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Antioxidant Evaluation of Three Sudanese Medicinal Plants Used in Traditional Medicine

Sufyan Awadelkarim[1], Alsiddig Osama[1, *], Eltayeb Fadul[2]

[1]Department of Chemistry, Faculty of Science and Technology, Omdurman Islamic University, Khartoum, Sudan

[2]Medical Biochemistry Research Department, Medicinal and Aromatic Plants Research Institute, National Centre for Research, Khartoum, Sudan

Email address:

alsiddigosama@gmail.com (A. Osama)

[*]Corresponding author

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Abstract: The present study was designed to investigate the antioxidant activity of *Solenostemma argel, Commiphora myrrha* and *Vernonia amygdaline*. The antioxidant activities were conducted via DPPH radical scavenging and iron chelating assays. Potent antioxidant activity was presented by *S. argel* for both DPPH and iron chelating ability. The highest chelating ability was showed by the petroleum ether extract with 60%. The other tested plants showed low antioxidant potential. This study give rise to antioxidant property of *S. argel.*

Keywords: Antioxidant, DPPH, Iron Chelating, *Solenostemma argel*, *Commiphora myrrha*, *Vernonia amygdaline*

1. Introduction

Generation of highly Reactive Oxygen Species (ROS) is an integral feature of normal cellular functions. Environmental factors such as pollution, radiation, cigarette smoking and herbicides can also spawn free-radicals [1]. Oxidative stress occurs when there is an imbalance between the production and quenching of free radicals from oxygen species. ROS as they can attack lipids, protein/ enzymes, carbohydrates, and DNA in cells and tissues. They induce undesirable oxidation, causing membrane damage, protein modification, DNA, These reactive oxygen species (ROS) play a role in many chronic diseases including mitochondrial diseases [2], neurodegenerative diseases [3-4], Strong experimental evidences have been established about the oxidative stress theory of Alzheimer's disease pathogenesis where oxidative damage plays a major role in neurological degeneration [5], renal disease [6], arteriosclerosis [7-8], diabetes [9], cancer [10] and SLE [11-12]. The process of aging is also associated with increased oxidative stress [13], and other critical illness. Antioxidants terminate these chains reactions by removing free radical intermediates and inhibit other oxidation reactions by being oxidized themselves. As a result, antioxidants are often reducing agents such as thiols, ascorbic acid or polyphenols [14].

Phytotherapy has been found to show potential in the treatment of ailments. Furthermore, the advantage of using phytotherapy resides in the concoction of chemicals found within plants, which potentially provide protection against a wide range of etiological factors [15].

The chemical diversity of the compounds found in nature makes plant and marine materials important potential sources of new drugs. Novel lead compounds and stereospecific structures for the synthesis of existing drugs. The most commonly used natural sources are plants and microorganisms, both in land and marine [16]. Almost all the medicinal plants available in the world have great potential sources for discovery as well as protection of new drugs of benefit to mankind. Presently, there is lot of approaches available to reach for new biologically active ingredients in the medicinal plants for the preparation of safe drugs. In ethnomedicine it is very common for a single plant species to be used to treat various ailments due to the multiplicity of bioactive molecules they contain. About 80% of individuals from developed countries use traditional medicine which has compounds derived from medicinal plants [17]. Natural phytochemicals isolated from plants used in traditional medicine are good alternatives to synthetic chemicals [18].

In this respect, medicinal plants provide a rich source of biologically active constituents with multiple activities. Check and need to check or systematic screening of these available traditional herbs may result in the discovery of novel effective bioactive compounds for the formulation of drugs. Phytochemical screening of the active morphological samples is extremely valuable in giving us information about the nature of constituents found in each plant sample [19]. *Solenostemma argel* (family: Asclepiadaceae) is used in different places in the world especially in Sudan, Libya and Chad and it is used wildly in traditional medicine. Argel belongs to the family. The leaves are used in herbal medicine for the treatment of part liver, kidney allergies diseases. It is an effective in the treatment of gastrointestinal cramps, stomach ache, colic, cold and urinary tract infections and are effectiveas anti-syphilitic if used for prolonged period of 40-80 days [20]. *Vernonia amygdalina* (Family: Compositae) traditionally used as self-deparasitization, enhancement of body fitness, appetite and reducing the constipation. It also used in the treatment of stomach ache [21]. *Commiphora myrrha* (family: Burseraceae) traditionally used in amenorrhea, ache, dysmenorrhea, tumors, fever, stomach complaints, chest ailments, snake and scorpion bites, and skin infections [22].

2. Materials and Methods

2.1. Extraction

The fresh samples were dried in shades for 7 days, powdered then used for extraction. Cold maceration methodology was used and it was carried out according to published method of Osama and Awdelkarim, 2015 [23].

