

# C MALIC-ACID

## Chemid

MALICACID

\*Unless otherwise noted all references are to Duke, James A. 1992. Handbook of phytochemical constituents of GRAS herbs and other economic plants. Boca Raton, FL. CRC Press.

Plant	Part	Low PPM	High PPM	StdDev	Reference
Acacia nilotica	Plant	--	--		--
Aconitum napellus	Plant	--	--		List, P.H. and Horhammer, L., Hager's Handbuch der Pharmazeutischen Praxis, Vols. 2-6, Springer-Verlag, Berlin, 1969-1979.
Allium cepa	Bulb	--	--		Soldatenkov, S. V., Mazurova, T. A., Ranteleev, A. N. 1960. Organic Acids of Onion and Spinach. Trudy Petergof Biol. Inst., Leningrad Gosudarst Univ Im AA Zhdanova, 18: 55-61.
Allium cepa	Leaf	--	--		Soldatenkov, S. V., Mazurova, T. A., Ranteleev, A. N. 1960. Organic Acids of Onion and Spinach. Trudy Petergof Biol. Inst., Leningrad Gosudarst Univ Im AA Zhdanova, 18: 55-61.
Allium schoenoprasum	Leaf	--	--		--
Alocasia macrorrhiza	Plant	--	--		--
Ananas comosus	Fruit	1000	4700	-0.6457922708636072	--
Angelica archangelica	Plant	--	--		--
Angelica archangelica	Root	--	--		--

Plant	Part	Low PPM	High PPM	StdDev	Reference
Annona muricata	Plant	--	--		--
Annona squamosa	Plant	--	--		--
Apium graveolens	Pt	--	--		--
Apium graveolens	Root	--	--		--
Apium graveolens	Shoot	--	--		--
Arctostaphylos uva-ursi	Leaf	--	--		List, P.H. and Horhammer, L., Hager's Handbuch der Pharmazeutischen Praxis, Vols. 2-6, Springer-Verlag, Berlin, 1969-1979.
Arnica montana	Flower	--	--		--
Avena sativa	Petiole	--	--		--
Avena sativa	Hull Husk	--	--		--
Averrhoa carambola	Fruit	12100	12100	-0.16400723769458544	Morton, J.F., Major Medicinal Plants. 1977. Atlas of Medicinal Plants of Middle America. Bahamas to Yucatan. 1981.
Berberis vulgaris	Plant	--	--		--
Berberis vulgaris	Fruit	--	--		Jim Duke's personal files.
Borago officinalis	Plant	--	--		--
Borago officinalis	Leaf	--	--		Leung, A. Y. and Foster, S. 1995. Encyclopedia of Common Natural Ingredients 2nd Ed. John Wiley & Sons, New York. 649 pp.
Brassica oleracea	Stem	--	--		--
Brassica oleracea var. botrytis l.	Plant	--	--		--
Brassica oleracea var. botrytis l.	Flower	--	--		--

Plant	Part	Low PPM	High PPM	StdDev	Reference
Brassica oleracea var. capitata l.	Leaf	--	--		Jim Duke's personal files.
Brassica oleracea var. gemmifera	Leaf	--	--		--
Brassica oleracea var. italica	Plant	--	--		Jim Duke's personal files.
Brassica oleracea var. sabellica l.	Leaf	--	--		--
Calendula officinalis	Flower	6400	6400	-1	--
Camellia sinensis	Leaf	--	--		--
Capsella bursa-pastoris	Plant	--	--		--
Carica papaya	Fruit	3150	23333	0.567329421438877	--
Carica papaya	Latex Exudate	4400	4400		ANON. 1948-1976. The Wealth of India raw materials. Publications and Information Directorate, CSIR, New Delhi. 11 volumes.
Cephaelis ipecacuanha	Plant	--	--		--
Chaenomeles lagenaria	Fruit	--	--		--
Chelidonium majus	Plant	--	--		--
Chenopodium ambrosioides	Fruit	--	--		--
Cichorium intybus	Plant	--	--		--
Citrus aurantiifolia	Fruit	2000	2000	-0.8215787018847368	--
Citrus aurantium	Plant	--	--		--
Citrus mitis	Fruit Juice	2000	2000		--
Citrus paradisi	Fruit	400	600	-0.9127272216734706	--
Citrus reticulata	Fruit	1800	2100	-0.8150680933283987	--

