

Cal Poly Humboldt

Digital Commons @ Cal Poly Humboldt

Botanical Studies

Open Educational Resources and Data

2022

Food Plants With Toxic Properties

James P. Smith Jr

Follow this and additional works at: https://digitalcommons.humboldt.edu/botany_jps



Part of the [Botany Commons](#)

FOOD PLANTS WITH TOXIC PROPERTIES

James P. Smith, Jr.
Professor of Botany, Emeritus
Department of Biological Sciences
Humboldt State University
Arcata, California

15 April 2020

Poisonous plants are those that contain one or more toxins that when consumed in ordinary quantities disrupt the normal state of health of the victim. The toxins are either manufactured by the plant itself, absorbed and sequestered from the soil where they were growing, or caused by fungal infections. The resulting effects range from relatively mild skin irritation (dermatitis) to death. In other words, a working definition is much broader than, "A poisonous plant is one that will kill you." Notice the qualifier — when consumed in ordinary quantities. Numerous websites raise the question of whether rapid consumption of 9 to 12 bananas would be dangerous to your health, perhaps even fatal. My guess is that few of us are that fond of bananas. Another case in the literature is that of a woman who consumed an entire bag of peppermint candy each day and then experienced some distress.

There are other factors of importance. There are individual sensitivities to various food plants. You may have some of your own. Friends may have commented on how they must avoid eating a fruit or vegetable that is one of your favorites because of its unpleasant effects. A major problem is consuming material that was not prepared properly. For example, toxicity in most of the plants in the bean family (Leguminosae) is the result of not cooking the seeds long enough.

Plants are presented first by plant family, then by scientific name within each family. The format for each plant entry is scientific name • common name • most toxic part of the plant • toxic principle(s), and syndrome(s) of toxicity. See the end of the table for an explanation of the various abbreviations.

GYMNOSPERMS

Ginkgoaceae (Ginkgo Family)

Ginkgo biloba • Ginkgo, maidenhair tree

- Seeds • Ginkgotoxin • Headache, dizziness, GI disturbances, skin reactions, heart palpitations

Pinaceae (Pine Family)

Pinus armandii • Chinese white pine

- Seeds • ? • PMS (pine mouth syndrome) • pronounced bitter, metallic taste lasting for 2-4 weeks

FLOWERING PLANTS

Amaranthaceae (Pigweed Family)

Beta vulgaris • beet, sugar beet, chard

- Leaves • Nitrates • GI; abortions; vitamin deficiency

Spinacea oleracea • spinach

- All parts • Oxalates • GI and circulatory

Amaryllidaceae (Amaryllis Family)

Allium spp. • wild onions, onion, garlic, etc.

- All parts • Sulfides/disulfides • Hemolytic anemia

Anacardiaceae (Cashew Family)

Anacardium occidentale • cashew nut

- Fruits • Anacardic acid • Dermatitis

Mangifera indica • mango

- Fruits • Urushiol (catechols) • Dermatitis

Annonaceae (Annona Family)

Asimina triloba • paw paw

- Fruits • Unknown • Dermatitis

Asparagaceae (Asparagus Family)

Asparagus officinalis • asparagus

- Stems, fruits • Glycosides and saponin • Dermatitis; GI; and CV

Bromeliaceae (Bromeliad Family)

Ananas comosus • pineapple

- All parts, esp. sap • Bromelain (proteolytic enzyme) • Dermatitis

Caricaceae (Papaya Family)

Carica papaya • papaya

- Latex, leaves • Dermatitis; stomach irritant

Compositae (Asteraceae) Sunflower or Aster Family

Artemisia absinthium - wormwood,

- Flowers, leaves • Thujone • ingredient in absinthe or green fairy • CNS

Convolvulaceae (Morning Glory Family)

Ipomoea batatas • sweet potato

- Tubers • Ipomeamarone • Liver; only in spoiled tubers

Cruciferae (Brassicaceae) (Mustard Family)

Armoracia lapathifolia • horseradish

- Roots • Glucosinolates • GI irritation, bloody vomiting, diarrhea

Brassica plants listed below share some of the same toxins and syndromes

- Various • Glucosinolates • GI irritation, goiter, anemia, hepatic and renal lesions

