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Research Article

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Anticancer Activity of Essential Oil from *Lantana camara* Flowers against Lung Cancer

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ABSTRACT

Lung cancer is a malignant tumor that characterized by uncontrolled cell growth in tissues of the lung. It is the most common cancer type causes death. The present study aimed to find and identify anticancer compound against lung cancer from the flower of Lantana camara plant. The wild L. camara was collected from the desert of 6th October city, Egypt. The yellow flowers were dried and extracted by different solvents with increasing polarity. The anticancer activity of each extract was investigated against lung carcinoma cell line by MTT test. The hexane extract that showed anticancer activity was purified by silica gel column eluted with ethyl acetate and methanol. The ethyl acetate fraction that showed the anticancer activity against lung cancer cells was analyzed by GC/MS. The analysis showed presence of 24 compounds including aliphatic and oxygenated hydrocarbons and mono and sesquiterpenes (sabinene, cis-Ocimene, Eucalyptol, Geranyl isovalerate, Menthol-1'-(butyn-3-one-1-yl), 7-epi-trans-sesquisabinene Hydrate, trans-Caryophyllene, tau.-Cadinol and Limonen-6-ol-pivalate. Several previous investigations reported presence of most of these terpenes in the essential oils that showed anticancer activities against different types of cancer cells. So, the present study is an addition for the anticancer activities of essential oils. Through this study we strongly recommend evaluation of such essential oils in in-vivo experiments against different types of cancer cells, as an initial step for clinical trials and chemotherapy of cancer disease.

Keywords: *L. camara*; Lung cancer; Monoterpenes; Sesquiterpenes

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INTRODUCTION

Lantana is a genus of about 150 species of perennial flowering plants that belongs to Verbenaceae family. *Lantana camara* Linn is a shrub that has found many applications in folk medicine [1]. Many studies have reported several biological activities and related these activities to its chemical composition. The antibacterial and antifungal activities of *Lantana* sp. essential oil were reported [2-10]. Furthermore, it showed several other activities such as insect repellent [11], insecticidal [12] anti-nematodes [13], larvicidal [14], anti-inflammatory [15] and antioxidant activities [16]. Analysis of the aerial part and roots for fixed compounds of genus Lantana indicated the presence of flavonoids, glycosides and alkaloids [15,17-19]; while the volatile constituents from showed abundance of monoterpenes and sesquiterpenes [8,9,20].The emergency and spread of cancer disease justifies searching for save and effective solutions. Therefore, the present study aimed to identify natural anticancer components from the yellow flower of *L. camara* against lung cancer.

MATERIALS AND METHODS

Plant Collection and Extraction

The *L. camara* wild plant was collected from the desert of 6th city, Giza, Egypt. The plant was identified in the Plant Biology Department, Faculty of Science, Cairo University. The plant flowers were dried in shadow and homogenized. Since this study aimed at extraction of any bioactive compound from flowers, the extraction was

performed using different organic solvents with increasing polarity, not by hydrodistillation that extract the volatile compounds only. To do that, ten g of the dried flowers were sequentially extracted by soaking in 100 ml of different solvents with increasing polarity (hexane, petroleum ether, ethyl acetate and methanol) in a conical flask on a rotary shaker for one day at room temperature. The supernatant was separated by filtration and evaporated by rotary evaporator at 40°C. The remaining residue after evaporation was dissolved in 1 ml of dimethyl sulfoxide (DMSO) for anticancer test.

Anticancer Test

MTT test [3-(4,5-Dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide] was used. Cell lines (5.0×10^4) were plated in 96-well plates with serum-free RPMI-1640 media. Aliquots from each plant extracts at 0, 2, 4, 8, 16, 32, 64, and 128 µg/ml concentration in triplicates were added followed by incubation for 24 h at 37°C in a 5% CO_2 incubator. The media were then removed and 100 µl of 3-(4, 5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) reagent was added to each well and was incubated again for 3-4 hr. Before adding 100 µl dimethyl sulfoxide to each, MTT reagent was removed and gently shaken. The untreated cells were compared to plant extract-treated cells. The absorbance was measured at 570 nm using a microplate-reader. This test was performed at the VACSERA lab, Giza, Egypt.

