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COUMARINS FROM THE ROOTS OF CANARIUM SP. (BURSERACEAE)

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ABSTRACT

The roots of the *Canarium sp* (Burseraceae), an endemic species of Madagascar is used to prevent and treat cancer diseases. A phytochemical studies about this plant was effectued. The use of chromatographic technique allowed the isolation of five coumarins. They were identified as Skimmin 1, Umbelliferone 2, Scopolotin 3, Scoparone 4 and Scopolin 5. They were isolated for the first time from the roots of *Canarium sp* (Burseraceae). Structure elucidations of the compounds were performed by means of NMR Spectra and comparison with literature data. Two of the isolated products possess anti-cancer activity according to bibliographic studies.

KEYWORDS -: *Canarium sp*, Coumarin, NMR.

1. INTRODUCTION

Cancer remains one of the deadliest diseases on earth.[1] Treatment in conventional medicine is difficult and very expensive. The use of phytomedicines presents an alternative of a sustainable solution for a country like Madagascar which is rich in endemic flora. The bark of the *Canarium sp*. are traditionally used in the south-eastern part of Madagascar to prevent and treat this disease.[2] Thus, a chemical study which highlights secondary metabolites present in the bark of this plant constitutes a first step to identify active compounds. The present work reports on the structure of coumarins isolated from the bark of *Canarium sp*. To the best of our knowledge, this is the first report about the chemical study of this plant.

2. MATERIALS AND METHODS

2.1. General

TLC were performed on aluminium silica gel 60 F254 (Merck) plates (0.2 mm layer thickness). Spots were visualized using UV lamp (254 and 366 nm) and spraying with vanillin-sulfuric acid reagent. Column chromatography was performed on silica gel 60 (6.3-20 µm) (Merck, Darmstadt, Germany). NMR spectra were recorded with a Brüker AV-400 with a cryoprobe for ^{1}H, ^{13}C. Chemical shift values are in δ (ppm) using the peak signals of the solvent $CDCl_3$ (δ-H=7.28 ppm and δ-C =70.00 ppm) as reference, and coupling constants are reported in Hz.

2.2. Plant material

The roots of *Canarium sp*. were collected in Mai 2019 in South-eastern parts of Madagascar. An herbarium of the plantes under the code JUM01 was deposited at the Laboratory of Analytical Chemistry and Formulation (LCAF) for a reference.

2.3. Extraction and Isolation

The powdered roots of *Canarium sp*. (500g) were extracted with ethanol 92% under room temperature within 10 days and filtered. Evaporation of EtOH under reduced pressure gave 104.56 gr of extract. This ethanolic extract was suspended in warm water, and partitioned with Hexane, AcOEt and n-BuOH.

A part of the AcOEt extract (5, 44g) was applied to a silica gel column with Petrol Ether/AcOEt as binary mixtures of increasing polarity afforded 21 fractions (F1→ F21). Further purification of F2 was performed on silica gel eluted with Hexan/AcOEt step gradients to obtain compound 1 and 2. F6 was washing with Hexan to obtained compound 3. Compounds 4 and 5 were obtained from the purification of F15 on silica gel column using the mixture Hexane – AcOEt (20/80) as eluant.

3. RESULTS AND DISCUSSIONS

The structure of the isolates were determined through analysis of their spectroscopic data. The NMR spectra of all isolated compounds are similar and showed coumarin skeleton. By means of 1-D and 2-D NMR spectra and

comparison with literature, they are respectively recognized as Umbelliferone 1,[3] Scopoletin 2,[4] Scoparone 3,[5] Skimmin 4,[6] and Scopolin 5.[4]

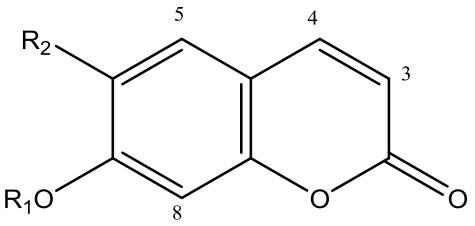

Fig. 1: Coumarin skeleton of isolated compounds.

