Phytochemical characterization of chloroform seed extract from *Schinus molle* collected in the Kingdom of Lesotho

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Abstract

Chloroform seed extract from *Schinus molle* was analyzed for its phytochemical compositions by GC-MS. A total of 38 compounds were identified. *S. molle* has therapeutic applications in traditional medicine. Essential oils obtained from various parts of this plant are reported to have promising biological and pharmacological activity.

Index Terms: Schinus molle, Anarcardiaceae, chloroform seed extract, GC-MS analysis, phytochemical compositions

1. Introduction

The species *Schinus molle* L. belongs to the Anarcardiaceae family[1-3] and has therapeutic applications in traditional medicine.[4] *S. molle* is native to South and Central America and has been cultivated in Southern African countries. *S. molle* grows to 7-10 m height. The reddish pink fruits (seeds) are edible and taste like pepper (*Piper nigrum*).[3] *S. molle* has antibacterial, analgesic, cytotoxic, anti-inflammatory, antifungal, antiseptic, insecticidal and antioxidant activities.[4-12] The phytochemical compositions of essential oils and extracts obtained from various parts of *S. molle* have previously been reported.[2,10-14] However, the chemical compositions of chloroform seed extract from *S. molle* has not been reported previously, particularly in plants gathered from the Kingdom of Lesotho. The aim of the present study is to determine the phytochemical compositions of chloroform seed extract from *S. molle* collected in the Kingdom of Lesotho by GC-MS analysis. The results thus obtained are communicated in this article.

2. Experimental Method

2.1 Plant materials

Seeds of *S. molle* (115.126g) were collected in August 2017 from Botanical Garden of Roma Campus, National University of Lesotho. The plant material was identified by Mr. Moretloa Polaki, Lecturer, Department of Biology, Faculty of Science and Technology, National University of Lesotho. A voucher specimen (NUL/KM/SM-SEED) is kept at Organic Chemistry Laboratory, Department of Chemistry and Chemical Technology, Faculty of Science and Technology, National University of Lesotho.

2.2 Processing plant materials

The air-dried seeds of *S. molle* were ground into powder using a commercial blender (Waring Blender, Blender 80119, Model HGB2WT93, 240V AC, 50-80 Hz, 3.6 AMPs, Laboratory and Analytical Supplies).

2.3 Preparation of chloroform seed extract

The powdered seeds of *S. molle* was extracted first with chloroform at room temperature and then at reflux condition for 5 hours. The combined extracts were filtered over Whatman No.1 filter paper and 12.91 g of chloroform seed extract was obtained after removal of solvent.

2.4 Analysis of essential oils

GC-MS analysis of the chloroform seed extract was carried out on GC-2010 (Shimadzu, Kyoto, Japan) equipped with a MS-QP2010 mass spectrometer and a Restek Rtx-5ms (5% phenyl-95% dimethylpolysiloxane) capillary column with the dimensions 30 m × 0.25 mm × 0.25 µm. The injection port temperature was set at 200 °C with a split ratio of 1:50. The optimized oven temperature programmer began at 50 °C held for 4 minutes, ramped to 250 °C at a rate of 10 °C/minutes and held for 6 minutes resulting in a total of 30 min. 1.0 µL dilute aliquot was injected in split less mode. Helium (UHP Helium, Afrox, South Africa) was used as carrier gas and was pumped through the column at a constant flow rate of 1 mL/minute. The MS transfer line temperature was set at 250 °C, ion source temperatures was 200 °C, with a scanning mode mass range of 50 – 500 *amu* and the time window was between 4 and 28 min. The acquisition was carried out relative to the tune file that was generated prior to the analysis.

2.5 Identification of chemical compositions

The chemical compositions in the chloroform seed extract were identified by comparison of their MS spectra with NIST/EPA/NIH/NIST08 library data. The relative quantities of the individual compounds in the chloroform seed extract were calculated based on GC peak areas without using correction factors.

