholinesterase; Antiaflatoxin *IC50=12 uM IC50=3.37 ppm*;  
Antiaggregant; Antialzheimeran; Antiamnesic; Anti-amyloid-beta; Antibacterial  
*MIC=250-500 ug/ml*; Anticancer; Antiescherichic; Antiestrogenic; Antifibrotic;  
Antihepatotoxic; Antiherpetic; AntiHIV *IC35=200 ug/ml*; Antiinflammatory *20 ppm*;  
Antileukemic *IC50=>10 ug/ml*; Antimutagenic *ID50=50-100 nM*; Antioxidant *7 x quercetin*;  
Antiperistaltic; Antiperoxidative; Antiradicular; Antisindhis *IC50=15 ug/ml*;  
Antispasmodic; Antistaphylococcic; Antitumor; Antitumor-Promoter; Antiulcer;  
Antiviral; Aphidifuge; Aromatase-Inhibitor *IC45=1 uM/l*; cAMP-Phosphodiesterase-Inhibitor;  
Cancer-Preventive; Candidicide; Choleric; Cytochrome-P450-Inhibitor;  
Decarboxylase-Inhibitor; Embryotoxic; Estrogenic *EC50=0.1-25 uM/l*; Fungicide *2.5 mM*;  
Fungistat; Hepatoprotective *IC50=12 uM IC50=3.37 ppm*; Neuroprotective; P450-Inhibitor;  
Pesticide; Serotonin-Inhibitor; Teratogenic; TNF-alpha-Inhibitor *IC50=14.41 uM*;  
Topoisomerase-I-Inhibitor; Uterotrophic *EC50=0.1-25 uM/l*

**NARINGENIN-4-BETA-D-GLUCOSIDE *Plant:***  
No activity reported.

**NARINGENIN-RUTINOSIDE *Fruit:***  
No activity reported.

**NARINGENIN-RUTINOSIDE-4-BETA-D-GLUCOSIDE *Fruit:***  
No activity reported.

**NARINGIN *Fruit:***  
Aldose-Reductase-Inhibitor; Antidermatitic; Antiinflammatory; Antimutagenic;  
Antineuropathic; Antioxidant; Antiviral; Cancer-Preventive; FLavor *FEMA*;  
Myorelaxant; Oviposition-Stimulant; Pesticide

**NARINGIN-7-O-ALPHA-L-RHAMNO-GLUCOSIDE *Fruit:***

No activity reported.

**NARIRUTIN *Pericarp*:**

Oviposition-Stimulant

**NEO-BETA-CAROTENE *Pericarp*:**

No activity reported.

**NEOCHROME-A *Pericarp*:**

No activity reported.

**NEOCHROME-B *Pericarp*:**

No activity reported.

**NEOHESPERIDIN *Pericarp* 28,000 ppm;**

Anticancer; Antioxidant 7 x *quercetin*; Antiradicular; Antitumor-Promoter; Cancer-Preventive

**NEOHESPERIDIN-DIHYDROCHALCONE *Pericarp*:**

Sweetener 1000-1500 x *sucrose*

**NEOPONCIRIN *Pericarp*:**

No activity reported.

**NEOXANTHIN-A *Pericarp*:**

No activity reported.

**NEOXANTHIN-B *Pericarp*:**

No activity reported.

**NERAL *Fruit* 1 - 20 ppm**

Antibacterial; Antispasmodic; Pesticide; Termiticide  $LD_{100}=5$  mg/g

**NEROLIDOL *Flower*:**

Aldose-Reductase-Inhibitor; Allergenic; Antiacne; Antibacterial  $MIC=25-200$  ug/ml; Anticariogenic; Antifeedant 1 mM (*diet*); Antistreptococcic; FLavor *FEMA* 1-10; Nematicide  $MLC=1$  mg/ml; Perfumery; Pesticide

**NERYL-ACETATE *Fruit* 10 ppm;**

Antiflu; Antiviral; FLavor *FEMA* 1-15; Perfumery; Pesticide

**NERYL-FORMATE *Fruit* 10 ppm;**

FLavor *FEMA* 5-15; Perfumery

**NEUROSPORIN *Pericarp*:**

No activity reported.

**NOBELITIN *Fruit*:**

No activity reported.

