Journal of Advanced Chemical Sciences 2(3) (2016) 299–301

ISSN: 2394-5311

Contents List available at JACS Directory

Journal of Advanced Chemical Sciences

journal homepage: www.jacsdirectory.com/jacs

Antioxidant and Antimicrobial Activity of Different Extracts Obtained from Aerial Parts of *Urospermum picroides* (L.) F.W. from Egypt

Y.A. El-Amier[1,*], O.N. Al-hadithy[2], T.J. Abdullah[2]

[1]*Botany Department, Faculty of Science, Mansoura University, 35516, Mansoura, Egypt.*
[2]*Biology Department, College of Education Pure Sciences, University of Al-Anbar, Iraq.*

ARTICLE DETAILS

Article history:
Received 03 May 2016
Accepted 20 May 2016
Available online 13 June 2016

Keywords:
Urospermum picroides
Antimicrobial
Antioxidant
Secondary Compounds

ABSTRACT

Medicinal plants are of great importance to the health of individuals and communities in general. The vital role of plants lies in some chemical substances that produce a definite physiological action on the human body. The different extracts of *Urospermum picroides* were tested against the following bacteria; six gram negative bacteria: *Proteus vulgaris*, *Klebsiella pneumoniae*, *Shigella, Escherichia coli*, *Erwinia carotovora*, *Pseudomonas aeruginosa*, and three gram positive bacteria; *Streptococcus pyogenes*, *Staphylococcus aureus* and *Bacillus subtilis*. The phytochemical analysis of the aerial parts of *U. picroides* indicated that the plant is rich in secondary compounds. Hexane extract had the highest scavenging activity (1.54 mg/mL). Methanol and ethyl acetate extracts of *U. picroides* showed the broad spectrum against the tested bacteria. Whereas, hexane extracts expressed an activity against *E. coli* and *Erwinia carotovora* (inhibition zone = 6.5 and 7 mm, respectively). Petroleum ether extract showed the inhibitory activities against *Escherichia coli, Klebsiella pneumoniae, Erwinia carotovora* and *Candida albicans* (inhibition zone =7, 8, 6.5 and 6.5 mm, respectively). The pathogen *Staphylococcus aureus* and *Bacillis subtillis* were the most sensitive bacteria (inhibition zone=10 mm, each) in case of ethyl acetate extract. On the other hand, *Erwinia carotovora* and *Candida albicans* were the most sensitive organisms to different extracts.

1. Introduction

Plants have been described as the oldest friends of man due to their value as sources of food, shelter and medicines [1]. The use of plants and their extracts in treatment of diseases dates back to 460-370 BC when Hippocrates practiced the art of healing by the use of plant based drugs [2]. Medicinal plants are of great importance to the health of individuals and communities in general. The high cost of new antibiotics and their non-availability with limited effective span resulted in the increase in mortality and morbidity. Therefore, there is a need to search for new drugs from other biological sources with proven antimicrobial activity.

The medicinal value of plants lies in some chemical substances that produce a definite physiological action on the human body. The most important of these bioactive constituents of plants are alkaloids, tannins, flavonoids and phenolic compounds [3, 4]. The Nile Delta region is flourished by many weeds, which seem to be promising economically. Some weeds can be used as forages, and/or agro-industrial raw materials and in drug industry.

The genus *Urospermum* in Mediterranean is represented by two species U. *dalechampii* Schmidt and *U. picroides* (L.) Scop. ex. F.W. Schmidt [5]. *Urospermum picroides* is annual herb of flowering plant in the family Asteraceae known by the common name prickly golden fleece, it is coated in long hairs and bristles. It is native to Eurasia and it is known as an introduced species in many other regions, including North and South America, Australia, and southern Africa. It grows as a common weed in disturbed habitat [6, 7].

Urospermum picroides has anti-inflammatory activity [8]. This species is a source of sesquiterpenen lactones and glycosides [9], a glucoside of urospermal A [10] and indole alkaloids [11], with many properties (angiogenic, antioxidant, anti-inflammatory) [8]. In the current paper, we investigate the potential antioxidant and antimicrobial properties of aerial parts of *U. picroides* collected from Nile Delta of Egypt, in order to evaluate their medicinal potentiality and their future industrial uses.

