



Hawthorn

Updated: January 28, 2023.

OVERVIEW

Introduction

Hawthorn is a flowering shrub or tree of several *Crataegus species*, which has been used in traditional medicine for digestive complaints and heart disease including hypertension and heart failure. Oral forms of hawthorn extracts have not been linked to elevations in serum aminotransferase levels or to instances of clinically apparent liver injury with jaundice.

Background

Hawthorn is bulky shrub or small tree of several species of the genus *Crataegus* (*pinnatifida*, *laevigata*, *monogyna*, *oxyacantha*), which is found throughout most of Asia, Europe and North America. Extracts of the dried ripe berries and leaves were used in ancient traditional Chinese medicine to treat indigestion, chest pain, and hernia. More recently it has been used largely to treat cardiovascular disease such as angina pectoris, hypertension, and congestive heart failure. The hawthorn berry is also used as a food, prepared as jam or jelly, and made into a fruit drink. Extracts of hawthorn berries and leaves contain multiple flavonoids, phenylpropanoids, lignans, triterpenoids and glycosides. The ingredient responsible for the purported activity of hawthorn in heart disease is unknown, but is suspected to be a flavonoid antioxidant. Studies in vitro and in vivo have shown that hawthorn extracts have multiple pharmacological actions, including cardiovascular protection and antioxidant, antibacterial, lipid lowering, and hepatoprotective activity. Clinical trials of hawthorn, however, have not consistently substantiated these medicinal properties. Hawthorn is found in multiple commercial forms, the recommended daily dose ranging widely from 120 to as high as 1800 mg of extract daily. Hawthorn is generally well tolerated without adverse events; minor side effects may include diarrhea, abdominal discomfort and nausea. Rare instances of hypersensitivity reactions, skin rash and allergic dermatitis have been described.

Hepatotoxicity

In several prospective clinical trials, hawthorn in conventional oral doses was typically described as having no serious, drug related adverse side effects and serum enzyme elevations were not mentioned. In most studies, adverse events with hawthorn occurred at rates similar to or less than that with placebo, and no instances of serum enzyme elevations or clinically apparent liver injury were mentioned. Despite widespread use as an herbal supplement, hawthorn has not been implicated in cases of drug induced liver injury.

Likelihood score: E (unlikely cause of clinically apparent liver injury).

Mechanism of Injury

The mechanism by which hawthorn might cause liver injury is unknown. Hawthorn is a widely used food, and liver injury arising while taking a multiingredient, hawthorn containing product might be due to a contaminant or another herbal component in the dietary supplement.

Drug Class: [Herbal and Dietary Supplements](#)

Other names: English Hawthorn, Hawthorne, Haw.

PRODUCT INFORMATION

REPRESENTATIVE TRADE NAMES

Hawthorn – Generic

DRUG CLASS

Herbal and Dietary Supplements

SUMMARY INFORMATION

[Fact Sheet at National Center for Complementary and Integrative Health, NIH](#)

CHEMICAL FORMULA AND STRUCTURE

DRUG	CAS REGISTRY NUMBER	MOLECULAR FORMULA	STRUCTURE
Hawthorn	90045-52-6	Herbal	Not Applicable

ANNOTATED BIBLIOGRAPHY

References updated: 28 January 2023

Abbreviations: HDS, herbal and dietary supplements.

Zimmerman HJ. Unconventional drugs. Miscellaneous drugs and diagnostic chemicals. In, Zimmerman, HJ. Hepatotoxicity: the adverse effects of drugs and other chemicals on the liver. 2nd ed. Philadelphia: Lippincott,1999: pp. 731-4.

(Expert review of hepatotoxicity published in 1999; several herbal medications are discussed, but not hawthorn).

Liu LU, Schiano TD. Hepatotoxicity of herbal medicines, vitamins and natural hepatotoxins. In, Kaplowitz N, DeLeve LD, eds. Drug-induced liver disease. 2nd ed. New York: Informa Healthcare USA, 2007, pp. 733-54.

(Review of hepatotoxicity of herbal and dietary supplements [HDS] published in 2007; no mention of Hawthorn).

English Hawthorn. In, PDR for Herbal Medicines. 4th ed. Montvale, New Jersey: Thomson Healthcare Inc. 2007: pp. 279-84.

(Compilation of short monographs on herbal medications and dietary supplements).

Stedman C. Herbal hepatotoxicity. Semin Liver Dis. 2002;22:195–206. PubMed PMID: 12016550.

