



EUROPEAN MEDICINES AGENCY  
SCIENCE MEDICINES HEALTH

25 September 2019  
EMA/HMPC/52978/2017  
Committee on Herbal Medicinal Products (HMPC)

## List of references supporting the assessment of *Thymus vulgaris* L., *Thymus zygis* L., aetheroleum

Draft – Revision 1

**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.**

Aftab K, Atta-ur-Rahman, Usmanghani K. Blood pressure lowering action of active principle from *Trachyspermum ammi* (L.) Sprague. *Phytomedicine* 1995; 2(1):35-40

Akačič B, Petričič J. Thymianöl als Anthelminthicum. *Pharmazie* 1956; 11:628-632

Allegrini J, Simeon de Bouchberg M. Une technique d'étude du pouvoir antibactérien des huiles essentielles. *Prod Probl Pharm* 1972; 27:891-897

Aydin S, Basaran AA, Basaran N. The effects of thyme volatiles on the induction of DNA damage by the heterocyclic amine IQ and mitomycin C. *Mutat Res* 2005a; 581(1-2):43-53

Aydin S, Basaran AA, Basaran N. Modulating effects of thyme and its major ingredients on oxidative DNA damage in human lymphocytes. *J Agric Food Chem* 2005b; 53:1299-1305

Aydın E, Türkez H, Keleş MS, The effect of carvacrol on healthy neurons and N2a cancer cells: some biochemical, anticancerogenicity and genotoxicity studies, *Cytotechnology*. 2014c;66:149-57.

Azad MF, Schwiertz A, Jentsch HF. Adjunctive use of essential oils following scaling and root planing -a randomized clinical trial, *BMC Complement Altern Med*. 2016; 16: 171.

Azirak S, Rencuzogullari E. The in vivo genotoxic effects of carvacrol and thymol in rat bone marrow cells. *Environ Toxicol* 2008; 23:728-735

Azizan A, Blevins RD. Mutagenicity and antimutagenicity testing of six chemicals associated with the pungent properties of specific spices as revealed by the Ames *Salmonella*/microsomal assay. *Arch Environ Contam Toxicol* 1995; 28(2):248-258

Beer AM, Lukanov J, Sagorchev P. Effect of thymol on the spontaneous contractile activity of the smooth muscles. *Phytomedicine* 2007; 14:65-69

---

**Official address** Domenico Scarlattilaan 6 • 1083 HS Amsterdam • The Netherlands

**Address for visits and deliveries** Refer to [www.ema.europa.eu/how-to-find-us](http://www.ema.europa.eu/how-to-find-us)

**Send us a question** Go to [www.ema.europa.eu/contact](http://www.ema.europa.eu/contact) **Telephone** +31 (0)88 781 6000

