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List of references supporting the assessment of *Levisticum officinale* Koch, radix

Draft

The Agency acknowledges that copies of the underlying works used to produce this monograph were provided for research only with exclusion of any commercial purpose.

Alanko J, Kurahashi Y, Yoshimoto T, Yamamoto S, Baba K. Panaxynol, a polyacetylene compound isolated from oriental medicines, inhibits mammalian lipoxygenases. *Bioch Pharmacol* 1994, 48:1979-1981

Andruszczak S. Wpływ sposobu założenia plantacji i zbioru liści na plonowanie lubczyku ogrodowego (*Levisticum officinale* Koch.). *Annales UMCS, Sec. E* 2004, 59:1049-1056

Andruszczak S. The effect of the method of plantation establishment and harvesting time on some morphological features of plants and essential oil content in lovage roots (*Levisticum officinale* Koch.). *Acta Scientiarum Polonorum, Hortorum Cultus* 2007, 6:21-27

Arnold S, editor. *Capitulare de villis*. E. Wende, Towarzystwo Wydawnicze Ignis, Warszawa 1923.

Aronson JK, editor. *Meyler's Side Effects of Herbal Medicines*. Elsevier, Amsterdam 2009, 45, 265.

Ashwood-Smith MJ, Ceska O, Yeoman AW, Kenny PG. Photosensitivity from harvesting lovage (*Levisticum officinale*). *Contact Derm* 1992, 26:356-357

Awang D. Lovage root. (in) Tyler's Herbs of Choice. The Therapeutic use of Phytomedicinals. CRC Press, Taylor and Francis Group, Boca Raton 2009, 63-64

Baerheim-Svendsen A. Über das Vorkommen der Chlorogen- und Kaffeesäure in der Pflanzenfamilie der Umbelliferen. Mitteilung über Papierchromatographie in der Phytochemische Analyse. *Pharm Acta Helv* 1951, 26:253-258

Bag A, Bhattacharyya SK, Chattopadhyay RR. Medicinal Plants and Urinary Tract Infections: An update. *Phcog Rev* 2008, 2:277-284



- Beck JJ, Chou SC. The structural diversity of phtalides from Apiaceae. *J Nat Prod* 2007, 70:891-900
- Berger F. Handbuch der Drogenkunde. Erkennung, Wertbestimmung und Anwendung. Band V. Radices. Radix Levistici. Wilhelm Maudrich Verlag, Wien, Bonn, Bern 1960, 287-292
- Belew C. Herbs and the childbearing woman. Guidelines for Midwives. *J Nurse-Midwifery* 1999, 44:231-252
- Blank I, Schieberle P, Grosch W. Quantification of the flavour compounds 3-hydroxy-4,5-dimethyl-2(5H)-furanone and 5-ethyl-3-hydroxy-4-methyl-2(5H)-furanone by a stable isotope dilution assay. In: Schreier P, Winterhalter P, editors. Progress in Flavour Precursor Studies. Allured Publishing Corporation 1993, 103-109
- Bradley P. Lovage root. Levistici radix. British Herbal Compendium. Vol 2. BHMA Bornemouth 2006, 258-261
- British Herbal Pharmacopoeia. Levisticum. British Herbal Medicine Association 1983, 130-131
- Bruneton J. Pharmacognosy, Phytochemistry, Medicinal Plants. Lavoisier Publishing Inc, Intercept Ltd, London, New York 1995
- Bundesanzeiger (BAZ) No 101. 01.06.1990. Levistici officinalis. In: [Rośliny Lecznicze w Fitoterapii.]. Instytut Roślin i Przetworów Zielarskich. Poznań 1994, 385
- Bylaite E, Roozen JP, Legger A, Venskutonis RP, Posthumus MA. Dynamic deadspace-gas chromatography-olfactometry analysis of different anatomical parts of lovage (*Levisticum officinale* Koch.) at eight growing stages. *J Agric Food Chem* 2000, 48:6183-6190
- Bylaite E, Venskutonis RP, Roozen JP. Influence of harvesting time on the composition of volatile components in different anatomical parts of lovage (*Levisticum officinale* Koch.). *J Agric Food Chem*. 1998, 46:3735–3740
- Cao YX, Zhang W, He JY, He LC, Xu CB. Ligustilide induces vasodilatation via inhibiting voltage dependent calcium channel and receptor-mediated Ca²⁺ influx and release. *Vascul Pharmacol* 2006, 45:171-176
- Cavallo P, Proto MC, Patruno C, Del Sorbo A, Bifulco M. The first cosmetic treatise of history. A female point of view. *Int J Cosmet Sci* 2008, 30:79-86
- Ceylan E, Fung DYC. Antimicrobial activity of spices. *J Rapid Meth Automat Microbiol* 2004, 12:1-55
- Chan SS, Choi AO, Jones RL, Lin G. Mechanisms underlying the vasorelaxing effects of butylidenephthalide, an active constituent of Ligusticum chuanxiong, in rat isolated aorta. *Eur J Pharmacol* 2006, 537:111-117
- Chan SS, Cheng TY, Lin G. Relaxation effects of ligustilide and senkyunolide A, two main constituents of Ligusticum chuanxiong, in rat isolated aorta. *J Ethnopharmacol* 2007, 111:677-680
- Chan SS, Jones RL, Lin G. Synergistic interaction between the Ligusticum chuanxiong constituent butylidenephthalide and the nitric oxide donor sodium nitroprusside in relaxing rat isolated aorta. *J Ethnopharmacol* 2009, 122:308-312
- Chen Q, Li P, Li B, Yang H, Li X, Chen F. A GC–MS–SIM Simultaneous Determination of Ligustilide and Butylidenephthalide from Ligusticum chuanxiong Using SFE. *Chromatographia* 2010, 72:963-967
- Chevallier A. Levisticum officinale, syn. Ligusticum levisticum. Lovage. In: Encyclopedia of Medicinal Plants. Dorling Kindersley, London 1996, 226

