Chemical composition, antitumor, antioxidant and antimicrobial activity of *Thymus vulgaris* and *T. algeriensis* essential oils

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Plants from genus *Thymus* are often used in traditional medicine. Some of these species are important medicinal plants that are used in ethnomedicine. In this work, analysis of phytochemicals and bioactivity evaluation of *Thymus vulgaris* and *T. algeriensis* essential oils were done. The chemical composition of oils were evaluated using GC/MS; cytotoxic activity was tested against five human tumor cell lines MCF-7 (breast adenocarcinoma), NCI-H460 (non-small cell lung cancer), HCT-15 (colon carcinoma), HeLa (cervical carcinoma), HepG2 (hepatocellular carcinoma) and non-tumor cell line PLP2 (porcine liver cell culture); DPPH scavenging activity, reducing power, β-carotene bleaching inhibition and TBARS inhibition were used to assessed the antioxidant potential of oils; antimicrobial activity, minimum inhibitory (MIC) and minimum bactericidal/fungicidal (MBC/MFC) concentrations, were determined using microdilution method. Eight bacterial species isolated from oral cavity were used: *S. mutans, S. sanguis, S salivarius, S. pyogenes, S. aureus, P. aeruginosa, L. acidophilus* and *E. feacalis* and fifty eight clinical oral *Candida spp.* along with two reference strains were used. The dominant constituents of *T. vulgaris* oil were: *p*-cymene (18.99%) and thymol (48.92%). The major component of *T. algeriensis* oil was: thymol (38.50%). Both essential oils inhibited the growth of human tumor cell lines tested. *T. algeriensis* showed greater potential (GI_{50} 0.062±3.11 – 0.064±1.51 mg/ml), compared to *T. vulgaris* (GI_{50} 0.076±5.98 –0.18±2.68 mg/ml). None of the oils showed hepatotoxicity in the porcine liver primary cell culture (GI_{50} > 0.40 mg/ml). *T. algeriensis* oil showed stronger antioxidant activity in DPPH scavenging activity and reducing power measurements (EC_{50} 1.64±0.05; 0.68±0.01 mg/ml) versus *T. vulgaris* (EC_{50} 4.80±0.18; 1.54±0.04 mg/ml). However, *T. vulgaris* oil showed

stronger activity in β-carotene bleaching inhibition and TBARS inhibition methods (EC_{50} 0.18±0.04; 0.05±0.00 mg/ml) compared to *T. algeriensis* (EC_{50} 1.56±0.12; 0.31±0.01 mg/ml). *T. algeriensis* showed higher antimicrobial activity towards the selected bacterial species (MIC 0.02-0.08; MBC 0.04-0.16 mg/ml) compared to *T. vulgaris* (MIC 0.08-0.16; MBC 0.16-0.32 mg/ml). Fungi appeared to be more sensitive and again *T. algerienesis* oil showed higher activity (MIC 0.005-0.010; MFC 0.010-0.020 mg/ml) than *T. vulgaris* oil (MIC 0.04-0.08; MFC 0.08-0.16 mg/ml). The data of this study suggested that the both essential oils, especially *T. algeriensis* have great potential as natural agents for microbial infections. However, since essential oils are complex mixture of compounds, further study toward single components and their synergism and antagonism is needed. These investigations will be helpful for further utilization of the plant essential oils for their safe use in the pharmaceutical, food and cosmetics industries.

Antinociceptive activity of *Amorpha fruticosa* L. (Fabaceae) essential oil

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Inflammation and pain are two kinds of defense reactions of living systems in reply to any invasive factor. Acetic acid-induced writhing test represents a model that can reveal both antinociceptive and anti-inflammatory properties of substances. The essential oil of *Amorpha fruticosa* L. (at 400, 200 and 100 mg/kg) was evaluated for its antinociceptive activity using this test in BALB/c mice (n=6), alongside of aspirin (200 mg/kg) and olive oil (negative control). All tested essential oil doses reduced the number of writhings induced by acetic acid. The calculated percent of inhibition for the 400 mg/kg dose of the oil (54.4%) statistically differed from the positive control, aspirin (90.2%). As the injection of acetic acid produces the release of prostaglandins, such as $PGE_{2\alpha}$ and $PGF_{2\alpha}$, and sympathetic nervous system mediators in peritoneal fluid, the inhibition of prostaglandin release might represent one of the possible mechanisms of action exerted by the oil.

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