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Phytochemical Screening on *Euphorbia milii* Red Flowers – Isolation of Terpenoids, Flavone and Phenols

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ABSTRACT

Objective: To learn the phytochemical screening of terpenoids, flavone and phenols from different extracts of*Euphorbia milii* Red flowers.
Materials and Methods: *Euphorbia milii* (Euphorbiaceae) is an ornamental plant plays a role in folk medicine. The Chinese use it as a cure for cancer, and some Brazilians believe that it can cure warts.The flowers were extracted with the three different solvents like petroleumether, ethyl acetate and 70% ethanol &the yield were found to be 21 g, 15 g and 12 g respectively, concentrations of 50 % and 100% ethanol respectively.
Results: Two triterpenoids, Taraxerol**(1),** 28-hydroxyfriedelan-1,3-dione-29-oic acid **(2)** as well as one flavone, Quercetin 3-O-(2"-O-galloyl)-a-L-arabinofuranoside **(3)** and two phenoilccompounds, 7 7'- dihydroxy, 8, 6'-bicoumarin **(4),** 9-acetyl-3'4'-dimethoxy dehydroconiferyl-3-alcohol **(5)** were isolated for the first time from the flowers of *Euphorbia milii*. The structures of the isolated compounds (1–5) were realized on the basis of the spectral data (IR, ^{1}H and ^{13}C NMR and mass**).**
Conclusion: The obtained compounds of *Euphorbia milii* flowers are effective pharmaceutical compounds which will serve as a better alternative to chemical based pharmaceuticals.

Keywords- *Euphorbia milii,* Euphorbiaceae, triterpenoids, flavones, coumarins, phenolic compounds.

INTRODUCTION

The genus Euphorbia is the largest genus of medicinal plants widely distributed in tropical countries. Different species of Euphorbia are used for the treatment of various ailments such as skin diseases, intestinal parasites and warts. It has been reported that Euphorbia possesses antiarthritis, anticancer[1], anticonvulsant, antidiabetic, anti-eczema, anti-inflammatory, antimicrobial, antioxidant, antispasmodic, antitumor, antitussive properties hormonal and myelopoiesis properties[2]. Some species of *Euphorbia* have been traditionally used for the treatment of skin diseases, gonorrhea, migraine, intestinal parasites and as wart cures[3]. The genus *Euphorbia* has been studied widely for its antiproliferative[4].*Euphorbia milii* (Euphorbiaceae), a flowering plant commonly known as "Christ plant" or "Christ thrown". It is ornamental shrub native to Madagascar and Philippines, widely distributed in India. *Euphorbia milii* widely used in folk medicine for the treatment of warts (South Brazil), cancer and hepatitis (china). It has been reported that *Euphorbia milii* possesses antifungal and antinociceptive property, acts as natural molluscicide, can curb the spread of schistosomiasis. Some of the latter diterpene esters of ingenol are potent skin irritants but, in contrast with other closely-related ingenol and phorbol derivatives, they showed no tumour promoting activity[5], Milliamines isolated from *E. milii* latex exhibited potent molluscicidal activity[6]. Phytochemical studies of *Euphorbia milii* revealed the presence of β-sitosterol, cycloartenol, β-amyrin acetate, lupeol, euphol, triterpenes, phenols and flavonoids[7]. *Euphorbia milli* crude latex showed potent plant molluscicide[8], its toxic effect to mammals has been studied. The undiluted latex of *E. milli* was also found to be irritant to mammalian eyes and skin[9].Inspite of the various researchers on *Euphorbia milii,* investigation on the chemical constituents was carried out on polar extracts. This paper elucidates the structures of two triterpenoids, one flavone and phenolic compounds from the flowers of *E.milii* on the basis of various spectroscopic data.

MATERIALS AND METHODS

General

Column chromatography was carried out by using silica gel (60-120 mesh) (Merck, Bombay) and Aluminum sheets and glass-backed TLC plates (20X20 cm; Merck, silica gel 60-F254) were used for isolation of compounds. Analytical grade solvents (Sigma Aldrich 32213) were used. IR spectra was recorded using KBr pellets on Thermo Nicolet Nexus 670; ^{1}H NMR spectra were taken on Varian EM-360 (300 MHZ) NMR spectrometer using $CDCl_3$ as solvent; ^{13}C NMR was recorded on Bruker instrument with $CDCl_3$ as solvent at 300 MHz and Mass spectra were recorded on a EI-MS, data on E:ISO/21184-1.QGD.

Plant material

Flowers of*Euphorbia milii* were collected from the local gardens of Hyderabad. The plant was authenticated by Dr. B. Bhadraiah (HOD, Dept. of Botany, Osmania University, Hyderabad). Voucher specimen (EM/2013/0067) was kept at Malla Reddy College of Pharmacy, Dhulapally, Hyderabad, Telangana, India.

