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Chemical constituents and antiproliferative properties of *Turraea vogelli* Hook. f. ex. Benth leaves.

A. A. Hamid, O. O. Aiyelaagbe, S. O. Oguntoye, A. S. Negi, M. F. Zubar

Department of Chemistry, University of Ilorin, Kwara State, Nigeria
Department of Chemistry, University of Ibadan, Oyo State, Nigeria
Central Institute of Medicinal and Aromatic Plants (CIMAP), Lucknow, India
Department of Industrial Chemistry, University of Ilorin, Kwara State, Nigeria
Tel No: +2347035931646
E-mail: hamidmemo@gmail.com, hamd.aa@unilorin.edu.ng

Abstract

Ethyl acetate and methanol extracts of *Turraea vogelli* leaves exhibited cytotoxic activity on leukaemia carcinoma K562 with IC_{50} values 85.00 and 85.22 μg/mL respectively. Isolation of the extracts afforded Tetradec-7-enoic acid **(1),** pentadec-1-ene **(2),** ethyl tridec-7-enoate **(3),** β-sitosterol **(4)** and stigmasterol **(5).** The structures of these compounds were characterised by IR, ID and 2D NMR and Mass spectroscopy, and supported with literature data. Compounds **1** and **4** exhibited antiproliferative activity against K562 tumor cell lines with IC_{50} of 57.27 and 27.56 μg/mL respectively. All isolated compounds exhibited low cytotoxicity against WRL and MCF-7 tumor cell lines.

Keywords: *Turraea vogelli*, antiproliferative activity, β-sitosterol, stigmasterol, ethyl tridec-7-enoate

Introduction

Turraea vogelli (Meliaceae) is used in ethnomedicine for the treatment of different types of diseases. Its leaves, stem and fruits have been shown to be capable of combating filariases and are used in making tonic and for use in rituals [1]. The leaf, bark and root can increase dynamic activity of sperm (curing impotence), cure cough, whooping cough and stomachache, and are used in preparing aphrodisiac foods [2]. The phytochemistry and therapeutic

properties of this plant have not been reported. Hence, our study was to isolate the phyconstituents of the leaf extracts of *Turraea vogelli* and evaluate its cytotoxic activity against leukaemia carcinoma K562, hepatic cell lines WRL, and breast carcinoma MCF-7.

Experimental

General experimental procedures

Melting points were determined in open capillaries using E-Z Melt automated melting point apparatus, Stanford Research System, USA which were uncorrected. TLC was carried out on Reactions and were monitored on aluminium precoated silica gel thin layer chromatography (TLC, UV_{254nm} plates), E. Merck Germany. Further, visualization was accomplished by spraying with a solution of 2% ceric sulphate in 10% aqueous sulphuric acid and heating at 80-100^{o}C. Column chromatography was carried out on silica gel (100-200 mesh, Avra Chemicals, India). FT-IR spectra were recorded on Perkin-Elmer Spectrum BX. NMR spectra were obtained on a Bruker Avance III 300 MHz spectrometer (1H at 300 Hz and 13C at 75 MHz) with tetramethylsilane (TMS, chemical shifts in δ ppm) as an internal standard. ESI mass spectra were recorded on API 3000 LC-MS-MS, Applied Biosystem, USA after dissolving the compounds in methanol or acetonitrile.

Plant material

Turraea vogelli was collected from Onigambari Forest Reserve, Ibadan, Oyo state, Nigeria, in May, 2010. The plant was identified and authenticated at Forestry Research Institute of Nigeria (FRIN) Ibadan, Oyo State. Voucher specimen identification number FHI 108802 was assigned to *T. vogelli* and the plant was deposited at the herbarium, FRIN.

