World Journal of Pharmaceutical and Life Sciences
WJPLS
www.wjpls.org
SJIF Impact Factor: 4.223

PHYSICOCHEMICAL CHARACTERIZATION OF A FLAVONE FROM *ACACIA ORFOTA* (FORSSK.) SCHWEINF (FABACEAE)

Abdel Karim. M.[1*], Abdelwahab A.[2], Sayed,E.[3] and Mahmoud,I.[4]

[1]Sudan University of Science and Technology, Faculty of Science, Dept. of Chemistry.
[2]University of Zalingei, Sudan.
[3]Chemistry of Tannins Department, National Research Centre, Dokki, Cairo, 12622, Egypt.
[4]Chemistry of Natural and Microbial Products Dept. National Research Centre (ID: 60014618), Dokki, 12311, Cairo, Egypt.

***Corresponding Author: Dr. Abdel Karim. M.**
Sudan University of Science and Technology, Faculty of Science, Dept. of Chemistry.

Article Received on 16/12/2016 **Article Revised on 06/01/2017** **Article Accepted on 26/01/2017**

ABSTRACT

Information on the constituents of medicinal plants used in Sudanese ethnomedicine could provide a rationale for their traditional uses. Hence this study was designed to investigate the phenolics of the medicinally important species *Acacia orfota* which is widely used in ethnomedicine to treat a wide array of human disorders. A Flavone was isolated from the leaves and its structure was partially elucidated on the basis of its spectral data (UV, ^{1}HNMR and MS).

KEYWORDS: *Acacia orfota*, Isolation, Flavone.

INTRODUCTION

Flavonoids are phenolic compounds widely present in plants and foods of plant origin.[1-4] Flavonoids contain fifteen carbon atoms in their basic nucleus- flavan, arranged in a C_6-C_3- C_6 configuration consisting of two aromatic rings (A and B) linked by a three carbon unit which may or may not form a third heterocyclic ring (C). There are six major subgroups: chalcones, flavones, flavonols, flavanones anthocyanins and isoflavonoids. Flavonoids encompass a large group of polyphenolic substances with marked physiological potential including: antibacterial, anti-inflammatory, antiallergic, antifungal, antimutagenic, antivirl and vasodilator effects.[5-7]

The genus *Acacia* (Fabaceae) comprises about 1350 species.[8] Species belonging to this genus are considered as a rich source of gallic and ellagic acids.[9] Many flavonoids have been reported from different *Acacia* species[10] and many Acacia species find applications in traditional medicine.[11] Some *Acacia* species were claimed to exhibit potent antimicrobial activity.[12] The medicinally important species *Acacia nilotica* is used traditionally in Sudan as a remedy for malaria, sore throat, cough , intestinal worms and wounds.[13-16] The plant is also used for leather tanning[17] while Gum Arabic- from *Acacia seyal*- is considered as a safe dietary fiber by the United States Food and Drug Administration since 1970s. Though its therapeutic use was extensively studied in animal models, there is paucity of data regarding quantified use in humans.[18] Acacia gum has been used in pharmaceuticals as demulcent. It is also used for wounds and has been shown to inhibit early deposition of plaque.[19]

The antioxidant capacity of the ethanolic extract of *Acacia nilotica* leaves against stable DPPH radical has been documented.[13] Also in DPPH bioassay, Duduku *et. al.*[14] evaluated the antioxidant capacity of *Acacia auricoliformis.*

In continuation of our interest in the constituents of Acacia species growing in Sudan, this study was designed to investigate the phenolics of the medicinally important *Acacia orfota* (Forssk.) Schweinf.

MATERIAL AND METHODS

Materials

Plant material

The leaves of *Acacia orfota* were collected from Kordofan, west Sudan in May 2016. The plant was authenticated by the direct comparison with a herbarium sample.

Instruments

The ultraviolet lamp used in visualizing paper chromatograms was a multiband UV Hanova lamp (6 watt S/Y and L/W). Ultraviolet absorption spectra were

obtained in spectroscopic methanol on a Shimadzu UV - Visible Spectrophotometer. The electron impact ionization (EIMS) mass spectrum was run on a solid probe using a Shimadzu QP-class-500 Spectrometer. ^{1}HNMR spectrum was obtained on a Bruker AM 500 Spectrophotometer (Germany) operating at 500 MHz in spectroscopic grade DMSO-d_6. The chemical shifts values are expressed in δ (ppm) units using (TMS) as an internal standard and the coupling constants (J) are expressed in Hertz (Hz).