Extraction of plant material

Around 4 kg of *Euphorbia milii red* flowers were shade dried, coarsely powdered and subjected for successive extraction process with three different solvents (petroleum ether, ethyl acetate and ethanol (70 %)) into 15 batches of each 200 g in Soxhlet extractor for 48 hours. After complete extraction, the solvents were distilled off and concentrated under reduced

pressure to the dryness in a flash evaporator. The yield was found to be 21 g, 15 g and 12 g respectively.

Isolation and purification of compounds

The concentrated petroleum ether extract (20 g) was eluted by gradients of petroleum ether/ethyl acetate, then ethyl acetate, followed by a gradient of ethyl acetate/methanol and finally with methanol to afford a total of 35 fractions (each 200 mL).

Fractions 02 to 15 (7.2 g) on silica gel column with Petroleum ether: EtOAC (85:15) gave six subfractions F_{1a}-F_{1f}.Fraction F_{1b}-F_{1e} (929 mg) was rechromatographed over a silica gel eluting with petroleum ether: EtOAC(83:17) to yield compound **1** on TLC (peteroleum ether: EtOAC; 8.2:1.8), the compound was further purified with acetone to give pure compound **(1)** (142 mg) **[Fig 1].**

Fractions 17 to 33 (6.5 g) was rechromatographaed on silica gel column with, Petroleum ether: EtOAC(gradient) to afford 8 new subfractions F_{2a}-F_{2f}. Fractions F_{2a}-F_{2h}(845 mg) was rechromatographed on silica gel with Petrolem ether: EtOAC (70:30 to 50:50) to yield compound **2**on TLC (petroleum ether: EtOAC ; 6.5:4.5), ascertained as pure **compound (2)** (79 mg) **[Fig 2].**

The ethyl acetate fraction (12 g) was fractionated by column chromatography over a silica gel G

(60-120 mesh, Merck) with ethyl acetate: n-hexane (gradient) to afford 15 factions. Fractions 3 to 12 (9.3 g) on silica gel column with Et OAC: n-hexane (80:20) gave eleven subfractions F_{3a}-F_{3k}. Fraction F_{3b}-F_{3j} (3.2g) was rechromatographed over a silica gel eluting with EtOAC: MeOH (90:10) to yield compound **3** on TLC (Toluene: ethyl acetate: formic acid ; 6:2:0.8) and sprayed with Aluminum chloride reagent as pure compound **(3)** (1.42 mg)**[Fig 3].**

The ethanolic fraction (11 g) was fractionated by column chromatography over a silica gel G

(60-120 mesh, Merck) was eluted with $CHCl_3$-MeOH (95:05, to 20:80) to afford 14 fractions[10, 11].Fractions **02 to 07** (3.7 g) on silica gel column with $CHCl_3$-MeOH (70:30) gave five subfractions F_{4a}-F_{4f}. Fractions F_{4a}-F_{4d} (757 mg) was rechromatographed over silica gel eluting with $CHCl_3$-MeOH (85:20) to yield 4 on TLC (BuOH-HOAc-H_2O ; 6.3:2.7:01),ascertained as pure compound **(4)** (92 mg) **[Fig4].**

Fractions **8 to 12** (2.7 g) was rechromatographed on silica gel column with $CHCl_3$: EtoAC (70:30 to 40: 60) to give four subfractions F_{5a}-F_{5d}. Fractions F_{5a}-F_{5c} (656 mg) was rechromatographed over silica gel eluting with $CHCl_3$: EtoAC (50:50) to yield 5 on TLC ($CHCl_3$: EtoAC; 1:1), the compound was further purified with methanol to give pure compound **(5)** (66 mg) **[Fig 5].**

RESULTS

Taraxerol(1): Pale yellow amorphous powder; (M.P: 283°C), (KBr, cm^{-1}): 3321,2944, 2871, 1715, 1642, 1463, 1380 cm^{-1}; ^{1}H NMR ($CDCl_3$, 500 MHz):δ5.32 (d,1H,olefinic proton, H-14), 3.39 (d,1H, OH group, H-3), δ2.35 to 1.27(m,24H,CH_2 & CH Protons), δ 1.32 to 1.00 (m, 12H,4XCH_3 groups,H-2,24,25,26), δ0.99 to 0.88(m,12H,4X CH_3 group H-27,28,29,30), ^{13}C NMR ($CDCl_3$, 125 MHz): Table 1; C_{30} $H_{50}O$; EIMS m/z: 426[M] $^+$, 449[M+ Na] $^+$.

28-hydroxyfriedelan-1,3-dione-29-oic acid (2):Acicular crystals;**(M.P: 296^0 C);** (KBr, cm^{-1}): 3349, 1767, 1696 cm^{-1}; ^{1}H NMR ($CDCl_3$, 500 MHz):δ 3.79, 3.77(d,d, 2H, CH_2OH group, H-28), δ 2.89 to 1.47 (m, CH_2 and CH group of skeleton moiety), δ 1.43 to 0.88 (m, 18H, 6XCH_3groups, H-23, 24, 25, 26, 27, 30). ^{13}C NMR ($CDCl_3$, 125

MHz): Table 1; C_{30} $H_{46}O_5$; EIMS m/z: 486[M] $^+$, 519[M+ Na] $^+$.

