Phenolic content, antioxidant and antifungal activities of acetonic, ethanolic and petroleum ether extracts of *Hypericum perforatum* L.

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Abstract

The objective of this study was to evaluate antifungal and antioxidant activities of *Hypericum perforatum* L. extracts against the growth of certain fungi. The ethanolic, acetonic and petroleum ether extracts of the plant were evaluated for phenols, flavonoids and non-flavonoids. The highest amounts of phenols (17.6 mg EPC/g dry extract) and flavonoids (16.85 mg EPC/g dry extract) were found in the acetonic extract. The highest inhibitory effect on the growth of *Penicillium canescens*, *Fusarium oxysporum*, *Alternaria alternata, Aspergillus glaucus* and *Phialophora fastigiata* by the disk diffusion method was exhibited by the ethanolic extract at the concentration of 25 mg/disk. The minimum inhibitory concentration (*MIC*) of the ethanolic and petroleum ether extracts was 20 mg/mL. The acetonic extract did not affect the growth of the tested fungi. Antioxidant activity was assessed by determining 1,1-diphenyl-2-picrylhydrazyl hydrate (DPPH) free radical scavenging activity. The results showed that the ethanolic extract of *Hypericum perforatum* L. possesses antioxidant activity. The IC_{50} values, defined as the concentration of the test sample leading to 50% reduction of the free radical concentration, determined for each measurement were <7.8125, 105.9, 5.99 and 12.77 μg/ml for the ethanolic extract, the acetonic extract, ascorbic acid and BHT, respectively, for DPPH free radical scavenging activity.

Keywords: Antifungal activity • *Hypericum perforatum* • Total phenols • Antioxidant

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In recent years, the consumption of products derived from *Hypericum perforatum* L. *(Hypericaceae = Clusiaceae*) has increased dramatically, the plant being one of the most popular of medicinal plants worldwide [1]. These products derived from *Hypericum perforatum* L. are available as phytopharmaceuticals, nutraceuticals, teas, tinctures, juices, and oily macerates [2]. *Hypericum perforatum* L. has a wide range of medicinal uses, including skin wounds, eczema, burns, diseases of the alimentary tract, and psychological disorders [3]. Ethanolic extracts of this plant are known to contain a number of phenolic compounds, including hypericin, hyperforin and their derivatives, rutin, hyperoside, quercetin, chlorogenic acid, flavonols and flavones. This can serve as an indicator of their potential antioxidant properties [4]. Hypericin exhibits antibacterial, antiviral and anti-inflammatory activities [5], and hyperforin is the major antidepressive component [6]. Hyperforin shows effects against methicillin-resistant strains of *Staphylococcus aureus* with a minimum inhibitory concentration (*MIC*) value of 1.0 μg/ml [7]. Apart from having therapeutic properties, *Hypericum perforatum* L. is also used as a flavouring substance for foods and alcoholic beverages [8]. Additionally, infusions, alcoholic tinctures and fluid extracts of the plant are used in the flavouring industry to prepare liqueurs, especially digestive and tonic bitters [9]. In view of the above literature data confirming the use of *H. perforatum* as both an effective antimicrobial substrate and a taste corrigent, this study was aimed at evaluating the inhibitory effect of the selected *Hypericum perforatum* L. extracts against fungal growth in foodstuffs i.e. determining the potential use of the plant extracts as natural preservatives. Various studies suggested that total phenolic compounds are closely associated with antioxidant [10] and antimicrobial activities of phenols and phenolic extracts [11]. Phenols take part in biological oxidation-reduction reactions following the quinone/ /hydroquinone mechanism.

EXPERIMENTAL

Chemicals

1,1-Diphenyl-2-picrylhydrazyl hydrate (DPPH), Folin–Ciocalteu, Muller–Hinton broth, ascorbic acid, butylated hydroxytoluene (BHT), nystatin and pyrocate-

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