Plant	Part	Low PPM	High PPM	StdDev	Reference
Citrus sinensis	Fruit	600	2000	-0.8215787018847368	--
Cocos nucifera	Seed	--	--		List, P.H. and Horhammer, L., Hager's Handbuch der Pharmazeutischen Praxis, Vols. 2-6, Springer-Verlag, Berlin, 1969-1979.
Convallaria majalis	Plant	--	--		--
Cornus officinalis	Fruit	--	--		--
Cryptostegia grandifolia	Latex Exudate	--	--		--
Cydonia oblonga	Seed	--	--		--
Daphne mezereum	Bark	--	--		--
Datura stramonium	Plant	2120	2120	-0.6235911066661377	--
Daucus carota	Root	--	--		--
Elytrigia repens	Rhizome	--	--		List, P.H. and Horhammer, L., Hager's Handbuch der Pharmazeutischen Praxis, Vols. 2-6, Springer-Verlag, Berlin, 1969-1979.
Equisetum arvense	Plant	--	--		--
Eriobotrya japonica	Leaf	--	--		Chemical Constituents of Oriental Herbs (3 diff. books)
Euonymus atropurpureus	Plant	--	--		--
Euphorbia tirucalli	Plant	--	--		--
Fagopyrum esculentum	Leaf	15100	15100	0.6105708397676417	List, P.H. and Horhammer, L., Hager's Handbuch der Pharmazeutischen Praxis, Vols. 2-6, Springer-Verlag, Berlin, 1969-1979.
Ficus carica	Fruit	30200	30200	1.0144129110026165	--

Plant	Part	Low PPM	High PPM	StdDev	Reference
Ficus carica	Leaf	23400	23400	1.658552103888763	Rizk, A.F.M. and Al-Nowaihi, A.S., The Phytochemistry of the Horticultural Plants of Qatar, Scientific and Applied Research Centre, University of Qatar.
Ficus carica	Fruit Juice	--	--		Shiraishi, S. C., Kawakami, K., Widodo, S. E., Shiraishi, M., Kitazaki, M. 1996. Organic acid profiles in the juice of fig fruits. Journal of the Faculty of Agriculture Kyushu University, 41(1-2): 29-33.
Foeniculum vulgare	Fruit	--	--		--
Foeniculum vulgare	Seed	--	--		Rizk, A.F.M., The Phytochemistry of the Flora of Qatar, Scientific and Applied Research Centre, University of Qatar, Kingprint, Richmond, UK, 1986.
Fragaria spp	Fruit	3500	8000	-0.4309421885044489	ANON. 1948-1976. The Wealth of India raw materials. Publications and Information Directorate, CSIR, New Delhi. 11 volumes.
Frangula purshiana	Plant	--	--		--
Galium odoratum	Plant	--	--		--
Genipa americana	Fruit	6300	6300	-0.5416225339621972	--
Ginkgo biloba	Pollen Or Spore	--	--		Jim Duke's personal files.
Glycine max	Seed	700	1000		List, P.H. and Horhammer, L., Hager's Handbuch der Pharmazeutischen Praxis, Vols. 2-6, Springer-Verlag, Berlin, 1969-1979.
Glycyrrhiza glabra	Root	--	--		=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
Hedera helix	Plant	--	--		--

Plant	Part	Low PPM	High PPM	StdDev	Reference
Helianthus annuus	Leaf	--	--		Rizk, A.F.M. and Al-Nowaihi, A.S., The Phytochemistry of the Horticultural Plants of Qatar, Scientific and Applied Research Centre, University of Qatar.
Hibiscus sabdariffa	Flower	6233	56667	1	--
Hibiscus sabdariffa	Leaf	--	12500	0.2822875522116279	ANON. 1948-1976. The Wealth of India raw materials. Publications and Information Directorate, CSIR, New Delhi. 11 volumes.
Hibiscus sabdariffa	Stem	--	6000		ANON. 1948-1976. The Wealth of India raw materials. Publications and Information Directorate, CSIR, New Delhi. 11 volumes.
Hippophae rhamnoides	Fruit	15000	29000	0.9362856083265589	--
Juglans regia	Fruit	--	--		List, P.H. and Horhammer, L., Hager's Handbuch der Pharmazeutischen Praxis, Vols. 2-6, Springer-Verlag, Berlin, 1969-1979.
Kalanchoe daegrिमontiana	Plant	--	--		--
Kalanchoe pinnata	Leaf	--	--		--
Lactuca sativa	Leaf	600	600	-1.2202398023716667	--
Lactuca scariola	Latex Exudate	--	--		--
Lactuca virosa	Plant	--	--		--
Ledum palustre	Plant	--	--		--
Leonurus cardiaca	Plant	--	--		--
Lepidium meyenii	Root	--	--		--
Linum usitatissimum	Seed	--	--		ANON. 1948-1976. The Wealth of India raw materials. Publications and Information Directorate, CSIR, New Delhi. 11 volumes.