2. Material and Methods

2.1 Plant Material and Preparation of the Extract

Urospermum picroides was collected from coastal desert (Deltaic Mediterranean coast) at the period of April 2015. The identification of species was done according to Boulos [7]. It was dried at room temperature (20-23 °C) and grinded into a powder using a blender. The dried plant powder (10g) was extracted using different solvents (Methanol, hexane, petroleum ether and ethyl acetate) by socking overnight with periodical shacking. The solution was filtered and evaporated to dryness. The dried residue was dissolved in dimethyl sulfoxide (DMSO) and kept at -20 °C for future use [12].

2.2 Phytochemical Analysis

Total phenolics, flavonoid and alkaloids were estimated according to the methods described by Harborne [13], Sadasivam and Manickam [14] and Bohm and Kocipai-Abyazan [15], respectively. Saponins content was determined by the method adopted by Obdoni and Ochuko [16], while tannins according to Van Burden and Robinson [17].

2.3 Determination of the Radical Scavenging Activity

The antioxidant activity was determined by using the free radical scavenging method (DPPH) described by Miguel [18]. Two mL of 0.15 mM DPPH was added to 2 mL of plant extracts in different concentrations (100, 200, 400, 600, 800 and 1000 ppm). A control was prepared by adding 2 mL solvent instead of sample. The mixture was incubated for 30 min in dark at the room temperature. The absorbance was measured at 517 nm and the IC_{50} was calculated graphically. The antioxidant activity was calculated using the following equation:

$$\% \text{ Radical scavenging activity} = [1 - (A_{sample}/A_{control})] \times 100 \quad (1)$$

2.4 Antimicrobial Activity

The different extracts of *Urospermum picroides* were tested against six gram negative bacteria: *Proteus vulgaris*, *Klebsiella pneumoniae*, *Shigella*, *Escherichia coli*, *Erwinia carotovora*, *Pseudomonas aeruginosa*, and three

*Corresponding Author
Email Address: yasran@mans.edu.eg (Yasser A. El-Amier)

Cite this Article as: Y.A. El-Amier, O.N. Al-hadithy, T.J. Abdullah, Antioxidant and antimicrobial activity of different extracts obtained from aerial parts of *Urospermum picroides* (L.) F.W. from Egypt, J. Adv. Chem. Sci. 2(3) (2016) 299–301.

gram positive bacteria; *Streptococcus pyogenes*, *Staphylococcus aureus*, *Bacillus subtilis* as well as *Candida albicans* is fungal strain employed in the screening using filter paper discs assay [19]. Standard antibiotic of ampicillin, clotrimazole and penicillin were used for comparison with the tested plant extracts.

3. Result and Discussion

3.1 Phytochemical Constituents

Drugs derived from natural products are usually secondary metabolites derived from living organisms and their derivatives must be pure and highly characterized compounds [20]. The phytochemical analysis of the aerial parts of *U. picroides* indicated that the plant is rich in secondary compounds. *U. picroides* exhibited the highest content of tannins and phenolics (17.11±0.05 and 19.34±0.04, mg/g D.W., respectively), followed by saponins (11.28±0.03 mg/g D.W.), flavonoids (8.28±0.02 mg/g D.W.) and then alkaloids (5.01±0.02 mg/g D.W.).

The phytochemical analysis of *U. picroides* in this study are relatively higher than those obtained by El-Amier et al. [21] on some wild Aizoaceae species (*Mesembryanthemum crystallinum* and *M. nodiflorum*) and Ramez [22] on *Launaea mucronata* and *L. nudicaulis* (Asteraceae) growing in coastal desert (Deltaic Mediterranean coast), but lower than those reported by Abd El-Gawad et al. [23] on *Lactuca serriola* and *Reichardia tingitana* (Asteraceae).

3.2 Antioxidant Activity

Plant-based antioxidants are now preferred to the synthetic ones because of safety concerns [24]. Plants produce various ant oxidative, enzymes and non-enzymes, compounds to counteract and detoxify these reactive oxygen species (ROS) in order to survive. Hence, natural product possessing ant oxidative and anti-inflammatory properties appear to contribute to their chemo preventive or chemo protective activity [25] which in turn, has been used to the benefit of human beings.

The IC_{50} values of the extracts of *U. picroides* were presented in Table 1, and Fig. 1. The free radicals of 2, 2-diphenyl-1-picrylhydrazyl (DPPH) is used for detection of the antioxidant activity of the extracts. Hexane extract had the highest scavenging activity. The radical scavenging activity of the other extracts and standard decreased in the following order: catechol, petroleum ether, methanol, ethyl acetate.