An agency of the European Union



- Benito M, Jorro G, Morales C, Pelaez A, Fernandez A. Labiate allergy: systemic reactions due to ingestion of oregano and thyme. *Ann Allergy Asthma Immunol* 1996; 76:416-418
- Blaschek W, Ebel S, Hackenthal E, Holzgrabe U, Keller K, Reichling J, Schulz V. *Thymi aetheroleum* (Thymianöl), HagerROM. Springer Verlag, Heidelberg 2008
- Böhme H, Hartke K, Hartke H, Wichtl M. *Kommentar zum Europäischen Arzneibuch*. Wissenschaftliche Verlagsgesellschaft, Stuttgart 2008
- Braga PC, Alfieri M, Culici M, Dal Sasso M. Inhibitory activity of thymol against the formation and viability of *Candida albicans* hyphae. *Mycoses* 2007a; 50:502-506
- Braga PC, Dal Sasso M, Culici M, Alfieri M. Eugenol and thymol, alone or in combination, induce morphological alterations in the envelope of *Candida albicans*. *Fitoterapia* 2007; 78:396-400
- Braga PC, Dal Sasso M, Culici M, Bianchi T, Bordoni L, Marabini L. Anti-Inflammatory Activity of Thymol: Inhibitory Effect on the Release of Human Neutrophil Elastase. *Pharmacology* 2006; 77:130-136
- Brandt W. Spasmolytische Wirkung ätherischer Öle. *Z Phytother* 1988; 9:33-39
- Busch-Petersen D, Hein J. Zur Therapie der paranasalen Sinusitiden im Kindesalter mit Li-iL-Thymian-Bädern. *Medicamentum* 1975; 16:51-53
- Buyukleyla M, Rencuzogullari E. The effects of thymol on sister chromatid exchange, chromosome aberration and micronucleus in human lymphocytes. *Ecotoxicology and Environmental Safety* 2009; 72:943-947
- Chaftar N, Girardot M, Labanowski J, Ghrairi T, Hani K, Frère J, Imbert C, Comparative evaluation of the antimicrobial activity of 19 essential oils. *Adv Exp Med Biol*. 2016;901:1-15.
- Charles CH, Vincent JW, Borycheski L, Amatnieks Y, Sarina M, Qaqish J, Proskin HM. Effect of an essential oil-containing dentifrice on dental plaque microbial composition. *Am J Dent* 2000; 13 (Spec No):26C-30C
- Chizzola R, Michitsch B, Franz C. Antioxidative properties of *Thymus vulgaris* leaves: comparison of different extracts and essential oil chemotypes. *J Agric Food Chem* 2008; 56:6897-6904
- Choi WS, Park BS, Ku SK, Lee SE. Repellent activities of essential oils and monoterpenes against *Culex pipiens pallens*. *J Am Mosq Control Assoc* 2002; 18:348-351
- Czygan FC, Hiller K. *Thymi herba*. In: Wichtl M (editor): *Herbal drugs and Phytopharmaceuticals*. Medpharm Scientific Publishers 2004; 607-610
- De Martino L, Bruno M, Formisano C, De Feo V, Napolitano F, Rosselli S, Senatore F, Chemical composition and *in vitro* antimicrobial and mutagenic activities of seven *Lamiaceae* essential oils, *Molecules*. 2009;14:4213-4230
- Domaracky M, Rehak P, Juhas S, Koppel J. Effects of selected plant essential oils on the growth and development of mouse preimplantation embryos *in vivo*. *Physiol Res*. 2007; 56:97-104
- Dorman HJD, Deans SG. Antimicrobial agents from plants: antibacterial activity of plant volatile oils. *J Appl Microbiol* 2000; 88:308-316
- Dunn LL, Davidson PM, Critzer FJ, Antimicrobial Efficacy of an Array of Essential Oils Against Lactic Acid Bacteria. *J Food Sci*. 2016;81:438-44.
- Dursun N, Liman N, Ozyazgan J, Günes I, Saraymen R. Role of thymus oil in burn wound healing. *J Burn Care Rehabil* 2003; 24:395-399

European Pharmacopoeia, 8<sup>th</sup> Ed, EDQM, Strasbourg, Thyme oil thymol type, Monograph 01/2012:1374

Fabian D, Sabol M, Domaracká K, Bujnáková D. Essential oils-their antimicrobial activity against *Escherichia coli* and effect on intestinal cell viability. *Toxicol In Vitro* 2006; 20:1435-1445

Fachini-Queiroz FC1, Kummer R, Estevão-Silva CF, Carvalho MD, Cunha JM, Grespan R, Bersani-Amado CA, Cuman RK, Effects of thymol and carvacrol, constituents of *Thymus vulgaris* L. essential oil, on the inflammatory response. *Evid Based Complement Alternat Med.* 2012;2012:657026

Gao S, Singh J. Mechanism of transdermal transport of 5-fluorouracil by terpenes: carvone, 1.8-cineole, and thymol. *Int J Pharmaceutics* 1997; 154:67-77

Gholijani N, Gharagozloo M, Kalantar F, Ramezani A, Amirghofran Z, Modulation of cytokine production and transcription factors activities in human Jurkat T cells by thymol and carvacrol., *Adv Pharm Bull.* 2015;5:653-60.

