

Historical Food and Supplement Adulterants List

Adulteration of food and agricultural materials has a long history. Below is a list in-progress of references citing adulteration of food and dietary ingredients in recent times (publications in the past ~30 years). The intent of this list to promote awareness for historical adulterants in natural products. NOTE: This list is for comprehensive and historical reference only, please see disclaimer below.

Ingredient/Product	Adulterant	Reference
5-HT, L-tryptophan	Chemical contaminants	Cole MR, Fetrow CW. Adulteration of dietary supplements. Am J Health Syst Pharm. 2003;60:1576–1580.
Actaea racemosa L., black cohosh	Other Actea species, Magnolia spp.	AHP Botanical Pharmacognosy Table 3.2; ABC Lab Guidance on Black Cohosh
Albizia julibrissin Durazz., bark/flowers	Magnolia spp.	AHP Botanical Pharmacognosy (2011) Table 3.2
Algal DHA	hexane	Cornucopia Institute report http://cornucopia.org/soysurvey/OrganicSoyReport/behindthebean_color_final.pdf
All materials	Undeclared allergens	FDA, FSMA, https://www.fas.org/sgp/crs/misc/R43358.pdf
All Powders	Fillers (sand, starch, spent material)	Sommerville, UNPA 2016; https://www.fas.org/sgp/crs/misc/R43358.pdf
Aloe	non-aloe polysaccharides, hydroxyanthracenes, Levisticum officinale W.D.J. Koch, lovage root	ABC, Blumenthal, CHFA Sept 2015, https://chfa.ca/files/regulatory_files/CHFA_Tradeshows/QA_Keynote_Presentation_Mark_Blumenthal.pdf
Angelica archangelica L., root	Lovage root	AHP Botanical Pharmacognosy Table 3.2
Apple juice products	mycotoxins (patulin)	http://www.fda.gov/Food/FoodbornellnessContaminants/NaturalToxins/ucm212520.htm
Arctostaphylos uva-ursi (L.) Spreng., uva-ursi leaf	Leaves from Vaccinium and other species,	Schier, W.; Schultze, W. Actual adulteration of medicinal crude drugs: bearberry leaves and sorrel herbs.] 1990 Dtsch Apoth Ztg, 130(Mar 1), 463-465 [German]
Arnica montana flower	Heterotheca inuloides Cass., Mexican arnica, Tagetes spp.	AHP Botanical Pharmacognosy Table 3.2, Walker KM, Applequist WL. Adulteration of Selected Unprocessed Botanicals in the U.S. Retail Herbal Trade. Econ Bot, 2012
Ashwagandha (Withania somnifera) root	ashwagandha leaf	AHP Botanical Pharmacognosy Table 3.2; ISRN Analytical Chemistry Volume 2014 (2014) http://dx.doi.org/10.1155/2014/351547
Astragalus membranaceus Moench, flower	dyes, fillers	ABC, Blumenthal, CHFA Sept 2015, https://chfa.ca/files/regulatory_files/CHFA_Tradeshows/QA_Keynote_Presentation_Mark_Blumenthal.pdf
Ayurvedic preparations (rasa shastra)	heavy metals	Saper et al. JAMA 2008 300 (8)
Beef products	horsemeat, phenylbutazone	European Commission, "Q&A on Horsemeat," http://ec.europa.eu/food/food/horsemeat/
Bodybuilding ingredients, proteins, etc.	Steroidal compounds	Food Addit Contam Part A Chem Anal Control Expo Risk Assess. 2015;32(5):635-47. doi: 10.1080/19440049.2015.1014868. Epub 2015 Mar 4.

Camellia sinensis (L.) Kuntze, tea leaf, and leaf extract	fillers, colorants, spent tea, coal tar dyes	http://bangalore.citizenmatters.in/articles/2002-method-detecting-food-adulteration Compiled with inputs from: Y G Muralidharan of Consumer Rights Education and Awareness Trust (CREAT), Bangalore; Vijetha B V, Research Scholar; Santhana Rajan, Consumer Association of India (CAI), Chennai;
Capsicum annum L. chili peppers	fillers	http://agmarknet.nic.in/adulterants.htm
Children's/prenatal vitamins	Arsenic	Anal Chim Acta. 2014 Mar 25;818:23-31. doi: 10.1016/j.aca.2014.01.060. Epub 2014 Feb 10.