**NOMILIN *Seed*:**

Antifeedant; Pesticide

**NONANAL Fruit 6 - 20 ppm**

No activity reported.

**NONANOL Fruit 10 ppm;**

No activity reported.

**NOOTKATOL Fruit:**

Calcium-Antagonist 30  $\mu$ M; Vasodilator

**NOOTKATONE Fruit 1 ppm;**

Antiulcer 20 mg/kg *orl rat*; FLavor FEMA 3-50; Perfumery

**NORDENTATIN Root Bark 300 ppm;**

Antibacterial 10-200 ppm

**OBACUNONE Seed:**

Anticataleptic; Antifeedant; Pesticide

**OCTAN-1-AL Fruit:**

No activity reported.

**OCTANAL Fruit 20 - 280 ppm Fruit Juice 0.28 ppm;**

No activity reported.

**OCTOPAMINE Fruit 1 ppm;**

No activity reported.

**OCTYL-ACETATE Fruit 10 ppm;**

No activity reported.

**OSTHOLE Root:**

Antimalarial; Calcium-Antagonist; Juvabional; Pesticide

**OXALIC-ACID Fruit 87 ppm;**

Acaricide; Antiseptic; CNS-Paralytic; Fatal; Hemostatic; Irritant; Pesticide; Renotoxic; Varroacide

**P-COUMARIC-ACID Fruit 5 - 17 ppm**

Aldose-Reductase-Inhibitor 4  $\mu$ g/ml (*weak activity*); Allelopathic; Antibacterial; Anticlastogen; Antifertility; Antihepatotoxic; Antileukemic  $IC_{50}=25-56 \mu$ g/ml; Antinitrosaminic; Antioxidant 1/3 BHA  $IC_{24}=30 \text{ ppm}$ ; Antiperoxidant  $IC_{50}=>100 \mu$ M; Antiseptic; Antispasmodic; Antitumor; Cancer-Preventive; Chemopreventive; Choleric; Cytotoxic; Diaphoretic?; Fungicide; Lipoxygenase-Inhibitor  $IC_{11}=5 \text{ mM}$ ; Pesticide; Prostaglandigenic; Prostaglandin-Synthesis-Inhibitor; Tyrosinase-Inhibitor  $ID_{50}=3,650 \mu$ M

**P-CYMENE Fruit 20 ppm;**

Analgesic; Antiacetylcholinesterase  $IC_{40}=1.2 \text{ mM}$ ; Antibacillary; Antibacterial; Antiflu; Antirheumatologic; Antiviral; FLavor FEMA 12-250; Fungicide; Herbicide  $IC_{50}=50 \mu$ M; Insectifuge; Irritant; Laxative; Pesticide; Sedative; Trichomonicide  $LD_{100}=50 \mu$ g/ml

**P-HYDROQUINONE Root Bark 80 ppm;**

No activity reported.

**PECTINESTERASE *Fruit:***

No activity reported.

**PERILLALDEHYDE *Fruit 2 ppm;***

Acaricide; Antibacterial *MIC=500->1,000 ug/ml*; Antimelanomic *IC50=120 uM/l*;  
Antiproliferative; Antiseptic; Candidicide *MIC=500 ug/ml*; Fungicide *MIC=250-500 ug/ml*; Mutagenic; Nematicide *MLC=1 mg/ml*; Sedative; Vibriocide *250 ug/ml*

**PHLORIN *Plant:***

No activity reported.

**PHYTOENE *Fruit 2 ppm;***

No activity reported.

**PHYTOFLUENE *Fruit 4 ppm;***

No activity reported.

**POLYGALACTURONIC-ACID *Fruit:***

No activity reported.

**PONCITRIN *Root:***

No activity reported.

