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ISOLATION & FIRST TOTAL ASYMMETRIC SYNTHESIS OF NEW PHENOLIC CONSTITUENT: ISOLATION FROM *WALSURA TRIFOLIATA*

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ABSTRACT

Previously we have isolated & synthesized the (2R, 3R) flavanol[3,4] and now continued the research on another one new Phenylpropanoid unit containing (2R, 3S) flavanol is abundant molecule in plant source, have been isolated from the leaves of *Walsura trifoliata*. The structure were conformed on the basis of spectroscopic evidence mainly 2D-NMR, HRESIMS and unambiguously confirmed by alternative syntheses. The synthesis of this natural product, is good yield from inexpensive and readily available starting materials of Phloroglucinol dihydrate exemplifies the powerful synthetic utility afforded by the Grubbs-2 RCM catalyst reaction, Wittig reaction and sharpless dihydroxylation using AD-mix -α. The important impact of the Wittig reaction on modern synthetic organic chemistry was recognized by the 1979 Nobel Prize that was awarded in part to Georg Wittig for his discovery and subsequent development of this reaction.

KEYWORDS: 3S-Flavan 3-ols, Phenylpropanoid synthesis, Phloroglucinol dehydrate.

INTRODUCTION

As part of our continuation work on isolation identification and synthesis of the structurally interesting and biologically significant secondary metabolites from Indian Meliaceae Plants[1,2], we were fascinated about *walsura trifloiata*. We previously done the work about isolation and synthesis of Phenylpropanoid unit containing 2R, 3R stereoselective flavanol[3,4], present work now the deals with the isolation & synthesis of Phenylpropanoid unit containing 2R, 3S stereoselective flavanol.

MATERIALS AND METHODS

Plant Material

The areal parts of *Walsura trifoliata* were collected from the tirumula forest Area, Chittoor district and were identified by taxonomist, Dr. K. Madhava Chetty, Sri Venkateswara University, Tirupati. The Voucher specimen (specimen no SVU-KM261) was deposited in the laboratory.

Extraction and isolation

The areal parts of *Walsura trifoliata* were shaded, powdered, and proceed to cold soxhlet extraction with methanolic solvent at 25-30°C for 48 hours. Filtered the extract solution under plant vacuum, filtrate layer proceed to distillation under plant vacuum at 43-50°C until to get the constant weight (250 g). The crude suspended in H_2O (500 ml) and extracted with ethyl acetate to give 75 g of ethyl acetate soluble portion. Crude was further proceeded to column chromatography with 100-200 mesh size, eluting with $CHCl_3$/MeOH 100:0 to increasing polarity 70:30 to get the 25 fractions. These fractions were systematically analyzed with TLC and similar fractions were combined to give five major fractions (F1, F2, F3, F4 and F5). TLC examinations of above obtained fractions by using different mobile phase of [hexane /ethyl acetate, 80: 20, chloroform/ acetone 80: 20 and chloroform /methanol, 80: 20)], to give 5 major fractions (F_1 to F_5). The methanol fractions F4 was analyzed by TLC technique, two spots were appeared in 5% methanol sulfuric acid spraying reagent, performed the column chromatography and eluted with $CHCl_3$-MeOH-H_2O (8:1.5:0.5) to yield fractions 1-5. Fraction 5 was again purified with HPLC technique on Cosmosil $5C_{18}$AR-II column (10x250 mm) in acetonitrile - MeOH system (4:6, at a flow rate of 3.0 mL/min) to yield the compound **A** (5 mg, t_R35 min).

RESULTS AND DISCUSSION

Compound A was isolated from chloroform: methanol fraction of *walsura trifoliata*, as a orange brown solid material. Analysis from HRESIMS data, a molecular ion peak appeared at m/z value 470.1005 $[M+Na]^+$ (calcd. 470.1005) and the corresponding molecular formula was determined as $C_{24}H_{20}O_9Na$. The IR absorption bands at 3474.4 is suggested for the O-H stretching of hydroxyl groups, 2920.6 is suggested for the C-H stretching of

