INTERNATIONAL RESEARCH JOURNAL OF PHARMACY
www.irjponline.com
ISSN 2230 – 8407

Research Article

PRELIMINARY PHYTOCHEMICAL SCREENIG AND HIGH PERFORMANCE THIN LAYER CHROMATOGRAPHY[HPTLC] DETECTION OF PHENOLIC ACIDS IN *LANATA CAMARA* LEAVES CULTIVATED IN IRAQ

Noor S Jaafar, Maha N Hamad, Dhuha A. Alshammaa *, Maryam R Abd
Department of Pharmacognosy and Medicinal Plants, College of Pharmacy, University of Baghdad, Baghdad, Iraq
*Corresponding Author Email: alshammaadhuha6@gmail.com

Article Received on: 28/06/18 Approved for publication: 12/07/18

DOI: 10.7897/2230-8407.097126

ABSTRACT

Objective: the objective of this work was to investigate the phytochemical groups and to detect phenolic acids in *L. camara* leaves using high-performance thin-layer chromatography (HPTLC). Methods: Leaves of *L. camara* were macerated thrice a week in petroleum ether, then in ethanol. Powdered leaves and ethanolic extract were subjected to phytochemical investigation. Acidic hydrolysis were performed on the extract, and then fractionated by petroleum ether, chloroform, ethyl acetate, and n-butanol. The chloroform and ethyl acetate fractions were analyzed by HPTLC for their phenolic acid contents. Result: *L. camara* leaves devoid of alkaloids. Three different phenolic acids were detected in the leaf extract. Conclusion: Gallic acid, caffeic acid and p-coumaric acid were detected in *L. camara* leaves

Keywords: *Lantana camara,* preliminary screening, phenolic acids, HPTLC.

INTRODUCTION

Lantana camara L. (Family: Verbenaceae) sometimes also known as wild or red sage[1], is an ornamental flowering evergreen shrub whose indigenous origin from America and Africa, it spreads over fifty countries[2,3]. Because *L. camara* predominates the native types and result in biodiversity loss so considered as a noxious weed[4], nevertheless it is recognized as one of the important medicinal plants[5]. *Lantana camara L* is a perennial, struggling, erect, aromatic odor shrub with diverse flower color as orange, red, pink, white and violet, it is growing to a height of about 3 meters and 2.5 meters width[6,7], this shrub mainly uses as an herbal medicine, but also as a source of firewood and mulch[8].

A great variation in *L. Camera* chemical constituents have been demonstrated according to geographical regions or climate[9]. Phytosterols, saponins, flavonoids, tannins, coumarins, anthocyanins, alkaloids, essential oil and glycosides have been identified in *Lantana camara* fruits and leaves[5, 7,10-12].

The whole plant is traditionally used for numerous illness[13]were it's used as a remedy respiratory problems as bronchitis[7] for rheumatism, wounds, headache, toothache, for malaria, epilepsy, urinary stone, skin problems and others[14].

The leaves have antimicrobial[15], antiurolithiatic, antioxidant[16,17], hypoglycemic[17], antiulcer, antispasmodic[18], antimotility, anthelmintic[19], cytotoxic[20], analgesic[14], antipyretic, hypolipidemic, wound healing[21] and larvicidal effects[22].

Phenolic acids (phenolcarboxylic acids) are non-flavonoids poly phenolic compounds [23], considered as a subclass of the larger phenolics family, designated as phenols having one carboxylic acid functionality[24]. Biosynthetically phenolic acids produced from shikmic acid via the phenylpropanoid pathway[25]. Predominantly phenolic acids are of plant origin, but some of them are of microbial origin[26]. Based on the constitutive carbon frameworks, two classes of phenolic acids are distinguished hydroxycinnamic (C6 - C3) and hydroxybenzoic (C6- C1) structures[27]. The number and the position of the hydroxyl functions on aromatic ring create the variation in phenolic acids, though the basic skeleton remains the same[28]. The hydroxylcinnamic acids as (p-coumaric, caffeic, sinapic and ferulic) are more common than the other class (hydroxybenzoic acids) and mostly occur as esters of quinic acid and glucose such as chlorogenic acid (an ester of caffeic acid and quinic acid). Inedible plants hydroxybenzoic acids(vanillic, p-hydroxy benzoic and protocatechuic acid) content is usually low, except onions, black radish and certain red fruits. Hydroxybenzoic acid derivatives predominantly occur as glycosides[29,30].