Chinese herbal medicines	Various	Ernst E. J Int Med 2002 (252) 107-113, Teschke R. J Clin Transl Hepatol. 2014 Jun;2(2):80-94. doi: 10.14218/JCTH.2014.00003.
Cleansing herbal products	digitalis	Cole MR, Fetrow CW. Adulteration of dietary supplements. Am J Health Syst Pharm. 2003;60:1576–1580.
Coffea arabica/robusta Coffee (black)	chicory, tamarind, dates, corn, barley, parchment, grains	https://www.fas.org/sgp/crs/misc/R43358.pdf , http://bangalore.citizenmatters.in/articles/2002-method-detecting-food-adulteration
Colors (Naturally derived)	Artificial colors	https://www.fas.org/sgp/crs/misc/R43358.pdf
Comfrey (Symphytum spp.)	atropine	Food Chem News, Nov 21, 1983(1983), 45 [English]. Lancet. 1989 Jul 1;2(8653):44. Atropine as possible contaminant of comfrey tea. Awang DV, Kindack DG.
Cooking oils, ginger and mustard oil	Argemone mexicana	FDA Poisonous Plant Database; incl. Balderstone, P.; Dyke, S. F. Detection and quantitative analysis of sanguinarine in edible oils. 1977 J Chromatogr, 132(2), 359-362 [English]
Cordyceps chinensis	Other cordyceps or mushroom species, wheat flour	AHP Botanical Pharmacognosy Table 3.2
Creatine	dicyandamide, dihydrotriazines, arsenic, oxalic acid	Cole MR, Fetrow CW. Adulteration of dietary supplements. Am J Health Syst Pharm. 2003;60:1576–1580.
Cuminum cyminum L. cumin	peanut skin, fillers, charcoal dust	Sommerville, UNPA 2016, http://agmarknet.nic.in/adulterants.htm
Curcuma longa L, turmeric root powder or extract	lead, sudan dyes, chlorinated solvents, wheat/starch, synthetic curcumin	Injurious Adulterants/Contaminants in Foods and their Health Effects, http://agmarknet.nic.in/adulterants.htm
Milk products, Protein	melamine, urea, non-bovine milk	https://www.fas.org/sgp/crs/misc/R43358.pdf
Echinacea spp., root/aerial	Parthenium integrifolium	AHP Botanical Pharmacognosy Table 3.2
Eleutherococcus senticosus Rupr. ex Maxim.) Maxim., root	Periploca sepium, fillers	AHP Botanical Pharmacognosy Table 3.2
Evening primrose and other omega oils	vegetable oil	https://www.fas.org/sgp/crs/misc/R43358.pdf
Fish oil	PCB, DDT, others	Cole MR, Fetrow CW. Adulteration of dietary supplements. Am J Health Syst Pharm. 2003;60:1576–1580.
Formulas with Akebia trifoliata, Asarum sieboldii, Clematis chinensis	Aristolochic acid	Cole MR, Fetrow CW. Adulteration of dietary supplements. Am J Health Syst Pharm. 2003;60:1576–1580.

Fruit and vegetable powders (orange, peach, broccoli, kale)	Pesticides	US <561>, FDA PAM, <i>Anal Chem.</i> 2012 Jul 3;84(13): 5677-84. doi: 10.1021/ac300844d. Epub 2012 Jun 21.
Fruit and vegetable juices	Dilution, addition of undeclared juices	https://www.fas.org/sgp/crs/misc/R43358.pdf
Ginkgo biloba L., leaf	rutin, quercetin, Sophora japonica	ABC Botanical Adulterants Program; ABC, Blumenthal, CHFA Sept 2015, https://chfa.ca/files/regulatory_files/CHFA_Tradeshows/QA_Keynote_Presentation_Mark_Blumenthal.pdf
Grape seed extract	peanut skin ext, other polyphenol sources	ABC Botanical Adulterants Program, Food Chemistry Volume 170, 1 March 2015, Pages 271–280
Grapefruit seed extract	Benzethonium chloride, Benzalkonium chloride	Cardellina JH. The Adulteration of Commercial 'Grapefruit Seed Extract' with Synthetic Antimicrobial and Disinfectant Compounds. <i>HerbalGram.</i> 2012;94:62-66. <i>J Agric Food Chem.</i> 2006;54:3768-3772.