Purification of the Crude Hexane Extract

Primary TLC analysis was performed using silica gel TLC plates (Merck) eluted with different mobile phases: Hexane, hexane: petroleum ether 1:1 and 1:2, methanol and ethyl acetate. The obtained colored bands were examined by eyes As well as were visualized under UV lamp 254 nm. A glass column (35 cm × 2.2 cm) packed with silica gel, G50 (Merck) was used to separate the compounds in the hexane extract. The column was eluted with 50 ml portions of ethyl acetate followed by methanol. Each fraction was collected and evaporated by rotary evaporator at 40°C and the remaining residue was tested for anticancer activity against lung cancer cells.

GC/MS Analysis

The ethyl acetate fraction was analyzed by GC/MS (thermo Scientific instrument), Hp-5MS column (30 m × 0.25 mm × 0.25 µm). Initial column temperature 40°C for 5 min., increased up to 275 by rate of 5°C/min and hold for 5 min. Nitrogen was used as mobile phase with a flow rate of 10 ml/min. The mass detector temperature 300°C, ion source temperature 300°C and the ionization mode was electron impact ionization.

RESULTS AND DISCUSSION

Among the five extracts prepared from the yellow flowers of *Lantana camara* plant, only the hexane extract showed anticancer activity against lung carcinoma cells. TLC analysis of the hexane extract using hexane petroleum ether: hexane 1:1 and 1:2 mobile phases showed no separation. Therefore, other mobile phases with higher polarity index values (ethyl acetate (4.4) and Methanol (5.1)) were used. Two bands were obtained with each of these two mobile phases. Therefore, methanol and ethyl acetate were selected as mobile phases for purification of the crude hexane extract by silica gel column. The MTT test for both methanol and ethyl acetate fractions against lung cancer cells showed anticancer activity for each of them. The GC/MS analysis of the most active extract (the methanol extract) showed presence of 24 compounds (Figure 1) that are belonging to aliphatic and oxygenated hydrocarbons, monoterpenes and sesquiterpenes (Table 1). The monoterpenes were sabinene, cis- delta carene, eucalyptol (1,8-Cineole), geranyl isovalerate and menthol-1'-(butyn-3-one-1-yl)-(1R,2S,5R); while the sesquiterpenes were 7-epi-trans-sesquisabinene hydrate, trans-caryophyllene, tau.-cadinol and limonen-6-ol, pivalate. Several previous investigations have been conducted for evaluation of the anticancer activities of essential oil from different plants, followed by identification of the essential oil components. Sabinene, delta-Careen, Eucalyptol, Caryophyllene, tau.-Cadinol and Limonen were among the major components in these different essential oils that showed variable anticancer activates. Therefore, the anticancer activities of essential oils can be attributed to these components. The essential oil of Navel Orange Peel showed anticancer activity against lung cancer. Limonene (74.6%), sabinene (0.7%) and 3-carene (0.3%) were among the components of this oil [21]. Sabinene was found in the essential oil of *Beilschmiedia erythrophloia* (5%), which was tested against human oral, liver, lung, colon, melanoma, and leukemia cancer cells [22].

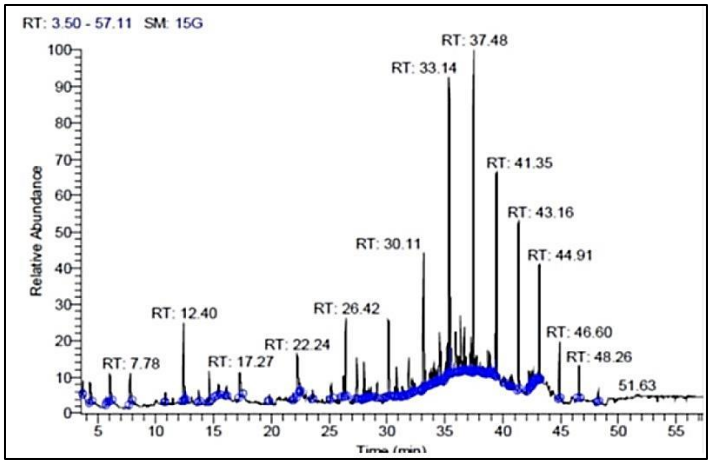

Figure 1: The GC/MS chromatogram of the ethyl acetate fraction of the *L. camara* yellow flowers extract

Table 1: Chemical composition of the ethyl acetate fraction of the *L. camara* yellow flowers extract