Pharmacologically phenolic acids act as antioxidants[31], anti-inflammatory[32] antiviral and antibacterial[33], anti-allergic and other effects[34].

The aim of this work was to investigate the phytochemicals and to detect phenolic acids in *L. camara* leaves using HPTLC.

MATERIAL AND METHODS

Collection of plant materials

Leaves of *Lanata camara* were collected from garden of college of pharmacy/Baghdad University in November 2017, the plant was authenticated by specialist botanist in our pharmacy college without specimen number.

The leaves were thoroughly washed under running tap water, then distilled water, shade dried at room temperature for two weeks, grind in an electric, grinder to get fine powder.

Equipment and chemicals

The instruments used were rotary evaporator (BÜCHI Rotavapor R-205, Swiss) and HPTLC (Eike Reich/CAMAG–Laborator, Switzerland). All chemicals and solvents (ethanol, petroleum ether 60-80 °C, chloroform, ethyl acetate, n-butanol, formic acid and hydrochloric acid) used were of analytical grade and obtained from Riedel-de Haen, Germany. The standard Gallic acid, Caffeic acid and P-Coumaric acid were purchased from Chengdu Biopurify phytochemicals, China (purity>97). HPTLC plates silica gel 60 F 254 (20 x 10cm) from E. MERCK KGaA was used in the analysis.

Extraction

Fifty grams of leaves were macerated thrice a week in 500 ml petroleum ether 60-80 °C with occasional shaking, then filtration, the dried marc was macerated thrice a week in 500 ml ethanol, and the filtrates were dried under reduced pressure to get dry extracts.

Phytochemical investigation for crude extract

Chemical tests are used to identify the presence of phytochemicals. The crude extract and powdered leaves were subjected to phytochemical investigation for flavonoids, tannins, alkaloids, saponins and phytosterols.

Test for flavonoids (alkaline reagent test)

The crude leaves extract was mixed with 2 ml of 2% sodium hydroxide solution. An intense yellow color which vanishes upon addition of a few drops of dilutes acid indicate the presence of flavonoids[35].

Test for tannins

In a test tube contains 0.5 g of extract, 10 ml of water was added and heated till boiling then filtration. A few drops of 0.1 % ferric chloride solution were added to filtrate. The presence of tannins was confirmed through the formation of brownish green or a blue-black color[36].

Test for alkaloids

A test tube containing 0.5 g of powdered leaves, 1.5 ml of ammonia solution was added to it, allowed to stand for minutes. 5 ml of chloroform was added to this mixture, which was shaken, filtered to remove the powder. The chloroform was evaporated by water bath. 1 ml of Mayer's reagent was added. The presence of alkaloid was confirmed through the formation of creamy colored precipitate[37].

Test for saponins

A pinch of the dried powdered leaves was added to a test tube contains 2-3 ml of distilled water. The mixture was shaken vigorously. The presence of saponin is indicated by foam formation[38].

Test for phytosterols

Fifty mg of the extract was dissolved in 2 ml of acetic anhydride, then into this mixture a few drops of concentrated sulfuric acid were added slowly along the sides of each test tube, the presence of phytosterol is indicating an array of color changes[39].

Hydrolysis of crude ethanolic extract

Three grams of the crude extract were boiled with 150ml of 5% HCl solution for seven hours using reflux. The solution was cooled and partitioned with 150ml x 2 of petroleum ether 60-80 °C, chloroform, ethyl acetate and n-butanol successively. The first three fractions were dried over anhydrous sodium sulfate, filtered and evaporated to dryness under reduced pressure using a rotary evaporator.

HPTLC analysis

Chloroform and ethyl acetate fractions were also analyzed for their phenolic acid contents utilizing HPTLC (Eike Reich/CAMAG–Laboratory, Switzerland), using HPTLC plates silica gel 60 F 254, 20 x 10cm, developed in twin trough chamber (20 x 10cm) previously saturated with a mobile phase composed chloroform: ethyl acetate: formic acid (25:20:5) for 20 min. The examination was done at 254, 366 nm wavelength, daylight and after spraying with alcoholic KOH.

Standard solutions of Gallic acid, caffeic acid and p-coumaric acid and samples (chloroform and ethyl acetate fractions) were prepared by dissolving 1 mg of each in 1 ml of methanol.