Plant	Part	Low PPM	High PPM	StdDev	Reference
Lupinus albus	Seed	--	--		--
Lycopersicon esculentum	Fruit	--	--		--
Mangifera indica	Fruit	6700	36600	1.431091858608257	--
Matricaria recutita	Plant	--	--		Kameoka, H. and Nakai, K. 1987. Components of essential oil from the root of Glycyrrhiza-glabra. Nippon Gogeikagaku Kaishi 61(9): 1119-1122.
Medicago sativa	Plant	--	--		Leung, A. Y. and Foster, S. 1995. Encyclopedia of Common Natural Ingredients 2nd Ed. John Wiley & Sons, New York. 649 pp.
Morus alba	Leaf	--	--		--
Musa x paradisiaca	Fruit	530	3730	-0.7089451738600872	Rizk, A.F.M. and Al-Nowaihi, A.S., The Phytochemistry of the Horticultural Plants of Qatar, Scientific and Applied Research Centre, University of Qatar.
Myrciaria dubia	Fruit	--	--		Jim Duke's personal files.
Myrtus communis	Fruit	--	--		--
Nicotiana tabacum	Leaf	--	--		ANON. 1948-1976. The Wealth of India raw materials. Publications and Information Directorate, CSIR, New Delhi. 11 volumes.
Opuntia ficus-indica	Fruit	180	1700	-0.84111105275537513	--
Opuntia ficus-indica	Plant	--	--		--
Opuntia ficus-indica	Leaf	--	950	-1.176047821354511	--
Panax ginseng	Root	--	--		--
Panax quinquefolius	Plant	--	--		--

Plant	Part	Low PPM	High PPM	StdDev	Reference
Papaver somniferum	Latex Exudate	--	--		ANON. 1948-1976. The Wealth of India raw materials. Publications and Information Directorate, CSIR, New Delhi. 11 volumes.
Passiflora edulis	Fruit	1200	3800	-0.7043877478706504	ANON. 1948-1976. The Wealth of India raw materials. Publications and Information Directorate, CSIR, New Delhi. 11 volumes.
Petroselinum crispum	Root	--	--		--
Physalis ixocarpa	Fruit	116	1500	-0.8541317446664275	--
Physalis peruviana	Plant	--	--		--
Pimenta dioica	Fruit	--	--		List, P.H. and Horhammer, L., Hager's Handbuch der Pharmazeutischen Praxis, Vols. 2-6, Springer-Verlag, Berlin, 1969-1979.
Piscidia piscipula	Plant	--	--		--
Pisum sativum	Seed	--	--		--
Polygonum hydropiper	Plant	--	--		--
Polygonum hydropiperoides	Plant	--	--		--
Polypodium vulgare	Root	--	--		--
Populus nigra	Plant	--	--		--
Portulaca oleracea	Plant	5100	5100	1.4110455698284867	List, P.H. and Horhammer, L., Hager's Handbuch der Pharmazeutischen Praxis, Vols. 2-6, Springer-Verlag, Berlin, 1969-1979.
Prunus armeniaca	Fruit	7000	22000	0.4805430093828897	--
Prunus cerasus	Fruit Juice	--	--		--



Plant	Part	Low PPM	High PPM	StdDev	Reference
Prunus domestica	Fruit	15000	15000	0.024800410439220405	List, P.H. and Horhammer, L., Hager's Handbuch der Pharmazeutischen Praxis, Vols. 2-6, Springer-Verlag, Berlin, 1969-1979.
Punica granatum	Fruit	--	--		--
Punica granatum	Fruit Juice	--	--		--
Pyrus communis	Fruit	--	--		--
Quassia amara	Root	--	--		--
Quisqualis indica	Fruit	--	--		--
Rheum rhabarbarum	Pt	--	--		--
Ribes rubrum	Fruit	2600	2600	-0.782515050546708	--
Ribes uva-crispa	Fruit	7300	7300	-0.4765164483988158	--
Rosa canina	Fruit	15000	62200	3.0978076490308193	--
Rosa centifolia	Flower	--	--		--
Rosa gallica	Flower	--	--		--
Rosa laevigata	Fruit	--	--		--
Rosa spp	Fruit	--	--		--
Rubus chingii	Fruit	--	--		--
Rubus fruticosus	Leaf	--	--		--
Rubus idaeus	Fruit	--	--		List, P.H. and Horhammer, L., Hager's Handbuch der Pharmazeutischen Praxis, Vols. 2-6, Springer-Verlag, Berlin, 1969-1979.