No.	Rt	Compound name	Composition %
1	3.7	2-methanol-1,3-Dioxolane	0.64
2	5.6	3-ethyl-Hexane	0.54
3	7.78	4-hydroxy-4-methyl-2-pentanone	2.88
4	12.4	Sabinene	4.93
5	13.7	delta carene	0.86
6	14.6	Eucalyptol (1,8-Cineole)	1.7
7	17.2	Nonanal	3.95
8	22.2	Nonadecane	4.84
9	25.19	7-epi-trans-sesquisabinene Hydrate	2.02
10	26.4	trans-Caryophyllene	4.8
11	27.3	à-Humulene	3.11
12	28	2,6,10,15-tetramethyl- Heptadecane.	2.23
13	28.3	Geranyl isovalerate	0.91
14	29.8	Menthol,1'-(butyn-3-one-1-yl)-,(1R,2S,5R)-	0.39
15	30.1	Nerolidol	8.25
16	32.14	tau.-Cadinol	1.44
17	33.14	Eicosane	9.85
18	34.16	Limonen-6-ol, pivalate	0.82
19	37.4	Heneicosane	22.91
20	41.3	Docosane	10.6
21	43.1	tricosane	6.88
22	44.9	Pentacosane	3.13
23	46.6	Heptacosane	2.49

Sabinene was also found in the essential oil of *Myristica fragrans* (16.1%) that showed anticancer activity against colon cancer [23] and the essential oil of *Tridax procumbens* that showed anticancer activity against melanoma cell line [24]. Sabinene was also found in the essential oil of the aerial parts of *Pituranthos tortuosus* that caused apoptosis of B16F10 melanoma cells [25] and in the essential oil of *Thymus vulgaris* (0.8%) that showed anticancer activity against breast adeno carcinoma, Human alveolar basal epithelial and hepatocellular carcinoma cells [26]. The essential oil (EO) of *Tanacetum annuum* aerial parts, containing 22.3% sabinene showed anticancer activity against human rhabdomyosarcoma cancerous cell line [27].

The essential oil of *Neolitsea variabillima* showed anticancer activity against human oral, liver, lung, colon, melanoma and leukemic cancer cells. The GC/MS analysis of this oil showed presence of trans-beta-ocimene (13.4%), alpha-cadinol (10.5%), terpinen-4-ol (9.3%), tau-cadinol (9.2%), beta-caryophyllene (8.8%) and sabinene (6.7%). The anticancer activity of this oil was attributed to beta-caryophyllene, tau-cadinol, and alpha-cadinol [28].

L. camara essential oil from leaves was cytotoxic to V79 mammalian cells and also to Artemia salina, showing 50% lethal concentration (LC50) value from 0.23 µg/mL. The major components of the essential oil were varying with the season of sample collection. Generally, the basic components were β-caryophyllene (10.5%), sabinene (7.98%), limonene (7.68%) and spathulenol (11.64%) [29]. The *Haplophyllum tuberculatum* essential oil showed anticancer

activity against lung and liver cancer cells. The GC/MS analysis of this oil showed presence of 3-Carene (3.8%) and Eucalyptol (1.6%) [30]. β-Caryophyllene was a major component of the *Commiphora gileadensis* essential oil that showed anticancer activity against lymphoma cell line**.** β-Caryophyllene was tested alone and showed the same effect [31]. The anticancer activity of β-Caryophyllene was also reported by Klaudyna et al. [32].

CONCLUSION

The volatile components of the *L. camara* yellow flower showed anticancer activity against lung cancer cells investigated by MTT test. The GC/MS analysis showed presence of monoterpenes (sabinene, cis- delta carene, eucalyptol (1,8-Cineole), geranyl isovalerate and menthol-derivative) and sesquiterpenes (7-epi-trans-sesquisabinene hydrate, trans-caryophyllene, tau.-cadinol and limonen-6-ol, pivalate). The literature showed presence of these components as major constitutes in the different essential oils that showed anticancer activities against variable cancer cells.