3. Results and Discussion

The phytochemical composition of chloroform seed extract from *S. molle* was determined by GC-MS. A total of 38 compounds were identified and are listed in the order of their elution along with the relative percentage and retention time (***Table1***). The chromatogram of the seed extract also is given in ***Figure 1***.

The phytochemical compositions of essential oils of *S. molle* from ripe berries collected in Tunisia,[11] leaves collected in Algeria,[13] fruits and leaves collected in Argentina,[2] fruits, leaves and stems collected in Tunisia,[10] and wood branch collected in Egypt[12] have previously been reported. Recently, the phytochemical compositions of essential oil of *S. molle* from leaves collected in the city of Botucatu, Brazil has been reported.[15] α-Pinene, β-pinene, myrcene, sabinene and epi-α-cadinol have been identified as major compounds in this essential oil.[15] Similarly, the phytochemical compositions of essential oil of *S. molle* from fresh leaves collected in the city of Uruguaiana, Brazil has also been reported. *α*-Pinene, sabinene, bicyclogermacrene and limonene have been identified as major compounds.[16] Garzoli, et al obtained petroleum ether, diethyl ether and acetone extracts from leaves of *S. molle* by sequential extraction.[17] A total of twenty-five compounds have been identified from these three extracts by GC-MS analysis.[17] Elemol has been identified as the most abundant compound followed by bicyclogermacrene, γ-eudesmol, α-eudesmol, β-eudesmol and isocalamendiol.[17] Sesquiterpene and monoterpene hydrocarbons have been identified as the major components in the petroleum ether and diethyl ether extracts while the acetone extracts showed different compositions.[17] Additionally, fatty acid compositions of hexane seed oil extract[3] and variations in total lipids and fatty acids compositions of mature, intermediately mature and immature fruits of *S. molle* have also been reported previously.[14] To the best of our knowledge, the chemical compositions of chloroform seed extract has not been reported previously. Our study indicated that the chemical compositions of this chloroform seed extract is

significantly different from that of essential oils and fatty acids reported in literature.[2,10-17] The essential oils from leaves and fruits of *S. molle* are reported to have significant antimicrobial activities against *Proteus mirabilis,*[1] *E. coli,*[1,2,13,] *S. aureus,*[1,2,13] *P. aeruginosa,*[1,2] *K. pneumonia,*[1] *C. albicans*[1,2,13] and *P. brasiliensis,*[15] and antioxidant activity in DPPH radical scavenging assay.[4,10-12] Recently, the acaricidal effect of the essential oil of *S. molle* on engorged adult females and larval stages of *Rhipicephalus sanguineus* has been evaluated.[18] At a concentration of 2%, the essential oil caused 99.3% of larval mortality.[18] The essential oil also caused inhibition of egg hatching, ovipositional and reproductive efficiency in adult *R. sanguineus* at concentrations of 4 to 20%.[18]

Table 1. Phytochemical compositions of chloroform seed extract from *S. molle*.