2.2. DPPH Free Radical Scavenging Activity

Experiments were carried out according to the method of Shimada *et al.,* 1992 [24] with slight modification. The test samples were allowed to react with 2.2 di (4-tretoctylphenyl)-1-picryl-hydrazyl stable free radical (DPPH) for half an hour at 37°C in 96-wells plate. The concentration of DPPH was kept at (300µM). The test sample was dissolved in DMSO while DPPH was prepared in ethanol. After incubation decrease in absorbance was measured at 517nm using multiplate reader spectrophotometer. Percentage of radical scavenging activity of the sample was determined in comparison with a DMSO treated control. All tests were conducted triplicate.

$$\text{DPPH radical scavenging (\%)} = 100-\{(Ac-At)/Ac\} \times 100 \quad (1)$$

Where, At= Absorbance value of test compound; Ac=Absorbance value of control

2.3. Iron Chelating Activity Assay

The iron chelating ability was determined according to the modified method of Dinis *et. al.,* 1994 [25]. in which the Fe^{+2} was monitored by measuring the formation of ferrous ion-ferrozine complex. The experiment was carried out in 96 micrometer plat. The plant extract was mixed with FeSO4. And the reaction was initiated by adding 5 mM ferrozine. The mixture was shaken, left at 25°C for 10 min. and finally the absorbance was measured at 562 nm, using multi-plate spectrophotometer. EDETA was used as positive control, and DMSO as control. All tests were done in triplicate.

3. Results and Discussion

The current study showed that the Petroleum ether extract of *Solenostemma argel* leaves have the highest iron chelating ability with 60% followed by chloroform and ethanolic extracts of the same plant with (52 and 13%) respectively. The ethanolic extract of *Commiphora myrrha* exhibit low chelating ability with 13%, *Vernonia amygdaline* was found to be not active as iron chelating ability. On the other hand, the ethanolic extract of *Solenostemma argel* was found to be the highest antioxidants against the DPPH among the tested plant samples with 41% followed by *Vernonia amygdaline* with 39%, as shown in table (1).

Table 1. *Percentage yield and antioxidant activity of Solenostemma argel, Commiphora myrrha and Vernonia amygdaline.*

Plant	Solvent	% yield	% RSA (DPPH)	% Iron chelating
Solenostemma argel	Ethanol	24.61	41±0.04	13±0.07
Solenostemma argel	Petroleum ether	1.92	22±0.08	60±0.03
Solenostemma argel	Chloroform	8.47	13±0.06	52±0.07
Commiphora myrrha	Ethanol	21.12	18±0.07	13±0.08
Vernonia amygdaline	Ethanol	17.30	39±0.09	In active
propyl gallate*	-	-	88±0.09	-
EDTA*	-	-	-	97±0.01

* = standard antioxidant

The present results reveal that the *Solenostemma argel* have iron chelating ability which gives it a favorable property to act as oxidation preventer by blocking the iron which is considered as radical chain initiator. By inhibiting the oxidation chain initiator, we prevent the radical to excised and reducing the damages which could occur by them. The ethanolic extract of *S. argel* also showed low DPPH activity, which gives him the ability to scavenging the produced radical in the body by breaking the chain reaction. However, the known methods to act as antioxidant is: 1) blocking of the initiator, 2) radical chain breaking [26]. And as we described the *S. argel*is active for both ways. *The Commiphora myrrha* and *Vernonia* amygdaline showed lowantioxidant potential by both tested methodologies.

4. Conclusion

All tested solvent extracts of *Solenostemma argel, Commiphora myrrha and Vernonia amygdaline* showed antioxidant activity. The effect of this plant bioactivities, and toxicological investigation and Further purification, need to be carried out.

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Competing Interests

The authors declare there that they have no competing interests.

References

[1] Halliwell B., Gutteridge J (1989) in free radicals in Biology and Medicine, 2nd edtion Oxford University Press, Oxford, UK.

[2] Enns GM, Kinsman SL, Perlman SL, Spicer KM, Abdenur JE, et al. (2012) Initial experience in the treatment of inherited mitochondrial disease with EPI-743. Mol Genet Metab 105: 91-102.

[3] Skulachev VP, Anisimov VN, Antonenko YN, Bakeeva LE, Chernyak BV(2009) An attempt to prevent senescence: a mitochondrial approach. BiochimBiophysActa 1787: 437-461.

[4] Jomova K, Vondrakova D, Lawson M, Valko M (2010) Metals, oxidative stress and neurodegenerative disorders. Mol Cell Biochem 345: 91-104.