Giarratana F, Muscolino D, Beninati C, Giuffrida A, Panebianco A, Activity of *Thymus vulgaris* essential oil against *Anisakis* larvae. *Exp Parasitol.* 2014;142:7-10.

Gildemeister E, Hoffmann F. Die ätherischen Öle. Akademie-Verlag, Berlin 1961

Giordani R, Regli P, Kaloustian J, Mikail C, Abou L, Portugal H. Antifungal effect of various essential oils against *Candida albicans*. Potentiation of antifungal action of amphotericin B by essential oil from *Thymus vulgaris*. *Phytother Res* 2004; 18:990–995

Gordonoff T, Janett F. Thyme and thymol as lung disinfectants and expectorants. II. *Zeitschrift fuer die Gesamte Experimentelle Medizin* 1932; 79:486-494

Gordonoff T, Merz H. Über den Nachweis der Wirkung der Expektorantien. *Klinische Wochenschrift* 1931; 10:928-930

Gordonoff T. Expectoration and expectorants. *Archiv der Pharmazie und Berichte der Deutschen Pharmazeutischen Gesellschaft* 1933; 271:382-387

Gutiérrez MM, Werdin-Gonzales JO, Stefanazzi N, Bras C, Ferrero AA, The potential application of plant essential oil to control *Pediculus humanus capitis* (Anoplura: Pediculidae), *Parasit Res* 2016;115:633-41

Haffner F, Schultz OE, Schmid W. Normdosen gebräuchlicher Arzneistoffe und Drogen. Wissenschaftliche Verlagsgesellschaft, Stuttgart 1984

Hagan EC, Hansen WH et al. Food Flavourings and Compounds of related structure .II subacute and chronic toxicity. *Food Cosmet Toxicol* 1967; 5:141-157

Hammer KA, Carson CF, Riley TV. Antimicrobial activity of essential oils and other plant extracts. *J Appl Microbiol* 1999; 86:985–990

Hänsel R, Sticher O. *Pharmakognosie – Phytopharmazie.* Springer Verlag, Heidelberg 2007

Hersch-Martinez P, Leanos-Miranda BE, Solorzano-Santos F. Antibacterial effects of commercial essential oils over locally prevalent pathogenic strains in Mexico. *Fitoterapia* 2005; 76:453–457

Hikiba H, Watanabe E, Barrett JC, Tsutsui T. Ability of fourteen chemical agents used in dental practice to induce chromosome aberrations in Syrian hamster embryo cells. *J Pharmacol Sci* 2005; 97:146-152

