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Research Article

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Phytochemical screening of *Gomphrena serrata L.*

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ABSTRACT

The phytochemical analysis of chloroform extract of the medicinal plant Gomphrena serrata was investigated. The qualitative phytochemical screening reported the presence of carbohydrates, glycosides, aminoacids, phytosterols, flavonoids, phenolics and terpenoids. The compound oleuropein isolated from Gomphrena serrata has been found earlier in Olive tree and other plant species, and our results further substantiated its structure. To the best of our knowledge oleuropein was isolated for the first time from Gomphrena serrata.

Key words: *Gomphrena serrata*, chloroform extract, phytoconstituent, oleuropein

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INTRODUCTION

The genus *Gomphrena* (Fam: Amaranthaceae) comprises approximately 120 species found in the Americas, Australia, and Indo-Malaysia; 46 species occur in Brazil, in savanna vegetation (cerrado), napeadic grassland (campo limpo), high altitude grassland (campo rupestre), and caatinga; only a few species are found in forest [1]. A number of Brazilian *Gomphrena* species are employed in the treatment of bronchial asthma, diarrhea, and fever, and as an analgesic, tonic, or carminative [1]. This species show antimalarial and diuretic activities [2, 3]. There is little phytochemical and pharmacological screening report on this genus [1, 4]. In this paper, we deal with the isolation and structural elucidation of oleuropein, a phenolic glycoside constituent.

EXPERIMENTAL SECTION

Plant material

Fresh plant *Gomphrena serrata* was collected in the month of August from the surroundings of Calicut and authenticated **(**Specimen No. 95953**)** by Dr. A. K. Pradeep, Herbarium Curator, Department of Botany, University of Calicut, Calicut and a voucher specimen is deposited in the Department of Botany, University of Calicut, itself.

Chemicals and instruments

The chemicals were purchased from Aldrich Chemical Co. Bangalore, India. Extraction and isolation were monitored by thin layer chromatography on pre-coated silica gel H aluminium backed plates (Merck, Darmstadt). Visualisation of spots for thin layer chromatography was performed using a UV GL-58 Mineral-Light lamp. Melting points were determined using a Gallenkamp Melting Point apparatus microscope (UK). IR Spectra were recorded using a Bruker Tensor 27 spectrometer, resolution 4 cm-1. NMR spectra were recorded using a Bruker Avance-300 spectrometer (7.05 T) equipped with a 5 mm singleaxis Z-gradient quattro nucleus probe, operating at 300 MHz for 1H and at 75 MHz for 13C. The spectrometer was running TOPSPIN NMR system software (Version **2.0**). Chemical shifts (d) are reported in parts per million (ppm), peak positions relative to Me4Si (0.00 ppm) for 1HNMR and 13C-NMR spectra. Mass spectra were recorded using a Micromass PLATFORM II (ES) and Thermo Finnigan

MAT95XP (Accurate mass) instrument. UV-visible spectra were recorded in 1 mL quartz cuvettes using a Cary 4000 UV-visible spectrophotometer equipped with a Peltier-thermostatted cuvette holder.

Extraction and purification

Dry powdered plant of *Gomphrena serrata* (1 kg) was subjected to exhaustive hot extraction with chloroform, using Soxhlet apparatus. The extract was concentrated to a dry mass by vacuum distillation, which yielded 8.0 g. The extract was subjected to qualitative phytochemical screening for the detection of phytoconstituents such as alkaloids, glycosides, carbohydrates, proteins and amino acids, steroids, saponins, flavonoids, tannins and phenol, triterpenoids and fixed oils [5].

Isolation and characterization

The extract was chromatographed over a column filled with silica gel (Silica gel H, Merck). The elution started with hexane. Then petroleum ether was gradually added until the eluent was pure petroleum ether. Then chloroform was gradually added until the final eluent was pure chloroform. Fractions were collected and grouped according to the results of TLC. The combined fractions of the chloroform extract were submitted to preparative TLC with hexane: ethyl acetate (8.5: 0.7) as mobile phase. This yielded three compounds, out of which only one (Compound 1) was isolated (Rf value 0.38). Characterization of the isolated compound was carried out by Melting point, UV, IR, ^{1}HNMR spectroscopy, ^{13}CNMR spectroscopy, mass spectroscopy analysis.