RESULT AND DISCUSSION

Preliminary phytochemical screening tests are useful in the recognition of bioactive principles and consequently may lead to drug or medicine discovery and development. In this study, several phytochemical constituents have been identified. Preliminary phytochemical screening of *Lanata camara* leaves revealed the presence of flavonoids, tannins, steroids and saponins, while alkaloids are absent[9,40]. These phytochemicals might be responsible for various medicinal characteristics[13]. The result of the phytochemical analysis is listed in table 1.

HPTLC becoming a popular method for analysis and quantification of compounds present in plant extract, because of better resolution, short analysis duration, small amount of mobile phase required and several samples can be analyzed simultaneously (i.e. On the same plate)[41].

HPTLC chromatograms of chloroform and ethyl acetate fractions at UV 254 and 366 nm revealed that all the sample constituents were obviously separated without any tailing and diffuseness. After spraying with alcoholic KOH the color of separated spots was changed or intensified give an indication for the presence of phenolic compounds. Chloroform and ethyl acetate fractions contain five and eight peaks respectively, which indicate the presence of five and eight constituents successively. The R_f values ranged from 0.02 to 0.62, and from 0.02 to 0.52 for separated constituents in chloroform and ethyl acetate respectively.

By comparing the R_f values of standards with the R_f values of the separated components in both fractions, caffeic, p-coumaric acids were detected in both fractions while Gallic acid was only detected in ethyl acetate fraction. The HPTLC profile of the analyzed fractions is shown in table 2.

Previous studies reported the presence of chlorogenic acid in the *L. camara* leaves[42], which upon hydrolysis yield caffeic acid and quinic acid[43]. Also caffeic acid is generated from p-coumaric acid via hydroxylation[44] Gallic acid (3,4,5 -trihydroxybenzoic acid) is found both as part of the tannin molecule and as a free state. Since Gallic acid has a carboxylic acid functionality and the hydroxyl groups in the same molecule, two of its molecules can interact

with one another to form a digallic acid (an ester), acidic hydrolysis of digallic or tannic acid yield Gallic acid[45]. The max R_f values of standards (Gallic acid, caffeic acid, p-coumaric acid) and detected phenolic acids in analyzing fractions are shown in table 3. The chemical structures of detecting phenolic acids are shown in figure 1, HPTLC chromatograms of standards and analyzed fractions are shown in figure 2 and figure 3.

Table 1: phytochemical analysis of *Lanata camara* leaves

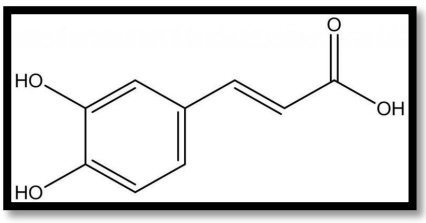
	Test				
***L. camara* leaves**	**flavonoids**	**Tannins**	**alkaloids**	**saponins**	**phytosterols**
	+	+	-	+	+

Table 2: Phenolic acid content of *Lanata camara* leaves

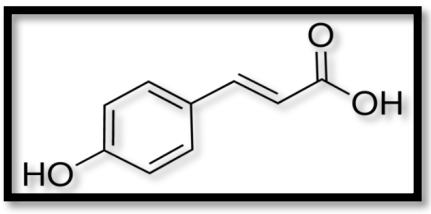
Sample	Phenolic acids
Chloroform fraction	Caffeic acid, p-coumaric acid
Ethyl acetate fraction	Gallic acid, caffeic acid, p-coumaric acid

Table 3: The max R_f values of standards and detected phenolic acids in analyzing fractions

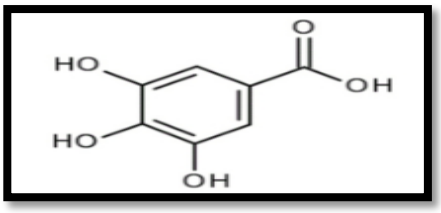
Sample	Max R_f of Gallic acid	Max R_f of p-coumaric acid	Max R_f of caffeic acid
Standard	0.29	0.52	0.44
Chloroform fraction	----	0.49	0.46
Ethylacetate fraction	0.29	0.52	0.43



a

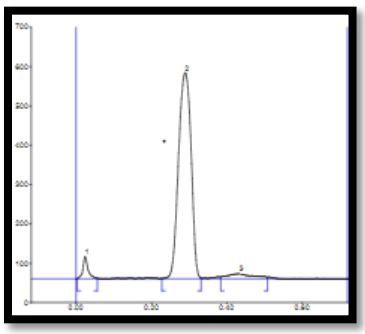


b



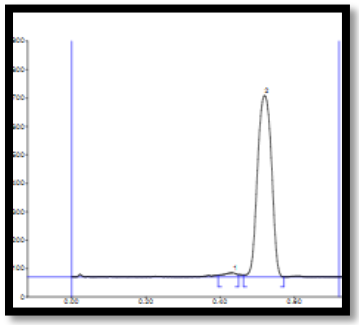
c

Fig. 1: Chemical structures of (a: caffeic acid, b: p-coumaric acid, c: gallic acid)



