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ANTIFUNGAL ACTIVITY OF *Critmum maritimum* ESSENTIAL OIL AND ITS COMPONENTS AGAINST MUSHROOM PATHOGEN *Mycogone perniciosa*

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The young shoots and leaves of *Critmum maritimum* are valued for their salty, spicy taste and for their vitamin C and mineral salts content. The strongly scented essence extracted from the whole plant can be added to food or medicinal wine to stimulate the appetite, aid digestion, and relieve flatulence [1]. The leaves have been used for medicinal purposes as a tonic, an antiscorbutic, diuretic, carminative, and digestive [2]. Essential oil isolated from see fennel exibited antioxidant and antibacterial activities [3], and high insecticidal activities [4]. Previously isolated classes of constituents were essential oils [5, 6], coumarins [5, 7], and flavonoids [7].

We tested the antifungal activity of *C. maritimum* essential oil against mushroom pathogenic microfungi *Mycogone perniciosa* Mang.

Roots of *Critmum maritimum* L. (Apiaceae) were collected in Herceg Novi, Montenegro during May 2003. Voucher specimen accession number CM 12505 is deposited in the herbarium of the Botanical Garden, Faculty of Biology, University of Belgrade.

Essential oil was prepared by hydrodistillation (in Clevenger-type apparatus) of fresh plant material (yield: 1.0%). Essential oils were investigated for their composition by the use of analytical GC/FID and GC/MS technique.

Antifungal activity was tested using the modified microatmospheric method [8]. Petri plates measuring 50 mm were filled with 10 mL potato dextrose agar (PDA) medium and then seeded with a small amount of 7-day-old mycelium culture of the tested fungi. The Petri dishes were then inverted and the determined amount (1–20 μL/disc) of pure oil and components (1–10 μL/disc) impregnated on sterile filter paper discs (6 mm in diameter) deposited on the inverted lid. Commercial fungicide, Prochloraz-Mn, was used as a negative control (5->50 μL/disc)). Minimal inhibitory quantities (MIQ) and minimal fungicidal quantities (MFQ) of essential oils were noted every 7 days. MIQ and MFQ are reported as the mean ± SD of tree replicates for each concentration (quantities) of oils. The inverted Petri dishes were incubated for 21 days at 25°C.

The chemical composition of *Critmum maritimum* essential oil is listed in Table 1. The two most abundant components were α-pinene (26.29%) and limonene (31.74%) and were used for testing antifungal activity (Table 2).

It can be seen that the essential oil and components tested showed much better antifungal activities than the commercial fungicide prochloraz-Mn. The essential oil of *C. maritimum* possessed antifungal activity with minimal inhibitory quantity at 1 μL/disc and minimal fungicidal quantity at 20 μL/disc. MIQ for α-pinene was 5 μL/disc, and MFQ 10 μL/disc, while limonene showed higher antifungal activity with MIQ 1 μL/disc, and MFQ 5 μL/disc. The essential oil and components showed high antifungal properties, which may be useful for practical purposes.

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TABLE 1. Chemical Composition of *Crimum maritimum* Essential Oil

Compound	KI*	%	Compound	KI*	%
α-Thujene	930	0.39	*cis*-Sabinene hydrate	1070	0.08
α-Pinene	**939**	**26.29**	Terpinolene	1089	0.45
Camphene	954	1.77	Linalool	1097	0.35
Sabinene	975	4.26	*trans*-Sabinene hydrate	1098	0.32
Myrcene	991	3.79	*trans*-Limonene oxide	1142	0.40
n-Octanal	999	2.92	Terpinen-4-ol	1177	0.77
α-Terpinene	1017	2.46	α-Terpineol	1189	0.14
p-Cymene	1025	2.78	*trans*-α-Bergamotene	1435	0.05
Limonene	**1029**	**31.74**	β-Sesquiphellandrene	1523	0.08
***cis*-β-Ocimene**	**1037**	**10.89**	Apiol	1678	0.11
trans-β-Ocimene	1050	0.29	Total		96.76
γ-Terpinene	1060	6.43			

*Kovats indices (KI).

TABLE 2. Antifungal Activity of *Critmum maritimum* Essential Oil and Its Components

Mycogone perniciosa	Essential oil	α-Pinene	Limonene	Proch.-Mn
	µL/disc			
MIQ	1.0	5.0	1.0	5.0
MFQ	20.0	10.0	5.0	>50.0

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