- Homa M, Fekete IP, Böszörményi A2, Singh YR, Selvam KP, Shobana CS, Manikandan P, Kredics L, Vágvölgyi C, Galgóczy L, Antifungal effect of essential oils against *Fusarium* keratitis isolates. *Planta Med.* 2015;81:1277-84.
- Horváth G, Jenei JT, Vágvölgyi C, Böszörményi A, Krisch J. Effects of essential oil combinations on pathogenic yeasts and moulds. *Acta Biol Hung.* 2016;67:205-14.
- Horvathova E, Sramkova M, Labaj J, Slamenova D. Study of cytotoxic, genotoxic and DNA-protective effects of selected plant essential oils on human cells cultured *in vitro*. *Neuro Endocrinol Lett* 2006; 27(Suppl2):44-47
- Inouye S, Takizawa T, Yamaguchi H. Antibacterial activity of essential oils and their major constituents against respiratory tract pathogens by gaseous contact. *J Antimicrob Chemother* 2001; 47:565–573
- Inouye S, Uchida K and Yamaguchi H. *In-vitro* and *in-vivo* anti-*Trichophyton* activity of essential oils by vapour contact. *Mycoses* 2001a; 44:99-107
- Inouye S, Uchida K, Nishiyama Y, Hasumi Y, Yamaguchi H, Abe S. Combined effect of heat, essential oils and salt on fungicidal activity against *Trichophyton mentagrophytes* in a foot bath. *Nippon Ishinkin Gakkai Zasshi* 2007; 48:27-36
- Ito Y, Osa T, Kuriyama H. Effect of thymol on the electrical and mechanical activities of the guinea pig alimentary canal. *Jap J Physiol* 1974; 24:343-357
- Janssen AM, Chin NLJ, Scheffer JJC, Baerheim Svendsen A. Screening for antimicrobial activity of some essential oils by the agar overlay technique. *Pharm Weekbl* 1986; 8 (Sci):289-292
- Janssen AM. Antimicrobial activities of essential oils. Leiden: University of Leiden 1989; 91-108
- Jeong EY, Lim JH, Kim HG, Lee HS. Acaricidal activity of *Thymus vulgaris* oil and its main components against *Tyrophagus putrescentiae*, a stored food mite. *J Food Protection* 2008; 71:351-355
- Jimenez J, Navarro MC, Montilla MP, Martin A. *Thymus zygis* oil: its effect on CCl<sub>4</sub>-induced hepatotoxicity and free radical scavenger activity. *J Ess Oil Res* 1993; 5:153-158
- Jukic M, Milos M. Catalytic oxidation and antioxidant properties of thyme essential oils (*Thymus vulgaris* L.). *Croat Chem Acta* 2005; 78:105–110
- Jukic M, Politeo O, Maksimovic M, Milos M, Milos M. *In vitro* acetylcholinesterase inhibitory properties of thymol, carvacrol and their derivatives thymoquinone and thymohydroquinone. *Phytotherapy Res* 2007; 21:259-261
- Kavanaugh NL, Ribbeck K, Selected antimicrobial essential oils eradicate *Pseudomonas* spp. and *Staphylococcus aureus* biofilms. *Appl Environ Microbiol.* 2012;78:4057-61.
- Khan MS, Ahmad I, Cameotra SS, Botha F, Sub-MICs of *Carum copticum* and *Thymus vulgaris* influence virulence factors and biofilm formation in *Candida* spp., *BMC Complement Altern Med.* 2014 Sep 15;14:337.
- Kitajima J, Ishikawa T, Urabe A, Satoh M. Monoterpenoids and their glycosides from the leaf of thyme. *Phytochemistry* 2004; 65:3279–3287
- Koch C, Reichling J, Schneele J, Schnitzler P. Inhibitory effect of essential oils against herpes simplex virus type 2. *Phytomedicine* 2008; 15:71-78
- Kohlert C, Schindler G, Marz RW, Abel G, Brinkhaus B, Derendorf H, Grafe EU, Veit M. Systemic availability and pharmacokinetics of thymol in humans. *J Clinical Pharmacol* 2002; 42:731-737

Kommission B8 Monograph. BAnz 1990, 115

Kulisic T, Krisko A, Dragovic-Uzelac V, Milos M, Pifat G. The effects of essential oils and aqueous tea infusions of oregano (*Origanum vulgare* L. spp. *hirtum*), thyme (*Thymus vulgaris* L.) and wild thyme (*Thymus serpyllum* L.) on the copper-induced oxidation of human low-density lipoproteins. *Int J Food Sci Nutrition* 2007; 58:87-93

Kulisic T, Radonic A, Milos M. Inhibition of lard oxidation by fractions of different essential oils. *Grasa y Aceites* 2005; 56:284-291

Kumar P, Mishra S, Kumar A, Sharma AK. Antifungal efficacy of plant essential oils against stored grain fungi of *Fusarium* spp., *J Food Sci Technol*. 2016;53:3725-3734.