Table 1 Antioxidant activity of the extracts of *Urospermum picroides* by DPPH

Extracts	IC50 mg/mL
Methanol	2.78
Hexane	1.54
Petroleum ether	2.16
Ethyl acetate	4.38
Catechol	0.18

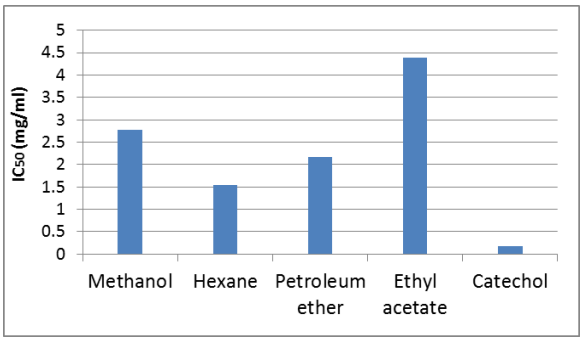

Fig. 1 IC_{50} values (mg/mL) of *U. picroides* extracts and natural antioxidant catechol (standard)

3.3 Antimicrobial Activity Assessment

In the world medicinal plants are used for antifungal, antibacterial and antiviral activities. These plant extracts were used as a source of medicinal agents to cure urinary tract infections, cervicitis vaginitis, and gastrointestinal disorders [26].

U. picroides extracts exhibited different inhibitory activities against the tested bacterial strains with different degrees as demonstrated by measuring the diameters of inhibition zones developed by the extracts Table 2 methanol and ethyl acetate extracts of *U. picroides* showed the broad spectrum against the tested bacteria Fig. 2. Whereas, hexane extracts expressed an activity against *E. coli* and *Erwinia carotovora*, only. Petroleum ether extract showed the inhibitory activities against *E. coli*, *Klebsiella pneumoniae*, *E. carotovora* and *Candida albicans*.

U. picroides produced inhibition zones less than that of the standard antibiotic ampicillin, clotrimazole and penicillin against tested organisms. The pathogen *Staphylococcus aureus* and *Bacillis subtillis* were the most sensitive bacteria in case of ethyl acetate extract. On the other hand, *E. carotovora* and *C. albicans* were the most sensitive organisms to different extracts.

Ramdani et al [27] found similar results that the methanol extract of *Urospermum dalechampii* from Algeria was active against *E. coli*, *K. pneumoniae*, *P. aeruginosa*, *B. subtilus* and *S. aureus*. El-Amier et al [28] also reported that *Sencio glaucus* (Asteraceae, from coastal desert of Nile Delta) extract showed an inhibition zone against *E. carotovora*, *S. biogensis* and *B. subtilis* but not against *S. aureus*, *E. coli* and *P. aeruginosa.*

Table 2 The inhibitory activity of the plant extract against the tested organisms as demonstrated by diameters of the inhibition zone (mm)*

Test microorganisms	Plant extracts				Standard antibiotic		
	Metha-nol	Hexane	Petrol-eum ether	Ethyl acetate	Ampi-cillin	Clotri-mazole	Peni-cillin
Gram positive bacteria							
Staphylococcus aureus	-	-	-	10	16	-	18
Bacillis subtillis	-	-	-	10	-	-	-
Streptococcus pyogenes	7	-	-	-	25	-	-
Gram negative bacteria							
Pseudomonas aeruginosa	7	-	-	-	10	-	8
Escherichia coli	-	6.5	7	-	14	-	16
Proteus vulgaris	8	-	-	-	16	-	10
Klebsiella pneumoniae	7	-	8	-	27	-	-
Shigella spp.	-	-	-	8	-	-	-
Erwinia carotovora	-	7	6.5	8	-	-	-
Fungi							
Candida albicans	7	-	6.5	8.3	-	15	-

* The recorded value is mean value of 3 replicates

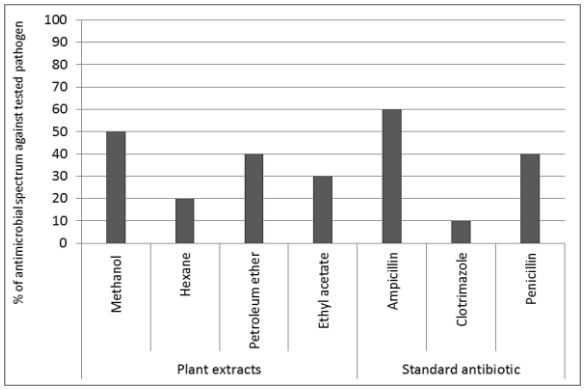

Fig. 2 % of antimicrobial spectrum of *U. picroides* extracts and standared antibiotic

4. Conclusion

A comparison of our results with those of previous studies shows that the locality of the plant material and the extraction procedure cause differences in the antimicrobial activity of the plants. The strong effect and broad spectrum of *U. picroides* can be used either in methanol or ethyl acetate solution for antimicrobial activity.