Guggul (Commiphora mukul) gum resin	boswellia, salai guggul, bhurkul, myrrh gum resins	AHP Botanical Pharmacognosy Table 3.2
Harpagophytum spp. devils claw	Other Harpagophytum species	http://www.ag.ny.gov/pdfs/enforcement_letters.pdf
High value material	spent material/ undeclared fillers	Sommerville, UNPA 2016
Honey	sugar, corn syrup	http://agmarknet.nic.in/adulterants.htm , https://www.fas.org/sgp/crs/misc/R43358.pdf , A. Schneider, "Tests Show most Store Honey Isn't Honey," <i>Food Safety News</i> , November 7, 2011
Hoodia gordonii (Masson) Sweet ex Decne.	prickly pear	AHP Botanical Pharmacognosy Table 3.2
Hydrastis canadensis L., goldenseal root	Goldenseal leaf, pure berberine, other berberine containing plants, yellow dyes, Coptis, Berberis, Rumex, Xanthorhize	AHP Botanical Pharmacognosy Table 3.2; ABC, Blumenthal, CHFA Sept 2015, https://chfa.ca/files/regulatory_files/CHFA_Tradeshows/QA_Keynote_Presentation_Mark_Blumenthal.pdf , Bowron P, Lewis JH. Possible contamination of a herbal product with a prohibited substance. <i>Med J Aust</i> 1987; 146: 325.
Hypericum perforatum L., St Johns Wort	other Hypericum species	<i>Anal. Methods</i> , 2013,5, 616-628 DOI: 10.1039/C2AY26030A
Illicium verum, Hook. F., star anise (Chinese)	Japanese star anise (Illicium anisatum), other Illicium species	AHP Botanical Pharmacognosy Table 3.2
Irvingia gabonensis (Aubry-Lecomte ex O'Rorke) Baill., African mango seed	Goji berry	Li J, Pan L, Naman CB, et al. <i>J Agric Food Chem.</i> 2014;62(22):5054-5060.
Krill oil	Fish oil	http://www.nutritionaloutlook.com/articles/how-will-usp's-new-krill-oil-monograph-help-industry , http://link.springer.com/article/10.1007/s11746-016-2836-3
Maca root powder	starch, other fillers	ABC Botanical Adulterants Program, http://cms.herbalgram.org/heg/volume11/12December/ChineseDemandForPeruvianMaca.html
Maple (Acer saccharum) syrup and products	sugar, corn syrup	https://www.fas.org/sgp/crs/misc/R43358.pdf
Melaleuca alternifolia Cheel. tea tree oil	terpinen-4-ol, "Nature-identical" oil blends	ABC Botanical Adulterants Program; www.attia.org.au

Melatonin	Chemical Contaminants	Cole MR, Fetrow CW. Adulteration of dietary supplements. Am J Health Syst Pharm. 2003;60:1576–1580.
Men's sexual health ingredients (fenugreek, etc)	Analogues of sildenafil and tadalafil.	Lee JH, Mandava S, Baek SY, Lee YM. J Pharm Biomed Anal. 2016 May 10;123:1-9.
Natural Vanilla extract	vanillin, etc	Sommerville, UNPA 2016
Olive oil	vegetable oils	https://www.fas.org/sgp/crs/misc/R43358.pdf , T. Mueller, Extra Virginity: The Sublime and Scandalous World of Olive Oil, W. W. Norton & Company, 2011
Organic Certified materials	non-Organic certified materials	https://www.fas.org/sgp/crs/misc/R43358.pdf
Origanum vulgare L., oregano oil	thyme oil, others	Gad HA, El-Ahmady SH, Abou-Shoer MI, Al-Azizi MM. Phytochem Anal. 2013;24(6):520-526.