Brassica campestris • turnip

Brassica chinensis • pak-choi

Brassica juncea • brown mustard

Brassica napus • rutabaga

Brassica nigra • black and brown mustard

Brassica oleracea var. botrytis • broccoli, cauliflower, broccoflower

Brassica oleracea • collards

Brassica oleracea • kale

Brassica oleracea var. gemmifera • Brussel sprouts

Brassica oleracea var. gongyloides • kohlrabi

Brassica oleracea var. oleracea • cabbage

Eutrema japonicum • wasabi

- Rhizomes (shavings or paste) • Allyl isothiocyanate • Burning in mouth and throat; GI disturbance

Raphanus raphanistrum • radish

- All parts • Glucosinolates • As in *Brassica* spp. (in excess)

Cucurbitaceae (Gourd Family)

Cucurbita spp. • gourds, squashes

- Fruits • Cucurbitacins • GI; prostration

Momordica charantia • bitter melon

- Seeds • Vicine • Headache, fever, abdominal pain, coma

Dioscoreaceae (Yam Family)

Dioscorea spp. • yams

- Tubers • Alkaloids • CNS paralysis; teratogenic

Ebenaceae (Persimmon Family)

Diospyros virginiana • persimmon

- Fruits • Plant tissues congeal to obstruct GI tract

Euphorbiaceae (Spurge Family)

Manihot esculenta • cassava, yuca (not yucca)

- Root • glycoside • Cellular asphyxiation

Fagaceae (Oak Family)

Fagus spp. • beeches

- Fruits • Tannic acid • GI

Quercus spp. • oaks

- Fruits • Tannins and gallotannins • M & T, GI

Gramineae (Poaceae) (Grass Family)

Bambusa spp. • bamboo

- Young shoots • HCN glycosides • Cellular asphyxiation

Secale cereale • rye

- Grains (when infected by ergot fungus) • cardiovascular (leading to gangrene), CNS (hallucinations)

Triticum aestivum • wheat

- Grains • Gluten sensitivity

Labiatae [Lamiaceae] (Mint Family)

Lavandula officinalis • lavender

- Leaves, flowers • Essential oils • Dermatitis (studies in mice)

Salvia officinalis • sage

- Leaves • Thujone • GI (in excess; especially in young children) • Seizures; liver CNS damage
- Thymus vulgaris* • thyme
- All parts • Thyme oil • Dermatitis; GI; CNS; CV

Lauraceae (Laurel Family)

- Persea americana* • avocado
- All parts • Persin • allergic responses; CV
- Sassafras albidum* • sassafras
- Roots • Safrole • Carcinogenic; overuse of flavoring
- Umbellularia californica* • California bay, Oregon myrtle
- Leaves • Umbellulone • Dermatitis, headache

Lecythidaceae (Brazil Nut Family)

- Bertholletia excelsa* • Brazil nut
- Seeds • Selenium • nausea, fatigue, diarrhea, hair loss

Leguminosae [Fabaceae] (Pea, Bean, or Legume Family)

- Arachis hypogaea* • peanut, goober
- Seeds • Aflatoxins (made by a fungal contaminant) • Carcinogen; allergy (mild symptoms to anaphylaxis)
- Cicer arietinum* • chick pea, garbanzo bean
- Seeds • Raffinose sugars • Stomach cramps
- Glycine max* • soy bean
- Seeds • Lectins* • Circulatory (agglutination); goitrogenic
- Glycyrrhiza glabra* • licorice
- Roots • Glycyrrhizin • Muscle weakness, hypertension, abnormal heart rhythms
- Lathyrus sativus* • Sweet pea, grass pea
- Seeds • Beta-N-oxalylamino-L-alanine • Muscular rigidity, weakness, paralysis of leg muscles ("lathyrism")
- Lens culinaris* • lentils
- Seeds • Lectins* • GI disturbances (when undercooked)
- Pachyrhizus erosus* • yam bean, jicama
- Seeds • Saponin, rotenone, pachyrrhizin • Catharsis
- Phaseolus lunatus* • lima bean
- Seeds • HCN glycosides • Cellular asphyxiation
- Phaseolus vulgaris* • kidney bean
- Seeds • Lectins*/enzyme inhibitors • GI; blocks starch digestion
- Pisum sativum* • garden pea
- All parts, esp. fruits; leaves • Phytohemagglutinins (PHA) • CNS; mitogenic; mechanical-injury
- Vicia faba* • fava bean
- Seeds • Phytohemagglutinins (PHA) • Anemia ("favism") in genetically sensitive