CH_3 and CH_2 groups and 1663.4 cm^{-1} suggested for the presence of carbonyl groups. Based on the ^1H NMR data in dueterated methanolic solvent analysis, displayed the phenyl group signals [δH 6.97 (2H, d, *J* = 1.9 Hz), 7.15 (1H, brs)] at C-2 position of B-ring, which indicated the 1,3,5 tri-substitution of phenyl group. Additionally, observed the signals at [δH 6.83 (1H, d, *J* = 7.8 Hz), 6.78 (1H, d, *J* = 1.2 Hz), 6.63 (1H, dd, *J* = 7.8, 1.7 Hz)] indicate the phenyl group at D ring with 1,3,4 tri substitution. Further it was also showed AMX_2-type signals at δ_H 5.03 (1H, d, *J* = 7.9 Hz), 4.40 (1H, ddd, *J* = 7.9, 1.8 Hz) and 3.10 (2H, dd, *J* = 17.4, 7.9 Hz) which can also be assigned to hydroxyl group attached to methine proton (H-3), these data indicate the presence of a flavan-3-ol framework with AMX_2 type signals Singlet proton signal at δH 6.42 (1H, s) belongs to proton on flavan-A ring (C-9), which indicated the tri-substituent on A-ring. The ^{13}C NMR spectrum displayed 24 resonances, which was further differentiated by DEPT 135 NMR experiment into 2 CH_2 carbons, 10 CH carbons and 12 quaternary including one C=O carbon. The above spectral data indicate that the isolated compound was having phenylpropanoid substituted flavan-3-ol, similar to those of cinchonian Ia[5], which is isolated from the *trichilia catigua*[6, 7]

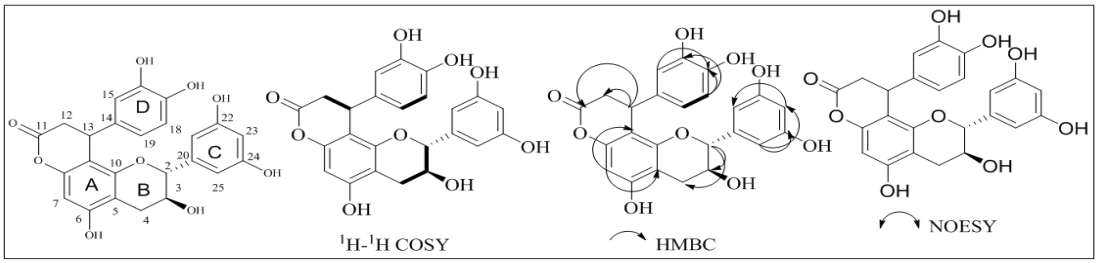


Figure 1: HMBC, COSY & NOESY correlation of compound A.

Based on the ^{13}C NMR & DEPT-135 data, identified the benzylic methine carbon at δC 38.4 [C-12], a methylene carbon δC 35.06 [C-13], additionally, appeared the ^{13}C NMR chemical shift values at δ_C135.04 [C-14], 114.9 [C-15], 145.95 [C-16], 144.78 [C-17], 116.39 [C-18] belongs to aromatic group and lactone carbonyl signal (δ_C 170.69) [C-11], suggesting the presence of a phenylpropanoid (C6-C3) unit with the aromatic dihydroxyl moiety, it was linked with 3-hydroxy isoflavone at 8th & 9th position via lactone ring.

Table 1: ^1H NMR (300 MHz, in MeOH-d4), ^{13}C NMR (75 MHz, in MeOH-d4) δ in ppm) data and key HMBC correlations of compound-A.

Position	δ_H	δ_C	(multiplicity)
1	----	----	
2	5.03 (1H, d, *J* = 7.9 Hz)	79.45	3-C & 20-C
3	4.40 (1H, ddd, *J* = 7.9, 8.0 Hz)	66.36	2-C & 4-C
4	3.10 (2H, dd, *J* = 17.4, 7.9 Hz)	29.23	3-C & 5-C
5	-----	105.77	-----
6	-----	153.06	-----
7	-----	104.97	-----
8	-----	156.95	-----
9	6.42 (1H, s)	96.37	8-C & 10-C
10	-----	151.72	-----
11	----	170.69	-----
12	3.24 (2H, dd, *J* = 6.9, 17.4 Hz)	38.40	11-C & 13-C
13	4.62 (1H, dd, *J* = 6.7, 1.9 Hz)	35.06	7-C, 12-C & 14-C
14	-----	135.04	-----
15	6.78 (1H, d, *J* = 1.2 Hz)	114.92	14-C & 16-C
16	-----	145.95	-----
17	-----	144.78	-----
18	6.83 (1H, d, J= 7.8 Hz)	116.39	17-C, 19-C
19	6.63 (1H, dd, J = 7.8, 1.7 Hz)	119.10	18-C & 14-C
20	-----	131.53	-----
21	6.97 (1H, d, J = 1.9 Hz)	119.04	20-C & 22-C
22	-----	145.95	-----
23	7.15 (1H,s)	114.84	22-C, 23-C & 25-C
24	-----	145.65	-----
25	6.97 (1H, d, J = 1.9 Hz)	115.95	20-C, 24-C & 21-C