**PROPIONIC-ACID *Plant:***

FLavor *FEMA 1-36,000*; Fungicide *2,500-36,000*; Irritant; Perfumery; Pesticide;  
Rubefacient

**QUINIC-ACID *Fruit:***

Choleretic

**RUTIN *Leaf 9,000 ppm; Pericarp 6,100 ppm;***

5-HT-Inhibitor; Aldehyde-Oxidase-Inhibitor *IC27-52=10 uM*; Aldose-Reductase-Inhibitor *100 uM 4 ug/ml*; Allelochemic; Antiaggregant *ED50=33 nmol/kg iv*;  
Antiallergic; Antiapoplectic; Antiatherogenic; Antiatherosclerotic; Antibacterial;  
Anticancer; Anticapillary-Fragility *20-100 mg orl man*; Anticataract; Anticlastogen;  
Anticonvulsant; AntiCVI *270 mg/man/day*; Antidementia; Antidermatitic; Antidiabetic;  
Antiedemic *270 mg/day orl man*; Antierhythmic; Antifeedant; Antiglaucomic *60 mg/day*;  
Antihematuric; Antihemorrhoidal; Antihepatotoxic; Antiherpetic;  
Antihistaminic; Antihypertensive; Antiinflammatory *20 mg/kg*; Antimalarial  
*IC50=>100 ug/ml*; Antimelanomic; Antimetastatic; Antimutagenic *ID50=2-5 nM*;  
Antinephritic; Antinociceptive; Antioxidant *IC28=30 ppm IC50=120 uM IC54=10 uM*;  
Antiperoxidant *IC50=10-20 uM*; Antiplatelet; Antiproliferant *50-75 uM/l*;  
Antiprotozoal; Antipurpuric; Antiradicular *9 x quercetin*; Antispasmodic; Antisunburn;  
Antithrombogenic *EC50=500 nM*; Antithyroid *IC50=68 uM*; Antitrypanosomic *100 mg/kg*;  
Antitumor; Antitumor-Promoter; Antiulcer; Antivaricose; Antiviral; Apoptotic  
*75 uM/l*; cAMP-Phosphodiesterase-Inhibitor; Cancer-Preventive; Capillariprotective;  
Catabolic; Chemopreventive; Cytoprotective *IC50=3 uM*; Estrogenic?; Hemostat;  
Hepatomagenic *20,000 ppm (diet) rat*; Hepatoprotective *20 mg/kg rat*;  
Hypocholesterolemic; Hypotensive; Immunomodulator; Insecticide; Insectiphile;  
Juvabional; Larvostat *IC95=4,000-8,000 ppm diet*; Lipoxygenase-Inhibitor *IC75=2.5*

*mM*; Mutagenic; Myoprotective; Myorelaxant; Oviposition-Stimulant; PAF-Inhibitor; Pesticide; Protisticide; Radioprotective; Sunscreen; Topoisomerase-II-Inhibitor  $IC_{50}=1$  *ug/ml*; Vasodilator; Vasopressor

**SABINENE Fruit** 10 - 60 ppm **Fruit Juice** 0.15 ppm;  
Antibacterial; Antihelicobacter; Antiseptic; Antiulcer; Perfumery

**SCOPARONE Bark:**  
Aldose-Reductase-Inhibitor 10 *ug/ml cow*; Analgesic; Antiatherogenic; Antihepatotoxic; Antiimplantation; Antiinflammatory; Antiischemic; Antiproliferant; Antiradicular; Antiretinopathic; Antispasmodic; Cardiac; Cholagogue; Choloretic; CNS-Depressant 40-80 *mg/kg ipr*; Hepatoprotective; Hypocholesterolemic; Hypotensive 5-20 *mg/kg ivn*; Immunosuppressant 10-30 *uM*; Myorelaxant; Tranquilizer; Vasodilator

**SCUTELLAREIN Fruit:**  
Aldose-Reductase-Inhibitor  $IC_{56}=10uM$ ;  $IC_{10}=1uM$ ; Antihemolytic; Antileukemic  $IC_{50}=10 uM$ ; Antioxidant  $ED=uM$ ; Antiviral  $IC_{50}=10 uM$ ; Cancer-Preventive; Phospholipase-A2-Inhibitor

**SESELIN Root:**  
Antileukemic  $IC_{50}=17.3 ug/ml$ ; Fungicide; Pesticide

**SESLIN Root:**  
No activity reported.

**SILVER Fruit** 0.027 - 0.055 ppm  
Antibacterial; Astringent; Pesticide

**SINAPIC-ACID Fruit** 7 - 19 ppm  
Antibacterial; Antihepatotoxic; Antioxidant  $IC_{27}=30 ppm$ ; Antiperoxydinitrite  $IC_{39}=5 uM$   $IC_{60}=20 uM$   $IC_{75}=100 uM$ ; Cancer-Preventive; Fungicide; Pesticide