1 : R1= OH, R2= H
2 : R1= OH, R2= OCH_3
3 : R1= CH_3, R2= OCH_3
4 : R1 = Glucose, R2= H
5 : R1= Glucose, R2= OCH_3

Umbelliferone 1: Yellow crystals: ^{1}H NMR (400 MHz in $CDCl_3$): δ (ppm) 6.20 (1H, d, J=10Hz, H-3), 7.10 (1H, s, H-8), 7.25 (1H, d, J=10 Hz, H-6), 7.45 (1H, d, J=10 Hz, H-5), 7.90 (1H,d, 10 Hz, H-4); ^{13}C NMR (400 MHz in $CDCl_3$): δ (ppm) 103.0 (C-6), 111.9 (C-3), 113.0 (C-8), 114.1 (C-10), 128.9 (C-5), 144.2 (C-4), 155.3 (C-9), 161.2 (C-7), 162.3 (C-2).

Scopoletin 2: Pale yellow powder; ^{1}H NMR (400 MHz in $CDCl_3$): δ (ppm) 3.94 (3H, s, 6-OCH_3,), 6.25 (1H, d, *J* = 10 Hz, H-3), 6.97 (1H, s, H-8), 7.25 (1H, s, H-5), 7.83 (1H, d, *J* = 10 Hz, H-4); 13C-NMR (125MHz, $CDCl_3$) *δ*; 56.4 (6-OCH3), 104.0 (C-6), 109.4 (C-8), 113.5 (C-3), 113.8 (C-10), 128.1 (C-5), 143.3 (C-4), 154.6 (C-9), 160.3 (C-7), 161.5 (C-2).

Scoparone 3: Pale yellow powder; ^{1}H-NMR (400 MHz in $CDCl_3$) : *δ* (ppm) 3.96 (7-OCH3, s, 3H), 3.94 (3H, s, 6-OMe), 6.22 (1H, d, *J* = 9.7 Hz, H-3), 6.98 (1H, s, H-8), 6.87 (1H, s, H-5), 7.64 (1H, d, *J* = 9.7 Hz, H-4); 13C-NMR (125MHz, CD_3Cl), *δ*; 56.10 (6-OCH_3), 56.40 (7-OCH_3), 100.05 (C-5), 107.98 (C-10), 111.45 (C-3), 113.59 (C-9), 143.28 (C-8), 147.37 (C-4), 148.06 (C-7), 152.87 (C-6), 161.41 (C-2).

Skimmin 4: White crystals: ^{1}H NMR (400 MHz in $CDCl_3$)): δ (ppm) 3.40 (1H, m, H-4'), 3.5 (2H, m, H-2', H-3'), 3.53 (1H,m, H-5'), 3.71 (1H, q, H-6'), 3.94 (1H, d, H-6'), 5.06 (1H, d, J=7.5 Hz, H-1'), 6.31 (1H, d, J=10 Hz, H-3), 7.1 (1H, s, H-8), 7.2 (1H, d, J=8 Hz, H-6), 7.58 (1H, d, J=10 Hz, H-5), 7.92 (1H, d, J=10 Hz,H-4); ^{13}C NMR (400 MHz in $CDCl_3$): δ (ppm) 62.1 (-CH_2OH, C-6'), 70.4 (-CHOH,C-4'), 72.7(-CHOH, C-2'), 75.8 (-CHOH, C-3'), 77.5 (-CHOH, c-5'), 101.9 (-CH,C-1'), 103 .9 (-CH, C-6), 113.3(-CH, C-3), 114.2 (-CH, C-8), 114.3 (-CH, C-10), 129.4 (-CH, C-5), 144.6 (-CH, C-4), 155.8 (-Cq, C-9), 161.1 (-Cq, C-7), 162.1 (-Cq, C-2).

