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Research Article

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Partial Characterization of a Flavone from Sudanese *Dichrostachys cinerea* (L.) Wight & Arn. (Mimosaceae)

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Abstract *Dichrostachys cinerea* is a potential medicinal plant and it finds numerous uses in ethnomedicine. The root is reported as astringent, anodyne, diuretic and anti-inflammatory. Roots are also used against urinary calculi, renal disorders, vaginitis and rheumatism.

This study was designed to investigate the major flavonoid of *Dichrostachys cinerea* leave. The flavonoid was extracted with ethanol and the crude extract was purified by a combination of chromatographic techniques where a flavone has been isolated. The structure of this compound has been partially characterized by some spectral tools (UV and ^{1}HNMR).

Keywords *Dichrostachys cinerea*, Flavone

Introduction

Traditional medicine has been practiced by different communities worldwide for centuries in treatment of diverse human ailments. Though the use of synthetic drugs has revolutionized the treatment of a wide range of human disorders, serious challenges, such as multi-resistance resulting from their indiscriminate recently became a cause of concern. To face these challenges extensive research work has been observed in bioactive phytochemicals that could serve as leads for drug development and drug design.

Dichrostachys cinerea (L.) Wight & Arn. is a leguminous shrub in the family Mimosaceae [1]. The plant is more common at low altitudes where it grows in a wide range of soils [2,3].

Dichrostachys cinerea is a potential medicinal plant and it finds numerous uses in ethnomedicine [3,4]. The root is reported as astringent, anodyne, diuretic and anti-inflammatory [5]. Roots are also used against urinary calculi, renal disorders, vaginitis and rheumatism [6]. *Dichrostachys cinerea* shoots are applied to eyes in case of opthalmia [7]. The antibacterial potency of leaves and fruits have been documented [8] and root extracts have been investigated against sexually transmitted diseases [9]. The roots are also used as febrifuge, antivenom and as a remedy for leprosy. Several studies documented the free radical scavenging capacity of *Dichrostachys cinerea* which contains antioxidants like tannins, flavonoids, terpenoids and phenolic acids[10,11].

It has been reported that some of these antioxidants are endowed with anti-inflammatory, anti-atherosclerotic, antitumor, antimutagenic, antibacterial, and antiviral properties [12,13].

Despite all these attributes of *Dichrostachys cinerea* , phytochemical and pharmacological studies on this potential plant are mostly limited to tannins and a preliminary report on the anticancer properties of some phytochemicals. Hence, this study was designed to investigate the flavonoids of this plant.

Materials and Methods

Collection of plant Sample

Dichrostachys cinerea was collected from Alnahud - western Kordufan Sudan. The plant was identified taxonomically and authenticated by the Institute of Aromatic and Medicinal Plants,Sudan.

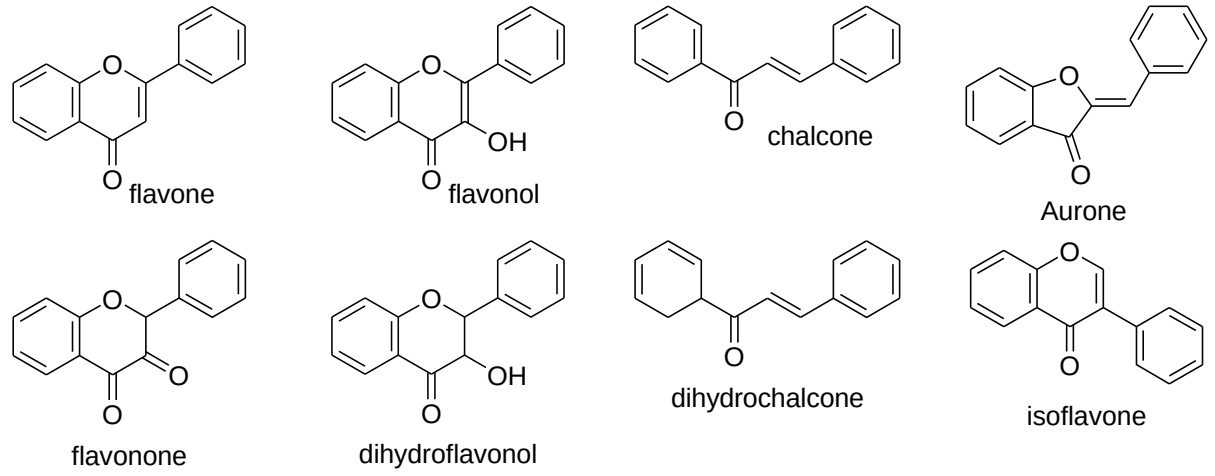
Extraction of Plant Material

Powdered shade-dried leaves of *Dichrostachys cinerea* (450g) were defatted with petroleum ether and macerated with 70% methanol for 48h. The solvent was removed under reduced pressure and the residue was dissolved in water (150ml) and filtered. The filtrate was partitioned with successive portions of n-hexane, chloroform, ethyl acetate and n-butanol.

