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SHORT COMMUNICATION

Isolation of quercetin-3-*O*-rutinoside from the leaves of *Globimetula braunii* (Loranthaceae) growing on *Terminalia catappa* (Combretaceae)

Suleiman DANLADI*, Aisha M. ALHASSAN

Department of Pharmaceutical and Medicinal Chemistry, Faculty of Pharmaceutical Sciences, Bayero University, Kano, Nigeria.

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Abstract
Globimetula braunii is a medicinal plant that grows in tropical countries and is used in the treatment of various diseases. The plant was reported to contain several secondary metabolites that are responsible for its therapeutic activities. This study aimed to isolate more flavonoid compounds present in the *n*-butanol fraction of the ethanol leaf extract of the plant. The *n*-butanol fraction of an ethanol leaf extract of *Globimetula braunii* was subjected to column chromatography over silica gel, and repeated gel filtration with Sephadex LH-20 eluted with methanol led to the isolation of a compound identified as the flavonoid glycoside, quercetin-3-*O*-rutinoside and its structure was elucidated on the basis of spectroscopic data.

Keywords: Quercetin-3-*O*-rutinoside; *Globimetula braunii*; Phytochemicals; Spectroscopy; NMR

INTRODUCTION

Flavonoids constitute a major group of phenolic compounds in plants [1]. They are widely distributed in plants. Chemically, flavonoids are characterized by their flavone backbone, which consists of 15 carbon atoms arranged in three (C6-C3-C6). It has been reported that more than 4000 are found in nature [2]. Flavonoids are reported to possess several biological and therapeutic activities, such as antioxidant, anticancer, and cardio-protective activities. A diet rich in flavonoids has been associated with various health benefits, including reduced risk of chronic diseases such as heart disease, cancer, and neurodegenerative disorders [3].

Globimetula braunii is a medicinal plant that grows in tropical countries and is used in the treatment of various diseases [4]. The plant was reported to contain several secondary metabolites that are responsible for its therapeutic activity [5]. In our previous studies, we reported the isolation of flavonols (rhamnetin, quercetin and rhamnetin-3-*O*-α-L-rhamnopyranoside) from this plant [6]. This study aimed to isolate more flavonoid compounds present in the *n*-butanol fraction of the ethanol leaf extract of the plant.

*Correspondence. *E-mail*: Sdanladi.phc@buk.edu.ng *Tel*: +234-8062228858. ISSN 0189-8442

EXPERIMENTAL METHODS

Collection and identification of plant material. The whole *Globimetula braunii* plant, growing on *Terminalia catappa* was collected from Tarauni Local Government Area, Kano State, in December 2017. It was identified and authenticated by Mallam Namadi Sunusi of the Herbarium Unit, Department of Botany, Ahmadu Bello University Zaria, Nigeria. A specimen of the collected plant was issued a voucher number (No. 2839) after comparing with an existing specimen [7].

Extraction and isolation of the compound. The leaves of *Globimetula braunii* growing on *Terminalia catappa* (2.5 kg) were extracted with 70% v/v ethanol at room temperature. The solvent was removed under a vacuum. The crude ethanol extract was successively partitioned with n-hexane, chloroform, ethyl acetate and *n*-butanol. The *n*-butanol fraction (3.0 g) was chromatographed on a silica gel column eluting with chloroform 100%, then chloroform-methanol with constant increasing polarity. A total of 128 fractions were collected. The fractions were pooled together based on their TLC profiles to give 21 major fractions coded A-U [6]. Fraction R was further subjected to repeated gel filtration with Sephadex LH-20 and eluted with 100% methanol to afford compound GB_5 (7 mg). The compound was further recrystallized, to give a yellow amorphous powder. The compound was characterized by 1D and 2D NMR and, in comparison with data reported in literature for the identical compound.

RESULTS AND DISCUSSION

The compound GB_5 was isolated as yellow amorphous powder having a melting point of 215-217°C.