Extraction and Isolation Procedures

The air-dried, powdered plant materials: (1,350 g) leaves of *T. vogelli* were extracted successively with hexane, ethyl acetate and methanol by maceration. The extracts were filtered with whatmann NO 1 filter paper and separately concentrated on rotatory evaporator at 37^{o} C to about 50 mL and freeze dried. Hexane extract of *T. vogelli* leaves gave a yellowish brown solid (18.5 g, coded TVLH). The extract gave seven spots (Rf values of TVLH 0.34, 0.65, 0.94, 1.58, 3.36, 8.76 and 9.20) on analytical TLC plates (Kieselgel 60 PF_{254}) in hexane: ethyl acetate (9:2). The plate was visualized by spraying with a solution of 2% ceric sulphate in 10% aqueous sulphuric acid and charring at 80-100^{o}C, and UV-visible light. Hexane extract (12.0 g)

of *T. vogelli* leaves was chromatographed on silica gel and eluted with hexane and $CHCl_3$ to give 80 fractions. The fractions were pooled to 5 sub-fractions coded TVLH 1-5. The TVLH-1 eluted with hexane: $CHCl_3$, 9:1, 8:2, 7:3, 3:2 and 1:1 ratios yielded two spots coded HTVL-1. Fraction HTVL-1 was further purified with Preparative thin layer chromatograpy (PTLC) using hexane: $CHCl_3$, 7:3 to give creamy white solid coded **2** (18.0 mg) and a light yellow solid, **3** (20 mg). Fraction TVLH-3 was purified with column chromatography using hexane: $CHCl_3$, 1:9, 1:19, $CHCl_3$, 100%; hexane: ethyl acetate, 9:1, 17:3 and 4:1 to produce two unresolved spots. The isolate mixture was further purified by fingered column chromatography, followed by recrystallisation to obtain two pure compounds; cream solid coded **1** (20 mg) and yellow viscous solid **4** (35 mg). Fraction TVLH-4 was also purified with column chromatography using hexane: $CHCl_3$, 1:7, 1:8, $CHCl_3$ to obtain three isolates; white solid, **5** (27 mg), creamy white solids, **6** (25 mg), and **7** (30 mg). The separation of TVLH-5 with column chromatography also afforded yellow viscous solid, **8** (28 mg).

The ethyl acetate extract (21 g) of *T. vogelli* leaves was mixed with silica gel (40 g) to form slurry. The extract slurry was chromatographed on silica gel and eluted with hexane and ethyl acetate in order of hexane: ethyl acetate (9:1, 500 mL); (4:1, 500 mL); (7:3, 500 mL); (3:2, 500 mL); (1:1, 500 mL); (2:3, 500 mL); (3:7, 500 mL); (1:4, 500 mL), (1:9, 500 mL), (1:19, 500 mL), and ethyl acetate (100%, 500 mL) to give 55 fractions of 100 mL each. The fractions were pooled to 4 sub-fractions, TVLE (1-4) using TLC analysis. Formation of dirty creamy white solid was revealed in the TVLE-2 when eluted with Hex: EtOAc, 5:1 and 4:1. The dirty creamy white solid was purified with Preparative TLC in hexane-ethyl acetate 4:1 to give white crystals coded **9** (25 mg) and creamy white solid, **12** (21 mg). The sub-column chromatography and preparative TLC of TVLE-4 followed by re-crystallization afforded a pure white solid, **13** (22 mg). The methanol extract (20 g) of *T. vogelli* leaves was also chromatographed on silica gel and eluted with hexane and ethyl acetate in order of hexane: ethyl acetate (9:1, 500 mL); (4:1, 500 mL); (7:3, 500 mL); (3:2, 500 mL); (1:1, 500 mL); (2:3, 500 mL); (3:7, 500 mL); (1:4, 500 mL), (1:9, 500 mL), (1:19, 500 mL), ethyl acetate (100%, 500 mL), and ethyl acetate: methanol (98:2, 500 mL), (96:4, 500 mL), (95:5, 500 mL), (94:6, 500 mL) and (92:8, 500 mL) to give 80 fractions of 100 mL each. The fractions were pooled to 4 sub-fractions, TVLM (1-4) using TLC analysis. The sub-column chromatography and

preparative TLC of TVLM-3, followed by re-crystallization gave compound **10** (white crystals, 15 mg), while the column chromatographic purification of TVLM-4 yielded cream solid, **11** (18 mg).