- Christensen LP, Brandt K. Bioactive polyacetylenes in food plants of the Apiaceae family: occurrence, bioactivity and analysis. *J Pharm Biomed Anal* 2006, 41:683-693
- Cichy M, Wray V, Höfle G. [New constituents of *Levisticum officinale* Koch (Lovage)] German/English summary. *Liebigs Ann Chem* 1984, 397-400
- Colombo ML, Dalfra S, Scarpa B. The origin and the tradition of European herbalism for human wellness: from the roots of an ancient approach to modern herbalism. *Mediterr J Nutr Metab* 2001, DOI 10.1007/sw12349-011-0062-y
- Combest W, Newton M, Combest A, Kosier JH. Effects of herbal supplements on the kidney. *Urol Nurs* 2005, 25:381-386
- Conway GA, Slocumb JC. Plants used as abortifacients and emmenagogues by Spanish New Mexicans. *J Ethnopharmacol* 1979, 1:241-261
- Czech Pharmacopoeia (2009, Supplement 2010), *Levistici radix*.
- Daukšas E, Rimantas Venskutonis P, Sivik B, Nillson T. Effect of fast CO₂ pressure changes on the yield of lovage (*Levisticum officinale* Koch.) and celery (*Apium graveolens* L.) extracts. *J Supercrit Fl* 2002, 22:201-210
- Deans SG, Ritchie G. Antibacterial properties of plant essential oils. *Intern J Food Microbiol* 1987, 5:165-180
- Deng S, Chen SN, Lu J, Wang ZJ, Nikolic D, Van Breemen RB, Santarsiero BD, Mesecar A, Fong HH, Farnsworth NR, Pauli GF. Gabaergic phthalide dimers from *Angelica sinensis* (oliv.) Diels. *Phytochem Anal* 2006, 17:398-405
- De Voss P. European materia medica in historical texts: longevity of a tradition and implication for future use. *J Ethnopharmacol* 2010, 132:28-47
- Diawara MM, Chavez KJ, Hoyer PB, Williams DE, Dorsch J, Kulkosky P, Franklin MR. A novel group of ovarian toxicants: the psoralens. *J Biochem Mol Toxicol* 1999, 13:195-203
- Dioskurides De Materia Medica. Ligusticum. Available at: <http://buecher.heilpflanzen-welt.de/Dioskurides-Arzneimittellehre/297.htm> Accessed 10/04/2011
- Du J, Yu Y, Ke Y, Wang C, Zhu L, Qian ZM. Ligustilide attenuates pain behavior induced by acetic acid or formalin. *J Ethnopharmacol* 2007, 112:211-214
- Du J, Bai B, Kuang X, Yu Y, Wang C, Ke Y, Xu Y, Tzang AH, Qian ZM. Ligustilide inhibits spontaneous and agonists- or K⁺ depolarization-induced contraction of rat uterus. *J Ethnopharmacol* 2006, 108:54-58
- Duke JA. CRC Handbook of Medicinal Herbs. Lovage (*Levisticum officinale* W.D.J. Koch) CRC Press, Inc. Boca Raton. London, New York, Washington 2002, 474-475
- Ebadi M. Pharmacodynamic Basis of Herbal Medicine. CRC Press, Taylor and Francis, Boca Raton 2007, 44, 47
- EFSA Scientific Cooperation (ESCO) Report EFSA Compendium of botanicals that have been reported to contain toxic, additive, psychotropic or other substances of concern. *Levisticum officinale* W.J.D. Koch. *EFSA Journal* 2009, 7(9):281
- Ernst E. Herbal medicinal products during pregnancy: are they safe? *BJOG* 2002, 109:227-235.