Quercetin 3-O-(2"-O-galloyl)-a-L-arabinofuranoside (3): Orange yellow powder;(M.P: 319^{0}C); (KBr, cm^{-1}): 3462, 2915, 2847, 1738, 1653, 1472, 1432, 1234 cm^{-1}; ^{1}H NMR ($CDCl_3$, 500 MHz): δ 7.45 to 6.32, (dd, 8H, Ar-protons, H-6,7, 8,2',5',6', 2'", 6'"), δ 6.12 (d, 1H, CH group of pyranose moiety, H-1"), δ 5.35 (s, br, 6H, OH group of aromatic ring), δ 4.72 to 3.32 (m, 4H, pyranosemoeity), δ 3.69, 3.51 (s, 2H, OH group of pyranose moiety, H-6"),δ 3.58 & 3.63 (s,OH group of pyranose moiety, H-3", 4"), δ 3.63 (s, OH group of pyranose moiety, H-6") .

^{13}C NMR ($CDCl_3$, 125 MHz): Table 1; C_{28} $H_{24}O_{15}$; EIMS m/z: 600[M] $^+$, 623 [M+ Na] $^+$.

7 7'- dihydroxy, 8, 6'-bicoumarin (4): Red sticky mass; (M.P: 270°C);(KBr, cm^{-1}): 3484, 2916, 2849, 1734, 1605, 1376, 1242 cm^{-1}; ^{1}H NMR ($CDCl_3$, 500 MHz): δ 7.29 (d, 2H, Ar-proteins, H-4,4'), δ 7.61 to 6.59 (d, 4H, d, Ar-proteins, H-5,6,5', 8'), δ 5.58(d, 2H, Ar-proton, H-3,3'), δ 5.41 (s, 2H, OH groups, H-7,7'). ^{13}C NMR ($CDCl_3$, 125 MHz): Table 1; C_{18} $H_{10}O_6$; EIMS m/z: 322[M] $^+$, 345[M+ Na] $^+$.

9-acetyl-3'4'-dimethoxy dehydro-coniferyl-3-alcohol (5): Brown sticky mass; (M.P: 274°C); (KBr, cm^{-1}): 3333, 2932, 2817, 1516, 1337, 1203 cm^{-1}; ^{1}H NMR ($CDCl_3$, 500 MHz): δ7.55 to 6.63 (d, 5H Ar-protons), δ 6.48 (d, 2H oleifinic protons, H-11), δ 6.45 (m, 1H, OH group, H-3), δ 4.07 (m, 2H, CH_2 group, H-13), δ 3.87 & 3.41 (m 2H, CH_2 group, H-9). δ3.61 (s, 6H, 2XOCH_3 group, H-3', 4'), δ 3.56 (s, 3H, -$COOCH_3$ group, H-9), δ 3.21 (s, 3H, OCH_3 group, H-13).). ^{13}C NMR ($CDCl_3$, 125 MHz): Table 1; C_{18} $H_{10}O_6$; EIMS m/z: 322[M] $^+$, 325[M+ Na] $^+$.

DISCUSSION

The above obtained isolated compound (1-5) was realized on the basis of spectral evidence (IR, ^{1}H &^{13}C NMR and Mass).

Compound **(1)** was obtained as pale yellow amorphous powder. Its molecular formula was determined to be C_{30} H_{50}Oon the basis of positive-ion peak EIMS (m/z) 426 [M$^+$]. IR spectral data showed absorption bands for hydroxyl group (3321 cm^{-1}), C-H stretching (2944& 2871 cm^{-1}), for C=C stretching (1642 cm^{-1}) functionalities. ^{1}H NMR data of **1** indicated the presence of double doublet centered at δ 5.32 attributable to the olefinic proton at C-14. The broad doublet centered at δ 3.39 could be assigned to the oxymethine proton at C-3. The large coupling of this proton (H-3) with the vicinal methylene protons suggested a β (beta) orientation of the hydroxyl group at C-3 and eight three proton singlets at δ 0.80, 0.82, 0.90, 0.94, 0.92, 0.964, 0.97, and 0.99. These were attributed to the methyl group protons at C-17, C-13, C-4α, Me-4β, C-20α, C-10, C-8 respectively. The above ^{1} H-NMR signals suggested the presence of a typical pentacyclictriterpene skeleton[12].^{13}C NMR spectrum of **1** exhibited the presence of 30 carbon signals are there in respective δ ppm (See Table 1). Olefinic carbons of double bonds at δ 156. 6 and 116.9 attributed to C-14& C-15 respectively, in addition to one oxymethane group at δ 33.1 for C-3 postion[13].