GB_5 was identified by 1D (^{1}H and ^{13}C) and 2D (Cosy, HSQC and HMBC) -NMR spectral data analysis. The doublet signals at δ 6.24 (1H, d, *J* = 2.1 Hz, H-6) and δ 6.42 (1H, d, *J* = 2.1 Hz, H-8) were attributed to H-6 and H-8 protons respectively. The signal at δ 7.69 (1H, d, *J* = 2.2 Hz, H-2') and δ 7.66 (1H, dd, *J* = 8.5 Hz, 2.2 Hz, H-6') were assigned to H-2' and H-6'. The ^{1}H-^{1}H correlation was observed between H-5' (δ 6.90, d, *J* = 8.5) and H-6' (δ7.66, dd, *J* = 8.5, 2.2). This suggests that GB_5 has a quercetin nucleus [8].

The presence of two anomeric signals δ 5.13 (1H, d, *J* = 4.45) and δ 4.45 (1H, d, *J* = 1.2) in the ^{1}H NMR spectra and two anomeric carbons at δ 103.32 and 101.03 suggested that GB_5 contained two sugar moieties. The glucose contained in GB_5 was identified by signals at 5.13 (1H, d, *J* = 4.45), 3.30 (1H, m), 3.43 (1H, m), 3.30 (1H, m), 3.36 (1H, dd, *J* = 1.3), 3.83 (2H, dd, *J* = 11.1). In addition, the rhamnoside present in GB_5 was identified by signals at 4.45 (1H, d, *J* = 1.2), and the doublet at 1.13 (3H, d, *J* = 6.3) ^{13}C NMR spectra showed signals of a glucopyranosyl; 103.32 (C-1''), 74.34 (C-2''), 76.83 (C-3''), 70.72 (C-4''), 75.86 (C-5''), 67.17 (C-6''). The signals of α–L-rhamnopyranosyl were found to be at; 101.03 (C-1'''), 70.03 (C-2'''), 70.86 (C-3'''), 72.55 (C-4'''), 68.32 (C-5'''), 16.47 (C-6'''). The HMBC spectrum showed correlation between H-6 (δ 6.24, 1H, d, *J* = 2.1) and C-5 (δ 161.62), C-7 (δ 165.00), C-8 (δ 93.50), C-10 (δ 105.50). Similarly, correlation was observed between H-8 (δ 6.42, 1H, d, *J* = 2.1) and C-6 (δ 98.61), C-7 (δ 165.00), C-9 (δ 157.16), C-10 (δ 105.50). Moreover, H-2' (δ 7.69, 1H, d, *J* = 2.2) showed correlation with C-2 (δ 158.32). In addition, correlation was observed between the anomeric signal of glucose (δ 5.13, 1H, d, *J* = 4.45) and C-3 (δ 134.23) of quercetin. Another long-range correlation was observed between C-6'' (δ 67.17) glucose and anomeric proton of rhamnose (δ 4.45, 1H, d, *J* = 1.2). The analysis of 1D and 2D spectral data and comparison with reported data led to the conclusion that GB_5 is quercetin-3-*O*-rutinoside (Figure 1) [9].

In addition to our previous research finding, this study revealed the presence of quercetin-3-*O*-rutinoside in *Globimetula*

braunii. Quercetin-3-*O*-rutinoside is perhaps the most abundant flavonoid glycoside in plants. It has been reported to possess antioxidant activity [10]. Moreover, the compound has been reported to exhibit therapeutic activities against several disease conditions such as haemorrhoids, diabetic vascular disease, diabetic retinopathy and, colorectal cancer [11].

