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Short communication

Plants used in folk medicine: The potential of their hydromethanolic extracts against *Candida* species

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ABSTRACT

Currently, opportunistic fungal infections are considered a serious problem regarding public health. Despite the advances towards the synthesis of new antifungal agents, an increasing incidence of drug-resistant microorganisms has been observed. In this sense, other alternatives are necessary. In the present work, the antifungal activity of extracts from ten different plants, commonly used in folk medicine, were evaluated against nineteen *Candida* strains, including *C. albicans*, *C. glabrata*, *C. parapsilosis* and *C. tropicalis* species. Although the majority of the extracts had no antimicrobial effect, *Juglans regia* extract was very effective, exerting an inhibitory effect against all the tested *Candida* strains, while *Eucalyptus globulus* was effective against seventeen of them. *Pterospartum tridentatum* and *Rubus ulmifolius* presented similar antifungal effects, being effective against six *Candida* strains. The diameter of halo ranged, respectively, between 9–14 mm and 9–21 mm to the mentioned plant extracts, and the MIC_{50} values evidenced mainly a fungistatic activity. Both extracts showed similar MIC_{50} values for *C. albicans* strains, while *C. parapsilosis* and *C. glabrata* were more sensible to *E. globulus*. Otherwise, all the *C. tropicalis* strains were more sensible to *J. regia*. Overall, hydromethanolic plant extracts could constitute promissory alternatives to the traditional antifungal agents.

1. Introduction

Medicinal plants have been widely used, since pre-historic era, not only to improve health and well-being, but also to treat some specific diseases/disorders (Agarwal et al., 2010; Bakkali et al., 2008; Sher, 2009). In the last years, those natural matrices have sparked an increasing interest for scientific researchers, who have proved their extremely richness in natural biomolecules, conferring a multitude of biological properties. Their phytochemical potential, synergistic effects and mechanisms of action have been studied, in different areas of knowledge (Alves-Silva et al., 2013; Shojaii and Fard, 2012; Singh et al., 2010). However, many extracts/compounds from plant origin remain unstudied.

In parallel with these advances on plant products research, microbiological area has been subjected to severe modifications. A wide variety of microorganisms exist in the commensal flora of healthy population, providing several benefits to the host. However, in the last two decades, some species have presented an abnormal overgrowth and they become harmful, affecting directly not only the welfare, but also the life of individuals (Kim and Sudbery, 2011; Mayer et al., 2013; Tsai et al., 2013).

Opportunistic fungal infections, namely *Candida* species, comprise the most common deep pathogenic infections, being observed not only in immunocompromised patients, but also around the hospital and even in the rest of the population (Abi-Said et al., 1997; Eggimann et al., 2003; Li et al., 2006; Raman et al., 2013). *Candida albicans* has been considered the most relevant species in the mentioned infections, nevertheless, other *Candida* species have been, currently, pointed out, such as *Candida tropicalis*, *C. glabrata*, *C. dubliniensis*, *C. parapsilosis*, *C. orthopsilosis*, *C. metapsilosis*, *C. krusei*, *C. famata*, *C. guilliermondii* and *C. lusitaniae* (Brunke and Hube, 2013; Ferreira et al., 2013; Kim and Sudbery, 2011; Mayer et al., 2013; Sardi et al., 2013).

Concomitantly, increasing rates of drug-resistant pathogenic microorganisms have been observed, in part due to the indiscriminate use of some antimicrobial agents (Kanafani and Perfect, 2008; Sangamwar et al., 2008; Sanglard and Odds, 2002; Sanglard, 2002; White et al., 1998). Some advances in pharmaceutical industries have been achieved, towards the synthesis and/or preparation of

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Table 1
Antifungal activity of hydromethanolic extracts from different plant origin, against several *Candida* species.

Species	Strains	Origin	Inhibition zones (mm)									
			Echinacea purpurea	*Eucalyptus globulus*	*Foeniculum vulgare*	*Juglans regia*	*Matricaria recutita*	*Melissa officinalis*	*Pterospartum tridentatum*	*Rosa canina*	*Rubus ulmifolius*	*Tabebuia impetiginosa*
C. albicans	ATCC 90028	Reference	–	10	–	13	–	–	10	–	10	–
	575541	Urinary	–	12	–	13	–	–	–	–	9	–
	557834	Vaginal	–	12	–	12	–	+	10	++	10	–
	558234	Vaginal	–	11	–	12	–	–	9	–	15	++
C. glabrata	ATCC 2001	Reference	–	21	–	14	–	–	11	–	19	–
	D1	Oral	–	13	–	12	–	–	11	–	++	–
	513100	Urinary	–	11	–	10	–	–	9	–	16	–
C. parapsilosis	ATCC 22019	Reference	++	10	++	12	–	–	++	–	–	–
	AM2	Oral	–	9	–	12	–	–	++	–	++	–
	AD	Oral	–	18	–	12	–	–	–	–	+	+
	491861	Vaginal	–	+	++	11	+++	–	–	–	++	+++
	513143	Vaginal	–	12	–	10	+	–	–	–	–	–
C. tropicalis	ATCC 750	Reference	–	13	–	11	–	–	+	–	–	–
	AG1	Oral	–	11	++	12	–	–	+++	–	–	–
	75	Vaginal	–	12	–	10	–	–	–	–	++	–
	12	Vaginal	–	+++	–	9	–	–	–	–	–	–
	544123	Urinary	–	9	–	10	–	–	–	–	–	–
	519468	Urinary	–	10	–	10	–	–	–	–	–	–
	T2.2	Oral	–	9	–	10	–	–	–	–	–	–

(–) Absence of antifungal effect, (+) cell growth inhibition, (++) cell density reduction, (+++) cell density reduction and growth inhibition.