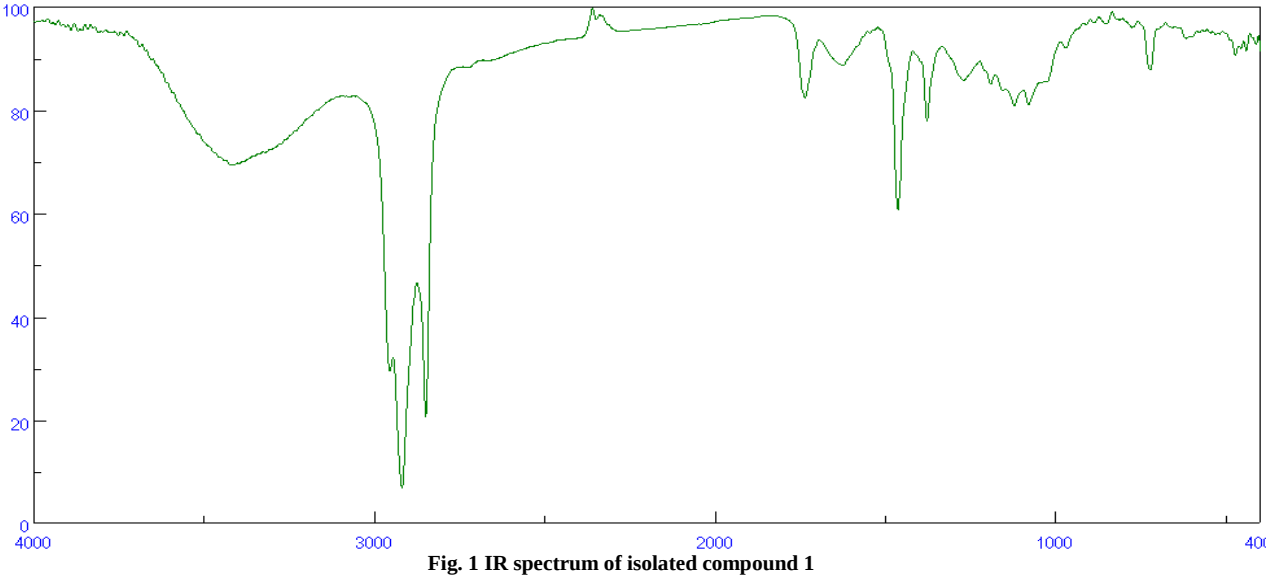

Fig. 1 IR spectrum of isolated compound 1

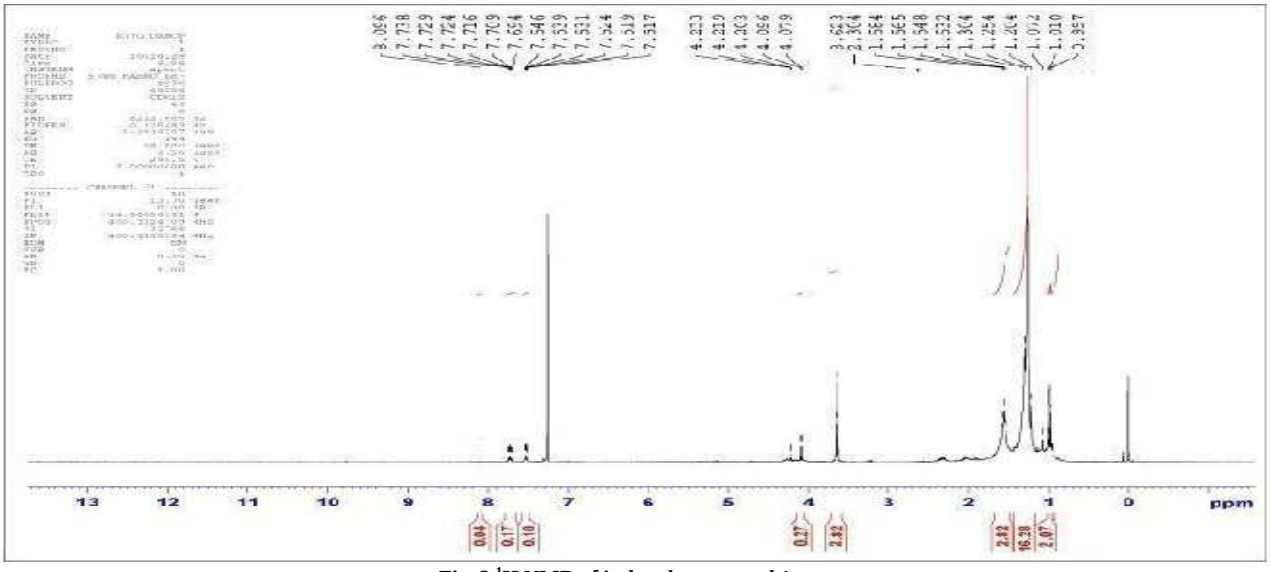

Fig. 2 ^{1}H NMR of isolated compound 1

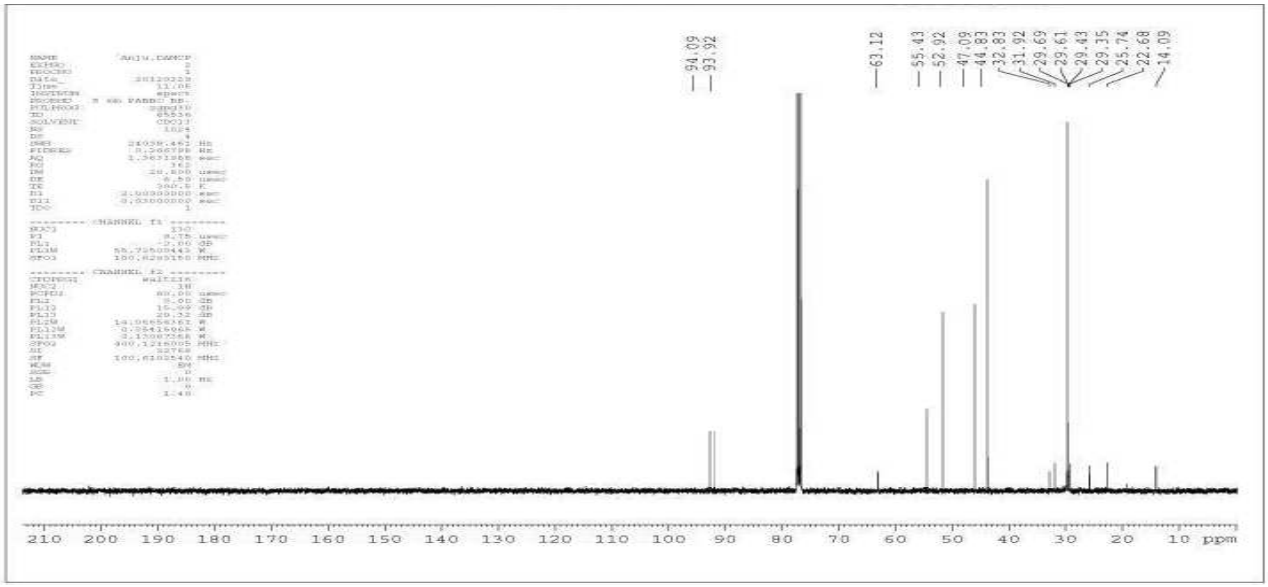

Fig. 3 ^{13}C NMR of isolated compound 1

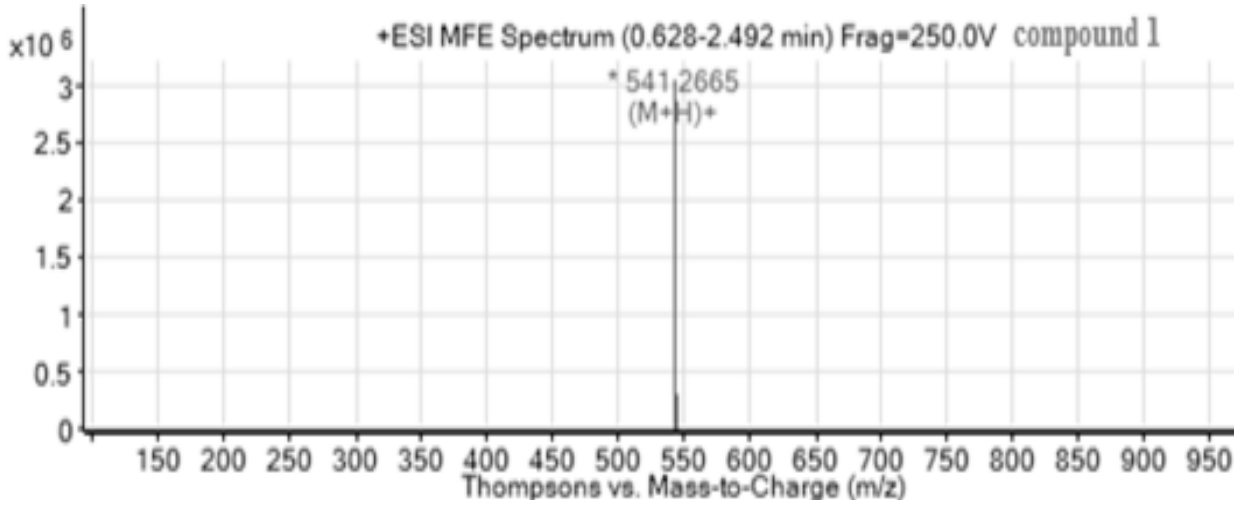

Fig. 4 Mass spectrum of isolated compound 1

RESULTS AND DISCUSSION

Dry powdered plant of *Gomphrena serrata* when subjected to exhaustive hot extraction with chloroform, yielded 8.0 g of mass. The qualitative phytochemical screening reported the presence of carbohydrates, glycosides, aminoacids, phytosterols, flavonoids, phenolics and terpenoids. The compound **1 (Oleuropein)** isolated from *Gomphrena serrata* has been found earlier in *Olive* tree and other plant species, and our results further substantiated its structure. To the best of our knowledge oleuropein was isolated for the first time from *Gomphrena serrata*.

