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# American Journal of Essential Oils and Natural Products

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American  
Journal of  
Essential  
Oils and  
Natural  
Products

ISSN: 2321 9114  
AJEONP 2015; 2 (3): 16-17  
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Received: 29-01-2015  
Accepted: 14-04-2015

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## Composition and bioactivities of the leaf essential oil of *Ficus religiosa* Linn.

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### Abstract

The leaf essential oil of *Ficus religiosa* from Nepal was obtained by hydrodistillation and analyzed by gas chromatography – mass spectrometry. The major components of the leaf oil were eugenol (27.0%), itaconic anhydride (15.4%), 3-methyl-cyclohexanone-1,2-dione (10.8%), 2-phenylethyl alcohol (8.0%), and benzyl alcohol (4.2%). The leaf oil was screened for antimicrobial activity and was marginally active (MIC = 625 µg/mL) against *Aspergillus niger*, but was inactive (MIC = 2500 µg/mL) against *Pseudomonas aeruginosa*, *Bacillus cereus*, *Staphylococcus aureus*, *Escherichia coli*, and *Candida albicans*. The oil was marginally active in the brine shrimp lethality test ( $LC_{50}$  = 50 µg/mL) and also showed *in-vitro* cytotoxic activity against MCF-7 human breast tumor cell line (80±5% kill at 100 µg/mL).

**Keywords:** *Ficus religiosa*, peepal, essential oil composition, Nepal.

### 1. Introduction

The genus *Ficus* (Moraceae) is represented by 800 species and 2000 varieties throughout the world, among them forty-eight species of *Ficus* are found in Nepal [1], those are widely distributed in tropical and sub-tropical regions [2]. *Ficus religiosa* Linn. grows from 150 m to 1550 m above sea level. *F. religiosa* is considered to be the oldest and most sacred tree in the Hindu mythology which is commonly known as ‘Peepal tree’. It is a widely branched tree; leaves are heart shaped with long tips and long slender petioles [3]. *F. religiosa* is traditionally used in treatment of many diseases such as skin diseases, diabetes, respiratory disorders, gastric problems, and central nervous system disorders [4].

Previous phytochemical investigations have shown that *F. religiosa* is a good source of the flavonoid quercetin [5]. The bark of this tree contains tannins, saponins, flavonoids, steroids, terpenoids, and cardiac glycosides [6-7]. The leaf oil of *Ficus capensis* from India has carvacrol, (*E*)-caryophyllene, and caryophyllene oxide as the major components [8]. The biological activities and chemical composition of the leaf essential oil of *F. religiosa*, however, have not been previously reported.

### 2. Materials and Methods

Leaves of *F. religiosa* were collected from Kirtipur, Nepal (27°67' N 85°28' E, 1360 m above sea level), and the essential oil was obtained by hydrodistillation in a yield of 0.009% (v/w). The essential oil was analyzed by GC-MS and screened for antimicrobial, cytotoxicity, and brine shrimp lethality as described previously [9].

### 3. Results and Discussion

The leaf essential oil composition of *F. religiosa* is listed in Table 1. From a total of 44 peaks, 97.20% of the compounds were identified in the oil. The major components of the leaf oil were identified to be eugenol (27.0%), itaconic anhydride (15.4%), 3-methyl-cyclohexanone-1,2-dione (10.8%), 2-phenylethyl alcohol (8.0%), and benzyl alcohol (4.2%).

The leaf oil was screened for antimicrobial activity and was marginally active (MIC = 625 µg/mL) against *Aspergillus niger*, but was inactive (MIC = 2500 µg/mL) against *Pseudomonas aeruginosa*, *Bacillus cereus*, *Staphylococcus aureus*, *Escherichia coli*, and *Candida albicans*. The oil was marginally active in the brine shrimp lethality test ( $LC_{50}$  = 50 µg/mL) and also showed *in-vitro* cytotoxic activity against MCF-7 human breast tumor cell line (80±5% kill at 100 µg/mL).

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**Table 1:** Composition of the leaf essential oil of *Ficus religiosa* Linn. From Nepal

RI	Compound	%
856	(3Z)-Hexenol	1.1
867	(2Z)-Hexenol	0.7
869	n-Hexanol	0.7
983	Phenol	0.7
995	Adipoin	0.6
999	3-Methylcyclohexane-1,2-dione	10.8
1018	Itaconic anhydride	15.4
1032	Benzyl alcohol	4.2
1041	Salicylaldehyde	1.5
1043	Phenylacetaldehyde	0.6
1095	Allyl caproate	3.5
1100	Linalool	0.3
1105	n-Nonanal	0.3
1112	2-Phenylethyl alcohol	8.0
1131	Unidentified	0.8
1138	Benzeneacetonitrile	1.2
1154	(2E,6Z)-Nonadienal	0.4
1157	(2E)-Nonen-1-ol	0.5
1166	(2E,6Z)-Nonadienol	0.5
1168	(E)-Linalool oxide	0.5
1198	Catechol	1.1
1217	Coumaran	3.4
1299	(E)-Cinnamyl alcohol	0.6
1308	p-Vinylguaicol	1.1
1323	(3Z)-Hexenyl tiglate	0.6
1358	Eugenol	27.6
1434	(2E)-Hexenyl (3Z)-hexenoate	0.3
1487	(E)- $\beta$ -Ionone	1.6
1528	Dihydroactinidiolide	0.4
1537	$\alpha$ -Copaene-11-ol	0.4
1569	(3Z)-Hexenyl benzoate	0.5
1582	Unidentified	1.7
1596	Unidentified	0.7
1628	epi- $\gamma$ -Eudesmol	0.5
1631	$\gamma$ -Eudesmol	0.4
1641	epi- $\alpha$ -Cadinol	1.0
1650	$\beta$ -Eudesmol	1.8
1653	$\alpha$ -Eudesmol	1.0
1654	$\alpha$ -Cadinol	0.7
1715	Pentadecanal	0.7
1955	Palmitic acid	0.7
2108	Phytol	0.7
	Total identified	97.2%

#### 4. Acknowledgments

PS is grateful to Samjhana Maharjan and Bimala Lamichhane for assistance in collecting essential oil sample and Noura S. Dosoky for cytotoxic activity. WNS is grateful to an anonymous private donor for the gift of the GC-MS instrumentation.

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