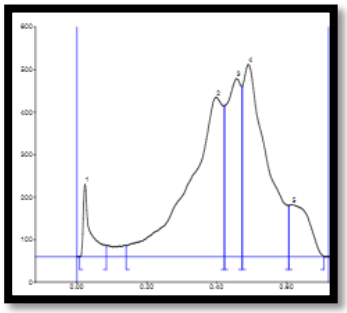
Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %
1	0.00	0.7	0.02	57.0	9.56	0.06	1.9	624.6	4.16
2	0.23	1.5	0.29	525.1	88.15	0.33	3.1	13653.4	90.89
3	0.39	5.2	0.43	13.6	2.29	0.51	4.6	744.6	4.96

Track 1: Gallic acid standard



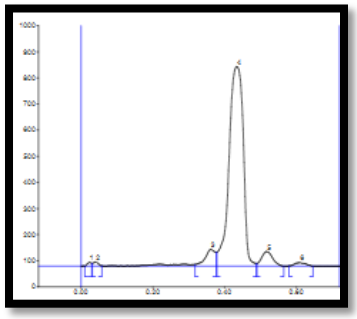
Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %
1	0.40	6.7	0.44	15.1	2.31	0.45	8.6	425.5	2.22
2	0.46	7.3	0.52	639.3	97.69	0.57	0.1	18733.7	97.78

Track 2: p-coumaric acid standard



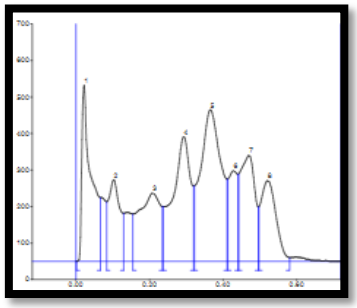
Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %
1	0.01	0.3	0.02	16.2	1.74	0.03	10.7	133.8	0.49
2	0.03	10.8	0.04	16.4	1.76	0.06	1.5	193.0	0.71
3	0.32	6.7	0.36	64.2	6.89	0.38	53.4	1447.1	5.34
4	0.38	53.8	0.44	764.3	82.07	0.49	10.5	23608.7	87.17
5	0.49	10.6	0.52	56.2	6.03	0.57	0.1	1360.9	5.02
6	0.58	1.4	0.61	14.0	1.50	0.65	0.3	340.1	1.26

Track 3: Caffeic acid standard



Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %
1	0.01	0.1	0.02	170.4	11.06	0.09	26.3	2815.1	3.81
2	0.14	26.8	0.40	375.4	24.37	0.42	355.5	28422.6	38.50
3	0.42	355.7	0.46	419.7	27.23	0.47	400.9	13329.0	18.05
4	0.47	402.2	0.49	452.6	29.38	0.61	120.7	23893.6	32.36
5	0.61	120.9	0.62	122.8	7.97	0.71	0.3	5371.5	7.28