Methods

Isolation of flavonoids from *Acacia orfota*

(1Kg) Of powdered air-dried plant material was macerated with 80% aqueous methanol (5L) for 24hr. at room temperature with occasional shaking and then filtered off. The extraction process was repeated two more times with the same solvent. Combined filtrates were concentrated under reduced pressure yielding a crude product, which was suspended in 300 ml water and left overnight in a refrigerator and then filtered. The aqueous filtrate was partitioned successively with n-hexane, chloroform, ethyl acetate and n-butanol.

Open column (80x 4 cm) was used for fractionating the n-butanol fraction. Polyamide was used as stationary phase and water /methanol (4:1 ; 3:2 ; 2:3 ;1:4 ;v:v:v) was used as mobile phase to afford collective fractions. Fraction 1(4:1; water: methanol) was further purified by paper chromatography followed by a Sephadex column eluted with water: methanol(1:1.v:v) to yield compound I.

RESULTS AND DISCUSSION

Compound I was isolated as a pale yellow powder from *Acacia orfota.* The structure of this isolate was partially elucidated on the basis of its spectral data (UV, ^{1}HNMR and MS). The UV spectrum of compound I gave λ_{max} (MeOH) 272,323, 354nm(Fig.1). Such absorption is usually given by flavones.[1,2] The sodium acetate spectrum (Fig.1) revealed a bathochromic shift diagnostic 7-OH function[1]. No detectable bathochromic shifts were observed with other shift reagents.

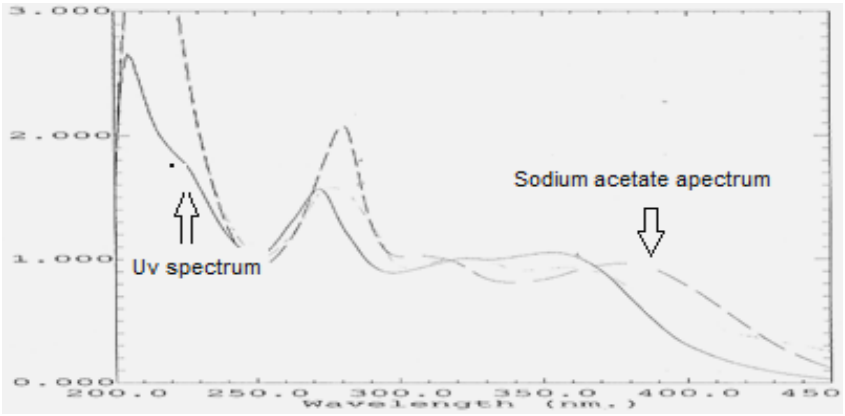


Fig. 1: UV spectrum of compound I.

The ^{1}HNMR spectrum (Fig. 2) showed: δ01.00 integrating for 6 protons assigned for two methyl groups; δ3.63 (3H) and δ3.80(3H) accounting for two methoxyl functions; δ3.40-3.70(m) assigned for a sugar moiety; δ5.96, δ7.04 assigned for C_6- and C_8-protons respectively. The B ring aromatic protons appeared at δ6.94 and δ8.19ppm. The mass spectrum gave m/z326 for M^+ (aglycone).

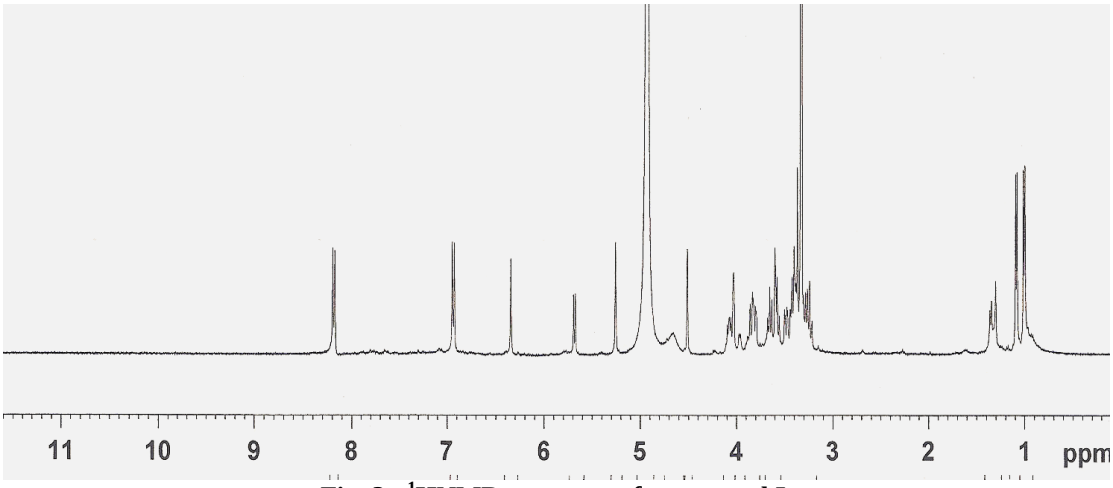
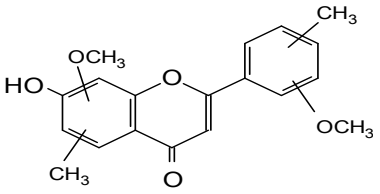
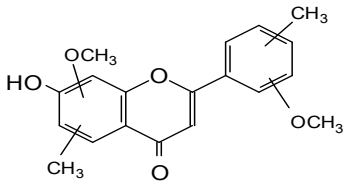