Comprehensive analysis of HSQC data (Figure 1), the resonances was observed at presence of a flavan-3-ol ring signals at C-2 δ_C (79.45) to δ_H 5.03 (d, *J* = 7.9 Hz, H-2), C-3 δ_C (66.36) to 4.40 (1H, ddd, *J* = 7.9, 1.8 Hz, H-3), and C-4 δ_C (29.23) bearing protons at 3.10 (2H, dd, *J* = 17.4, 7.9 Hz, H-4) respectively. additionally, phenyl propanoid substitution signals at C-12 δ_C (38.40) bearing protons at δ_H 3.24 (2H, dd, *J* = 6.9, 17.4 Hz, H-12), C-13 δC (35.06) bearing protons at 4.62 (1H, brs), C-15 δ_C (114.92) bearing protons at 6.78 (1H, d, *J* = 1.2 Hz), C-18 δ_C (116.39) bearing protons at 6.83 (1H, d, *J* = 7.8 Hz), and C-19 δ_C (119.10) bearing protons at 6.63 (1H, dd, *J* = 7.8, 1.7 Hz) respectively.

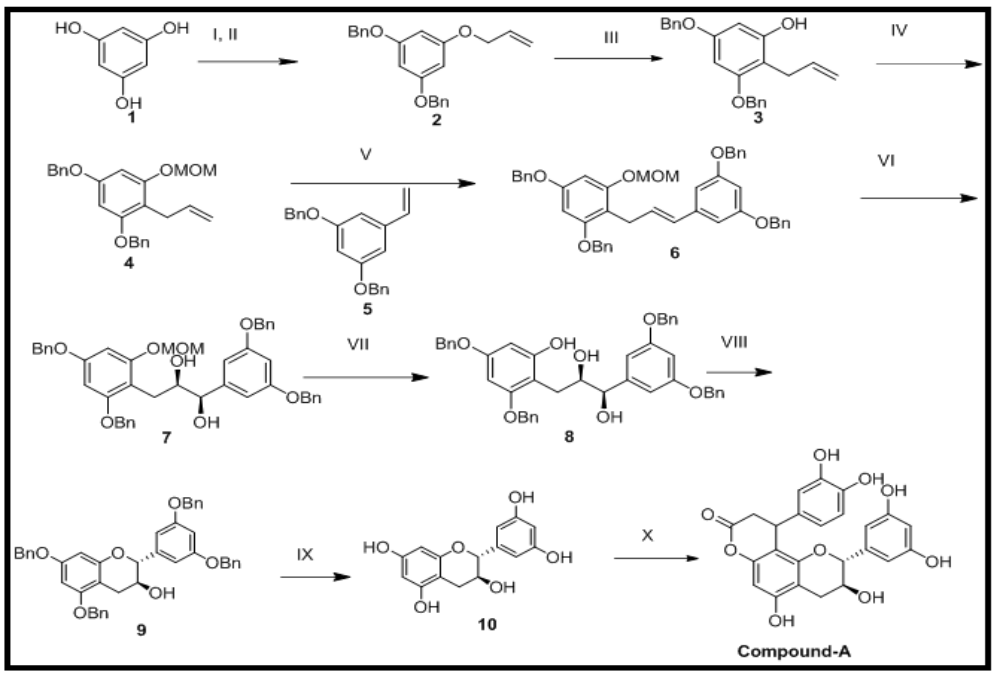
Comprehensive analysis of the 2D NMR spectra of compound A(Figure 1), especially ^{1}H-^{1}H COSY and HMBC data give the information about the broad structure of compound A. Three COSY fragments for flavan-3-ol ring -CH-CH-CH_2 δH 5.03 (1H, d, J = 7.9 Hz), 4.40 (1H, ddd, J = 7.9, 8.0 Hz) 3.10 (2H, dd, *J* = 17.4, 4.9 Hz, H-4), two COSY fragments for lactone ring was appeared at δ_H 3.24 (2H, dd, *J* = 6.9, 17.4 Hz, H-12), 4.62 (1H, brs, H-13) and 3,4 dihydroxyl ring structural fragment -CH-CH- δH (6.83, 1H, d, *J* = 7.8 Hz, H-18), 6.63 (1H, dd, *J* = 7.8, 1.7 Hz, H-19).