Plant	Part	Low PPM	High PPM	StdDev	Reference
Ruta graveolens	Leaf	--	--		--
Salvia officinalis	Plant	--	--		--
Sambucus nigra	Fruit	1200	19000	0.2852247526927457	--
Sanguinaria canadensis	Plant	--	--		--
Sarcostemma acidum	Plant	--	--		--
Schisandra chinensis	Plant	--	--		--
Schisandra chinensis	Fruit	5000	33333	1.2183902770726902	--
Sclerocarya caffra	Fruit	--	--		--
Solanum tuberosum	Tuber	1120	1120		--
Sophora pachycarpa	Leaf	--	--		--
Sorbus aucubaria	Fruit	19000	39000	1.5873464639603723	--
Spinacia oleracea	Leaf	--	4300	-0.7530674316188777	Soldatenkov, S. V., Mazurova, T. A., Ranteleev, A. N. 1960. Organic Acids of Onion and Spinach. Trudy Petergof Biol. Inst., Leningrad Gosudarst Univ Im AA Zhdanova, 18: 55-61.
Stevia rebaudiana	Plant	--	1880	-0.787454463162349	Kinghorn, A. D. (Ed.) 2002. Medicinal and Aromatic Plants - Industrial Profiles. Stevia. The genus Stevia. Taylor & Francis. New York, NY. 211 pp.
Tamarindus indica	Fruit	10000	10000	-0.30073001737768623	ANON. 1948-1976. The Wealth of India raw materials. Publications and Information Directorate, CSIR, New Delhi. 11 volumes.
Tamarindus indica	Leaf	15000	15000	0.5979445594770258	ANON. 1948-1976. The Wealth of India raw materials. Publications and Information Directorate, CSIR, New Delhi. 11 volumes.
Tussilago farfara	Flower	--	--		--

<b>Plant</b>	<b>Part</b>	<b>Low PPM</b>	<b>High PPM</b>	<b>StdDev</b>	<b>Reference</b>
Urtica dioica	Plant	--	--		--
Vaccinium macrocarpon	Fruit	--	--		Duke, J. A. Writeups or information summaries on approximately 2,000 economic plants, USDA, ARS, Beltsville, MD 20705.
Vaccinium myrtillus	Leaf	--	--		List, P.H. and Horhammer, L., Hager's Handbuch der Pharmazeutischen Praxis, Vols. 2-6, Springer-Verlag, Berlin, 1969-1979.
Vaccinium vitis-idaea	Fruit	--	--		--
Valeriana jatamansi	Root	--	--		List, P.H. and Horhammer, L., Hager's Handbuch der Pharmazeutischen Praxis, Vols. 2-6, Springer-Verlag, Berlin, 1969-1979.
Valeriana officinalis	Root	--	--		--
Vanilla planifolia	Fruit	--	--		List, P.H. and Horhammer, L., Hager's Handbuch der Pharmazeutischen Praxis, Vols. 2-6, Springer-Verlag, Berlin, 1969-1979.
Viburnum opulus	Bark	--	--		List, P.H. and Horhammer, L., Hager's Handbuch der Pharmazeutischen Praxis, Vols. 2-6, Springer-Verlag, Berlin, 1969-1979.
Viburnum prunifolium	Root Bark	--	--		Leung, A.Y., Encyclopedia of Common Natural Ingredients Used in Food, Drugs, and Cosmetics, John Wiley & Sons, New York, 1980.
Vicia faba	Fruit	--	--		ANON. 1948-1976. The Wealth of India raw materials. Publications and Information Directorate, CSIR, New Delhi. 11 volumes.
Viola odorata	Flower	--	--		--
Vitis vinifera	Fruit	1500	2000	-0.8215787018847368	List, P.H. and Horhammer, L., Hager's Handbuch der Pharmazeutischen Praxis, Vols. 2-6, Springer-Verlag, Berlin, 1969-1979.

<b>Plant</b>	<b>Part</b>	<b>Low PPM</b>	<b>High PPM</b>	<b>StdDev</b>	<b>Reference</b>
Vitis vinifera	Plant	--	--		--
Zea mays	Plant	--	--		--
Zea mays	Silk Stigma Style	--	--		Leung, A. Y. and Foster, S. 1995. Encyclopedia of Common Natural Ingredients 2nd Ed. John Wiley & Sons, New York. 649 pp.