Characterisation of Compound 1

White crystals, yields = 25 mg, Mpt: 75-77 ^{o}C; **IR (KBr, cm^{-1}):** 3443 (O-H), 2930, 2854 (C-H), 1712 (C=O), 1664 (C=C), 1244 (C-O), 723 (C-H bending vibration). **^{13}C NMR (CDCl$_3$, 75 MHz):** δ 14.48 (C$_{-14}$), 23.07 (C$_{-12}$), 25.08 (C$_{-6}$), 27.54 (C$_{-9}$), 29.46 (C$_{-5}$), 29.63 (C$_{-4}$), 29.75 (C$_{-3}$), 29.82 (C$_{-10}$), 30.06 (C$_{-11}$), 32.31 (C$_{-13}$), 34.46 (C$_{-2}$), 130.10 (C$_{-7}$), 130.40 (C$_{-8}$), 180.29 (C$_{-1,}$ acid); **^{1}H NMR (CDCl$_3$, 300 MHz):** δ 0.89-0.91 (t, 3H, CH_3), 1.28 (s, 14H, 7CH_2), 1.65 (m, 2H, 6-CH_2), 2.16 (m, 2H, 9-CH_2), 2.39 (t, 2H, 2-CH_2), 5.37 (bs, 2H, 7 & 8-CH); **ESI-MS:** 255, 413 $[2M-K]^-$, 429 $[2M-Na]^-$, for $C_{14}H_{26}O_2$, M.M. 226

Characterisation of Compound 2

White paste, yields = 25 mg, **IR (KBr, cm^{-1}):** 2920, 2851 (C-H), 1738, 1657 (C=C), 1168 (C-O), 791 (C-H bending vibration). **^{13}C NMR (CDCl$_3$, 75 MHz):** δ 14.48 (C$_{-15}$), 23.07 (C$_{-13}$), 29.35 (C$_{-11}$), 29.55 (C$_{-10}$), 29.75 (C$_{-5}$), 29.75 (C$_{-4}$), 30.08 (C$_{-6}$), 30.08 (C$_{-7}$), 30.08 (C$_{-8}$), 30.08 (C$_{-12}$), 30.08 (C$_{-9}$), 32.31 (C$_{-14}$), 34.20 (C$_{-3}$), 114.45 (C$_{-1}$), 130.40 (C$_{-2}$); **^{1}H NMR (CDCl$_3$, 300 MHz):** δ 0.89 (t, 3H, 15-CH_3), 1.29 (s, 20H, 10CH_2), 1.64 (m, 2H, 14-CH_2), 2.08 (m, 2H, 3-CH_2), 4.98 (d, 2H, 1-CH_2), 5.84 (m, 1H, 2-CH); **ESI-MS:** 255, 459 $[2M+K]^+$, for $C_{15}H_{30}$, M.M. 210