References

[1] A.C. Kariuki, G.N. Njoroge, Ethnobotanical and antimicrobial studies of some plants used in Kibwezi (Kenya) for management of lower respiratory tract infections, Afr. J. Tradit. Comp. Altern. Med. 8 (2011) 144–149.
[2] A. Sofowora, Medicinal plants and traditional medicine in Africa, John Wiley and Sons Ltd., New York, 1982.
[3] P.C. Njoku, M.I. Akumufula, Phytochemical and nutrient evaluation of spondias mombi leave, Pak. J. Nutr. 6 (2007) 613-615.
[4] F.O. Ekhaise, A.E. Soroh, A. Falodun, Antibacterial properties and preliminary phytochemical analysis of methanolic extract of *Ocimum gratissium* (Scent leaves), Bayero J. Pure Appl. Sci. 3 (2010) 81–83.
[5] E.A. Kamel, Cytotaxonomical investigations of the Egyptian compositae (Asteraceae), I-Card. Cichorieae Composit. Newslett. 41 (2004) 9–28.
[6] H.W. Lack, B. Leuenberger, Pollen and taxonomy of urospermum (Asteraceae, Lactuceae). Pollen Spores. 21 (1979) 415–425.

Cite this Article as: Y.A. El-Amier, O.N. Al-hadithy, T.J. Abdullah, Antioxidant and antimicrobial activity of different extracts obtained from aerial parts of *Urospermum picroides* (L.) F.W. from Egypt, J. Adv. Chem. Sci. 2(3) (2016) 299–301.