Compound **(2)** was obtained as pale yellow amorphous powder. Its molecular formula was determined to be C_{30} $H_{46}O_5$ on the basis of positive-ion peak EIMS (m/z) 486 [M$^+$]. IR spectral data at showed absorption one broad absorption band due to a hydroxyl function at (3349 cm^{-1}) and another intense band at (1696 cm^{-1}) corresponding to a carboxylic acid group. The skeletal basis of a friedelanetriterpenoid

skeleton[14].^{1}H NMR data of **2** indicated the presence of six methyl group signals at δ 0.88, 0. 95, 1.04, 1.24, 1.43 (s, 3H each) as singlet and δ 0.99 as doublet for H-3 position. The δ 2.21, 2.07 for H-2, 4 positions respectively and doublet of doublet signals at δ3.79, 3.77 for carbonly carbon H-28 were consistent with a type friedelanetriterpene.^{13}C NMR spectrum of **2** exhibited the presence of 30 carbon signals are there in respective δ ppm (see Table 1). Two carbonyl carbons at δ 70.1 and other at δ 181.2 for C-28, 29 position respectively, six carbon signals at δ9.9, 16.9, 19.2, 17.2, 19.6 and 33.7 for C-23, 24, 25, 26, 27 and 30 positions, specifically a downfield shift at δ 40.2 for C-20 in agreement with terpenoid skelton[15].

Compound **(3)** was obtained as pale yellow amorphous powder. Its molecular formula was determined to be C_{30} $H_{46}O_5$ on the basis of positive-ion peak EIMS (m/z) 600 [M^+]. IR spectral data showed absorption bands for OH stretching for phenol (3462 cm^{-1}), C=O Aryl ketonicstretch at (1653cm^{-1}), C-O stretch for phenol (1232cm^{-1}), C-CO-C stretch & bending in ketone & out of plane C-H bending of hydrocarbons (945, 822, 576 cm^{-1}) groups of alcohols respectively[16].

^{1}H NMR data of **3** indicated the presence of hydrogen-bonded hydroxyl signal at δ 5.35 indicated the presence of a 5-hydroxy A ring system in flavonol. A spin system of three aromatic signals at δ 7.72 1H, d, δ 6.93, 7.29, 1H, dd, indicated the presence of a 3',4'-dihydroxy B ring system in flavonol, an aromatic methine correlated at δ 6.97 for 2''' & 6''' positions. Four anomeric protons of pyranose ring were resonated as doublets in between δ 4.45 to 3.73 for H-2", 3", 4" and methylene signals at δ 3, 79, 3.54 for H-6" was observed. ^{13}C NMR spectrum of **2**exhibited the presence of 28 carbon signals are there in respective δ ppm (see Table 1). Significant flavonol signals at δ 155.6, 136.7, 177.8 (C-4) were observed for C-2, 3, 4 position, the signals at δ 149.9 for c-3', δ 145.2 for C-4', δ 121.2 for C-6' and δ 144.1 for C-2', 116.9 for C-1' were found. From these data, the aglyconeof **3** was determined to be quercetin[17]. In addition, an aromatic methineδ 109.5 for C-1", δ 143.5 for C-2''' & 6''', δ 141.2 for C-3''' & 5''' and δ 147.7 for C-4''' and δ 166.6 for carbonyl (C=O), indicating the presence of a galloyl moiety. From these observations, the sugar moiety was determined to be L-a-arabino-pyranose. Thus, the structure of **3** was determined to be Quercetin 3-O-(2"-O-galloyl)-a-L-arabinofuranoside.

Compound **(4)** was obtained as pale yellow amorphous powder. Its molecular formula was determined to be C_{18} $H_{10}O_6$on the basis of positive-ion peak EIMS (m/z) 322 [M^+].IR spectral data showed absorption bands at (3484, 2916 & 2849 cm^{-1}) compatible with the presence of OH groups and two carbonyl carbon functionalities and it also further demonstrated peak at 1734cm-1)for lactone carbonly group.^{1}H NMR data of **4** signal peak atδ 5.41indicates the presence of basic bicoumraol unit with OH groups of either bridge linking the umbelliforne unit, two protons are all most identical chemical shifts at δ 7.55 for H-4,4' positions[18].It alsoreveals the presence of hydroxylic group as broad singlet at δ 5.41 for 7, 7' position integrating for two protons. ^{13}C NMR spectrum of **4** exhibited the presence of 18 carbon signals are there in respective δ ppm (see Table 1). Showing signals at δ160.8, 115.3 for aromatic carbons account for their coumarin skeleton, showed a long range correlation signals at δ117.5for C-8 position.