Eskin MNA, Tamir S. Lovage, (in) Dictionary of nutraceuticals and functional foods. Taylor and Francis, Boca Raton, London, New York 2006, 403-404

European Pharmacopoeia 5th ed. Lovage root, Council of Europe. 1932-1933

European Pharmacopoeia 6th ed. Lovage root, Council of Europe. 2290-2291

Evans WC. Trease and Evans Pharmacognosy. Sixteenth Edition. Saunders Elsevier, Edinburgh-London 2009

Ezz El-Din A, Hendawy SF. Comparative efficiency of organic and chemical fertilizers on herb production an essential oil of lovage plants grown in Egypt. *American-Eurasian J Agric Environ Sc* 2010, 8:60-66

Fehr D. Über das ätherische Öl von *Levisticum officinale*. I. Untersuchung der ätherischen öle aus Frucht, Blatt, Stengel und Wurzel. *Planta Medica* 1980, 40 (Suppl.):34-40

Fischer CF, Baerheim-Svendsen A. Apterin, a common furanocoumarin glycoside in the Umbelliferae. *Phytochemistry* 1976, 15: 1079-1080

Frohne D. Heilpflanzenlexicon [Polish Translation]. Ein Leitfaden auf wissenschaftlicher Grundlage. *Levisticum officinale*. Stuttgart, 2006

Garrod B, Lea EJA, Lewis BG. Studies on the mechanism of action of the antifungal compound faltarindiol. *New Phytol* 1979, 83:463-471

Garvey MI, Rahman MM, Gibbons S, Piddock LJ. Medicinal plant extracts with efflux inhibitory activity against Gram-negative bacteria. *Into J Antimicrob Agents* 2011, 37:145-151

Gehrmann B, Koch WG, Tschirch CO, Brinkmann H. Lovage root. *Levistici radix*. *Levisticum officinale*. In: Medicinal Herbs: A Compendium. Binghamton, New York 2005, 124

Hsu J, Friedlander SF. Rethinking diet and the skin: an unusual downside of some fruits and vegetables. *Pract Dermatol Pediatr* 2010, 1:17-18

Gholamhoseinian A, Shahouzehi B, Shafifi-far F. Inhibitory effect of some plant extracts on pancreatic lipase. *Int J Pharmacol* 2010, 6:18-24

Gijbels MJM, Scheffer JJC, Baerheim Svendsen A. Z-Butylidenephtalide in the essential oil from roots of *Levisticum officinale*. *Planta Medica* 1980, 40:41-47

Gijbels MJ, Scheffer JJ, Baerheim Svendsen A. Phtalides in the essential oil from roots of *Levisticum officinale*. *Planta Medica* 1982, 44:207-211

Goetz P. Aromathérapie en pathologie digestive. *Phytothérapie* 2007, 1:21-24

GRAS (Botanicals Generally Recognized As Safe). Available at: <http://www.biologie.uni-hamburg.de/b-online/ibc99/dr-duke/gras.htm>. Accessed 2/04/2011

Gruenwald J, Brendler T, Jaenicke C, editors. PDR for Herbal Medicines, 3rd Edition. Lovage. *Levisticum officinale*. Medical Economics Co., Inc., Montvale, NJ. 2000: 618-619