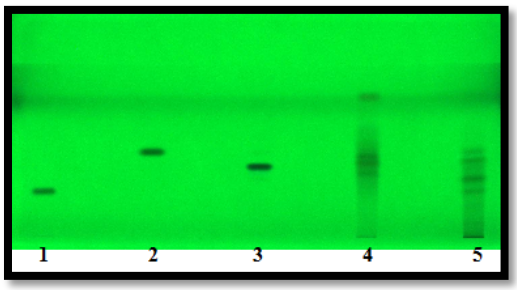
Track 4: Chloroform fraction



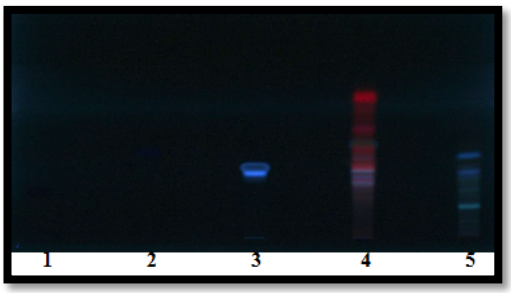
Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %
1	0.00	0.2	0.02	483.0	20.01	0.07	175.0	9895.4	12.92
2	0.08	163.7	0.10	224.1	9.28	0.13	132.1	5639.5	7.36
3	0.16	129.8	0.21	187.4	7.76	0.24	150.4	8660.9	11.31
4	0.24	150.4	0.29	342.1	14.17	0.32	206.7	12959.3	16.92
5	0.32	207.1	0.37	415.9	17.23	0.41	225.5	18481.5	24.13
6	0.41	226.1	0.43	248.7	10.30	0.44	238.8	4802.8	6.27
7	0.44	239.9	0.47	290.8	12.05	0.50	149.4	9027.0	11.79
8	0.50	150.1	0.52	221.7	9.18	0.58	10.8	7113.9	9.29

Track 5: Ethyl acetate fraction

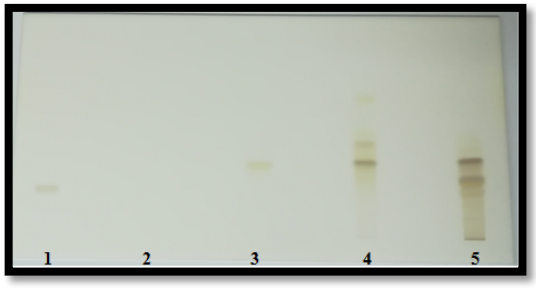
Fig 2: HPTLC chromatograms showing max retardation factor values of standard phenolic acids and analyzed fractions



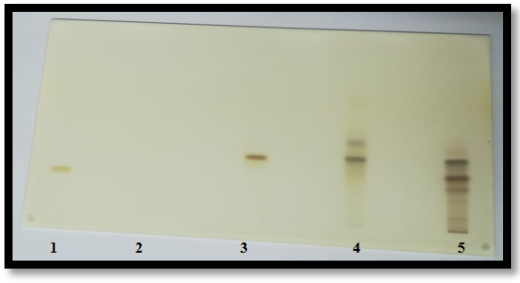
a: HPTLC chromatogram at 254nm



b: HPTLC chromatogram at 366nm



c: HPTLC chromatogram at day light



d: HPTLC chromatogram at after spraying with 5% alcoholic KOH

Fig 3: (a,b,c and d) HPTLC plates of analyzed fractions with reference standards, detection under UV light (a) at 254 nm, (b) 366 nm, (c) at day light and (d) after spraying with alcoholic KOH (1: gallic acid, 2: p-coumaric acid, 3: caffeic acid, 4: chloroform fraction, 5: ethyl acetate fraction)

CONCLUSION

The present study provides enough information concerning numerous phytoconstituents present in Iraqi *L. camara* leaves extract and more precise information concerning the type of phenolic acids in chloroform and ethyl acetate fraction. Three different phenolic acids (gallic, caffeic and p-coumaric acid) were detected in the leaf extract by HPTLC. Gallic acid only detected in ethyl acetate fraction.

ACKNOWLEDGMENT

We are deeply grateful to the college of pharmacy/university of Baghdad for giving us the opportunity and facilities to achieve this work.