The key HMBC (Figure 1) correlations were appeared at H-13 [δ_H 4.62 (1H, dd, *J* = 6.7, 1.9 Hz)]; to C-14 (δ_C 135.04) and C-19 (δ_C 119.10) were similar to catechol group correlations. Further, correlations of H-9 [δ_H 6.42 (1H, s)] to C-8 (δ_C 156.95) & C-10 (δC 151.72), in HMBC spectra established the connections and indicated the flavan-3-ol skeleton. Additionally, few correlations were observed between the H-2 δ_H [5.03 (1H, d, *J* = 7.9 Hz)] to C-20 (131.53), C-21 (119.04) and C-25 (115.95) was confirmed the position of 3, 5 dihydoxy aromatic ring.

Based on the NOESY spectrum (Figure 1), cross peaks were not find out between H-2 δ_H [5.03 (1H, d, *J* = 7.9 Hz)]/H-3 δ_H [4.40 (1H, ddd, *J* = 7.9, 1.8 Hz)], indicate the trans relationship between H_2 & H_3. it was supported by large coupling constant of H-2, J = 7.9 Hz & H-3 J= 7.9 Hz.

EXPERIMENTAL

The new compound was synthesized from inexpensive starting material phloroglucinol dihydrate. Thus, Phloroglucinol dehydrate (1) was converted to the (5-(allyloxy)-1, 3-phenylene) bis (oxy) bis (methylene) di-benzene *via* di benzyalation reaction followed by allyl bromide in the presence of K_2CO_3 in acetone furnished the desired allylic ether (**2**) in 70% yield. Allyl phenol **3** was obtained by Claisen rearrangement of allylic ether **(2)**. The compound 4 was achieved by MOM protection of hydroxyl group. we planned that the MOM group would be orthogonal to the benzyl groups and could be selectively removed under acidic conditions. Desired high stereo selective isomer of alkene **6** was achieved by ring-closing metathesis of dienes 4 & 5 using Grubbs-2 catalyst. The alkene compound **6** was performed with sharpless dihydroxylation using AD-mix α to give the optically active diol **7**. Further isolation and recrystallization of 7 gave a 90% ee of pure compound (60%) yield. Subsequent deprotection with 3M HCl gave triol **8**, cyclization of **8** with orthoformate under acetic conditions followed by base may facilitate cyclisation to form the ring B (**9**). The trans stereochemistry of 9 was evident from its ^{1}H NMR spectrum. Subsequent global debenzylation of compound 9 by hydrogenolysis with Pd $(OH)_2$ catalysis (48%) to give the enantiomerically pure 3-hydroxy B ring. Completion of the synthesis was achieved by TFA and sodium acetate induced coupling with 3, 4 di hydroxy cinnamic acid.[8]



Scheme-I: Reagents and conditions: (i) Bromo methyl benzene, DMF, NaH, 90-100°C, 9h, 45% (ii) K_2CO_3, DMF, allyl bromide, 65 ^{0}C, 12.5 h, 70%; (iii) 191-210 ^{0}C, 1 h, 80%; (iv) NaH, MOMCl, MCl, 0^{0}C to rt, 80%; (v) dry DMF, hoveda-grubs, 80^{o}C, 1.5 h, 55% (vi AD-mix-α, t-BuOH, H_2O, $MeSO_2NH_2$, O °C, 5 days, 60% (vii) HCl, MeOH, Et_2O, reflux, 5h, 90% crude (viii) HC $(OMe)_3$, PPTS cat. DCE, rt (a) K_2CO_3/MeOH/MTBE, rt; 45%(ix) H_2, 10% $Pd(OH)_2$/C, EtOAc, rt, 12 h. 48% (xi)1eq NaOAc, 6 eq TFA, in Dry THF, 85% yield, 90%.