Packaging	unapproved components (phthalates, DEHP)	https://www.fas.org/sgp/crs/misc/R43358.pdf
Panax quinquefolius L., (American Ginseng root)	whole plant, exhausted material, pesticides	AHP Botanical Pharmacognosy Table 3.2, p50
Panax.ginseng C.A. Mey., Asian Ginseng root	Other plants, ginseng leaf, fillers, Rumex hymenosepalus	AHP Botanical Pharmacognosy Table 3.2; ABC, Blumenthal, CHFA Sept 2015, https://chfa.ca/files/regulatory_files/CHFA_Tradeshows/QA_Keynote_Presentation_Mark_Blumenthal.pdf
Panax.ginseng C.A. Mey., Asian Ginseng root	Pesticides	J Agric Food Chem. 2010 May 26;58(10):5884-96. doi: 10.1021/jf903851h.
Peanut products	salmonella	https://www.fas.org/sgp/crs/misc/R43358.pdf , Department of Justice press release, "Former Officials and Broker of Peanut Corporation of America Indicted Related to Salmonella-Tainted Peanut Products," February 21, 2013
Phytochemicals derived from plant source	synthetic/fermented sources	Curcumin: ftp://ftp.fao.org/es/esn/jecfa/cta/CTA_61_Curcumin.pdf
Piper nigrum L., black pepper	papaya fruit seeds, synthetic piperine	http://bangalore.citizenmatters.in/articles/2002-method-detecting-food-adulteration
Plantain aerals	Purple foxglove (digitalis); food allergens	AHP Botanical Pharmacognosy Table 3.2
Pomegranate fruit extract	ellagic acid sources (chinese gall nut)	ABC, Blumenthal, CHFA Sept 2015, https://chfa.ca/files/regulatory_files/CHFA_Tradeshows/QA_Keynote_Presentation_Mark_Blumenthal.pdf
Pomegranate fruit juice/juice powder	cherry, grape, others	J. Agric. Food Chem., 2009, 57 (6), 2550-2557• DOI: 10.1021/jf803172e
"Raw" products incl. chia, psyllium, coconut/coconut products	salmonella, pathogens	FDA Import Alert 23-12, http://www.nutraingredients-usa.com/Suppliers2/Chia-and-psyllium-Sterilization-and-adulteration-show-importance-of-choosing-suppliers-carefully
Red yeast Rice	synthetic statins	ABC, Blumenthal, CHFA Sept 2015, https://chfa.ca/files/regulatory_files/CHFA_Tradeshows/QA_Keynote_Presentation_Mark_Blumenthal.pdf ; J Pharm Biomed Anal. 2014 Nov;100:243-53. doi: 10.1016/j.jpba.2014.07.039. Epub 2014 Aug 9.

Root botanicals (e.g. black cohosh, valerian, ginger, ginseng, turmeric), and some soy and grain products	Mycotoxins incl. Zearalenone	Food Chem Toxicol. 2007 Jan;45(1):1-18. Epub 2006 Aug 30.
Rumex spp. (sorrel)		Schier, W.; Schultze, W. [Actual adulteration of medicinal crude drugs: bearberry leaves and sorrel herbs. 1990 Dtsch Apoth Ztg, 130(Mar 1), 463-465 [German]
Saffron	turmeric, Sudan dyes,	http://www.iso.org/iso/home/news_index/news_archive/news.htm?refid=Ref1819
Schisandra chinensis (Turcz.) Baill., berries	other Schizandra species, Kadsura spp.	AHP Botanical Pharmacognosy Table 3.2
Scutellaria baicalensis (Skullcap) aerial parts	Germander (Teucrium canadense)	AHP Botanical Pharmacognosy Table 3.2
Seaweed/kelp (incl fucoxanthin)	arsenic, heavy metals, iodine, radioactivity	Cole MR, Fetrow CW. Adulteration of dietary supplements. Am J Health Syst Pharm. 2003;60:1576–1580. JAOAC Int. 2015 Mar-Apr;98(2):321-9. doi: 10.5740/jaoacint.14-166.
Serenoa repens (W. Bartram) Small, saw palmetto	vegetable oils, spent material, argemone oil?	AHP Botanical Pharmacognosy Table 3.2; Myers S. Booker A, Suter A, Krnjic A et al. J Pharm Pharmacol. 2014;66(6): 811-822.