^{1}H-NMR (600 MHz, CD_3OD): 7.69 (1H, d, *J* = 2.2 Hz, H-2'), 7.66 (1H, dd, *J* = 8.5 Hz, 2.2 Hz, H-6'), 6.90 (1H, d, *J* = 8.5 Hz, H-5'), 6.42 (1H, d, *J* = 2.1 Hz, H-8), 6.24 (1H, d, *J* = 2.1 Hz, H-6) 5.13 (1H, d, *J* = 7.7 Hz, H-1"), 4.45 (1H, d, *J* = 1.22 Hz, H-2"), 3.83-3.27 (m, remaining sugar protons), 1.13 (3H, d, *J* = 6.3 Hz, H-6").

^{13}C-NMR (150 MHz, CD_3OD): 158.32 (C-2), 134.23 (C-3), 178.10 (C-4), 161.62 (C-5), 98.61 (C-6), 165.00 (C-7), 93.50 (CH-8), 157.16 (C-9), 105.50 (C-10), 122.15 (C-1'), 116.29 (CH-2'), 144.47 (C-3'), 148.43 (C-4'), 114.68 (CH-5'), 121.76 (CH-6'), 103.32 (C-1''), 74.34 (C-2''), 76.83 (C-3''), 70.72 (C-4''), 75.86 (C-5''), 67.17 (C-6''), 101.03 (C-1'''), 70.03 (C-2'''), 70.86 (C-3'''), 72.55 (C-4'''), 68.32 (C-5'''), 16.47 (CH_3-6''').

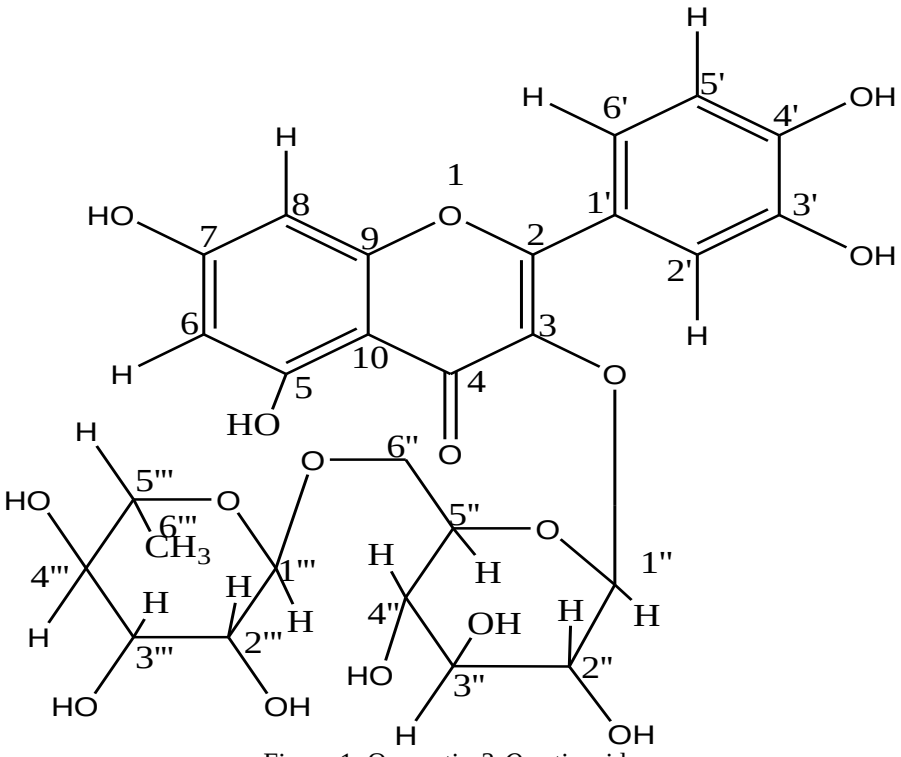

Figure 1: Quercetin-3-*O*-rutinoside

Conclusion. The present study has demonstrated that the leaves of *Globimetula brauni* can serve as a potential source of quercetin-3-*O*-rutinoside and can be used as herbal supplement in the treatment of several disease conditions. Moreover, the isolation of this compound from *n*-butanol fraction of the ethanol leaf extract of *Globimetula braunii* is being reported for the first time.

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