Compound **(5)** was obtained as pale yellow amorphous powder. Its molecular formula was determined to be C_{18} $H_{10}O_6$on the basis of positive-ion peak EIMS (m/z) 600 322[M^+]. IR spectraldata showed absorption bands forhydroxyl group (3333 cm^{-1}), C-H functional group and stretching vibration (2932& 2817 cm^{-1}) suggesting the

presence of benzene ring, C=C stretching for conjugated carbonly group (1516cm^{-1}).NMR data of **3** indicated the presence of

doublet of doublet signals at δ4.04 as doublet of doublet for H-13 position revealed the presence of diastereotopic methylene protons, A doublet signal at δ 4.46 (d, 1H) showed the presence of methine proton attached to a heteroatom and following evidence this methine was also connected to a methine at δ2.55 (m, 1H) forming an furan ring.The presence of doublet of doublet signal at δ6.81, 6.83, 7.03 for H-1', 2', 5' positions respectively and doublet of doublet at δ5.09 for H-4 position suggested the presence of spin system on the aromatic ring. ^{13}C NMR spectrum of **2** exhibited the presence of 18 carbon signals are there in respective δ ppm (see Table 1). The three aromatic proton at δ116.3 for C-4, 6.86 (H-8) with δ108.1, methylene protons at δ76.7 for C-2 and oxymethylene protons were observed.Theaceytocy (-COOCH$_3$) group at δ 171.1, whereasmethoxy group were observed at peak δ 56.5, 56.1 for C-3', 4' positions respectively[19].

CONCLUSION

The investigation of chemical compounds from Natural products is fundamentally important for the development of new drugs, especially in view of the vast worldwide flora. Total five compounds include, two triterpenoids, one flavone and two phenolic compounds were isolated from the petroleum ether, ethyl acetate and ethanolic extracts of *E. Milii* flowers. This study is considered as the first report of these compounds from *E. Milii* flowers which could be helpful and can contribute in the chemotaxonomic analysis of this complex genus.The structures of isolated compounds were characterized by IR, ^{1}H-NMR, ^{13}C-NMR and Mass spectral studies. Based on the results, the obtained compounds of *E. Milii* flowers are effective pharmaceutical compounds which will serve as a better alternative to chemical based pharmaceuticals.

Over all conclusion, triterpenoids, flavonoids and phenolic compounds are of great biological properties. Their physiological, bacteriostatic, antioxidant and cardiovascular activities etc, makes these compounds attractive for further derivatization and screening as novel therapeutic agents, which will be related to various beneficial effects exerted on human health.

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Conflict of Interest

The authors declare that there is no conflict of interests regarding the publication of this paper.

REFERENCES

1. Bani S, Kaul A, Khan B, Gupta VK, Satti NK, Suri KA, Qazi GN. Anti-arthritic activity of a biopolymeric fraction from Euphorbia tirucalli. *Journal of Ethnopharmacology*. 2007; 110(1): 92-98.
2. Milica P, Jasna B, Ivana SA, Nina M, Todorovic, Milka J, Vlatka E. Vajs, Vele VT, IvanV, Miljana M, Ivanka D, Markovic, Nikola T, Sabera R. New anticancer characteristics of jathrophanediterpenes from *Euphorbia dendroides*. Food Chemistry and Toxicology. 2011; 49(12): 3165-3173.
3. Mwine TJ, Van Damme P. Why do Euphorbiaceae tick as medicinal plants: a review of Euphorbiaceae family and its