Gruenwald J, Brendler T, Jaenicke C, editors. PDR for Herbal Medicines 4th Edition. Lovage. *Levisticum officinale*. Thomson Medical Economics, Montvale NJ. 2004, 525-526

Guba R. Toxicity myths – the actual risks of essential oil. *Int J Aromather* 2000, 10: doi:10.1054/ijar.2000.0030, Available online <http://www.idealibrary.com>

- Guo J, Duan JA, Shang E-X, Tang Y, Qian D. Determination of ligustilide in rat brain after nasal administration of Essential oil from rhizoma Chuanxiong. *Fitoterapia* 2009, 80:168–172
- Hadacek F, Greger H. Testing of antifungal natural products: methodologies, comparability of results and assay choice. *Phytochemical Analysis* 2000, 11:137-147
- Haffner F, Schultz OE, Schmid W, Braun R. Normdosen gebräuchlicher Arzneistoffe und Drogen. *Levistici radix*. Wissenschaftliche Verlagsgesellschaft, Stuttgart 2009
- Hänzel R, Keller K, Rimpler H, Scheider G, editors. Hagers Handbuch der Pharmazeutischen Praxis, Band 4-6. *Levisticum*. Springer, Berlin, Heidelberg, New York, Tokyo 1994, 664-670
- Heck AM, DeWitt BA, Lukes AL. Potential interactions between alternative therapies and warfarin. *Am J Health Syst Pharm* 2000, 57:1221-1230
- Heyneman CA. Preoperative considerations: which herbal products should be discontinued before surgery? *Crit Care Nurse* 2003, 23:116-124
- Helbling A, Lopez M, Schwartz HJ, Lehrer SB. Reactivity of carrot-specific IgE antibodies with celery, apiaceous spices, and birch pollen. *Ann Allergy* 1993, 70:495-49
- Herr SM. Herb-Drug Interaction Handbook, 3rd ed. Church Street Books, 2005, 209, 351
- Heyneman CA. Preoperative considerations: which herbal products should be discontinued before surgery? *Crit Care Nurse* 2003, 23:116-124
- Hogg CL, Svoboda KP, Hampson JB, Brocklehurst S. Investigation into the composition and bioactivity of essential oil from lovage (*Levisticum officinale* W.D.J.Koch.). *Int J Aromather* 2001, 11:144-151
- Hsu J, Friedlander SF. Rethinking diet and the skin: an unusual downside of some fruits and vegetables. *Pract Dermatol Pediatr* 2010, 1:17-18
- Kemp MS. Falcarindiol: an antifungal polyacetylene from *Aegopodium padagraria*. *Phytochemistry* 1978, 17:1002
- Ko WC. A newly isolated antispasmodic-butylidenephthalide. *Jpn J Pharmacol* 1980, 30:85-91
- Ko WC, Sheu JR, Leu YR, Tzeng SH, Chen CM. Stereoselectivity of butylidenephthalide on voltage-dependent calcium channels in guinea-pig isolated ileum. *J Pharm Pharmacol* 1997, 49:1121-1125
- Ko WC, Chang CY, Sheu JR, Tzeng SH, Chen CM. Effect of butylidenephthalide on calcium mobilization in isolated rat aorta. *J Pharm Pharmacol* 1998, 50:1365-1369
- Kobayashi M, Fujita M, Mitsunashi H. Components of *Cnidium officinale* Makino: occurrence of pregnenolone, coniferyl ferulate and hydroxyphthalides. *Chem Pharm Bull* 1984, 32:3770-3773
- Kobayashi M, Fujita M, Mitsunashi H. Studies on the Constituents of Umbelliferae plants. XV. Constituents of *Cnidium officinale*: occurrence of pregnenolone, coniferylferulate and hydroxyphthalides. *Chem Pharm Bull* 1987, 35:1427-1433
- Kohlmünzer S. Farmakognozja. Podręcznik dla studentów farmacji. *Levisticum officinale*. PZWL, Warszawa 2000, 573-574
- Kraft K, Hobbs C. Pocket Guide to Herbal Medicine. Lovage (*Levisticum officinale* Koch) Thieme, Stuttgart, New York 2004, 88
- Kuang X, Yao Y, Du JR, Liu YX, Wang CY, Qian ZM. Neuroprotective role of Z-ligustilide against forebrain ischemic injury in ICR mice. *Brain Res* 2006, 1102:145-153