Characterisation of Compound 3

Cream solid, yields = 18 mg, Mpt: 65-67 ^{o}C; **IR (KBr, cm^{-1}):** 2919, 2850 (C-H), 1737 (C=O), 1656 (C=C), 1462 (C-O), 792 (C-H bending vibration). **^{13}C NMR (CDCl$_3$, 75 MHz):** δ 14.48 (C$_{-13}$), 23.07 (C$_{-11}$), 26.13 (C$_{-6}$), 29.74 (C$_{-9}$), 29.83 (C$_{-5}$), 30.09 (C$_{-3}$), 30.09 (C$_{-10}$), 30.09 (C$_{-4}$), 32.31 (C$_{-12}$), 33.20 (C$_{-2}$), 63.48 (O**C**H_2CH_3), 130.10 (C$_{-7}$), 130.40 (C$_{-8}$), 174.54 (C$_{-1,}$ acetate ester); **^{1}H NMR (CDCl$_3$, 300 MHz):** δ 0.88 (t, 3H, CH_3), 1.29 (s, 14H, 7CH_2), 1.56 (m, 2H, 6-CH_2), 2.07 (m, 2H, 9-CH_2), 2.34 (t, 2H, 2-CH_2), 3.69 (m, 2H, OC**H$_2$**CH_3), 5.16 (m, 2H, 7 & 8-CH); **ESI-MS:** 240 $[M]^+$, 479 $[2M-H]^-$, 720 $[3M]^+$, for $C_{15}H_{28}O_2$, M.M. 240

Characterisation of Compound 4

Creamy white solid, yields = 21 mg, Mpt: 125-127 ^{o}C; **IR (KBr, cm^{-1}):** 3652 (O-H), 2920, 2852 (C-H), 1709 (C-O), 1709 (C=C), 1294 (C-O), 788

(C-H bending vibration). **^{13}C NMR ($CDCl_3$, 75 MHz):** δ 12.24 (C_{-19}), 12.36 (C_{-20}), 19.17 (C_{-21}), 19.37 (C_{-26}), 19.77 (C_{-27}), 20.19 (C_{-29}), 21.47 (C_{-1}), 23.07 (C_{-28}), 23.46 (C_{-11}), 24.69 (C_{-12}), 27.59 (C_{-22}), 28.64 (C_{-23}), 30.09 (C_{-15}), 31.86 (C_{-16}), 32.30 (C_{-4}), 37.64 (C_{-2}), 42.71 (C_{-7}), 29.55 (C_{-24}), 36.54 (C_{-25}), 40.18 (C_{-8}), 42.60 (C_{-14}), 50.54 (C_{-18}), 56.47 (C_{-9}), 57.16 (C_{-17}), 72.20 (C_{-3}), 122.09 (C_{-6}), 34.34 (C_{-10}), 36.89 (C_{-13}) and 141.10 (C_{-5}); **^{1}H NMR ($CDCl_3$, 300 MHz):** δ 3.50 (m, 1H, 3CH), 2.26, 2.21 (2 & 4-CH_2), 5.37 (dd, *J* = 1.6 Hz, 6-CH), 0.69 (s, 3H, 18-CH_3), 0.99 (s, 3H, 19-CH_3), 0.89 (d, *J* = 6.6 Hz, 21-CH_3), 0.80 (d, *J* = 6.6 Hz, 26-CH_3), 0.84 (d, *J* = 6.6 Hz, 27-CH_3), 0.88 (t, *J* = 7.2 Hz, 29-CH_3). **Mass:** 376 $[M-K+H]^-$, 392 $[M-Na+H]^-$, 499 $[M+K+2Na]^+$, 750 $[2M-2K]^-$ for $C_{29}H_{50}O$, M.M. 414