REFERENCES

1. Amutha.S. Phytochemical Investigation and in vitro Evaluation of *Lantana camara* seed Extracts on Selected Human Pathogenic Bacteria. Int J Pharm Bio Sci. 2014;5(4):416 – 421.
2. Erlânio O. Sousa, Thiago S. Almeida, Irwin R. A Menezes, Fabíola F. G.Rodrigues, Adriana R. Campos, Sidney G. Lima and José G. M. da Costa Rec. Chemical Composition of Essential Oil of *Lantana camara* L. (Verbenaceae) and Synergistic Effect of the Aminoglycosides Gentamicin and Amikacin. Nat. Prod. 2012;6(2):144-150.
3. Sushama Raj R.V. Preliminary phytochemical screening of *Lantana camara* L., a major invasive species of Kerala, using different solvents. Annals of plant science. 2017;6(11): 1794-1798.
4. Jo-Ann T. Salada, Lotis M. Balala, Erlinda A. Vasquez. Phytochemical and Antibacterial Studies of *Lantana camara* L. Leaf Fraction and Essential Oil. International Journal of Scientific and Research Publications. 2015;5(3): 1-5.
5. Mamta Saxena, Jyoti Saxena1 and Sarita Khare. A brief review on: Therapeutical values of *Lantana camara* plant. Int. J. of Pharm. & Life Sci. (IJPLS),2012;3(3):1551-1554
6. Piush Sharma, B Shrivastava, Ganesh N. Sharma, Hemant R.Jadhav. Phytochemical and Pharmacological profile of *Lanata camara* l: An Overview. J. Adv. Pharm. Edu. & Res.2013;3(4): 294-305.
7. Sanjeeb Kalita, Gaurav Kumar, Loganathan Karthik, Kokati Venkata Bhaskara Rao. A Review on Medicinal Properties of *Lantana camara* Linn. Research J. Pharm. and Tech. J. 2012;5(6):711-715.
8. Claude Kirimuhuzya, Paul Waako, Moses Joloba, Olwa Odyek. The anti-mycobacterial activity of *Lantana camara* a plant traditionally used to treat symptoms of tuberculosis in South-western Uganda. African Health Sciences. 2009;9(1):40-45. PMid:20842241 PMCid:PMC2932521
9. David M. Musyimi, George T. Opande, Jane Chesire, Phoebe A. Sikuku and Daniel K.Buyela. Antimicrobial potential and screening of phytochemical compounds of *Lantana camara* Linn. IJRDO-Journal of Biological Science .2017;3(6):18-35
10. T.Venkatachalam, V.Kishor Kumar, P.Kalai Selvi, Avinash O. Maske, N.Senthil Kumar. Physicochemical and preliminary phytochemical studies on the *Lantana camara* (L.) fruits.Int J Pharm Pharm Sci, 2011;3(1):52-54.
11. Singh Charan and Choure Kamlesh. Micropropogation and Analysis of Phytochemical Profile of *Lantana camara* Whole Plant Extraction. World Journal of Pharmacy and Pharmaceutical Sciences. 2015;4(8):1907-1919.
12. Leena Das 1 and Suchitra Godbole. Antifungal and Phytochemical Analysis of *Lantana Camara, Citrus Limonum (*Lemon*), Azadirachta Indica (*Neem*)* and *Hibiscus Rosasinensis* (China Rose). Journal of Pharmacy Research 2015;9(7):476-479.
13. Sharma B and Kumar P. Bioefficacy of Lantana camara L. against Some Human Pathogens. Indian J Pharm Sci. 2009 Sep;71(5):589-93. https://doi.org/10.4103/0250-474X.58177 PMid:20502587 PMCid:PMC2866360