- Liu WS, Lin PC, Chang LF, Harn HJ, Shiuan D, Chiou TW, Jeng JR. Inhibitory Effect of n-Butylidenephthalide on Neointimal Hyperplasia in Balloon Injured Rat Carotid Artery. *Phytother Res* 2011, 25:1494-502
- Liu L, Ning ZQ, Shan S, Zhang K, Deng T, Lu XP, Cheng YY. Phthalide lactones from *Ligusticum chuanxiong* inhibit lipopolysaccharide-induced TNF- α production and TNF- α -mediated NF- κ B Activation. *Planta Med* 2005, 71:808-813
- Madaus G. Lehrbuch der Biologischen Heilmittel (1938). *Levisticum officinale*. Available at: <http://www.henriettesherbal.com/eclectic/madaus/levisticum.html>. Accessed 30/03/2011
- Martindale: The Complete Drug Reference. Lovage root. The Pharmaceutical Press 2009. (Electronic version). Available at: <http://www.medicinescomplete.com/mc/martindale/current/20810-e.htm>
- Mitsuhashi H, Nagai U, Muramatsu T, Tashiro H. Studies on the constituents of Umbelliferae plants. II Isolation of the active principles of *Ligusticum* root. *Chem Pharm Bull* 1960, 8:243-245
- Mitsuhashi H, Nomura M. Studies on the constituents of Umbelliferae plants. XII. Biogenesis of 3-Butylphthalide. *Chem Pharm Bull* 1966, 14:777-778
- Muszyński J. Radix Levistici – Lubczyk (F.P. II). *Ziołolecznictwo i leki roślinne (Fitoterapia)*. PZWL, Warszawa 1954, 143
- Myhre MJ. Herbal remedies, nephropathies and renal disease. *Nephrol Nurs J* 2000, 27:473-478
- Najda A, Wolski T, Dyduch J, Baj T. Determination of quantitative composition of polyphenolic compounds occur in anatomically different parts of *Levisticum officinale* Koch. *Electr Polish Agr Univ, Seri Horticult*. 2003, <http://www.ejpau.media.pl/series/volume6/issue1/horticulture/art-02.html>
- Natural Medicines Comprehensive Database. [Eleventh edition]. Lovage. Therapeutic Research Faculty, Stockton CA 2009
- Naves YR. Etudes sur les matières végétales volatiles XXIV. Composition de l'huile essentielle et du résinoïde de liveche (*Levisticum officinale* Koch). *Helv Chim Acta* 1943, 26:1281-1294
- Nunes IS, Faria JMS, Figueiredo AC, Pedro LG, Trindade H, Barroso JG. Menthol and Geraniol Biotransformation and Glycosylation Capacity of *Levisticum officinale* Hairy Roots. *Planta Med* 2009, 75: 387-391
- Nutescu EA, Shapiro NL, Ibrahim S, West P. Warfarin and its interactions with foods, herbs and other dietary supplements. *Expert Opin Drug Saf* 2006, 5:433-451
- Ożarowski A. *Ziołolecznictwo. Levisticum officinale – Lubczyk ogrodowy*. Państwowy Zakład Wydawnictw Lekarskich, Warszawa 1976, 138-139
- Ożarowski A, Jaroniewski W. *Rośliny lecznicze i ich praktyczne zastosowanie. Lubczyk ogrodowy. Levisticum officinale* Koch. Instytut Wydawniczy Związków Zawodowych, Warszawa 1987, 231-234
- Paszkievicz M, Orlita A, Dziabas A, Gołębiowski M, Łojkowska E, Szafranek J, Maliński E, Stepnowski P. Simplex optimized LC analysis of plant coumarins and furanocoumarins. *Chromatographia* 2008, 67:653-657
- Patel JA, Gohil KJ. Warfarin-herb interactions: a review and study based on assessment of clinical case reports in literature. *Bol Latinoamericano Carib Plantas Med Aroma* 2008, 7:85-99
- Peter KV, editor. Lovage. In: *Handbook of herbs and spices, Vol. 2*, CRC Press, Boca Raton Boston, New York, Washington 2004, 96-97