Characterisation of Compound 5

White solid, yields = 22 mg, Mpt: 155-158^{o}C; **IR (KBr, cm^{-1}):** 3651 (O-H), 2924, 2854 (C-H), 1663 (C=C), 1284 (C-O), 789 (C-H bending vibration). **^{13}C NMR ($CDCl_3$, 75 MHz):** δ 12.26 (C_{-19}), 12.44 (C_{-20}), 19.18 (C_{-21}), 19.38 (C_{-26}), 19.79 (C_{-27}), 20.20 (C_{-29}), 21.47 (C_{-1}), 21.61 (C_{-28}), 23.49 (C_{-11}), 24.76 (C_{-12}), 129.71 (C_{-22}), 138.70 (C_{-23}), 25.79 (C_{-15}), 32.06 (C_{-16}), 32.31 (C_{-4}), 37.67 (C_{-2}), 42.71 (C_{-7}), 29.59 (C_{-24}), 36.54 (C_{-25}), 40.19 (C_{-8}), 40.86 (C_{-14}), 50.56 (C_{-18}), 56.38 (C_{-9}), 57.18 (C_{-17}), 72.21 (C_{-3}), 122.10 (C_{-6}), 34.37 (C_{-10}), 36.92 (C_{-13}) and 141.17 (C_{-5}); **^{1}H NMR ($CDCl_3$, 300 MHz):** δ 3.48 (m, 1H, 3CH), 2.27, 2.23 (2 & 4-CH_2), 5.34 (dd, *J* = 4.3 Hz, 6-CH), 0.69 (s, 3H, 18-CH_3), 0.99 (s, 3H, 19-CH_3), 0.89 (d, *J* = 6.6 Hz, 21-CH_3), 0.80 (d, *J* = 6.6 Hz, 26-CH_3), 0.84 (d, *J* = 6.6 Hz, 27-CH_3), 0.88 (t, *J* = 7.2 Hz, 29-CH_3). **Mass:** 373 $[M-K]^-$, 412 $[M]^+$, for $C_{29}H_{48}O$, M.M. 412

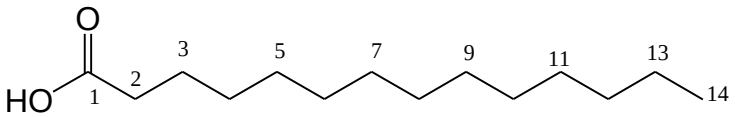
Cell culture and MTT assay for cell viability

Three human (K562 Leukemia, WRL hepatic and MCF-7 breast cancer) cancer cells were obtained from the American Type Culture Collection (Lucknow, India), and cultured in DMEM/Ham's F-12 medium containing 10% heat-inactivated FBS, 5 mg/mL of penicillin, 10 mg/mL of neomycin and 5 mg/mL streptomycin. All cells were cultured at 37 ^{o}C in a humidified incubator containing 5% CO_2. The suppressive effects of test agents on cell viability were assessed by using the 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyl-2H-tetrazolium bromide (MTT) assay in six replicates. Cells (5x103/200 µL) were seeded and incubated in 96-well, flat-bottomed plates in 10% FBS-supplemented medium for 24 h and were exposed to various concentrations of test agents dissolved in DMSO (final DMSO

concentration, 0.1%) in 5% FBS-supplemented medium. Controls received DMSO vehicle at a concentration equal to that of drug-treated cells. The medium was removed and replaced by 0.5 mM MTT (200 µL) in 10% FBS-containing DMEM/Ham's F-12 medium, and cells were incubated in the 5% CO_2 incubator at 37 ^oC for 2 h. Supernatants were removed from the wells, and the reduced MTT dye was solubilized in 200 µL/well DMSO. Absorbance at 570 nm was determined on a plate reader. The cell viability was expressed as a percentage to the viable cells of control culture condition and IC_{50} values of each group were calculated [3].

Results and Discussion

Ethyl acetate and methanol extracts of *Turraea vogelli* leaves inhibited the growth of leukaemia carcinoma K562 with IC_{50} of 85.00 and 85.22 µg/mL respectively, while the extracts exhibited low cytotoxicity against WRL and MCF-7 with IC_{50} values ≥ 150 µg/mL. The chromatographic isolation of 21.0 g ethyl acetate extract of the plant yielded compounds **1, 4** and **5.** Separation of methanol extract afforded compounds **2** and **3.**



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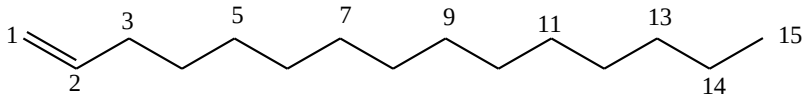