Silybum marianum L.) Gaertn. milk thistle	fillers, solvents	ABC, Blumenthal, CHFA Sept 2015, https://chfa.ca/files/regulatory_files/CHFA_Tradeshows/QA_Keynote_Presentation_Mark_Blumenthal.pdf , Liva R http://www.imjournal.com/resources/web_pdfs/0409_liva.pdf
Solvent extracts	solvent residues	USP <467>
Soy protein, soy lecithin	hexane (10-20ppm in soy meal)	Cornucopia Institute report http://cornucopia.org/soysurvey/OrganicSoyReport/behindthebean_color_final.pdf
soy, wheat, corn, papaya	GMO	EU regs
Spices (black pepper, cinnamon)	salmonella, fillers (starch etc)	FDA Import Alert 28-02 and 28-04, https://www.fas.org/sgp/crs/misc/R43358.pdf
Spirulina spp. blue-green algae,	Microcystis aeruginosa, microcystins	Cole MR, Fetrow CW. Adulteration of dietary supplements. Am J Health Syst Pharm. 2003;60:1576–1580.
Spirulina spp. blue-green algae,	beta-N-methylamino-L-alanine (BMAA)	Aquat Biosyst. 2014 Aug 8;10:5. doi: 10.1186/2046-9063-10-5. eCollection 2014.
Stephania tetrandia S. Moore, root	Aristolochia fangjii	AHP Botanical Pharmacognosy Table 3.2
Thyroid supplements	Synthetic thyroid hormones	Kang GY, Parks JR, Fileta B, et al. Thyroid. October 2013;23(10):1233-1237.
Ulmus fiulva Michx., slippery elm inner bark	Rice flour	AHP Botanical Pharmacognosy Table 3.2
Vaccinium macrocarpon Aiton, cranberry extract	grapeseed ext	ABC Botanical Adulterants Program; J Agric Food Chem. 2014;62(5):1038-1046. ABC, Blumenthal, CHFA Sept 2015, https://chfa.ca/files/regulatory_files/CHFA_Tradeshows/QA_Keynote_Presentation_Mark_Blumenthal.pdf

Vaccinium myrtillus L., bilberry fruit	Red #2, charcoal, other Vaccinium, amaranth dyes, mulberry, elderberry, black bean, black rice	AHP Botanical Pharmacognosy Table 3.2; ABC, Blumenthal, CHFA Sept 2015, https://chfa.ca/files/regulatory_files/CHFA_Tradeshows/QA_Keynote_Presentation_Mark_Blumenthal.pdf
Valeriana officinalis L., root	Valeriana wallichii root, pesticides	AHP Botanical Pharmacognosy Table 3.2
Viiburnum opulus L., cramp bark root/stem bark	Other Viburnum species	AHP Botanical Pharmacognosy Table 3.2
Vitex agnus-castus L. (chaste tree berry)	V. negundo, V. trifolia, V. rotundifolia	ABC Botanical Adulterants Program, AHP, Fukahori M, Kobayashi S, Naraki Y, et al. Chem Pharm Bull (Tokyo). 2014;62(4):379-385.
Weight loss ingredients (green tea, etc)	Sibutramine and analogs	J Pharm Biomed Anal. 2014 Jan;88:136-43. doi: 10.1016/j.jpba.2013.08.031. Epub 2013 Aug 31.
Wetland-origin plants	heavy metals, PCB, pesticides	AHP Botanical Pharmacognosy p49
Yohimbine	synthetic, caffeine, Podophyllum hexandrum, solvents	J AOAC Int. 2015 Mar-Apr;98(2):330-5. doi: 10.5740/jaoacint.14-246.
Zinc	Cadmium	Cole MR, Fetrow CW. Adulteration of dietary supplements. Am J Health Syst Pharm. 2003;60:1576–1580.
<i>NOTE: Reports may be biased, unreliable, and/or uncorroborated. Many confirmed instances of adulteration have been resolved through advances in manufacturing and testing technology. This is a list of publicly available references of adulteration of some food dietary ingredients in media and academic publications, and is for informational purposes only. NaturPro Scientific LLC has not verified the truthfulness or reliability of any information, beyond verifying the existence of the citations in the published reference.</i>		