The n-butanol extract was concentrated to dryness to yield a dark amorphous material. This extract was chromatographed on polyamide column eluted by H_2O/ EtOH (3:4;v:v) where three subfractions (i), (ii) and (iii) were obtained. Fraction (iii) was chromatographed on a Sephadex LH-20 column using 50% methanol as an eluent. Finally the isolated flavonoid was purified -before spectral analysis- by paper chromatography eluted with BAW (n-BuOH-HOAc-H_2O 4:1:5, upper layer) .

Results and Discussion

In most cases, the UV spectra of flavonoids is a valuable tool that can distinguish the class of a specific flavonoid. Some flavonoids exhibit two UV absorption bands: band II – due to benzoyl chromophore – and band I – due to cinnamoyl chromophore. Band II appear in the range 230-290 nm , while band I occur usually in the range 300-400nm. Those flavonoids which are characterized by conjugation between the carbonyl function and the aromatic B ring of flavonoids exhibit both bands. Thus flavones, flavonols, chalcones and aurones show both bands. Other classes of flavonoids – flavanones, isoflavones, dihycrochalcones and dihydroflavonols – exhibit only one band (band II) due to loss of conjugation between the carbonyl group and ring B [14-16].



The UV spectrum of compound I showed (Fig. 1) λ_{max} (MeOH) 289, 323nm. Such absorption suggests a flavones [15,16]. The hydroxylation pattern of this compound was studied using different UV shift reagents; sodium methoxide (diagnostic of 3- and 4`-OH); sodium acetate (diagnostic of 7-OH); aluminium chloride (diagnostic of 3- and 5-OH and catechol systems) and boric acid (diagnostic of catechol moieties) [16].

The sodium methoxide spectrum (Fig. 2) showed a bathochromic shift in band I with increase in intensity indicating a 4`-OH function [15,16]. The sodium acetate spectrum (Fig. 3) failed to afford a bathochromic shift suggesting absence of a 7-OH group [16]. The aluminium chloride spectrum (Fig. 4) gave a 6nm bathochromic shift in band I. This shift is diagnostic of a catechol system (the aluminium complex decomposed on addition of HCl as suggested [16] by Fig. 5. Further evidence [16] in favor of a catechol moiety comes from the boric acid spectrum (Fig. 6) which revealed a bathochromic shift (see also figures 7-9).