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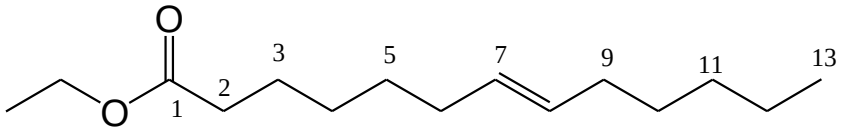

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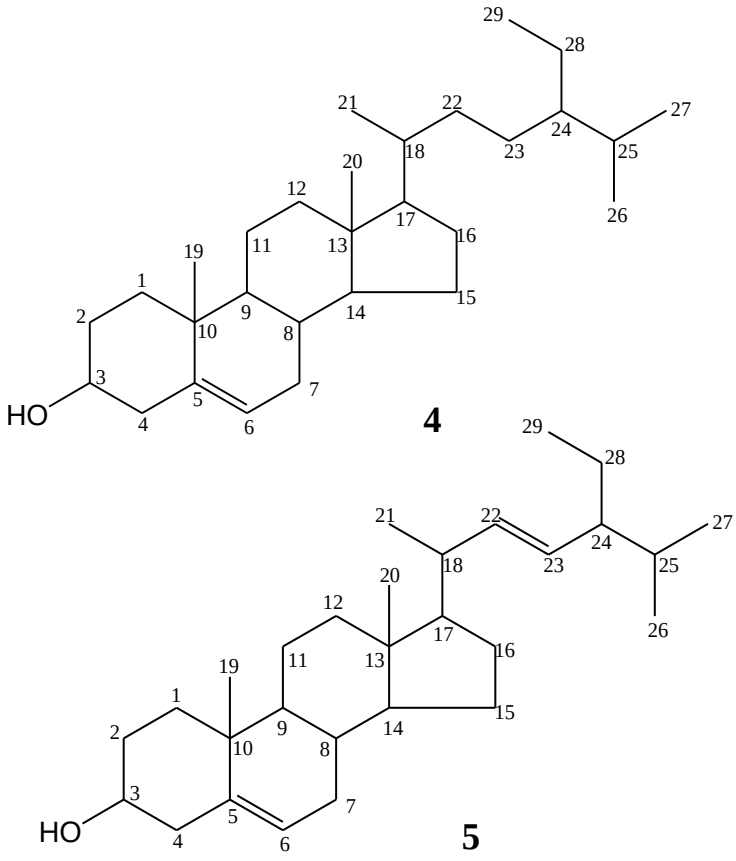

Figure 1: Structures of compounds 1-**5**

Compound **1** (25.0 mg) is a white crystalline solid (melting point 75-77 ^{o}C). The molecular formula $C_{14}H_{26}O_2$ (226) of the compound was obtained by MS fragment ions 413 $[2M\text{-}K]^-$, 429 $[2M\text{-}Na]^-$. The IR ῡ (cm^{-1}) absorptions of O-H, C-H, C=O and C=C functions appeared at 3443, 2930, 1712 and 1664 signals. The ^{1}H NMR spectrum is identical to fatty acid skeleton. The signals at δ_H 0.85-0.87 (3H, t, CH_3) and 1.26 (16H, d, $8CH_2$) correspond to terminal methyl and cluster of methylene protons of fatty acid, while δ_H 5.34 (m) was attributable to olefinic methine protons of fatty acid. ^{13}C NMR and DEPT experiment of **1** also showed resonances consistent with fatty acid skeleton. The carbon resonances were classified into one methyl carbon, ten

methylene carbons, two olefinic methine carbons and one quartenary carbon. The ^{1}H, ^{13}C NMR and DEPT resonances are identical to tetradec-7-enoic acid reported in the literature [4-7, 10, 11]. Compound **1** was identified as tetradec-7-enoic acid (Figure 1).