14. Sore A. Millycent, Mwonjoria K. John, Juma K. Kelvin, Ngugi M. Piero, Njagi E.N. Mwaniki. Evaluation of Analgesic, Anti-inflammatory and Toxic Effects of *Lantana camara* L. International Journal of Phytopharmacology. 2017;8(3):89-97.
15. Francis Lyumugahe, Jeanne Primtive Uyisenga, Claude Bayingana and Emmanuel Bajyana Songa Antimicrobial Activity and Phytochemicals Analysis of *Vernonia aemulans, Vernonia amygdalina, Lantana camara* and *Markhamia lutea* Leaves as Natural Beer Preservatives. American Journal of Food Technology. 2017;12(1):35-42. https://doi.org/10.3923/ajft.2017.35.42
16. Mayee R., Thosar A. Evaluation of *Lantana camara* Linn. (Verbenaceae) for Antiurolithiatic and Antioxidant Activities in Rats. International Journal of Pharmaceutical and Clinical Research 2011;3(1):10-14.
17. Anjum Ayub, Saima Tauseef, Syed Tahir Ali, Sabira Begum, Bina Shaheen Siddiqui and Aqeel Ahmed. Antioxidant Activity of the Medicinal Plant *Lantana camara*. fuuast j.biol.,2017; 7(2): 227-230
18. Prasanna P. Ghodake, Ajit S. Kulkarni, Nagesh H. Aloorkar, Riyaz Ali Osmani, Rohit R. Bhosale, Bhargav R. Harkare, Birudev B. Kale In-vitro Antispasmodic Activity Analysis of Methanolic Leaves Extract of *Lantana camara* Linn. On Excised Rat Ileum. Journal of Pharmacognosy and Phytochemistry 2013; 2 (3): 66-71.
19. M.Sangeetha, C. Mahendrn, C.Ushadevi. An overview on the medicinal properties of *Lanata camara* Linn. IJIPSR. 2015;3(5): 645-654.
20. M. Sharma, P.D. Sharma, and M.P. Bansa. Chemopreventive Effect of *Lantana camara* Leaf Extract on 7,12-Dimethylbenz[a]anthracene-Induced Squamous Cell Carcinoma of Skin in Swiss Albino Mice. Pharmaceutical Biology 2007; 45(2): 145–148 https://doi.org/10.1080/13880200601113115
21. Mallappa Kumara Swamy, Uma Rani Sinniah, and Mohd. Sayeed Akhtar. In Vitro Pharmacological Activities and GC-MS Analysis of Different Solvent Extracts of *Lantana camara* Leaves Collected from Tropical Region of Malaysia. Evidence-Based Complementary and Alternative Medicine. 2015;2015:1-9 https://doi.org/10.1155/2015/506413 PMid:26783409 PMCid:PMC4689920
22. Patil Shriniwas Pramod, Kumbhar Subhash Trimbakrao, Ambhore Vanita. Evaluation of Unsaponified Petroleum Ether Extract of *Lantana camara* L. leaves for Antioxidant Activity and Oxidative Stability. Indian Journal of Pharmaceutical Education and Research2017; 51(4):692-699. https://doi.org/10.5530/ijper.51.4.102
23. Rong Tsao. Chemistry and Biochemistry of Dietary Polyphenols. Nutrients 2010;2:1231-1246. https://doi.org/10.3390/nu2121231 PMid:22254006 PMCid:PMC3257627
24. Mamta Saxena, Dr Jyoti Saxena, Dr Alka Pradhan. Flavonoids and Phenolic acids as Antioxidants in Plants and Human Health. Int.J.Pharm.Sci. Rev. Res.2012;16(2):130-134.
25. Yafang Shao, Zhanqiang Hu , Yonghong Yu , Renxiang Mou , Zhiwei Zhu , Trust Beta. Phenolic acids, Anthocyanins, Proanthocyanidins, Antioxidant activity, Minerals and their Correlations in non-Pigmented, red, and black rice. Food Chemistry 2018; 239:733–741. https://doi.org/10.1016/j.foodchem.2017.07.009 PMid:28873629