1-((3-(Allyloxy)-5-(benzyloxy) phenoxy) methyl) benzene[4] (2)

Sodium hydride taken into 1000 ml 4NRB flask, 200 ml DMF taken into flask under N_2 condition. Phloroglucinol dihydrate (5 g, 30.83 mmol), Benzyl bromide (11.4 g, 61.46 mmol) taken into addition funnel, slowly added into the reaction mass 1.5 hrs. Reaction mass stirred 9 hrs at 90-100°C, after TLC complies rm cooled to 0°C, diluted with water & extracted with ethyl acetate. Distil the organic layer & proceed to column chromatography with 20% ethyl acetate -hexane as a mobile phase to get the dibenzyl pure product (4.2 g, 45%).

The above dibenzyl compound (4.0 g, 19.6 mmol), Potassium carbonate (3.25 g, 23.5 mmol) and DMF solvent taken into flask at temperature 0 °C. To the reaction mass allyl bromide (1.57g, 19.6 mmol) slowly added in 30 mins. The reaction mass was gradually allowed to 70°C and maintained for 12.5 h. Monitored the S.M. content by TLC, after consumption of starting material, reaction mixture was cooled to RT. Three times extractions were done with diethyl ether (50 mL) and washed with D.M water, dried over magnesium sulphate and concentrated to furnish compound-2 as a brown color semisolid.

^{1}H NMR (400MHz, $CDCl_3$): δ 7.51-7.46 (m, 10H), 6.37 (d, *J* = 1.9 Hz, 1H), 6.29 (d, *J* = 1.9 Hz, 1H), 6.03-6.17 (m, 1H), 5.17 (tq, *J*= 16.8 and 1.5 Hz, 2H), 5.12 (s, 4H), 4.47 (dt, *J*= 4.9 and 1.3 Hz, 2H). ^{13}C NMR (100MHz, $CDCl_3$): δ 69.7, 71.0, 94.4, 116.9, 127.3, 128.1, 128.2, 133.0, 136.4, 159.8, and 160.4. ESI-MS: 369.5 $[M+Na]^+$.

(((5-(allyloxy)-1,3-phenylene)bis(oxy))bis(methylene))dibenzene[4] (3)

Compound-2 was taken in 100 ml sealed tube. This tube is kept in oil mantle and given the heating at pressure 0.1mm. The reaction was continued at 191-210^{o}C. Monitored the S.M. content by TLC until the absence of S.M. content.

^{1}H NMR (400MHz, $CDCl_3$): δ 7.49-7.29 (m, 10H), 6.25 (d, *J* = 1.9 Hz, 1H), 6.17 (d, *J* = 1.9 Hz, 1H), 6.03-5.90 (m, 1H), 5.17-5.07 (tq, *J* = 16.6 and 1.4 Hz, 2H), 5.01 (s, 2H), 4.99 (s, 2H), 3.45 (d, *J* = 5.9 Hz, 2H). ^{13}C NMR (100MHz, $CDCl_3$): δ 26.9, 69.5, 69.7, 92.9, 94.6, 113.9, 127.0, 127.1, 127.3, 127.6, 127.8, 127.9, 136.1, 136.2, 136.5, 154.9, 156.9, 157.9. ESI-MS. 369.4 $[M+Na]^+$.

2-allyl-3,5-bis(benzyloxy)phenol[4] (4)

Sodium hydride (1.3 g, 66 mmol) was taken in MCl solvent and cooled to temperature 0 °C. To this charged Compound-3 (5.5 g, 33 mmol). Stirring was given, methoxy methyl chloride (2.5 mL, 33 mmol) was added dropwise and the reaction mass was allow to RT. After completion of TLC, 50 ml of 10% sodium chloride solution was added, three times extracted with diethyl ether (3X50 mL) and dried over sodium sulphate and concentrated to furnish compound-4 as a brown color liquid.

^{1}H NMR (400MHz, $CDCl_3$): δ 7.33-7.41 (m, 10H), 6.45 (d, *J* = 1.9 Hz, 1H), 6.31 (d, *J* = 1.9 Hz, 1H), 5.16 (s, 2H), 5.02 (s, 2H), 4.99 (s, 2H), 5.46-4.90 (tq, *J* = 2.1, 16.1 Hz, 2H), 3.46 (s, 3H,), 3.42 (dt, 1H, *J* =1.5, 7.6 Hz),^{13}C NMR (100MHz, $CDCl_3$): δ27.7, 56.0, 70.8, 71.1, 93.7, 95.0, 115.2, 126.9, 127.5, 127.8, 128.2, 128.9, 136.5, 137.1, 137.5, 156.6, 156.3, 158.1, 158.9. ESI-MS. 413.3$[M^+$+Na].