Linaceae (Flax Family)

- Linum usitatissimum* • flax
- All parts • HCN glycosides • Cellular asphyxiation

Moraceae (Mulberry Family)

- Ficus* spp. • fig
- Sap • Ficin + methoxyypsoresalen • Dermatitis; photodermatitis
- Morus* spp. • mulberry
- Unripe fruits, sap, wood (dust) • Unknown • Dermatitis; GI; CNS (hallucinations)

Myristicaceae (Nutmeg Family)

- Myristica fragrans* • nutmeg
- Seeds + covering • Myristicin • GI, CNS; recreational drug use

Passifloraceae (Passion Flower Family)

- Passiflora* spp. • passion flower
- Fruits (in high amount) • Alkaloids (some cyanogenic) • GI disturbance; tachycardia

Phytolaccaceae (Pokeweed Family)

- Phytolacca americana* • poke, poke weed, poke berry
- Roots (most), stems, leaves, berries (least) • Phytolaccine
 - Burning sensation in mouth, salivation; GI; bloody diarrhea; CV; cytotoxic

Polygonaceae (Smartweed Family)

- Fagopyrum esculentum* • buckwheat
- Seeds • Fagopyrin • Photosensitization
- Rheum rhabarbarum* • rhubarb
- Leaf blades • Anthraquinone glycosides • GI and circulatory

Rosaceae (Rose Family)

The plants cited below share the same entry: Seeds • HCN glycosides • GI; convulsions; coma

Eriobotrya japonica • loquat

Malus domestica • apple

Prunus dulcis • sweet almond

Prunus avium • sweet cherry

Prunus armeniaca • apricot

Prunus domestica • plum

Prunus persica • peach

Prunus serotina • black cherry

Pyrus communis • pear

Rutaceae (Citrus Family)

Citrus x aurantiifolia • lime

• Fruits • Limonene, etc. (terpenes) • Photodermatitis ("Club Med dermatitis"); respiratory

Citrus bergamia • bergamot orange tree

• Fruits (rind) • Bergapten (furanocoumarin) • Photodermatitis

Sapindaceae (Soapberry Family)

Blighia sapida • akee

• Fruits, seeds • Hypoglycin A & B • "Jamaican Vomiting sickness"

Litchi chinensis • lychee (litchi)

• Fruit • Hypoglycin A • low blood sugar, acute encephalopathy

Schisandraceae (Star Vine Family)

Illicium anisatum • Japanese star anise

• All parts • Anethole • Seizures, vomiting, rapid eye movements, hallucinations

Solanaceae (Nightshade Family)

Capsicum spp. • chili pepper, etc.

• Fruits (esp. placenta) • Capsaicin • M & T; GI

Piper nigrum • black pepper, white pepper

• Fruits (black), seeds (white) • GI and urinary tract irritation

Solanum lycopersicum • tomato

• Leaves, young shoots (esp. in children) • Tomatine • GI disturbance; liver and heart damage (in excess)

Solanum tuberosum • potato

• All parts, esp. green tubers • Solanine • CNS and GI

Umbelliferae (Apiaceae) (Parsley or Carrot Family)

Daucus carota • carrot

• All parts • Furanocoumarins • Photodermatitis

Levisticum officinale • lovage

• Rhizomes, roots, leaves • Furanocoumarins • Photodermatitis

Pastinaca sativa • parsnip

• All parts • Furanocoumarins • Photodermatitis; dermatitis

Viburnaceae (Viburnum Family)

Sambucus spp. • elderberry

• Fruits (raw) • Glycosides

SYMPTOMS OR SYNDROMES OF TOXICITY

Cellular • inhibition or stimulation of mitosis, neoplastic growths (tumors), lymphocyte transformation, mutagenic activity (induce mutations)