(Review and description of patterns of liver injury due to herbals, including discussion of potential risk factors, and herb-drug interactions).

Holubarsch CJ, Colucci WS, Meinertz T, Gaus W, Tendera M. Survival and prognosis: investigation of Crataegus Extract WS 1442 in CHF (SPICE) trial study group. The efficacy and safety of Crataegus extract WS 1442 in patients with heart failure: the SPICE trial. *Eur J Heart Fail.* 2008;10:1255–63. PubMed PMID: 19019730.

(Among 2681 adults with heart failure treated with a hawthorn extract or placebo for 24 months, the mean times to first cardiovascular event, rates of death from heart failure and hospitalizations for heart failure were the same in both groups as were total [67% vs 68] and severe adverse event rates [39% vs 41%]; no mention of ALT elevations or hepatotoxicity).

Zick SM, Vautaw BM, Gillespie B, Aaronson KD. Hawthorn Extract Randomized Blinded Chronic Heart Failure (HERB CHF) trial. *Eur J Heart Fail.* 2009;11:990–9. PubMed PMID: 19789403.

(Among 120 adults with chronic heart failure treated with a hawthorn extract [450 mg] or placebo twice daily for 6 months, there were no differences in rates of deaths or hospitalizations, or changes of symptoms and signs of heart failure while adverse events were more frequent with hawthorn [60% vs 38%], no mention of ALT elevations or hepatotoxicity).

Jacobsson I, Jönsson AK, Gerdén B, Hägg S. Spontaneously reported adverse reactions in association with complementary and alternative medicine substances in Sweden. *Pharmacoepidemiol Drug Saf.* 2009;18:1039–47. PubMed PMID: 19650152.

(Review of 778 spontaneous reports of adverse reactions to herbals to Swedish Registry found no reports attributed to Hawthorn).

Reuben A, Koch DG, Lee WM; Acute Liver Failure Study Group. Drug-induced acute liver failure: results of a U.S. multicenter, prospective study. *Hepatology.* 2010;52:2065–76. PubMed PMID: 20949552.

(Among 1198 patients with acute liver failure enrolled in a US prospective study between 1998 and 2007, 133 [11%] were attributed to drug induced liver injury of which 12 [9%] were due to herbals, including several herbal mixtures, usnic acid, Ma Huang, black cohosh, and Hydroxycut, but not Hawthorn).

Stickel F, Kessebohm K, Weimann R, Seitz HK. Review of liver injury associated with dietary supplements. *Liver Int.* 2011;31:595–605. PubMed PMID: 21457433.

(Review of current understanding of liver injury from herbals and dietary supplements focusing upon Herbalife and Hydroxycut products, green tea, usnic acid, noni juice, Chinese herbs, vitamin A and anabolic steroids; Hawthorn is not discussed).

Teschke R, Wolff A, Frenzel C, Schulze J, Eickhoff A. Herbal hepatotoxicity: a tabular compilation of reported cases. *Liver Int.* 2012;32:1543–56. PubMed PMID: 22928722.

(A systematic compilation of all publications on the hepatotoxicity of specific herbals identified 185 publications on 60 different herbs, herbal drugs and supplements, but does not list or mention Hawthorn).

Björnsson ES, Bergmann OM, Björnsson HK, Kvaran RB, Olafsson S. Incidence, presentation and outcomes in patients with drug-induced liver injury in the general population of Iceland. *Gastroenterology.* 2013;144:1419–25. PubMed PMID: 23419359.

(In a population based study of drug induced liver injury from Iceland, 96 cases were identified over a 2 year period, 15 of which [16%] were attributed to HDS products, but none were listed as containing Hawthorn).

Bunchorntavakul C, Reddy KR. Review article: herbal and dietary supplement hepatotoxicity. *Aliment Pharmacol Ther.* 2013;37:3–17. PubMed PMID: 23121117.

(Systematic review of literature on HDS associated liver injury does not mention Hawthorn).

Navarro VJ, Seeff LB. Liver injury induced by herbal complementary and alternative medicine. *Clin Liver Dis.* 2013;17:715–35. PubMed PMID: 24099027.