5-vinyl-1, 3-phenylene) bis (oxy) bis (methylene) dibenzene[4] (5)

C1 salt (3.0 g, 8.39 mmol) was taken into 250 ml 3NRB flask, 100 ml Dry THF charged into flask. Rm allow to -5°C and then n-BuLi (8.37 mmol) was added into flask at -4 to -7°C. 3,5-bis(benzyloxy) benzaldehyde (2.67 g, 8.39 mmol) in 30 ml THF solvent addition was started slowly at -4 to -7^{0}C, stirred the reaction mass 2 hours at -4 to -7°C, checked TLC. After completion of TLC, 50 ml of 10% sodium chloride solution was added, three times extracted with diethyl ether (3X50 mL) and dried over sodium sulphate and concentrated to furnish compound-5 as a brown color liquid.

^{1}H NMR (400MHz, $CDCl_3$): δ 7.320-7.44 (m, 10H), 6.45(d, *J* = 2.2 Hz, 1H), 6.45(d, *J* = 2.2 Hz, 1H), 6.66 (1H, s), 6.60-6.66 (1H, m, *J*=10.7, 17.8 Hz), 6.54 (t, *J*= 2.1, 4.4, Hz, 1H), 5.70 (1H, d, *J*= 17.3 Hz), 5.24(1H, d, *J*=10.7, Hz) 5.04 (s, 4H). ^{13}C NMR (100MHz, $CDCl_3$): δ 70.1, 101.6, 105.58, 114.34, 127.5, 128.0, 128.5, 136.7, 136.8, 139.6, 160.0. **ESI-MS.** 317.2 $[M^+$+H].

(E)-(5-(3-(2,4-bis(benzyloxy)-6-(methoxymethoxy)phenyl)prop-1-enyl)1,3 phenylene)bis(oxy)bis(methylene)dibenzene[4, 9] (6)

Compound 4 (1.0 mol) was taken into a dry DMF solvent, at room temp under N_2 condition. To this reaction mass 2.0 mol styrene moiety (compound 5) and 0.02 mol $Cl_2(PCy_3)$RuCHPh was charged and stirred for the 10 mints at rt under nitrogen atmosphere. Reaction mass was brought to reflux at 80 °C for 1.5 hrs. Monitored the S.M content by TLC and after consumption of starting material, reaction mixture was cooled to rt. Filtered the reaction mass and wash with water and diethyl ether (2X50 mL), dried over magnesium sulphate and concentrated to furnish compound-6 with 50% yield as a white solid.

^{1}H NMR (400MHz, $CDCl_3$): δ 7.46-7.28 (m, 20H), 6.55 (d, *J* = 2.1 Hz, 2H), 6.46 (d, *J* = 2.1 Hz, 1H), 6.45 (t, *J* =

2.1, 4.2 Hz, 1H), 6.33 (d, *J* = 2.1 Hz, 1H), 6.28 (d, *J* = 1.8 Hz, 2H), 5.17 (s, 2H), 5.05 (d, *J* = 18.1 Hz, 2H), 5.01 (s, 2H), 4.99 (s, 4H), 3.54 (d, *J* = 2.1, 4.5 Hz, 2H), 3.45 (s, 3H).

^{13}C NMR (100MHz, $CDCl_3$)
δ 26.10, 55.69, 69.61, 69.75, 69.80, 93.86, 94.07, 94.20, 100.2, 100.8, 105.49, 109.95, 126.84, 127.11, 127.24, 127.37, 127.51, 127.59, 128.11, 128.14, 128.22, 129.02, 129.56, 136.44, 136.49, 136.58, 136.77, 139.85, 155.95, 157.48, 158.21, 159.54, 159.74, 1598.74.

ESI-MS. 679.6 $[M+H]^+$.

(1S, 2S) -3- (2, 4- bis (benzyloxy) -6- (methoxymethoxy) phenyl) -1- (3, 5 bis (benzyloxy) phenyl) propane -1, 2-diol[4, 9] (7)
AD-mix-α (4.0 g) was taken into a 100 ml flask and ter-butanol (25 mL) and water (25 mL) charged at 0 °C. To this, methane sulfonamide (500 mg, 0.73 mmol) was charged followed by addition of compound-6. Reaction mass is allowed for five days at 0 °C. After complete the reaction, extract the reaction mass with ethyl acetate three times and concentrated to get crude product. Purification was done by column chromatography to afford compound-10 as a white solid. Re-crystallization was done with 50 % hex/EtOAc to afford enantioselective pure compound-10.