Lens-Lisbonne C, Cremieux A, Maillard C, Balansard G. Méthodes d'évaluation de l'activité antibactérienne des huiles essentielles: application aux essences de thym et de cannelle. *J Pharm Belg* 1987; 42:297-302

Leung AY. Encyclopedia of common natural ingredients. John Wiley & Sons, Chichester Brisbane Toronto 1980; 309-311

Lim WC, Seo JM, Lee CI, Pyo HB, Lee BC. Stimulative and sedative effects of essential oils upon inhalation in mice. *Arch Pharm Res* 2005; 28:770-774

Lis-Balchin M, Hart S. A preliminary study of the effect of essential oils on skeletal and smooth muscle *in vitro*. *J Ethnopharmacol* 1997; 58:183-187

LLana-Ruiz-Cabello M, Maisanaba S, Puerto M, Prieto AI, Pichardo S, Jos Á, Cameán AM, Evaluation of the mutagenicity and genotoxic potential of carvacrol and thymol using the Ames *Salmonella* test and alkaline, Endo III- and FPG-modified comet assays with the human cell line Caco-2., *Food Chem Toxicol*. 2014 Oct;72:122-8

Madaus R. Lehrbuch der biologischen Heilmittel. Thieme, Leipzig 1938

Magyar J, Szentandrassy N, Banyasz T, Fulop L, Varro A, Nanasi P. Effects of thymol on calcium and potassium currents in canine and human ventricular cardiomyocytes. *Br J Pharmacol* 2002; 136:330-338

Maisanaba S, Prieto AI, Puerto M, Gutiérrez-Praena D, Demir E, Marcos R, Cameán AM, In vitro genotoxicity testing of carvacrol and thymol using the micronucleus and mouse lymphoma assays., *Mutat Res Genet Toxicol Environ Mutagen*. 2015 Jun;784-785:37-44

Mancini E, Senatore F, Del Monte D, De Martino L, Grulova D, Scognamiglio M, Snoussi M, De Feo V, Studies on Chemical Composition, Antimicrobial and Antioxidant Activities of Five *Thymus vulgaris* L. Essential Oils. *Molecules*. 2015;20:12016-28.

Martindale. The extra pharmacopoeia. Pharmaceutical Press, London 1972

Maruniak J, Clark WB, Walker CB, Magnusson I, Marks RG, Taylor M, Clouser B. The effect of 3 mouthrinses on plaque and gingivitis development. *J Clin Periodontol* 1992; 19:19-23

Melo AD, Amaral AF, Schaefer G, Luciano FB, de Andrade C, Costa LB, Rostagno MH, Antimicrobial effect against different bacterial strains and bacterial adaptation to essential oils used as feed additives. *Can J Vet Res*. 2015;79:285-9.

Menghini A, Savino A, Lollini MN, Caprio A. Activite antimicrobienne en contact direct et en micro-atmosphere de certaines huiles essentielles. *Plant Med Phytother* 1987; 21:36-42

Mikus J, Harkenthal M, Steverding D, Reichling J. *In vitro* effect of essential oils and isolated mono- and sesquiterpenes on *Leishmania major* and *Trypanosoma brucei*. *Planta Med* 2000; 66:366-368