Compound **2** (15.0 mg) was obtained as white paste. The Mass fragment ions 255, 459 $[2M+K]^{+}$ correspond to a molecular formula $C_{15}H_{30}$ (210). The IR $\tilde{\upsilon}$ (cm^{-1}) absorptions of 2920, 1657 and 1168 cm^{-1} were assignable to C-H, C=C and C-O respectively. The ^{1}H NMR spectrum resonances at δ_H 0.89 (3H, t, CH_3) and 1.29 (20H, s, 3 x $10CH_2$) were assignable to terminal methyl and cluster of methylene protons, while unsaturated methylene and methine proton resonances appeared at δ_H 4.98 (d) and 5.84 (m). The presence of δ_C 114.45 and 130.40 carbon-13 signals also revealed methylene and methine carbons.. The spectroscopic data of compound **2** suggested its structure to be pentadec-1-ene (Figure 1).

Compound **3** (18.0 mg) is a cream solid (melting point, 65-67 ^{o}C). The Mass pseudo molecular ions 240 $[M]^{+}$, 479 $[2M-H]^{-}$, 720 $[3M]^{+}$ calculated to a molecular formula $C_{15}H_{28}O_2$ (240). The IR $\tilde{\boldsymbol{\upsilon}}$ (cm^{-1}) vibrational absorptions of C-H, C=O and C=C were revealed at 2919, 1737 and 1656 cm^{-1} respectively. The ^{1}H NMR spectrum signals at δ_H 0.88 (3H, t, CH_3) and 1.29 (14H, s, $7CH_2$) correspond to methyl proton and cluster of methylene protons of fatty ester skeleton, while resonances δ_H 3.69 (m) and 5.16 (m) were attributable to oxymethylene protons of fatty ester and olefinic methine protons. Further, ^{13}C NMR spectrum of **3** also revealed resonances consistent with thirteen carbon member straight chain fatty ester, with $\boldsymbol{\delta_C}$ 63.48, 130.10 and 130.40 signals corresponding to methyleneoxy (O**C**H_2CH_3**)** and unsaturated carbons at C-7 & C-8. The spectroscopic data of compound **3** and the reported data in the literature [4-10] were used to identify the structure of **3** to be ethyl tridec-7-enoate (Figure 1).

Compound **4** (21.0 mg), a creamy white solid, has melting point of 125 – 127 ^{o}C. The molecular formula $C_{29}H_{50}O$ (414) was revealed by Mass fragment and pseudo ions 376 $[M-K+H]^{-}$, 392 $[M-Na+H]^{-}$, 499

$[M+K+2Na]^+$, 750 $[2M-2K]^-$. The IR ῡ (cm^{-1}) absorptions at 3652, 2852, 1709 and 1294 cm^{-1} correspond to the presence of O-H, C-H, C=C and C-O moieties respectively. The signals of ^1H NMR spectrum at δ_H 0.69-0.99 are characteristics of cluster of methyl protons of stigmastane, while resonances δ_H 2.21 (t) and 2.28 (d) were attributed to methylene protons at C-2 and C-4 respectively. The signals at δ_H 3.50 (m) and 5.37 (dd) revealed the presence of oxymethine and olefinic methine protons at C-3 and C-6. ^{13}C NMR experiment also showed resonances similar to stigmastane skeleton. There are twenty nine carbon resonances which were sorted by DEPT experiment into one oxymethine, six methyl, eleven methylene, eight methine and three quartenary carbon resonances. The resonance signals at δc 72.20, 122.09 and 141.10 were due to the presence of oxymethine carbon at C-3 and olefinic carbons at C-5 and C-6. The NMR data of **4** was similar to stigmast-5-en-3-ol [12-14]. Hence, **4** was elucidated as β-sitosterol (Figure 1).