- Podebrad F, Heil M, Reichert S, Mosandl A, Sewell AC, Böhles H. 4,5-dimethyl-3-hydroxy-2[5H]-furanone (sotolone)-the odour of maple syrup urine disease. *J Inherit Metab Dis* 1999, 22:107-114
- Raal A, Arak E, Orav A, Kailas T, Mürisepp M. Composition of the essential oil of *Levisticum officinale* Koch from some European countries. *J Essential Oil Res* 2008, 20:318-322
- Raghavan S. Lovage. In: Handbook of spices, seasonings, and flavourings. CRC Press, Taylor & Francis Group Boca Raton 2007, 129-130
- Receptariusz Zielarski. Radix Levistici (F.P. III, U.S.L.). Zjednoczenie Przemysłu Zielarskiego Herbapol. Wydawnictwo Przemysłu Lekkiego i Spożywczego, Warszawa 1967, 182
- Robbers JE, Tyler VE. Tyler's Herbs of Choice. The Therapeutic Use of Phytomedicinals. Lovage root. The Haworth Herbal Press, New York, London 1999, 94-95
- Roeske W. Zarys Fitoterapii. (Farmakologia i receptura ziół leczniczych). Radix Levistici – Korzeń lubczyka. PZWL, Warszawa 1955, 212-213
- San Martin R. [The estrogenic activity of various plant species, the activity of *Levisticum officinale*]. *Spanish Farmacognosia* 1958, 18:179-186
- Santos PAG, Figueiredo AC, Oliveira MM, Barroso JG, Pedro LG, Deans SG, Scheffer JJC. Growth and essential oil composition of hairy root cultures of *Levisticum officinale* W.D.J. Koch (lovage). *Plant Science* 2005, 168:1089–1096
- Schimmer O. Bestimmung der phototoxischen und photomutagenen Potenz furocumarinhaltiger Drogenzubereitungen und Handelspräparate mit dem Testsystem *Chlamydomonas*. *Planta Med* 1983, 47:79-82
- Schimmer O, Beck R, Dietz U. Phototoxizität und Photomutagenität von Furocumarinen und Furocumarindrogen bei *Chlamydomonas reinhardtii*. *Planta Med* 1980, 40:68-76
- Schimmer O. Studies on the photobiological activity of two naturally occurring furochromones, visnagin and khelin, in *Chlamydomonas reinhardtii*. *Mutagenesis* 1997, 12:141-145
- Schimpfky R. Unsere Heilpflanzen in Bild und Wort für Jederman. Ihr Nutzen and ihre Anwendung in Haus und Familie. Vol 1. Liebstöckel. *Levisticum officinale*. Hugo Bermühler Verlag, Berlin Lichtenfelde 1900, 48
- Schinkovitz A, Stavri M, Gibbons S, Bucar F. Antimycobacterial polyacetylenes from *Levisticum officinale*. *Phytother Res* 2008, 22:681-684
- Schneider I, Bucar F. Lipoxygenase inhibitors from natural plant sources. Part 1: Medicinal plants with inhibitory activity on arachidonate 5-lipoxygenase and 5 lipoxygenase[sol]cyclooxygenase. *Phytother Res* 2005, 19:81-102
- Schulz V, Hänsel R, Tyler VE. Rational, Phytotherapy. A Physician's Guide to Herbal Medicine. Springer Verlag, Berlin, Heidelberg 1998, 25-28, 221
- Schulzova V, Hajšlova J, Botek P, Peroutka R. Furanocoumarins in vegetables: influence of farming system and other factors on levels of toxicants. *J Sci Food Agric* 2007, 87:2763-2767
- Scientific Opinion on the substantiation of health claims related to *Levisticum officinale* W.D.J. Koch and improvement of diuretic function (ID 2292, 3420) pursuant to Article 13(1) of Regulation (EC) No 1924/2006 (Question No EFSA-Q-2008-3025, EFSA-Q-2008-4149, adopted on 02 July 2009), EFSA Panel on Dietetic Products, Nutrition and Allergies (NDA) *EFSA J* 2009, 7: 1297, 1-11