Scopolin 5: White crystals, ^{1}H NMR (400 MHz, MeOH-d4) δ (ppm) 3.42 (1H, m, H-4'), 3.50 (1H, m,H-5'), 3.54 (1H, m, H-2'), 3.60 (2H, m, H-6'a,H-3'), 3.71 (1H, m, H-6'a), 3.92 (3H,s,6-OCH3), 5.06 (d, *J* = 7.5 Hz, H-1'), 6.30 (d, *J* = 9.5 Hz, H-3), 7.17(s,H-8), 7.19 (s,H-4), 7.88 (d, *J* = 9.6 Hz,H-4), 13C NMR, δ (ppm) 56.02 (-OCH3), 63,20 (-CH_2OH, C-6'), 70.8 (-CHOH,C-4'), 71.7(-CHOH, C-2'), 73.6 (-CHOH, C-3'), 76.9 (-CHOH, c-5'), 101.7 (-CH,C-1'), 113 .9 (-CH, C-6), 113.4(-CH, C-3), 104.1 (-CH, C-8), 148.7 (-CH, C-10), 109.4 (-CH, C-5), 144.6 (-CH, C-4), 147.8 (-Cq, C-9), 151.1 (-Cq, C-7), 162.3 (-Cq, C-2).

The roots of this plant is a new source of coumarins. Coumarins exhibit a wide range of activities which includes anti-diabetic, anti-viral, anti-microbial, anticancer, anti-parasitic, anti-inflammatory. Scopoletin 5 is known of its pharmacological activities against cancer, diabet, inflammatory, cardioprotective, hepatoprotective.[7] Scoparone 3 has an anti-tumor activity against DU145 prostate cancer cells.[8] These may explain the traditional use of the plant. The substances responsible for the therapeutic activity are certainly coumarins.

4. CONCLUSION

The results of this study contribute to validate the traditional use of *CANARIUM sp. (BURSERACEAE).* This is the first report about chemical study of this plant. The coumarins isolated during this study are known by their biological activity. This plant has an particular interest for the research an anti-cancer drug.

REFERENCES

1. Descheemaeker A., Ravi-maitso, Imprimerie Saint Paul Fianarantsoa, 1986.
2. Hu X.J., Jin H.Z., Su J., Zhang W., Xu W.Z., Yan S.K., Liu R.H., Li J.Q., Zhang W.D. Coumarins from *Daphne retusa*. Chin. J. Nat. Med, 2009; 7: 34–36.
3. Rajbir S., Bikram S., Sukhpreet S., Neeraj K., Subodh K., Saruj A. Umbelliferone – An antioxidant isolated from *Acacia nilotica* (L.) Wild. Ex. Del. Food chemistry, 2010; 120: 825-830.
4. Randrianasolo R., Krebs H.C., Rakotoarimanga J.V, Raharisolololao A., Rakotondramanga M. Secondary metabolites of *Phellolophium madagascariensis*, Journal of Pharmacognosy and Phytochemistry, 2015; 4(1): 55-56.
5. Ibrahim A., Yang C.X, and Hu Y.L, Isolation and Structure Elucidation of a new coumarin glycoside from *Xeromphis Nilotica* World Journal of Pharmaceutical Research, 2016 ; 5(4) : 292-300.
6. Mogana R., Adhikari A., Debnath S., Hazra S., Hazra B, Teng-Jin K, Wiart C., The antiacetylcholinesterase and antileishmanial activities of *Canarium patentinervium* Miq, Biomed. Rest. Int. eCollection, 2014. doi: 10.1155/2014/903529.
7. Reisch J, Achenbach SH. A furanocoumarin glucoside from stembark of *Skimmia japonica*. Phytochemistry, 1992; 31(12): 4376-4377.

8. Dey P., Sosmitha G., Elina K., Aviral K., Mohammed S.A., Mohamed A., Gautam S., Ajaikumar B., Kunnumakkara. An overview of the pharmacological activities of scopoletin against different chronic diseases, Pharmacological Research, 2022 ; 1006202.