- Miladi H, Mili D, Ben Slama R, Zouari S, Ammar E, Bakhrouf A, Antibiofilm formation and anti-adhesive property of three mediterranean essential oils against a foodborne pathogen *Salmonella* strain. *Microb Pathog.* 2016; 93:22-31.
- Mills S, Bone K. Principles and Practice of Phytotherapy. Churchill Livingstone, Toronto 2000.
- Mittal A, Sara UVS, Ali A, Aqil M. The effect of penetration enhancers on permeation kinetics of Nintrendipine in two different skin models. *Biol Pharm Bull* 2008; 31:1766-1772
- Mohammadi B, Haeseler G, Leuwer M, Dengler R, Krampfl K, Bufler J. Structural requirements of phenol derivatives for direct activation of chloride currents via GABA(A) receptors. *Eur J Pharmacol* 2001; 421:85–91
- Mühlbauer RC, Lozano A, Palacio S, Reinli A, Felix R. Common herbs, essential oils, and monoterpenes potently modulate bone metabolism. *Bone* 2003; 32:372-380
- OECD (2002) Test N° 404: Acute dermal irritation/corrosion, OECD Guidelines for the testing of chemicals, Section 4: Health Effects, OECD Publishing.
- Opdyke DLJ (Eds.), Monographs on Fragrance Raw Materials, A Collection of Monographs Originally Appearing in Food Cosmetics Toxicology, Pergamon Press, Oxford, 1979, p. 704.
- Park BS, Choi WS, Kim JH, Kim KH, Lee SE. Monoterpenes From Thyme (*Thymus vulgaris*) As Potential Mosquito Repellents. *J Am Mosq Control Assoc* 2005; 21:80-83
- Paster N, Juven BJ, Shaaya E, Menasherov M, Nitzan R, Weisslowicz H, Ravid U. Inhibitory effect of oregano and thyme essential oils on moulds and foodborne bacteria. *Letters Appl Microbiol* 1990; 11:33-37
- Patakova D, Chladek M. Über die antibakterielle Aktivität von Thymian- und Quendelölen. *Pharmazie* 1974; 29:140-143
- Penalver P, Huerta B, Borge C, Astorga R, Romero R, Perea A. Antimicrobial activity of five essential oils against origin strains of the Enterobacteriaceae family. *Acta Pathol Microbiol Immunol* 2005; 113:1-6
- Pérez-Rosés R, Risco E, Vila R, Peñalver P, Cañigueral S, Biological and nonbiological antioxidant activity of some essential oils. *J Agric Food Chem.* 2016 Jun 15; 64:4716-24.
- Plants in cosmetics -: potentially harmful components, vol. 3, Council of Europe Publishing, Strasbourg, 2006, pp. 247-256
- Radaelli M, da Silva BP, Weidlich L, Hoehne L, Flach A, da Costa LA, Ethur EM, Antimicrobial activities of six essential oils commonly used as condiments in Brazil against *Clostridium perfringens*. *Braz J Microbiol.* 2016; 47:424-30.
- Rajkowska K, Kunicka-Styczyńska A, Maroszyńska M, Selected essential oils as antifungal agents against antibiotic-resistant *Candida* spp.: *in vitro* study on clinical and food-borne Isolates. *Microb Drug Resist.* 2017; 23:18-24.
- Reiter M, Brandt W. Relaxant effects on Tracheal and Ileal Smooth muscles of the Guinea Pig. *Arzneim Forsch* 1985; 35:408-414
- Reyes-Jurado F, López-Malo A, Palou E. Antimicrobial activity of individual and combined essential oils against foodborne pathogenic bacteria. *J Food Prot.* 2016; 79:309-15.
- Sakkas H, Gousia P, Economou V, Sakkas V, Petsios S, Papadopoulou C, In vitro antimicrobial activity of five essential oils on multidrug resistant Gram-negative clinical isolates. *J Intercult Ethnopharmacol.* 2016; 5:212-8.