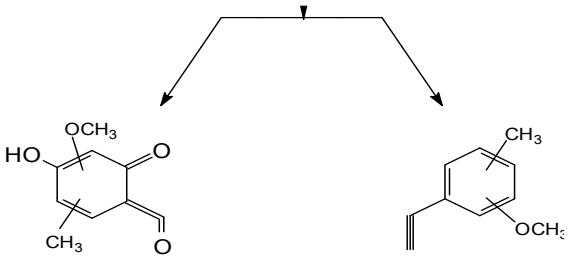
Fig. 2 : ^{1}HNMR spectrum of compound I.

The assignment of substituents for (A) and (B) rings was based on the retro Diels-Alder cleavage(Scheme I) which revealed signals at m/z1180 and m/z146 for intact (A) and (B) rings respectively. Comparison of the above cumulative data with data published on literature resulted in the partial structure for compound I(aglycone):



Compound I (aglycone)





m/z180 m/z146

Scheme I: Retro Diels-Alder fission of compound I.

REFERENCES

1. Markham, K.R. "Techniques of Flavonoids Identification", 1982, Academic Press, London.
2. Harborne, J.B. "Phytochemical Methods: A guide to Modern Techniques of Plant Analysis", Chapman and Hall, London, 1973, pp. 1–74.
3. Nuutila, A.M., Kammiovirta, K.M., Oksman-Caldentey, K.M., *J. Food Chem*, 2002; 76: 519.
4. Argaez, B., Flowers, B.A., Gimenez-Turba, A., Ruiz, G., Waterman, P.G., Pena-Rodriguez, L.M., *J. Phytomed*, 2007; 11: 214.
5. Skibola, C.F. and Smith, M.T., *Free Radical Biology and Medicine*, 29, 2000; 375-383.
6. Messina, M. and Messina,V., *Journal of the American Dietetic Association*,1991; 91: 836-840.
7. Dajas, F., *Brazilian Journal* of *Medical and Biological Research*, 2003; 36: 1613.
8. Seigler, D. S.,*Biochemical Systematics and Ecology*, 31, 2003; 845.
9. Sultana N, Akhter M and Khatoon Z, *Nat Prod Res*, 2010; 24(5): 407.
10. Gaara A. H., Nassar M. I., Younis, M., Elmegeed, G. A., Mabry, T. J., Pare, P. W. *Latinoamer. Quim, 36*, 2008; 52.
11. Boulos, L. "Medicinal Plants of North Africa" Algonac, Michigan, P 115(1983).
12. Almagboul A. Z., Bashir A. K., Saleh A. K., Farouk A., Khalid S. A., *Fitoterapia*, 59, 1988; 57.
13. Shetty K A B, *Indian Farming*, 1977; 26(11): 82.
14. Joshi P, Ethnomedicine of Tribal Rajasthan - An over view; In: Pushpangadan (Eds.), "Gilmpses of Indian Ethnopharmacology", TBGRI, Thiruvunanthapura, India, 1994; 147-162.
15. Jain A, Katewa S S, Galav P K and Sharma P, *Indian J Ethnopharmacol*, 2005; 102(2): 143.
16. Kubmarawa D, Ajoku G A, Enwerem N M and Okorie D A, *Afr. J. Biotechnol*, 2007; 6(14): 1690.
17. Sahni M, "Important Trees of the Northern Sudan", Khartoum University Press, 1968; 40-63.
18. Rasha,B.,Tarig,H.,Khalifa,E.,Rehab,M.,Florian,L. and Amal,M.,*Nutr. J*., 11, 2012; 111.
19. WWW.drugs.com/npp/Acacia-gum.
20. Kalaivani,T., Mathew,L., *Food and Chemical Toxicology*, 2010; 48(1): 298.
21. Duduku,K., Rosalam,S., Rajesh,N., *Food and Bioproducts Processing*, 2011; 89(3): 217.