**SINENSETIN Fruit:**  
Fungicide; Pesticide

**SINENSIAXANTHIN Fruit:**  
No activity reported.

**SINESETIN Plant:**  
No activity reported.

**STACHYDRINE Fruit:**  
Cardiotonic; Emmenagogue; Insectifuge; Lactagogue; Oxytocic?; Systolic-Depressant

**SUBAPHYLLIN Fruit: Leaf:**  
Antiviral; Hypotensive; Pesticide

**SUBERENOL Root Bark** 700 ppm;  
No activity reported.

**SUBEROSIN Root:**  
No activity reported.

**SUGARS *Fruit* 39,600 - 119,800 ppm**

No activity reported.

**SYNEPHRINE *Fruit* 15 - 43 ppm**

Cancer-Preventive; Cardiovascular 0.25 mg/kg *ivn dog*; Hypertensive; Oxytocic 2.5 mg/kg *ivn mus*; Vasoconstrictor

**TANGERETIN *Fruit*:**

Antiallergic; Antihistaminic *ED*=50 mg/kg; Antilymphocytic; Antimetastatic; Antimutagenic; Antioxidant; Antiproliferant *IC*70=8ug/ml; Apoptotic; Cancer-Preventive; ERK-1-Inhibitor; ERK-2-Inhibitor; Fungicide; Hypolipidemic; MDR-Inhibitor; Neuroprotective

**TAU-CAROTENE *Pericarp*:**

No activity reported.

**TERPINEN-4-OL *Fruit* 6 - 550 ppm**

Allelopathic; Antiacetylcholinesterase *IC*21-24=1.2 mM; Antiacne; Antiallergic; Antiasthmatic; Antibacterial; Antioxidant; Antiseptic; Antispasmodic; Antitussive; Antiulcer; Bacteriostatic; Diuretic 0.1 ml/rat; Fungicide; Herbicide *IC*50=200 mM *IC*50=22 uM; Insectifuge; Irritant; Nematicide *MLC*=1 mg/ml; Pesticide; Renoirritant; Spermicide *ED*100=0.015; Vulnerary

**TERPINOLENE *Fruit* 10 ppm;**

Allelochemic; Antifeedant; Antinitrosaminic; Antioxidant; Deodorant; FLavor *FEMA* 15-60; Fungicide; Perfumery; Pesticide

**TETRA-O-METHYL-SCUTELLAREIN *Fruit*:**

No activity reported.

**TETRADECANAL *Fruit* 5 - 9 ppm**

No activity reported.

**TRANS-2-HEXENOL *Fruit Juice* 0.1 ppm;**

FLavor *FEMA* <1-1

**TYRAMINE *Fruit* 1 ppm;**

Adrenergic; Antiaggregant; Cardiovascular 0.8 *ivn cat* 30 mg/kg *scu mus*; Hypertensive; Insectifuge; Neurotoxic 1 mg/kg *ivn dog*; Pesticide; Sympathomimetic; Vasoconstrictor; Vasopressor

**VALENCENE *Fruit* 10 - 20 ppm *Fruit Juice* 0.04 - 15.3 ppm**

No activity reported.

**VALENCIACHROME *Plant*:**

No activity reported.

**VALENCIAXANTHIN *Fruit* 3 ppm;**

No activity reported.

**VALENCIC-ACID *Root*:**

No activity reported.



**VIOLAXANTHIN *Fruit:***

Colorant; Ubiquinol

**VIT-B-6 *Fruit 1 - 5 ppm***

No activity reported.

**VITEXIN-XYLOSIDE *Fruit:***

No activity reported.

**XANTHOXYLETIN *Root Bark 24,000 ppm;***

Anticonvulsant

**XANTHYLETIN *Root Bark 45,000 ppm;***

DME-Inhibitor  $IC_{50}=57.5 \mu M$

**XYLAN *Fruit:***

No activity reported.

**XYLOSYL-VITEXIN *Leaf:***

No activity reported.

**ZEAXANTHIN *Fruit 2 ppm;***

Anticancer (Breast); Antitumor (Breast); Colorant; Hepatoprotective; Quinone-Reductase-Inducer

**ZETA-CAROTENE *Fruit 2 ppm;***

No activity reported.