medicinal features. *Journal of Medicnal plant Research.* 2011; 5(5): 652-662.
4. Chaabi M, Freund-Michel V, Frossard N, Randriantsoa A, Andriantsitohaina R, Lobstein A. Anti-proliferative effect of *Euphorbia stenoclada* in human airway smooth muscle cells in culture. Journal of Ethnopharmacol. 2007; 109(1):134-139.
5. Opferkutch HJ, Hecker E. Active Principles of the Euphorbiaceae. *Journal of Cancer Ressearch Clinical Oncology*. 1982;103: 255-68.
6. Rauf A, Khan A, Uddin N, Akram N, Arfan M, Uddin G, Quasir M. Priliminary Phytochemical screening, antimicrobial and antioxidant activities of *Euphorbia milii*. *Pakisthan Journal of Pharmceutical Science*. 2014; 27(4):947-51.
7. Qaisar M, Gilani SN, Farooq S, Rauf A, Naz R, Shaista, Perveez S. Preliminary Comparative Phytochemical Screening of Euphorbia Species. *American-Eurasian Journal of Agriculture & Envirormental Science*. 2012; 12 (8): 1056-1060.
8. Delgado IF, De-Carvalho RR, De-Oliveria AC, Kuriyama SN, Oliveira-Filho EC, Souza CA, Paumgarteen FJ, Absence of tumor promoting activity of *Euphorbia milii* latex on the mouse back skin. Toxicology Letters. 2003; 145: 175-180.
9. Freitas JCBR, Presgrave OAF, Fingola FF, Menezes MAC, Vasconcellos MC, Schall VT, Paumgartten FJR 1991. Toxicological study of the molluscicidal latex of *Euphorbia splendens*. Irritant action on skin and eye. MemInstOswaldo Cruz.1991; 86: 87-88.
10. Khan R, Shawl AS, Tantray M, Alam MS. New coumarin glycosides from *Rhododendron lepidotum.* Fitoterapia. 2008;79: 232-233.
11. Zhang W, Shen YH, Liu RH, Zhang C, Chen HS, Fu P, Shan L, Zhang WD. Coumarins from the Stem bark of *Daphne marginata*. Chemistry of Natural Compounds.2007;43: 317-318.
12. Fakir Shahidullah Tareq, Md. Hossain Sohrab AM. Sarwar Uddin Chowhdury, FarhanaAfroz, M. Al-Mansur and Choudhury M. Hasan. Phytochemical Studies on the Leaves of *Xyliadolabriformis. Journal of Pharmaceutical Science*.2009; 8(2): 171-172.
13. Ahmed Al-Harrasi, Liaqat Ali, JavidHussain, Ahmed Al-Rawahi.Two New and Four Known Triterpenoids from *Boswellia sacra* Fluckiger. Records of Natural Products. 2014; 8(4): 407-411.
14. Mahabir P. Gupta, DionisioA. Olmedo, José L. López-Pérez, Esther del Olmo, YelkairaVásquez, Arturo San Feliciano and Mahabir P. Gupta . A New Cytotoxic Friedelane Acid – Pluricostatic Acid – and Other Compounds from the Leaves of *Marilapluricostata*. Molecules. 2008; 13: 2915-2924.
15. Cui-Rong Sun, He-Jiao Hu, Run-Sheng Xu, Jie-Hong Yang and Hai-Tong Wan. A New Friedelane Type Triterpenefrom *Euonymus hederaceus*. Molecules. 2009; 1: 2650-2655.
16. AartiChourasiya, Anil Upadhayay, R.N. Shukla.Isolation of Quercetin-from the leaves fromAzadirachta*indica* and anti-diabetic studies from crude extracts. *Journal of Pharmaceutical & Biomedical Science*. 2012; 25(25): 179-181
17. Keiichi Matsuzaki, Rie Ishii, Kaori Kobiyama, Susumu Kitanaka. New benzophenone and quercetingalloyl glycosides from *Psidiumguajava* L. *Journal of Natural Medicine*.2010; 64:252–256.
18. SheelaTandon and Rastogi. Wikstrosin. A Tricoumarin from *Wikstroemiaviridiflora*. Phytochemistry, 1977; 16(1): 1991-1993.
19. Shakeel-u-Rehma, Reehana Khan, Khursheed A. Bhat, Alsaba F. Raja, Abdul S. Shawl, Mohd S. Alam. Isolation, characterisation and antibacterial activity studies of coumarins from *Rhododendron lepidotum* Wall, Ericaceae. *Brazilian Journal of Pharmacognosy* 2010; 20(6): 886-890.

Table 1. ^{13}C-NMR Spectral data of triterpenoids (1& 2), flavone (3)& phenols (4&5)

C	1	2	3	4	5
1	37.8	217.7	C-O	C-O	C-O
2	29.2	63.6	155.6	160.8	76.7
3	33.1	215.2	136.7	115.3	188.6
4	206.9	57.5	177.8	154.5	116.3
5	49.2	37.2	160.1	130.9	131.3
6	18.9	46.9	115.4	113.5	145.7
7	35.2	18.3	139.6	163.3	60.9
8	36.5	55.1	105.7	117.5	35.1
9	36.9	38.1	155.6	157.2	33.3
10	47.6	63.9	113.3	119.3	89.9
11	17.1	37.3			121.3
12	31.2	30.1			133.3
13	31.3	41.2			82.3
14	156.6	41.3			
15	116.9	30.3			
16	35.5	31.6			
17	41.5	37.2			
18	36.3	33.9			
19	50.1	40.2			
20	30.3	33.7			
21 22	29.2 34.1	32.2 32.2			
CH_3	26.0	9.9			
CH_3	25.8	16.9			
CH_3	15.4	17.2			
CH_3	19.2	19.6			
CH_3 CH_3 CH_3 CH_3 CH_2OH COOH OCH_3 OCH_3 OCH_3 OCH_3 C=O	26.2 29.3 31.8 31.9	18.8 33.7 70.1 181.2			56.5 56.6 61.9 55.5 177.1
1'			116.9	C-O	120.3
2'			144.1	166.8	113.3
3'			149.9	116.3	151.2
4'			145.2	151.3	153.2
5'			129.9	128.8	109.9
6'			121.2	125.3	137.7

7' 8' 9' 10'				159.9 101.3 157.3 117.2	
1″			105.5	159.9	
2″			73.5	101.3	
3″			74.1	157.3	
4″			72.9	117.2	
5″			81.3		
6″ 1‴ 2‴ 3‴ 4‴ 5‴ 6‴			65.6 109.5 143.5 141.2 147.7 143.5 166.6		