^{1}H NMR (400MHz, $CDCl_3$): δ 7.27-7.43 (m, 20H), 6.65 (d, *J* =1.9 Hz, 2H), 6.49 (t, *J* = 1.9, 4.05 Hz, 1H), 6.46 (d, *J* = 1.9 Hz, 1H), 6.33 (d, *J* = 1.9 Hz, 1H), 5.12 (dd, *J* = 6.6, 8.9 Hz, 2H), 5.01 (s, 2H), 4.99 (s, 2H), 4.98 (s, 4H), 4.45 (d, J = 4.2 Hz, 1H), 3.97-3.88 (m, 1H), 3.39 (s, 3H), 2.93-2.89 (dd, *J* = 2.8, 7.7 Hz, 2H).

^{13}C NMR (100MHz, $CDCl_3$): δ 27.1, 55.9, 69.7, 69.8, 70.1, 75.1, 75.6, 93.9, 94.2, 94.4, 100.7, 105.4, 107.7, 126.8, 127.3, 127. 6, 127.7, 128.2, 128.3, 135.9, 136.2, 136.4, 133.5, 143.4, 156.4, 157.6, 158.5 & 159.6.

ESIMS: 712.8 $[M+H]^+$.

(1S, 2S) -3- (2, 4- bis (benzyloxy) -6- hydroxyphenyl) -1- (3, 5 bis (benzyloxy) phenyl) propane-1, 2-diol[4, 9] (8)
Diol compound **7** (250 mg, 0.35 mmol) was taken into a 100 ml flask and charged methanol (10 mL) and diethyl ether (10 mL). to this 0.5 ml con. HCl added and RM is allowed to reflux for 5 h. concentrated the reaction mass and extractions were done with ethyl acetate to get a white color solid (164 mg, 70% yield).

^{1}H NMR (400MHz, $CDCl_3$): δ 7.44-7.21 (m, 20H), 6.57 (d, *J* = 1.9 Hz, 2H), 6.50 (d, *J* = 1.9 Hz, 1H), 6.27 (d, *J* = 1.9 Hz, 1H), 6.20 (d, *J* = 1.9 Hz, 1H), 4.99 (s, 2H), 4.94 (brs, 4H), 4.89 (s, 2H), 4.49 (d, *J* = 5.8 Hz, 1H), 4.06-3.97 (brs, 1H), 2.96 (dd, *J* = 3.5, 14.5 Hz, 1H), 2.82 (dd, *J* = 3.5, 14.5 Hz, 1H).

^{13}C NMR (100MHz, $CDCl_3$): δ 29.55, 69.72, 69.89,76.67, 93.25, 95.72, 101.69, 105.63, 105.81, 126.47, 127.39, 127.44, 127.82, 127.89, 128.32, 128.42, 136.46, 136.77, 142.65, 157.22, 157.63, 158.96, 159.88.

(2R,3S)-2-(3,5-dihydroxyphenyl) chromane-3,5,7-triol (9)
Triol compound **8** was dissolved in (150 mg, 0.2242 mmol) in 1, 2-DCE (50 ml). To this triethyl orthoformate was charged and followed by the addition of PPTS. Reaction mass was allowed to RT for 20 minutes until the dissolve the solids. RM was allowed to reflux for 5 hrs until the completion of SM by TLC. Distill the RM and MTBE (30 mL) and methanol (30 mL) solvents are added to the residue. Potassium carbonate was added to the RM and allowed to stir for twelve hours. Concentrated the reaction mass and extractions were done with ethyl acetate and concentrates to afford compound-12 as a white color solid. Re-crystallization was done with 80 % Et_2O/EtOAc to afford enantiomerically pure compound-12 (80 mg, 55% yield).