Elution of the column with solvents petroleum ether: chloroform (70:30) gave 60 mg of compound **1** as pale yellow crystalline compound. It showed positive test for phenolic compound. The compound was identified as (*E*)-methyl 4- (2- (3, 4- dihydroxy phenethoxy) -2- oxoethyl) -5- ethylidene -6- (3, 4, 5-trihydroxy -6 (hydroxymethyl)- tetrahydro -2*H*- pyran -2- yloxy) -5, 6- dihydro -4*H*- pyran -3- carboxylate (**1**). The spectral data are consistent with those previously reported. Mp. 91-92 ^{0}C; UV λmax 332 nm; IR 3490 (O-H str), 2940 (C-H str, asym), 2890 (C-H str), 1710 (C=O str), 1480 (C-H def, asym), 1390 (C-H def, sym) cm-1; 1H NMR (300 MHz, DMSO-d6) δ 8.09 (s, 2H, phenolic OH), 7.694 (s, 1H, CH of pyran)**,** 7.524 (m, 3H, ArH of dihydroxy phenol), 4.20 (t, J=12 Hz, 1H, CH of CH-CH_2-COO), 4.07 (d, J=6.8 Hz, 1H, CH of pyranose)**,** 3.62 (s, 3H, carbomethoxy), 2.31 (s, 3H, acetate), 1.53-1.58 (m, 4H, CH of pyranose), 1.304, 1.254, 1.204, 1.072 (s, 1H, 4xOH of pyranose), 1.01 (d, J = 5.2 Hz, 3*H*, CH_3 of CH-CH_3), 0.980 (t, J = 5.2 Hz, 2H, CH_2 of phenethoxy); 13C NMR (75 MHz, DMSO-d6) δ 63.12, 93.9, 94.09 (C), 44.83, 47.09, 52.9, 55.4, 56.1 (CH), 25.74, 29.35, 31.92, 32.83 (CH2), 14.09, 22.68 (CH3). MS (ES-) m/z 540.514; HRMS (ES-) C17H25O4 Calcd. 541.2665.

In conclusion, this study confirms the presence of a phenolic glycoside, oleuropein from *Gomphrena serrata* and this is reported to be present in this species for the first time. The development of novel oleuropein as an anti cancer agents and *in-silico* docking or computational studies are in progress.

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