[5] Mariani E., Polidori MC., Cherubini A., Mecocci P (2005) Oxidative stress in brain aging, neurodegenerative and vascular diseases: an overview. J Chromatogr B AnalytTechnol Biomed Life Sci, 827(1):65–75.

[6] Madeo J, Zubair A, Marianne F (2013). A review on the role of quinones in renal disorders. Springerplus 2: 139.

[7] Tsai KL, Chen LH, Chiou SH, Chiou GY, Chen YC, et al. (2011) Coenzyme Q10 suppresses oxLDL-induced endothelial oxidative injuries by the modulation of LOX-1-mediated ROS generation via the AMPK/PKC/NADPH oxidase signaling pathway. MolNutr Food Res 55 Suppl 2: S227-240.

[8] Morré DJ, Morré DM (2011) Non-mitochondrial coenzyme Q. Biofactors 37: 355-360.

[9] Karunakaran U, Park KG (2013) A systematic review of oxidative stress and safety of antioxidants in diabetes: focus on islets and their defense. Diabetes Metab J 37: 106-112.

[10] McCarty MF, Barroso-Aranda J, Contreras F (2010). Oxidative stress therapy for solid tumors - a proposal. Med Hypotheses 74: 1052-1054.

[11] Kurien BT, Scofield RH (2008) Autoimmunity and oxidatively modified autoantigens. Autoimmun Rev 7: 567-573.

[12] Frieri M (2012) Accelerated atherosclerosis in systemic lupus erythematosus: role of proinflammatory cytokines and therapeutic approaches. Curr Allergy Asthma Rep 12: 25-32.

[13] Kritchevsky SB, Muldoon MF (1996). Oxidative stress and aging: still a hypothesis. J Am GeriatrSoc 44: 873-875.

[14] Sies H. (1997). Oxidative stress: oxidants and antioxidants. Exp. Physiol. 82(2): 291–295.

[15] Prerna U., Vikas S. (2010). Therapy of Alzheimer's disease: An update. African Journal of Pharmacy and Pharmacology. 4,6, 408-421.

[16] Gareth Thomas (2007). Medicinal Chemistry. 2nd edition. John Wiley & Sons Ltd.

[17] Hema, T. A., Shiny, M. and Parvathy, J., (2012). Antimicrobial activity of leaves of Azimatetracantha against clinical pathogens. Int J PharmaSci 4(4):317-319.

[18] Prabhu GR., Gnanamani A and Sadulla S (2006). Guaijaverinaplant flavonoid as potential antiplaque agent against Streptococcus mutans. J. Applmicrobial.; 10: 487-95.

[19] Tiwari p, Kumar B, Kaur M, Kaur G and Kaur H (2011). Phytochemical screening and Extraction: A Review. Internationale Pharmaceutica Sciencia. 1, 98-106.

[20] Al- Deen AT and Al-Naqeb G (2014). Hypoglycemic effect and in vitro antioxidant activity of methanolic extract from Argel (Solenostemma Argel) plant. *International Journal of Herbal Medicine.* 2 (2): 128-131.

[21] Yeap SK, Ho WY, Beh BK, Liang WS, Ky H, Yousr AHN and Alitheen NB (2010). Vernoniaamygdalina, an ethnoveterinary and ethnomedical used green vegetable with multiple bioactivities. *Journal of Medicinal Plants Research.* 4 (25): 2787-2812.

[22] Su S, Wang T, Chen T, Duan J, Yu L and Tang Y (2011). Cytotoxicity activity of extracts and compounds from Commiphoramyrrha resin against human gynecologic cancer cells. *Journal of Medicinal Plants Research.* 5(8): 1382-1389.

[23] Osama A and Awdelkarim S. Phytochemical screening of Ficussycomorus L. bark and Cleome gynandra L. aerial parts. J. Pharmacog. and Phytochem. 2015; 4(4): 24-27.

[24] Shimada K., Fujikawa K., Yahara K., Nakamura T. (1992) antioxidative properties of xanthan on the antioxidation of soybean oil in cyclodextrin emulsion. Journal of Agric food chemistry. 40:945-948.

[25] Dinis T, Madeira V, Almeida L, (1994) Action of phenolic derivates (acetoaminophen, salycilate, and 5-aminosalycilate) as inhibitors of membrane lipid peroxidation and as peroxyl radical scavengers. Arch BiochemBiophys. 315:161-169.

[26] Osama A, Awdelkarim S, Fadul E, Mohamed G, Siddig M, Sheikh A, Abdelmoneim A, Khalid A, Mohammed A (2015). In vitro Evaluation of Acacia nilotica Pods for its Antioxidant, Acetylcholinesterase Inhibitory Activities and Phytochemical Screening. Euro. Acad. Res. 3(3): 3059-3069.