Compound **5** was obtained as white solid (yields, 22.0; melting point, 155 – 158 ^oC). The molecular formula $C_{29}H_{48}O$ (412) was revealed by Mass fragment and pseudo ions 373 $[M-K]^-$, 412 $[M]^+$. The IR ῡ (cm^{-1}) absorptions at 3651, 2924, 1663 and 1284 cm^{-1} correspond to the presence of O-H, C-H, C=C and C-O moieties respectively. The signals of ^1H NMR spectrum at δ_H 0.69-0.99 and 1.02-1.67 are characteristics of cluster of methyl and methylene protons of stigmastane, while resonances δ_H 2.23 (t) and 2.27 (d) were also attributable to methylene protons at C-4 and C-2 respectively. The proton resonances at δ_H 3.48 (m) and 5.34 (dd) revealed the presence of oxymethine and olefinic methine protons at C-3 and C-6 respectively. ^{13}C NMR experiment showed resonances similar to stigmastane skeleton. There are twenty nine carbon resonances which were sorted by DEPT experiment into one oxymethine, six methyl, nine methylene, ten methine and three quartenary carbon resonances. The resonance signals at δc 71.58 (m), 121.57 (t) and 140.75 (m) were due to the presence of oxymethine carbon at C-3 and olefinic carbons at C-5 and C-6, while unsaturated carbon resonances at C-22 & C-23 were obtained at δ_C 129.71 and 138.70. The spectroscopic data of **5** was similar to stigmasterol [12-14]. Hence, **5** was identified as stigmasterol (Figure 1).

Antiproliferative activity

Ethyl acetate and methanol extracts of *Turraea vogelli* leaves revealed cytotoxic activity on leukaemia carcinoma K562 with IC_{50} of 85.00 and 85.22 μg/mL respectively. The isolated compounds obtained from the extracts were evaluated for antiproliferative activities against three human cancer cell lines; leukaemia carcinoma K562, hepatic liver carcinoma WRL, and breast carcinoma MCF-7). Tetradec-7-enoic acid, **1** and β-sitosterol, **4** exhibited cytotoxicity against K562 tumor cell lines, with IC_{50} values of 57.27 and 27.56 μg/mL, respectively, while stigmasterol, **5** showed inhibition of MCF-7 growth with IC_{50} of 164.60 μg/mL [Table 1]. Meanwhile compounds **2** and **3** isolated from methanol extract exhibited very low cytotoxicity against three test tumor cell lines with $IC_{50} \geq 200$ μg/mL.

Table 1: Antiproliferative activity of isolates from leaves extracts of *Turraea vogelli*

S/No.	Extracts	IC_{50}(μg/mL)		
		K562	WRL	MCF-7
1	Ethyl acetate	85.00	***	***
2	Methanol	85.22	***	***
	Compounds (code) from ethyl acetate extract			
1.	1.	57.27	***	***
2.	4.	27.56	***	***
3.	5.	***	***	164.60
	Compounds (code) from methanol extract			
4.	2.	***	***	***
5.	3.	***	***	***
	Tamoxifen	7.26	12.25	8.54

***** IC_{50} (ug/mL) >150; K562 - leukaemia carcinoma; WRL - hepatic liver cell lines; MCF-7 – breast carcinoma**

Conclusion

Ethyl acetate and methanol extracts of *Turraea vogelli* leaves demonstrated cytotoxic activities on leukaemia carcinoma (K562) with IC_{50} of 85.00 and 85.22 μg/mL. Five compounds, Tetradec-7-enoic acid **(1),** pentadec-1-ene **(2),** ethyl tridec-7-enoate **(3),** β-sitosterol **(4),** and stigmasterol **(5)** were isolated from ethyl acetate and methanol extracts of *Turraea vogelli* leaves. These compounds are being reported for the first time from the plant. Compounds **1** and **4** showed antiproliferative property by suppressing the viability of leukaemia (K562) cell lines with IC_{50} of 57.27 and 27.56 μg/mL, while all isolates exhibited low activity on the three tumor cell lines. The antiproliferative activities of leaves extracts of *Turraea vogelli* justify their use in ethnomedicine.

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