- Segebrecht S, Schilcher H. Ligustilide: Guiding component for preparation of *Levisticum officinale* roots. *Planta Med* 1989, 55:572–573
- Shehadeh MB, Afifi FU, Abu-Hamdah SM. Platelet aggregation inhibitors from aerial parts of *Ruta Chalapensis* grown in Jordan. *Integr Med Insights* 2007, 2:35-39
- Stahl-Biskup E, Wichtmann EM. Composition of the essential oils from roots of some Apiaceae in relation to the development of their oil duct systems. *Flavour Fragr J* 1991, 6:249-255
- Tisserand R, Balacs T. Essential Oil Safety. Churchill Livingstone, Edinburgh 1998, 201-204
- Vollmann C. *Levisticum officinale*: (Lovage). *Ztschr Phytother* 1988, 9:128-132
- Vollmer H, Weidlich R. Untersuchungen über die diuretische Wirkung der Fructus juniperi, Radix levistici, Radix liquiritiae und Herba violae tricoloris an Kaninchen und Mäusen. *Naunyn-Schmiedeberg's Arch Pharmacol* 1937, 186:574-583
- Vollmer H, Hübner K. Untersuchungen über die diuretische Wirkung der Fructus juniperi, Radix levistici, Radix ononidis, Folia betulae, Radix liquiritiae und Herba equiseti an Ratten. *Naunyn-Schmiedeberg's Archives of Pharmacology* 1937, 186:592-605
- Wagner H, Bladt S. Plant Drug Analysis. A Thin Layer Chromatography Atlas. Springer Verlag Berlin Heidelberg 2001:128-143
- Wagner H, Wiesenauer M. Phytotherapie. Phytopharmaka und pflanzliche Homöopathika. Gustav Fischer Verlag, Stuttgart, Jena, New York, 1995, 181-187
- Weiss RF. Herbal medicine: translated from the sixth German edition of Lehrbuch der Phytotherapie by A.R. *Levisticum officinale* (Lovage). Meuss. AB Arcanum, Gothenburg 1988, 236
- Weiss RF, Fintelmann V. Herbal medicine. 2nd ed. Thieme, Stuttgart 2000, 229-230, 387, 416
- Werz O. Inhibition of 5-Lipoxygenase product synthesis by natural compounds of plant origin. *Planta Med* 2007, 73: 1331-1357
- Wichtl M. *Levistici radix*. Lovage. In: Herbal Drugs and Phytopharmaceuticals Medpharm GmbH Scientific Publisher, Stuttgart 1994, 295-297
- Wichtl M. *Levistici radix*. Lovage root. In: Herbal Drugs and Phytopharmaceuticals Medpharm GmbH Scientific Publisher, Stuttgart 2004, 335-337
- Wiesenauer M. Liebstockel (*Levisticum officinale*), In: PhytoPraxis. Springer Medizin Verlag Heidelberg 2008, 248-249
- Wolf B. Relapsed hand eczema with delayed type hypersensitivity to lovage. *Aktuelle Dermatologie* 1995, 21:319
- Wren RC. Potter's New Cyclopaedia of Botanical Drugs and Preparations. Health Science Press, Holsworthy 1975, 191
- Wyk BE van, Wink M. Medicinal plants of the world. An illustrated scientific guide to important medicinal plants and their uses. *Levisticum officinale*. Lovage. Timber Press, Portland 2004
- Yan R, Ko NL, Li SL, Tam YK, Lin G. Pharmacokinetics and metabolism of ligustilide, a major bioactive component in *Rhizoma Chuanxiong*, in the rat. *Drug Metab Dispos* 2008, 36:400-408
- Yarnell E. Botanical medicines for the urinary tract. *World J Urol* 2002, 20:285-293

Young JF, Duthie SJ, Milne L, Christensen LP, Duthie GG, Bestwick CS. Biphasic effect of falcarinol on Caco-2 cell proliferation, DNA damage, and apoptosis. *J Agric Food Chem* 2007, 55:618-623

Zehui P, Watson MF. *Levisticum Hill*, Brit. Herb. 423 1756, nom. Cons. *Flora of China* 2005, 14:172.2

Zidorn C, Jöhrer K, Ganzera M, Schubert B, Sigmund EM, Mader J, Greil R, Ellmerer EP, Stuppner H. Polyacetylenes from the Apiaceae vegetables carrot, celery, fennel, parsley, and parsnip and their cytotoxic activities. *J Agric Food Chem* 2005, 53:2518-2523

Zschocke S, Liu JH, Stuppner H, Bauer R. Comparative study of roots of *Angelica sinensis* and related umbelliferous drugs by thin layer chromatography, high-performance liquid chromatography, and liquid chromatography-mass spectrometry. *Phytochem Anal* 1998, 9:283-290