- Santoro GF, das Gracas Cardoso M, Guimaraes LG, Salgado AP, Menna-Barreto RF, Soares MJ. Effect of oregano and thyme essential oils on *Trypanosoma cruzi* growth and ultrastructure. *Parasitol Res* 2007; 100:783-790
- Sarkozi S, Almassy J, Lukacs B, Dobrosi N, Nagy G, Jona I. Effect of natural phenol derivatives on skeletal type sarcoplasmic reticulum Ca<sup>2+</sup>-ATPase and ryanodine receptor. *J Muscle Res Cell Motility* 2007; 28:167-174
- Schwarz K, Ernst H, Ternes W. Evaluation of Antioxidative Constituents from Thyme. *Journal of the Sci Food Agriculture* 1996; 70:217-223
- Shaaya E, Ravid U, Paster N, Juven B, Zisman U, Pissarev V. Fumigant toxicity of essential oils against four major stored-product insects. *J Chem Ecol* 1991; 17:499–504
- Shapiro S, Guggenheim B. The action of thymol on oral bacteria. *Oral Microbiol Immunol* 1995; 10:241-246
- Sharifzadeh A, Javan AJ, Shokri H, Abbaszadeh S, Keykhosravy K. Evaluation of antioxidant and antifungal properties of the traditional plants against foodborne fungal pathogens., *J Mycol Med.* 2016;26:e11-7.
- Shoeibi Sh, Rahimifard N, Pirouz B, Yalfani R, Pakzda SR, Mirab Samie S, Pirali Hamedani M, mutagenicity of four natural flavors: clove, cinnamon, thyme and *Zataria multiflora* Boiss., *J Med Plants* 2009; 8 (Suppl. 5): 89-96.
- Simeon de Bouchberg M, Allegrini J, Bessiere C, Attisso M, Passet J, Granger R. Propriétés microbiologiques des huiles essentielles de chimiotypes de *Thymus vulgaris* Linnaeus. *Riv Ital EPPOS* 1976; 58:527-536
- Soares IH, Loreto ÉS, Rossato L, Mario DN, Venturini TP, Baldissera F, Santurio JM, Alves SH, In vitro activity of essential oils extracted from condiments against fluconazole-resistant and -sensitive *Candida glabrata*. *J Mycol Med.* 2015;25:213-7.
- Sokovic M, Glamoclija J, Ciric A, Kataranovski D, Marin PD, Vukojevic J, Brkic D. Antifungal Activity of the Essential oil of *Thymus vulgaris* L. and Thymol on Experimentally Induced Dermatomycoses. *Drug Dev Ind Pharm* 2008; 24:1-6
- Soliman KM, Badeaa RI. Effect of oil extracted from some medicinal plants on different mycotoxigenic fungi. *Food Chem Toxicol* 2002; 40:1669-1675
- Stahl E. *Lehrbuch der Pharmakognosie.* Gustav Fischer Verlag, Stuttgart 1962
- Stahl-Biskup E, Hiller K, Loew D. Thymi herba in: Wichtl M (editor): *Teedrogen und Phytopharmaka.* Wiss. VerlagsgesmbH, Stuttgart 2009
- Stahl-Biskup E. The chemical composition of thymus oils: a review of the literature 1960-1989. *J Ess Oil Res* 1991; 3:61-82
- Stammati A, Bonsi P, Zucco F, Moezelaar R, Alakomi H-L, Wright A von. Toxicity of selected plant volatiles in microbial and mammalian short-term assays. *Food Chem Toxicol* 1999; 37:813-823
- Szentandrassy N, Szentesi P, Magyar J, Nanasi P, Csernoch L. Effect of thymol on kinetic properties of Ca and K currents in rat skeletal muscle. *BMC Pharmacology* 2003; 3:9
- Szentandrassy N, Szigeti G, Szegedi C, et al. Effect of thymol on calcium handling in mammalian ventricular myocardium. *Life Sciences* 2004; 74:909-921
- Szweda P, Gucwa K, Kurzyk E, Romanowska E, Dzierżanowska-Fangrat K, Zielińska Jurek A, Kuś PM, Milewski S, Essential oils, Silver nanoparticles and propolis as alternative agents against fluconazole resistant *Candida albicans*, *Candida glabrata* and *Candida krusei* clinical isolates. *Indian J Microbiol.* 2015;55:175-83.

