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Short report

Chemical composition and antimicrobial activity of *Momordica charantia* seed essential oil

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Abstract

The essential oil obtained from the seeds of *Momordica charantia* was analyzed by GC/MS. Twenty-five components, representing 90.9% of the oil, were identified. The main constituents were *trans*-nerolidol, apiole, *cis*-dihydrocarveol and germacrene D. Furthermore, the oil was tested for its antibacterial and antifungal activities. *Staphylococcus aureus* was found to be the most sensitive microorganism with MIC values <500 μg/ml.

Keywords: *Momordica charantia*; Essential oil; *Trans*-nerolidol; Antimicrobial activity

1. Plant

Momordica charantia L. (Cucurbitaceae), is a climber growing in tropical areas of Asia, Amazon, East Africa, and the Caribbean, seeds purchased in Hanoi, Vietnam, in May 2004. A voucher specimen (No. 8591/1) is deposited at the Herbarium Horti Botanici Pisani, Nuove Acquisizioni, Pisa, Italy.

2. Uses in traditional medicine

M. charantia is commonly known in English speaking countries as "bitter gourd" or "bitter melon" and is cultivated throughout the world for its use as vegetable as well as medicine [1,2]. The health benefits of bitter gourd have been well documented, especially its anti-diabetic properties [3]. It is also used as carminative, emmenagogue, in the treatment of colics, and as antiviral, anthelmintic, antimalarial, and antimicrobic remedy [4].

3. Previously isolated classes of constituents

Phenolics [5] and essential oil [6].

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4. Tested material

Essential oil (yield: 0.012%), was obtained from the dried seeds by hydrodistillation using the Clevenger-type apparatus. Composition of the oil [7–12] is reported in Table 1.

5. Studied activity

Antimicrobial activity by broth microdilution method (MIC) [13,14]. Bacteriostatic or bactericidal activity against the standard strain *S. aureus* ATCC 6538 by time kill assay [15].

6. Used microorganisms

Test microorganisms, listed in Table 2, were obtained from Pediatric Section (School of Medicine, University of Messina).

7. Results

The chemical composition of the essential oil is reported in Table 1. The results of the antimicrobial activity are given in Table 2; bacteriostatic or bactericidal activity against the standard strain *S. aureus* ATCC 6538 by time kill assay.

8. Conclusions

Twenty-five compounds were identified in the seed oil of *M. charantia* amounting to 90.9% of the total oil. The constituents are represented by sesquiterpenes (71.7%), phenylpropanoids (11.0%), and monoterpenes (7.6%), *trans*-

Table 1
Chemical composition[a] of the *M. charantia* seed essential oil

Constituents	l.r.i.[b]	%
A-Pinene	941	0.4
β-Pinene	982	tr[c]
Octanal	1003	tr
p-Cymene	1028	tr
Limonene	1033	tr
1,8-Cineole	1035	0.6
β-Phellandrene		0.3
Linalool	1100	tr
cis-Dihydrocarveol	1194	4.9
trans-Dihydrocarveol	1220	0.8
Carvone	1244	1.2
(*E*)-Anethole	1285	0.5
Safrole	1292	0.9
Methyl eugenol	1401	0.3
Germacrene D	1481	4.4
β-Selinene	1487	1.5
α-Selinene	1495	1.3
Myristecin	1521	0.4
δ-Cadinene	1524	0.4
trans-Nerolidol	1564	61.6
Spathulenol	1577	1.7
Cedrol	1598	0.3
β-Bisabolol	1672	0.5
Apiole	1580	8.9
Total identified		90.9

[a] Percentages obtained by FID peak-area normalization (HP-5 column).
[b] Linear retention indices (HP-5 column).
[c] tr=trace, <0.1%.

Table 2
Antimicrobial activity (MIC) of the *M. charantia* seeds essential oil

Microorganisms	MIC (μg/ml)[a]		
	EO[b]	Amikacin[c]	Amphotericin B[c]
E. coli ATCC 25922	>500	3.13	Not determined
C. albicans ATCC 10231	>500	–	0.78
S. aureus ATCC 6538	125	1.56	–
S. aureus clinical isolates (12)	125–500	1.56–3.13	–

[a] Values represent an average of triplicate.
[b] Essential oil.
[c] Positive control.

nerolidol being the major constituent (61.6%). The results of antimicrobial activity indicated that *S. aureus* ATCC 6538 was the most sensitive microorganism tested, while low inhibitory activities were evidenced against strains of *E. coli* and *C. albicans* with MIC values >500 μg/ml. Strains of *S. aureus* from clinical isolates were also tested resulting more susceptible with MIC values ranging from 125 to 500 μg/ml. Moreover, the bacteriostatic or bactericidal activity of the oil against the standard strain of *S. aureus* was evaluated performing a time kill assay. The time kill curve showed that the essential oil exhibited a time-dependent killing activity after 8 h of exposure to 1 × MIC (125 μg/ml) with a reduction >1 log CFU/ml from the starting inoculum. These results suggested that the antibacterial properties of *M. charantia* oil can be related to its high *trans*-nerolidol content which was tested previously [16,17].

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