26. Santi M Mandal, Dipjyoti Chakraborty, and Satyahari Dey. Phenolic acids act as signaling molecules in plant-microbe symbioses. Plant Signal Behav.2010;5(4):359–368. https://doi.org/10.4161/psb.5.4.10871
27. Venkata Saibabu, Zeeshan Fatima, Luqman Ahmad Khan, and Saif Hameed. Therapeutic Potential of Dietary Phenolic Acids. Advances in Pharmacological Sciences 2015:1- 10. https://doi.org/10.1155/2015/823539 PMid:26442119 PMCid:PMC4579300
28. Rebecca J. Robbins. Phenolic Acids in Foods: An Overview of Analytical Methodology. J. Agric. Food Chem. 2003;51(10):2866-2887. https://doi.org/10.1021/jf026182t PMid:12720366
29. Harish Kumar, Neha Choudhary, Varsha, Naveen Kumar, Suman and Raman Seth. Phenolic compounds and their health benefits: A review. Journal of Food Research and Technology 2014;2(2) :46-59
30. Tapan Seal. Quantitative HPLC Analysis of Phenolic acids, Flavonoids and Ascorbic acid in Four Different Solvent Extracts of Two Wild Edible Leaves, *Sonchus arvensis* and *Oenanthe linearis* of North-Eastern Region in India. Journal of Applied Pharmaceutical Science2016;6(02):157-166. https://doi.org/10.7324/JAPS.2016.60225
31. Nouha Nasr Bouzaiene a,b,n , Soumaya Kilani Jaziri a,b , Hervé Kovacic c , Leila Chekir-Ghedira a,b , Kamel Ghedira a , José Luis. The effects of Caffeic, Coumaric and Ferulic acids on Proliferation, Superoxide Production, Adhesion and Migration of Human Tumor Cells in Vitro. European Journal of Pharmacology 2015;766:99–105. https://doi.org/10.1016 /j.ejphar.2015.09.044 PMid:26432689
32. Jorge Carlos Ruiz-Ruiz, Angel Jesus Matus-Basto, Pablo Acereto-Escoffié & Maira Rubí Segura-Campos. Antioxidant and Anti-inflammatory Activities of Phenolic Compounds Isolated from Melipona Beecheii honey. Food and Agricultural Immunology2017; 28(6): 1424–1437 https://doi.org/10.1080/09540105.2017.1347148
33. Violeta Nour Ion Trandafir Sina Cosmulescu. HPLC Determination of Phenolic Acids, Flavonoids and Juglone in Walnut Leaves. Journal of Chromatographic Science2013; 51(9,1): 883–890
34. Magdalena Działo, Justyna Mierziak, Urszula Korzun, Marta Preisner, Jan Szopa, and Anna Kulma. The Potential of Plant Phenolics in Prevention and Therapy of Skin Disorders. Int. J. Mol. Sci. 2016; 17: 1-42 https://doi.org/10.3390 /ijms17020160 PMid:26901191 PMCid:PMC4783894
35. Nidal Jaradat, Fatima Hussen1 and Anas Al Ali. Preliminary Phytochemical Screening, Quantitative Estimation of Total Flavonoids, Total Phenols and Antioxidant Activity of *Ephedra alata* Decne. J. Mater. Environ. Sci.2015; 6(6):1771-1778.
36. Rattana S, Phadungkit M, Cushnie B. phytochemical Screening, Flavonoid Content and Antioxidant Activity of *Tiliacora triandra* Leaf Extracts. The 2nd Annual International Conference of Northeast Pharmacy Research 2010;13:60-63.
37. Tahiya Hilal AliAlabriAmira Hamood SalimAl Musalami Mohammad Amzad Hossain Afaf Mohammed Weli Qasim Al-Riyami. Comparative Study of Phytochemical Screening, Antioxidant and Antimicrobial Capacities of Fresh and Dry Leaves Crude plant extracts of *Datura metel* l journal of king saud university - science 2014;26(3):237-243.
38. Y. Vaghasiya, R. Dave and S. Chanda, Phytochemical Analysis of Some Medicinal Plants from Western Region of India. Research Journal of Medicinal Plants2011;5: 567-576. https://doi.org/10.3923/rjmp.2011.567.576
39. Satheesh Kumar Bhandary, Suchetha Kumari N., Vadisha S. Bhat, Sharmila K.P., Mahesh Prasad Bekal. Preliminary Phytochemical Screening of Various Extracts of *Punica Granatum* Peel, Whole Fruit and Seeds. NUJHS.2012;4(2):34-38.
40. Sunil H. Ganatra and Sevak B. Gurubaxani. Preliminary Phytochemical and TLC Profiling of *Lantana camara* Leaf Extracts. Journal of Chemical and Pharmaceutical Research 2016;8(5):614-617.
41. Duraisamy Gomathi, Ganesan Ravikumar, Manokaran Kalaiselvi, Balasubramaniam Vidya, Chandrasekar Uma. HPTLC fingerprinting analysis of *Evolvulus alsinoides* (L.) L. Journal of Acute Medicine 2012;2:77-82. https://doi.org/ 10.1016/j.jacme.2012.08.004
42. V. Kumar, A. Aharma, R. Bhardwaj and Ashwani Kumar Thukral. Polyphenol Profiling in the Leaves of Plants from the Catchment Area of River Beas, India. Int j pharm bio sci. 2015;6(4): 1005 – 1012.
43. Noor S. Jaafar, Maha N. Hamad, Ibrahim S. Abbas, Iman S. Jaafar. Qualitative Phytochemical Comparison between Flavonoids and Phenolic Acids Contents of Leaves and Fruits of *Melia azedarach* (FAMILY: Meliaceae) Cultivated in Iraq by HPLC and HPTLC, Int J Pharm Pharm Sci.2016; 8(10): 242-250. https://doi.org/10.22159/ijpps.2016v8i10.13868
44. Anna Masek, Ewa Chrzescijanska, Malgorzata Latos. Determination of Antioxidant Activity of Caffeic Acid and p-Coumaric Acid by Using Electrochemical and Spectrophotometric Assays. Int. J. Electrochem. Sci.2016;11:10644 – 10658. https://doi.org/10.20964/ 2016.12.73
45. Buran Phansawana , Supakorn Pongsabangphob. Determination of gallic acid and rutin in extracts *Cassia alata* and *Andrographis paniculata*. ScienceAsia 2014;40:414–419. https://doi.org/10.2306/scienceasia1513-1874.2014. 40.414

Cite this article as:

Noor S Jaafar *et al*. Preliminary phytochemical screening and High Performance Thin Layer Chromatography[HPTLC] detection of phenolic acids in *Lanata camara* leaves cultivated in Iraq. Int. Res. J. Pharm. 2018;9(7):59-64 http://dx.doi.org/10.7897/2230-8407.097126

Source of support: Nil, Conflict of interest: None Declared