- Takeuchi H, Lu ZG, Fujita T. New monoterpene glucoside from the aerial parts of thyme (*Thymus vulgaris* L.). *Biosci Biotechnol Biochem* 2004; 68:1131-1134
- Thompson JD, Chalchat JC, Michet A, Linhart YB, Ehlers B. Qualitative and quantitative variation in monoterpene co-occurrence and composition in the essential oil of *Thymus vulgaris* chemotypes. *J Chem Ecol* 2003; 29:859-880
- Thosar N, Basak S, Bahadure RN, Rajurkar M, Antimicrobial efficacy of five essential oils against oral pathogens: An *in vitro* study. *Eur J Dent.* 2013;7(Suppl 1):S71-7.
- Tschirch A. *Handbuch der Pharmakognosie. 2 Abteilungen (in 4 Bänden).* Leipzig, Tauchnitz 1909– 1917 (1917)
- Tullio V, Nostro A, Mandras N, Dugo P, Banche G, Cannatelli MA, Cuffini AM, Alonzo V, Carlone NA. Antifungal activity of essential oils against filamentous fungi determined by broth microdilution and vapor contact methods. *J Appl Microbiol* 2007; 102:1544-1550
- Twetman S, Petersson LG. Interdental caries incidence and progression in relation to mutans streptococci suppression after chlorhexidine-thymol varnish treatments in schoolchildren. *Acta Odontol Scand* 1999; 57(3):144-148
- Undeğer U, Başaran A, Degen GH, Başaran N, Antioxidant activities of major thyme ingredients and lack of (oxidative) DNA damage in V79 Chinese hamster lung fibroblast cells at low levels of carvacrol and thymol., *Food Chem Toxicol.* 2009;47:2037-43.
- Undeger U, Başaran A, Degen GH, Başaran N. Antioxidant activities of major thyme ingredients and lack of (oxidative) DNA damage in V79 Chinese hamster lung fibroblast cells at low levels of carvacrol and thymol. *Food Chem Toxicol* 2009; 47(8):2037-2043
- Vampa G, Albasini A, Provvisionato A, Bianchi A, Melegari M. Etude chimique et microbiologique sur les huiles essentielles de Thymus. *Plant Med Phytother* 1988; 22:195-202
- Vázquez-Sánchez D, Cabo ML, Rodríguez-Herrera JJ. Antimicrobial activity of essential oils against *Staphylococcus aureus* biofilms. *Food Sci Technol Int.* 2015;21:559-70.
- Vollmer H. Untersuchungen über Expektorantien und den Mechanismus ihrer Wirkung *Klinische Wochenschrift* 1932; 11:590-595
- Von Skramlik E. Über die Giftigkeit und Verträglichkeit von ätherischen Ölen. *Pharmazie* 1959; 14:435-445
- Wagner H, Wierer M, Bauer R. In vitro Hemmung der Prostaglandin-Biosynthese durch etherische Öle und phenolische Verbindungen. *Planta Med* 1986; 184-187
- Yones DA, Bakir HY, Bayoumi SA. Chemical composition and efficacy of some selected plant oils against *Pediculus humanus capitis* in vitro. *Parasitol Res.* 2016;115:3209-18.
- Youdim KA, Deans SG, Finlayson HJ. The antioxidant properties of thyme (*Thymus zygis* L.) essential oil: an inhibitor of lipid peroxidation and a free radical scavenger. *J Ess Oil Res* 2002; 14:210-215
- Youdim KA, Deans SG. Beneficial effects of thyme oil on age-related changes in the phospholipid C20 and C22 polyunsaturated fatty acid composition of various rat tissues. *Biochimica et biophysica acta* 1999; 1438:140-146
- Youdim KA, Deans SG. Dietary supplementation of thyme (*Thymus vulgaris* L.) essential oil during the lifetime of the rat: its effects on the antioxidant status in liver, kidney and heart tissues. *Mechanisms of ageing and development* 1999a; 109:163-175



Youdim KA, Deans SG. Effect of thyme oil and thymol dietary supplementation on the antioxidant status and fatty acid composition of the ageing rat brain. *British J Nutrition* 2000; 83:87-93

Zani F, Massimo G, Benvenuti S, Bianchi A, Albasini A, Melegari M, Vampa G, Bellotti A, Mazza P. Studies on the genotoxic properties of essential oils with *Bacillus subtilis* rec-Assay and *Salmonella* Microsome Reversion Assay. *Planta Med* 1991; 57:237–241