- (Review of the epidemiology, regulatory status, diagnosis, pathogenesis and causes of liver injury from herbal products with specific discussion of conjugated linoleic acid, ephedra, germander, green tea, usnic acid, flavocoxid, aloe vera, chaparral, greater celandine, black cohosh, comfrey, kava, skullcap, valerian, noni juice, pennyroyal and traditional herbal remedies).*
- Navarro VJ, Barnhart H, Bonkovsky HL, Davern T, Fontana RJ, Grant L, Reddy KR, et al. Liver injury from herbals and dietary supplements in the U.S. Drug-Induced Liver Injury Network. *Hepatology*. 2014;60:1399–408. PubMed PMID: 25043597.
- (Among 839 cases of liver injury from drugs collected in the US between 2004 and 2013, 130 were due to HDS products, including 45 from body building agents [probably anabolic steroids] and 85 from diverse HDS products, but no case was attributed specifically to Hawthorn).*
- Brown AC. Liver toxicity related to herbs and dietary supplements: Online table of case reports. Part 2 of 5 series. *Food Chem Toxicol*. 2017;107:472–501. PubMed PMID: 27402097.
- (Description of an online compendium of cases of liver toxicity attributed to HDS products, does not list or discuss Hawthorn).*
- Medina-Caliz I, Garcia-Cortes M, Gonzalez-Jimenez A, Cabello MR, Robles-Diaz M, Sanabria-Cabrera J, Sanjuan-Jimenez R, et al; Spanish DILI Registry. Herbal and dietary supplement-induced liver injuries in the Spanish DILI Registry. *Clin Gastroenterol Hepatol*. 2018;16:1495–1502. PubMed PMID: 29307848.
- (Among 856 cases of hepatotoxicity enrolled in the Spanish DILI Registry between 1994 and 2016, 32 were attributed to herbal products, the most frequent cause being green tea [n=8] and Herbalife products [n=6], while one anicteric, self-limited hepatocellular case was scored as probably due to Hawthorn).*
- Holubarsch CJF, Colucci WS, Eha J. Benefit-risk assessment of Crataegus Extract WS 1442: an evidence-based review. *Am J Cardiovasc Drugs*. 2018;18:25–36. PubMed PMID: 29080984.
- (Summary of the effects of a hawthorn extract [WS 1442] reporting evidence from post-hoc sub-analyses of large clinical trials in chronic heart failure mentions that in most studies adverse events were no greater than with placebo and in some instances were less frequent, indicating excellent safety and tolerance).*
- Ballotin VR, Bigarella LG, Brandão ABM, Balbinot RA, Balbinot SS, Soldera J. Herb-induced liver injury: Systematic review and meta-analysis. *World J Clin Cases*. 2021;9:5490–5513. PubMed PMID: 34307603.
- (Systematic review of the literature on herb induced liver injury identified 446 references describing 936 cases due to 79 different herbal products, the most common being He Shou Wu [91], green tea [90] Herbalife products [64], kava kava [62] and greater celandine [48]; hawthorn was not implicated in any cases).*
- Bessone F, García-Cortés M, Medina-Caliz I, Hernandez N, Parana R, Mendizabal M, Schinoni MI, et al. Herbal and dietary supplements-induced liver injury in Latin America: experience from the LATINDILI Network. *Clin Gastroenterol Hepatol*. 2022;20:e548–e563. PubMed PMID: 33434654.
- (Among 367 cases of hepatotoxicity enrolled in the Latin American DILI Network between 2011 and 2019, 29 [8%] were attributed to herbal products, the most frequent being green tea [n=7], Herbalife products [n=5] and garcinia [n=3], while no case was attributed to hawthorn).*
- Kim E, Jang E, Lee JH. Potential roles and key mechanisms of hawthorn extract against various liver diseases. *Nutrients*. 2022;14:867. PubMed PMID: 35215517.
- (Review of the possible roles of hawthorn in treating liver disease it having been found to have antioxidant activity and to decrease lipid accumulation in animal models of nonalcoholic fatty liver).*
- Zhang J, Chai X, Zhao F, Hou G, Meng Q. Food applications and potential health benefits of hawthorn. *Foods*. 2022;11:2861. PubMed PMID: 36140986.

(Description of the numerous components of hawthorn, which is rich in vitamins A, C, B1 and B2 as well as aminoacids calcium and carotene and has more than 60 flavonoids).

Li R, Luan F, Zhao Y, Wu M, Lu Y, Tao C, Zhu L, Zhang C, Wan L. Crataegus pinnatifida: A botanical, ethnopharmacological, phytochemical, and pharmacological overview. J Ethnopharmacol. 2023;301:115819. PubMed PMID: 36228891.

(Review of the botanical features, traditional usage, chemical composition, pharmacological actions, clinical efficacy and safety of Crataegus pinnatifida, mentions that C. pinnatifida has over 250 phytochemical components, causes liver injury when given in high doses to dogs, but has been used safely for centuries in China).