REFERENCES

[1] EL Ghisalberti. *Fitoterapia*. **2000**, 71, 467-486.
[2] MJ Deena; JE Thoppil. *Fitoterapia*. **2000**, 71, 453-455.
[3] T Hernández; M Canales; JG Avila; AM García; A Martínez; J Caballero; A Romo De Vivar; R Lira. *J Ethnopharmacol*. **2005**, 96: 551-554.
[4] A Jiménez-Arellanes; M Meckes; J Torres; J Luna-Herrera. *J Ethnopharmacol*. **2007**, 111, 202-205.
[5] AC Pereira; HWP Carvalho; GH Silva; DF Oliveira; HCP Figueiredo; AJ Cavalheiro; DA Carvalho. *Rev Bras Farmacogn.* **2008**, 18, 204-208.
[6] OO Sonibare; I Effiong. *Afr J Biotechnol*. **2008**, 7, 2618-2620.
[7] JGM Costa; EO Sousa; FFG Rodrigues; SGD Lima; R Braz-Filho. *Rev Bras Farmacogn*. **2009**, 19, 710-714.
[8] EO Sousa; NF Silva; FFG Rodrigues; AR Campos; SG De Lima; JGM Costa. *Pharmacogn Mag*. **2010**, 22, 78-82.
[9] O Erlânio; FS Sousa Natálya; FGR Fabiola; RC Adrian; GL Sidney; MJ Galberto. *Pharmacogn Mag*. **2010**, 6(22), 79-82.
[10] D Debasmita; RN Padhy. *J Herb Med*. **2013**, 3, 65-75.
[11] VK Dua; NC Gupta; AC Pandey; VP Sharma. *J Am Mosq Control Assoc*. **1996**, 12, 406-412.
[12] Y Rajashekar; HV Kumar; KV Ravindra; B Nandagopal. *Ind Crops Prod*. **2013**, 51,224-228.
[13] S Begum; A Wahab; BS Siddiqui; F Qamar. *J Nat Prod*. **2000**, 63, 765-767.
[14] JGM Costa; FFG Rodrigues; EO Sousa; DMS Junior; AR Campos; HDM Coutinho; SG De Lima. *Chem Nat Compd*. **2010**, 46, 313-315.
[15] LDS Julião; AL Piccinelli; S Marzocco; SG Leitão; C Lotti; G Autore; L Rastrelli. *J Nat Prod.* **2009**, 72, 1424-1428.
[16] N Rabia; B Asghari. *Asian Pac J Trop Dis.* **2013**, 3(6), 480-486.
[17] PC Rwangabo; M Claeys; L Pieters; J Corthout; DA Vanden Berghe; AJ Vlietinck. *J Nat Prod.* **1988**, 51, 966-968.
[18] JM Herbert; JP Maffrand; K Taoubi; JM Augereau; I Fouraste; J Gleye. *C J Nat Prod.* **1991**, 54, 1595-1600.
[19] G Deepak; S Sam; K Khan. *Eurasia J Biosci*. **2009**, 3, 69-77.
[20] MB Ngassoum; S Yonkeu; L Jirovetz; G Buchbauer; G Schmaus; FJ Hammerschmidt. *Flavour Frag J*. **1999**, 14, 245-250.
[21] C Yang; H Chen; H Chen; B Zhong; X Luo; J Chun. *Molecules*. **2017**, 22(8), 1391-1401.
[22] YC Su; CL Ho. *Nat Prod Commun*. **2013**, 8(1), 43-147.
[23] A Piras; A Rosa; B Marongiu; A Atzeri; MA Dessì; D Falconieri; S Porcedda. *J Food Sci.* **2012**, 77(4), 448-453.
[24] A Manjamalai; MJM Kumar; VMB Grace. *Asian Pac J Cancer Prev.* **2012**, 13(11), 5887-5895.
[25] M Krifa; H El Mekdad; N Bentouati; A Pizzi; K Ghedira; M Hammami; SE El Meshri,; L Chekir-Ghedira. *Tumour Biol*. **2015,** 36(7), 5165-5170.
[26] AA Fatimah. *Middle-East J Sci*. **2014**, 21(10), 1670-1676.
[27] S El Haddar; G Hassan; B Youssef; B Abdelaziz. *Moroccan J Biol*. **2008**, 4-5, 17-23.
[28] YC Su; KP Hsu; EI Wang; CL Ho. *Nat Prod Commun*. **2013**, 8(4), 531-532.

[29] LBP Medeiros; MDS Rocha; SG de Lima; GR de Sousa Júnior; GL Citó; D da Silva; JAD Lopes; DJ Moura; JS Mitra Mobin, JGM da Costa. *Rev Bras farmacogn.* **2012**, 22(6), 1259-1267.
[30] MS Omar; ME Abeer; KA Salmin. *Pharmacogn J*. **2016**, 8(1), 66-69.
[31] E Amiel; R Ofir; N Dudai; E Soloway; T Rabinsky; S Rachmilevitch. Evid Based Complement Alternat Med. **2012,** 2012, 872394.
[32] F Klaudyna; A Fiedorowicz; L Strza dała; A Szumny. *Cancer Med*. **2016**, 5(10), 3007-3017.