CNS (central nervous system) • headache, dizziness, faintness, weakness, impaired coordination, paralysis, contraction or dilation of pupils, difficulty in breathing, speaking, or seeing, heightened reactions to external stimuli, nervousness, giddiness, trembling, convulsions, depression, seizures, depression, hallucinations, coma

CV (cardiovascular system) • changes in pulse rate and blood pressure, changes in frequency and effectiveness of contractions, anemia, agglutination of red blood cells, bluish discoloration of mouth and skin, changes in oxygen-carrying capacity of blood

Dermatitis • itching, redness, stinging, burning, formation of blisters (vesicles)

GI (gastrointestinal tract) • nausea, retching, vomiting, stomach-abdominal pain, bloating, diarrhea, constipation

HCN (hydrogen cyanide) • weakness, giddiness, headache, blue discoloration of skin, nausea, vomiting, instantaneous

collapse, convulsions, coma, changes in the oxygen-carrying capacity of the blood, death, bitter almond odor on breath

M & T (mouth and throat) • tingling, numbness, burning, swelling of lips-tongue-throat, loss of speech or ability to swallow or eat

Photodermatitis • same as dermatitis, but with serum leakage into tissues

Reproductive system • changes in estrus cycles and spermatogenesis, sterility, abortions, stillbirths, teratogens (embryological malformations)

Respiratory • wheezing, coughing, emphysema, bronchitis

PRINCIPAL SOURCES

There is an extensive poisonous plants literature available in texts, monographs, and professional journals. I have listed the sources that I used most frequently. If you go to my Digital Commons account at the Humboldt State University Library you will find a much more complete introduction to the poisonous plants literature.

Brunton, J. 1999. Toxic plants dangerous to humans and animals. Intercept Ltd. Andover, U. K. 545 pp.

Burrows, G. E. & R. J. Tyrl. 2013. Toxic plants of North America. Second edition. John Wiley & Sons. 1383 pp.

Conning, D. M. & A. B. G. Lansdown. 1983. Toxic hazards in food. Croom Helm. London, U. K. 304 pp.

Coulombe, R. A. 2003. Pyrrolizidine alkaloids in foods. Adv. Food Nutrition Res. 45: 61-99.

Dabrowski, W. M. & Z. E. Sikorski (editors). 2004. Toxins in food. CRC Press. Boca Raton, FL. 376 pp.

Dolan, L. C. et al. 2010. Naturally occurring food toxins. Toxins 2: 2289-2332.

Frohne, D. & H. J. Pfänder. 2005. Poisonous plants: a handbook for doctors, pharmacists, toxicologists, biologists and veterinarians. Second edition. Timber Press. Portland, OR. 469 pp.

Fuller, T. C. & E. McClintock. 1987. Poisonous plants of California. California Nat. Hist. Guides: 53. Univ. California Press. Berkeley. 433 pp.

Lampe, K. F. & M. A. McCann. 1985. AMA handbook of poisonous and injurious plants. American Medical Assoc. Chicago, IL. 432 pp.

Liener, I. (editor). 1969. Toxic constituents of plant foodstuffs.

Morton, I. D. 1977. Naturally occurring toxins in foods. Proc. Nutrition Soc. 36(1): 101-105.

Quattrocchi, U. 2012. CRC world dictionary of medicinal and poisonous plants. CRC Press. Boca Raton, FL. 5 vols.

Rechigl, M. 2017. Handbook of naturally occurring food toxicants. CRC Press. Boca Raton, FL. 352 pp.

Singleton, V. L. 1981. Naturally occurring food toxicants: phenolic substances of plant origin common in foods. Adv. Food Res. 27: 149-242.

Tucker, A. O. & M. J. Maciearello. 1998. Some toxic culinary herbs in North America. Dev. Food. Sci. 40: 401-414.

Turner, N. J. & P. von Aderkas. 2009. The North American guide to common poisonous plants and mushrooms. Timber Press. Portland, OR. 376 pp.

Wagstaff, D. J. 2008. International poisonous plants checklist: an evidence-based reference. CRC Press. Boca Raton, FL. 443 pp.

Wink, M. & B.-E. Van Wyk. 2008. Mind-altering and poisonous plants of the world: a scientifically accurate guide to 1200 toxic and intoxicating plants. Timber Press. Portland, OR. 464 pp.