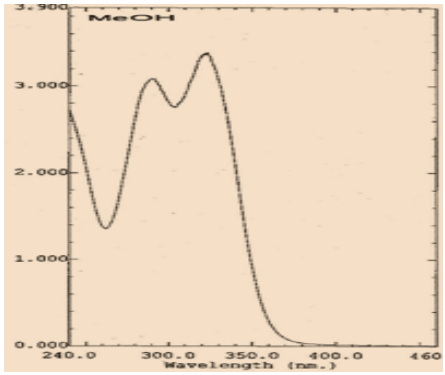


Figure 1: UV spectrum of compound I

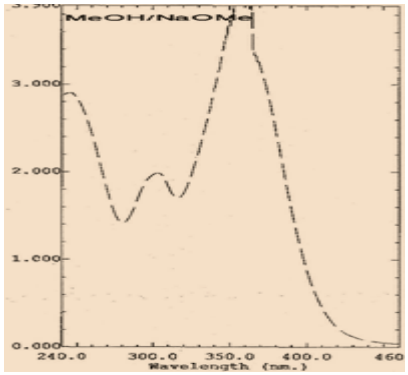


Figure 2: Sodium methoxide spectrum of compound I

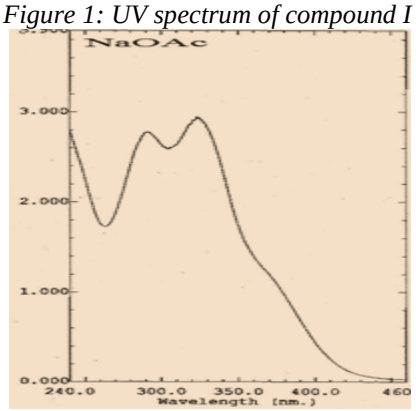


Figure 3: Sodium acetate spectrum of compound I

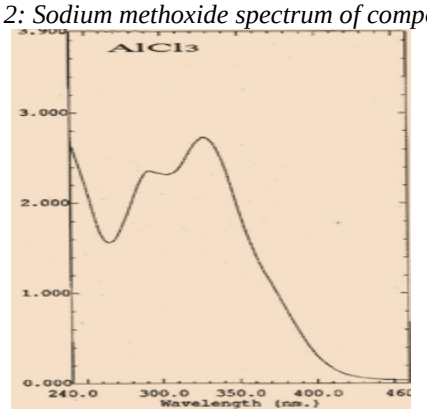


Figure 4: Aluminium chloride spectrum of compound I

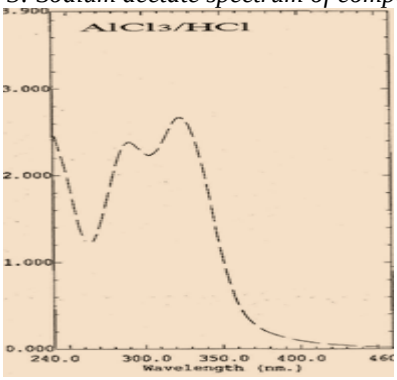


Figure 5: Aluminium chloride / HCl spectrum of compound I

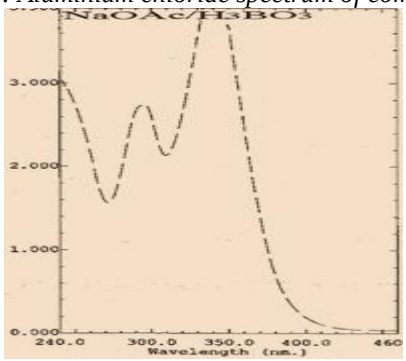


Figure 6: Boric acid spectrum of compound I

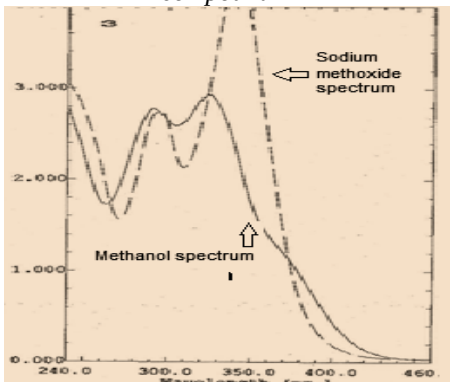


Figure 7: Methanol/sodium methoxide spectra

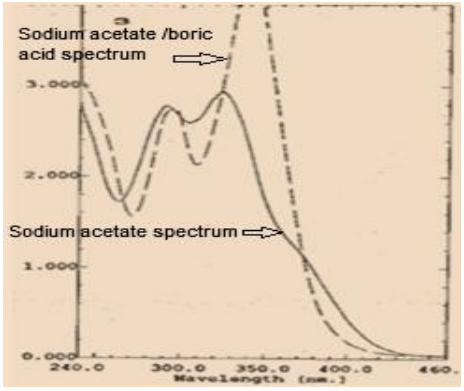


Figure 8: Sodium acetate / boric acid in sodium acetate spectra

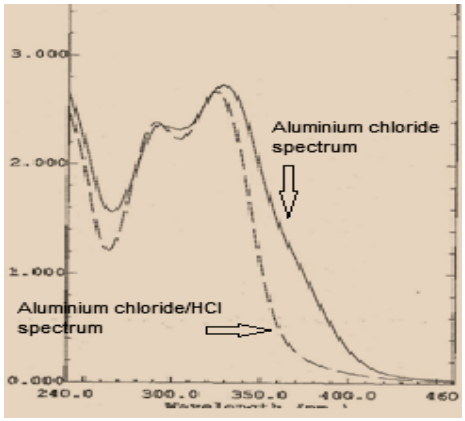
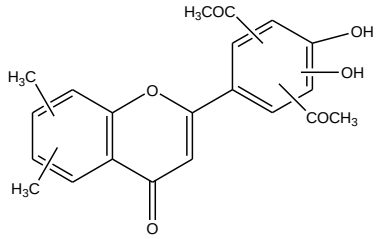


Figure 9: Aluminium chloride /Aluminium chloride/HCl spectra

The ^{1}H NMR spectrum (Fig.10) showed δ (ppm): 1.18(assigned for a methyl group); 2.66, 2.81(2 acetyl groups); 4.31 (methoxyl); 6.18-7.21-multiplet (Ar. protons); 7.91(Ar. proton). On the basis of its spectral data, the following partial structure was proposed for compound I:



Compound I

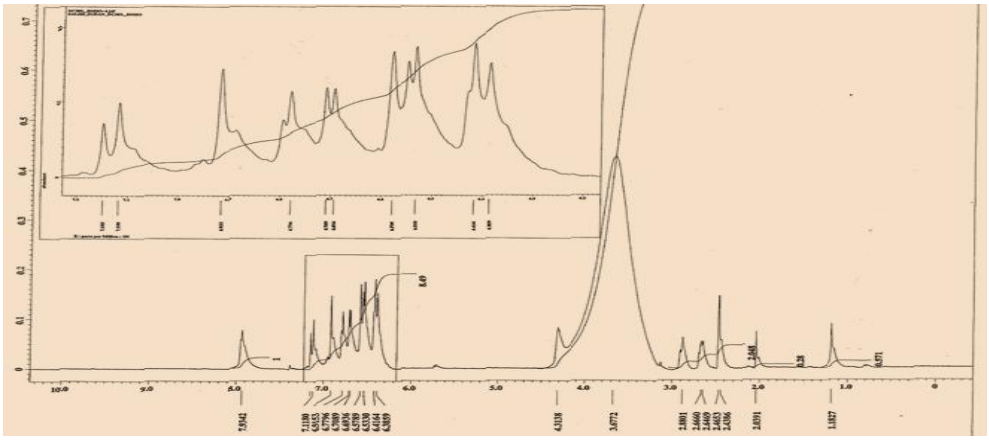


Figure 10 : ^{1}HNMR spectrum of compound I

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