^{1}H NMR (400MHz, $CDCl_3$): δ 7.43-7.17 (m, 20H), 6.68 (d, 1H, *J* = 2.1 Hz), 6.56 (t, 1H, *J* = 2.1Hz), 6.30 (d, *J* = 2.4 Hz, 1H), 6.23 (d, J = 2.2 Hz, 1H), 5.00 (s,2H), 4.95 (s, 2H), 4.93 (s, 4H), 4.64 (d, *J* = 8.5 Hz, 1H), 4.12 (ddd, J = 2.4, 8.5 Hz, 1H), 3.21 (dd, J = 15.1, 2.5 Hz, 1H), 2.95 (dd, J = 15.1, 6.7, Hz, 1H).

^{13}C NMR (100 MHz, CDCl3): δ 27.03, 70.01, 70.08, 81.53, 84.08, 93.5, 96.3, 101.8, 105.5, 105.9, 109.4, 126.4, 127.5, 127.6, 127.9, 128.4, 128.5, 136.6, 136.7, 137.0, 139.6, 157.6, 157.7, 159.3, 160.0. ESIMS: 673.4 $[M+Na]^+$.

(2R, 3R)-2-(3, 5-dihydroxyphenyl) chroman-3, 5, 7-triol (10)
Compound-9 (25 mg, 0.038 mmol) was dissolved in ethanol solvent (1 mL) added palladium hydroxide catalyst 10 mol% (2.5 mg) under the hydrogen atmosphere. Reaction mass was allowed to stir for one hour. After complete the reaction, RM was filtered through celite bed and concentrated the fml's to get the crude product. This was purified by column chromatography to furnish the product (2R, 3R)-2-(3,5-dihydroxy phenyl) chroman 3,5,7-triol as a yellow oil compound.

^{1}H NMR (400MHz, $CDCl_3$): δ 6.42 (d, *J* = 2.3 Hz, 2H), 6.18 (t, *J* = 2.3 Hz, 2H), 5.89 (d, *J* = 2.5 Hz, 1H), 5.85 (d, *J* = 2.5 Hz, 1H), 4.59 (d, *J* = 7.1 Hz, 2H), 3.97 (ddd, *J* = 7.1, 4.9 Hz, 2H), 2.69 (d, *J* = 4.9, 15.6 Hz, 1H), 2.49 (d, *J* = 4.9, 15.6 Hz, 1H).

^{13}C NMR (100MHz, $CDCl_3$): δ 158.9, 158.4, 157.3, 156.4, 144.1, 107.2, 102.9, 99.7, 97.2, 83.4, 67.5, 27.1. ESIMS: 291.4 $[M+H]^+$.

Compound-A
Compound 10 was dissolved in THF solvent and slowly added the and sodium acetate in nitrogen atmosphere.

After 10 mins, slowly charged the trifluoro acetic acid and RM was brought to reflux temperature. Monitored the S.M. content by TLC and after consumption of starting material, Reaction mass quenched with sodium bicarbonate solution (15 mL). Separated the both organic and aqueous layers. Two extractions of aqueous layer were done with ethyl acetate and concentrated the organic layers to furnish the crude product. This crude product was purified through column chromatography and recrystallization was done in ethyl acetate and hexanes solvents to get the product A**.**

^{1}H NMR (400 MHz, CDCl3): δ 7.01 (1H, s), 6.80 (2H, *J* = 2.01 Hz, d), 6.65 (1H, *J* = 7.8 Hz, d), 6.61 (1H, J = 1.8 Hz, d), 6.46 (1H, J = 7.8, 1.8 Hz, dd), 6.25 (1H, s), 4.87 (1H, *J* = 7.9 Hz, d), 4.45 (1H, *J* = 7.9, 8.1 Hz, ddd), 4.23 (1H, *J* = 7.9, 8.1 Hz, dd), 3.09 (1H, dd, *J* = 16.3, 4.5 Hz), 2.94 (2H, *J* = 16.3, 7.9 Hz, dd).

^{13}C NMR (100 MHz, CDCl3): δ 170.18, 156.44, 151.21, 153.0, 145.44, 145.14, 144.94, 144.27, 134.53, 131.02, 118.59, 118.9, 115.88, 115.44, 114.41,114.30, 105.26, 104.46, 96.61, 78.96, 65.85, 37.94, 34.55, 28.72. HRESI-MS: found 475.1033 $[M+Na]^{+}$, $C_{24}H_{20}O_9Na$ (calculated: 475.1005).

CONCLUSION

In this paper, we have described the isolation of new phenolic constituent (compound - A). The structures were elucidated on the basis of extensive NMR spectroscopic and same was confirmed by asymmetric synthesis.

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