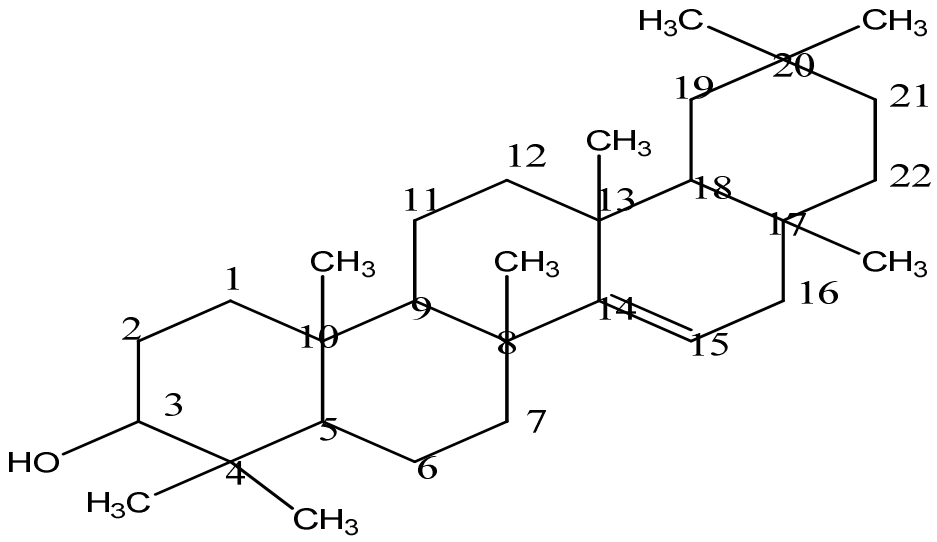

Figure 1: Taraxerol

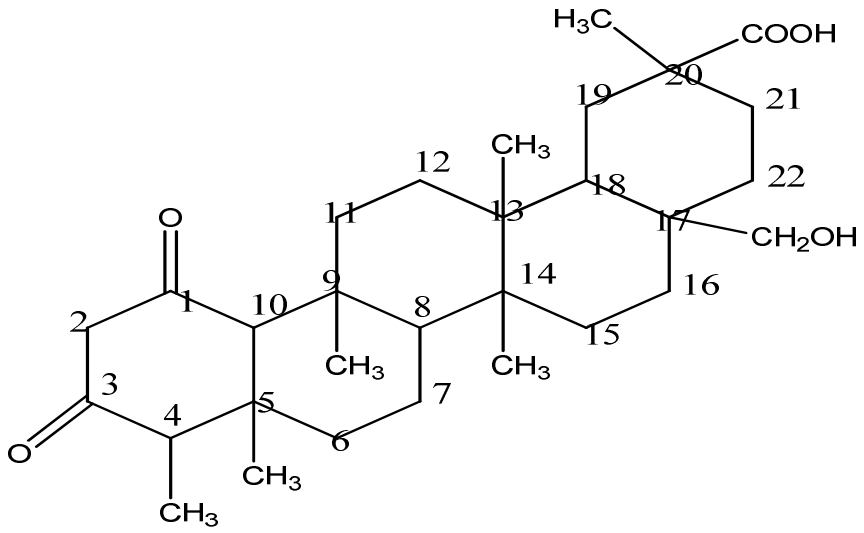

Figure 2: 28-hydroxyfriedelan-1,3-dione-29-oic acid

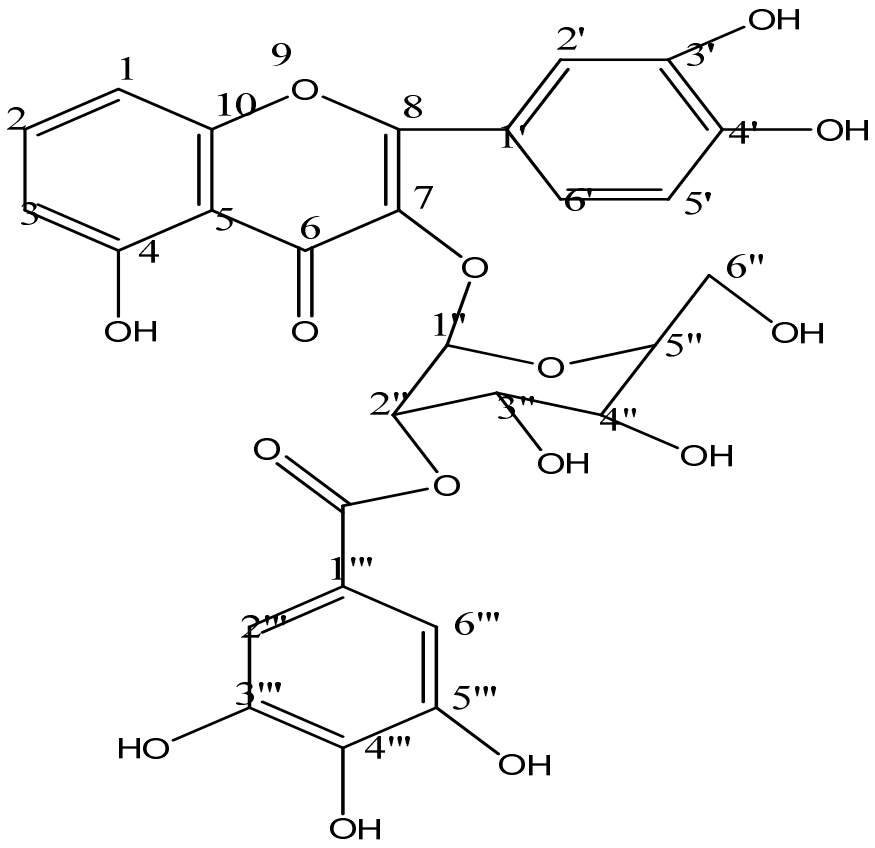