[7] L. Boulos, Flora of Egypt, Vol. 3, Al-Hadara Pub., Cairo, Egypt, 2002.
[8] M. Strzelecka, M. Bzowska, J. Kozie, B. Szuba, O. Dubiel, N.D. Rivera, et al, Anti-inflammatory effects of extracts from some traditional mediterranean diet plants (Conference paper), J. Physiol. Pharmacol. 56 (2005) 139-156.
[9] B.A. Balboul, A.A. Ahmed, H. Dsuka, Sesquiterpne lactones and glucosides from *Urospermum picroides*, Phytochem. 45 (1997) 368-373.
[10] M.M.A. Amer, O.M. Salama, F. Bohlmann, J. Ziesche, Urospermal, a glucoside from *Urospermum picroides,* Phytochem. 23 (1984) 692-693.
[11] X. Ji, G. Lu, Y. Gai, C. Zheng, Z. Mu, Biological control against bacterial wilt and colonization of mulberry by an endophytic *bacillus subtilis* strain, FEMS Microbiol. Ecol. 65 (2008) 565-573.
[12] F. Mehraban, O.T. Nasim, J. Fereshteh, Antidermatophyte activities *Eucalyptus comaldulensis* in comparism with Griscofulvin, Iran. J. Pharmacol. Ther. 4 (2005) 80-83.
[13] J.B. Harborne, Phytochemical methods, Chapman and Hall, Ltd., London, 1973, pp. 49-188.
[14] S. Sadasivam, A. Manickam, Biochemical methods, 3rd Ed., New Age International Limited, New Delhi, 2008.
[15] B.A. Boham, R. Kocipai-Abyazan, Flavonoids and condensed tannin from leaves of *Hawaiian vccinium vaticulatum* and *V. calycinium,* Pacif. Sci. 48 (1994) 458-463.
[16] B.O. Obadoni, P.O. Ochuko, Phytochemical studies and comparative efficacy of the crude extracts of some homeostatic plants in edo and delta states of Nigeria, Global J. Pure Appl. Sci. 8 (2001) 203-208.
[17] J.P. Van-Buren, W.B. Robinson, Formation of complexes between protein and tannic acid, J. Agric. Food Chem. 17 (1969) 772-777.
[18] J.G. Cappuccino, N. Sherman, Microbiology: A laboratory manual, Pearson/Benjamin Cummings, San Francisco, 2008.
[19] M. Lahlou, Screening of natural products for drug discovery, Exp. Op. Drug. Disc. 2 (2007) 697-705.
[20] Y.A. El-Amier, S.A. Haroun, O.A. El-Shehaby, O.N. Al-hadithy, Antioxidant and antimicrobial of properties of some wild aizoaceae species growing in Egyptian Desert, Mansoura University, J. Environ. Sci. 45 (2016) 1-11.
[21] B. Ramez, Ecological study and economic potentialities of some species of Genus *Launaea* in Egypt. MSc Dissertation, Faculty of Science, Mansoura University, 2015.
[22] A.M. Abd El-Gawad, I.A. Mashaly, R.I. Al-Nafie, Antioxidant activity and Allelopathic potential of five wild plants on germination and growth *Bidens pilosa* L., Int. J. Curr. Res. 7 (2015) 21019-21024.
[23] A.C. Akinmoladun, E.O. Ibukun, E. Afor, B.L. Akinrinlola, T.R. Onibon, A.O. Akinboboye, Chemical constituents and antioxidant activity of *Alstonia boonei*, Afr. J. Biotechnol. 6 (2007) 1197-1201.
[24] L.C. Chiang, H.Y. Cheng, C.C. Chen, C.C. Lin, In vitro anti-leukemic and antiviral activities of traditionally used medicinal plants in Taiwan, Am. J. Chin. Med. 32 (2004) 695-704.
[25] A. Caceres, O. Cano, B. Samayoa, L. Aguilar, Plants used in Guatemala for the treatment of gastrointestinal disorders, Screening of 84 plants against Enterobacteria, J. Ethnopharmacol. 30 (1990) 55-73.
[26] M. Ramdani, T. Lograda, P. Chalard, G. Figueredo, H. Laidoudi, A. Ounoughi, Chemical composition, antimicrobial activity and chromosome number of *Urospermum dalechampii* from Algeria, Scholars Acad. J. Pharm. 3 (2014) 477-482.
[27] Y.A. El-Amier, A.M. Abdelghan, A. Abed Zaid, Green synthesis and antimicrobial activity of *Senecio glaucus* - Mediated silver nanoparticles, Res. J. Pharm. Biol. Chem. Sci. 5 (2014) 631-642.
[28] R.A. Mothana, S.A. Abdo, S. Hasson, F.M. Althawab, Antimicrobial, antioxidant and cytotoxic activities and phytochemical screening of some Yemeni medicinal plants, Evid. Compl. Alternat. Med. 7 (2008) 323-330.
[29] B. Joshi, S. Lekhak, A. Sharma, Antibacterial property of different medicinal Plants, *Ocimum sanctum*, *Cinnamomum zeylanicum*, *Xanthoxylum armatum* and *Origanum majorana*, Kathmandu University, J. Sci. Eng. Tech. 5 (2009) 143-150.
[30] A. Iranbakhsh, M. Ebadi, M. Bayat, The inhibitory effects of plant methanolic extract of *Datura stramonium* L. and leaf explant callus against bacteria and fungi, Global Veterinaria. 4 (2010) 149-155.
[31] S. Baykanerel, G. Reznlcek, S.G. Senol, Antimicrobial and antioxidant properties of *artemisia* L. Species from Western Anatolia, Turk. J. Biol. 36 (2012) 75-84.
[32] H. Sytykiewicz, G. Chrzanowski, P. Czerniewicz, B. Leszczyński, I. Sprawka, R. Krzyżanowski, H. Matok, Antifungal activity of *Juglans regia* (L.) leaf extracts against *Candida albicans* isolates, Pol. J. Environ. Stud. 24 (2015) 1339-1348.
[33] M. Abdel-Salam, M. Farghaly, S. Abdel-Sattar, Monopolar Corona on bundle conductors, IEEE Transact. Power Apparat. Sys. 10 (1982) 4079-4089.

Cite this Article as: Y.A. El-Amier, O.N. Al-hadithy, T.J. Abdullah, Antioxidant and antimicrobial activity of different extracts obtained from aerial parts of *Urospermum picroides* (L.) F.W. from Egypt, J. Adv. Chem. Sci. 2(3) (2016) 299–301.