1		The inherent anti-Candida properties of cinnamon leaf essential oil
2		and the combination effects between cinnamon leaf and clove
3		essential oils on <i>Candida</i> species
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6		Outline
7	1.	Introduction
8	2.	Effect of Cinnamomum verum leaf essential oil on virulence factors of Candida
9		species and determination of the in-vivo toxicity with Galleria mellonella model
10	3.	Cinnamon leaf and clove essential oils are potent inhibitors of Candida albicans
11		virulence traits
12	4.	Conclusion
13		Abstract
14		Plant-based essential oils (EO) are promising anti-virulence agents against the
15	mul	tidrug resistant opportunistic pathogen Candida spp. Cinnamon leaf (CNL) and clove
16	(CL	V) EOs identified eugenol as the predominant component, with proven fungicidal
17	activ	vity. Among all Candida species, C. albicans is the most frequent etiological agent in
18	fung	gal infections. This report aims to investigate the efficacy of CNLEO against 3 types
19	of C	Candida spp. (including C. albicans, C. tropicalis and C. dubliniensis), and elaborate
20	on v	whether the combination effect of CNLEO and CLVEO enhances the anti-Candida
21	abil	ity. The major component of both EOs was determined as eugenol with gas
22	chro	omatography-mass spectrometry (GC-MS). The minimum inhibitory concentration
23	(MI	C) was determined using broth microdilution, showing that CNLEO has the same
24	MIC	C against 3 types of Candida spp., and the MIC values of both oils would be used to
25	estii	mate the combination effect, showing that they are additive and synergistic against $C$ .
26	albi	cans. The effect of CNLEO on initial adhesion of Candida spp. was quantified using
27	XT	$\Gamma$ assay, showing the attenuation of adhesion after treatment; the germ tube formation
28	wou	ld be observed by Neubauer improved counting chamber, as for the anti-biofilm
29	activ	vity, XTT viability assay, scanning electron microscope (SEM) and Time lapses
30	mic	roscope would be used to perceive the variation, result shows a decreased
31	deve	elopment of biofilm and germ tube formation after treatment, and it also shows no
32	leth	al effect with Galleria mellonella larvae model. Through membrane leakage assay,
33	yeas	st-to-hyphal transition assay and mycelial growth assay, CNLEO and CLVEO were
34	both	n found to be effective on reducing growth and dimorphism transition at MICs and
35	half	of the lowest combined lethal concentration. Mutant strains $als1\Delta /\Delta$ , $als3\Delta /\Delta$ ,
36	hwp	$p1\Delta/HWP1$ +, and $efg1\Delta/\Delta$ were sensitive to either or both oils. In conclusion,
37	CNI	LEO can reduce the virulence factor of Candida, and the ability would be enhanced
38	whe	n combined with CLVEO.

1	References
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