Figure 3: Quercetin 3-O-(2"-O-galloyl)-a-L-arabinofuranoside

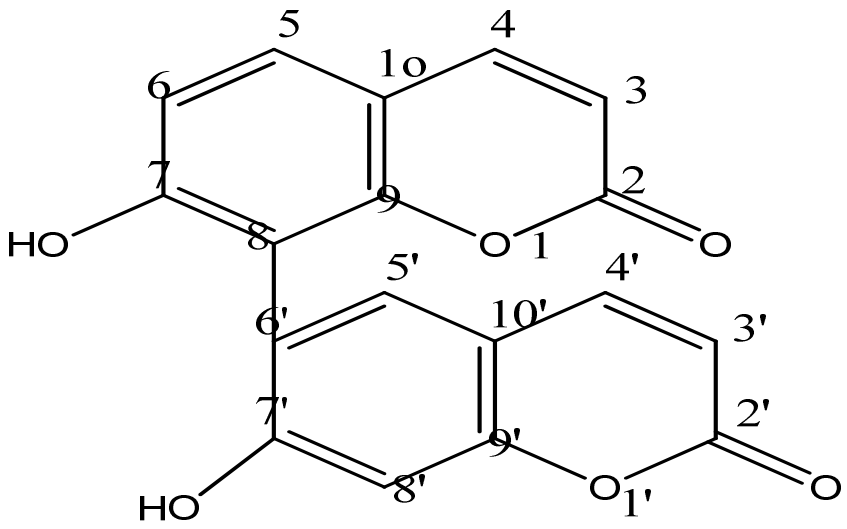

Figure 4: 7 7'- dihydroxy, 8, 6'-bicoumarin

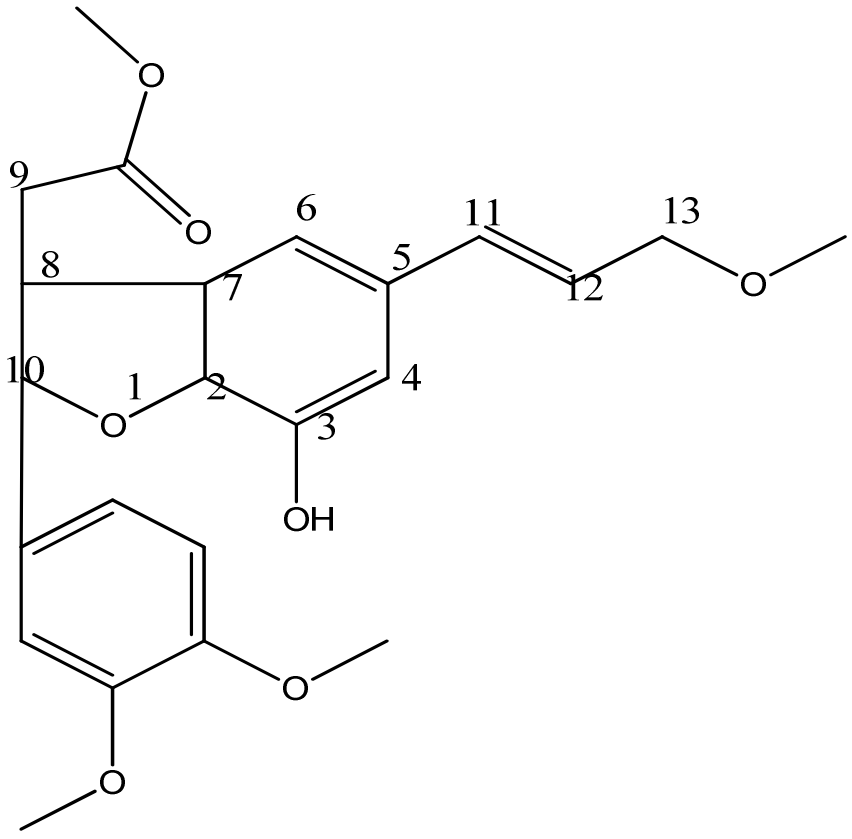

Figure 5: 9-acetyl-3'4'-dimethoxy dehydroconiferyl-3-alcohol