Peak No.	Rt. (min)	Peak Area (%)	Identification of Compounds
1	8.800	1.03	7-Methyl-3-methylene-1,6-octadiene
2	9.500	1.04	1-Methyl-2-iso-propylbenzene
3	9.603	5.34	1,5-Dimethyl-1,5-cyclooctadiene
4	10.900	0.64	5,8,10-Undecatrien-3-ol
5	11.247	0.47	Methyl octanoate
6	11.849	0.52	2,6-Dimethyl-1,5,7-octatrien-3-ol
7	12.655	0.53	4-Methylene-1-(1-methylethyl)-acetate-bicyclohexan-3-ol
8	14.449	1.36	5-Hydroxymethyl spiroheptan-5-ol
9	14.775	1.74	1,5,5,6-Tetramethyl-octahydro-1-oxa-cyclopropainden-6-one
10	14.906	0.48	3-Tetradecyn-1-ol
11	15.820	3.08	1,11-Hexadecadiyne
12	16.253	0.90	1,5-Dimethyl-1,4-hexadienyl-1-methyl-1-cyclohexene
13	16.607	2.04	1-Methyl-5-methylene-8-isopropyl-1,6-cyclodecadiene
14	16.781	1.37	1,1,7-Trimethyl-4-methylenedecahydrocyclopropaazulene
15	17.085	3.43	3,3,6,6,9,9-Hexamethyltetracyclononane
16	17.374	1.13	3,7-Dimethyl-2,6-octadienyl butanoate
17	17.721	0.56	Decahydro-1,1,4,7-tetramethylcyclopropeazulen-4-ol
18	17.854	1.66	10,12-Pentacosadiynoic acid
19	17.929	1.90	5-Oxatricyclododecane
20	18.164	1.07	1-Methyl-4-(2-methyloxiranyl)-7-oxabicycloheptane
21	18.231	1.14	4-Cyclopropyl-7-bicycloheptanyl methanol
22	18.389	0.72	Octahydro-1,4,9,9-tetramethyl-7-methanoazulene
23	18.463	1.81	2-Methyl-5-(1-adamantyl)pentan-2-ol
24	18.779	15.33	Decahydrotrimethyl-8-methylene-2-naphthalenemethanol
25	19.181	1.71	1,8-Cyclopentadecadiyne
26	19.269	6.00	(1-Allylcyclopropyl)methanol
27	19.358	3.48	1-Methyl-4-(2-methyloxiranyl)-7-oxabicycloheptane
28	19.605	0.98	3,7-Dimethyl-2,6-octadien-1-yl acetate
29	19.746	1.05	2,6,6-Trimethyl-1-cyclohexen-1-yl ethanol
30	20.085	5.09	3-Tetradecanynoic acid
31	20.119	2.72	1,1,7-Trimethyl-4-methylenedecahydrocyclopropaazulene
32	20.215	1.85	trans-Bisabolene epoxide
33	20.637	8.64	5-Trimethyl-5-vinyltetrahydrofuran-2-methanol
34	21.368	1.97	2-Bicyclonon-6-en-3-yl-propan-2-ol
35	21.600	0.86	2-Isopropylidene-5-methylhex-4-enal
36	21.696	1.07	3,7,11-Trimethyl-6,10-dodecadien-1-yn-3-ol
37	21.838	1.38	n-Hexadecanoic acid
38	23.456	1.10	1-Dodec-9-yn-1-yl 4-hexyl butanedioate

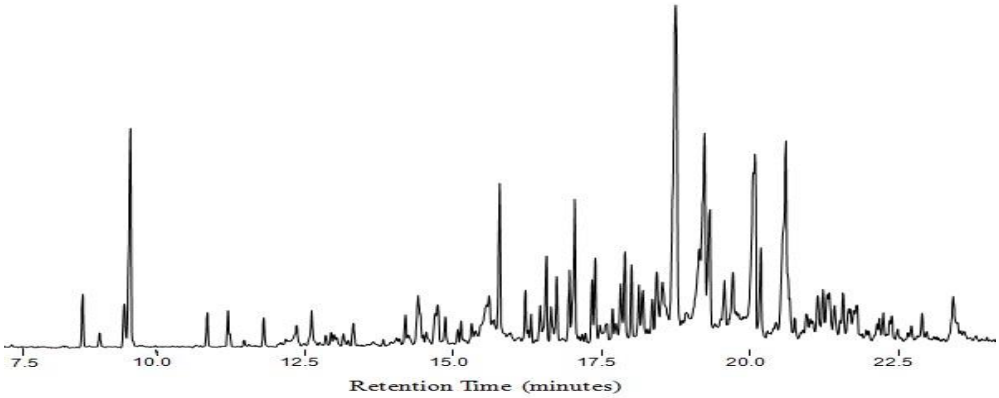

Figure 1. Chromatogram of chloroform seed extract of *S. molle.*

4. Conclusion

We identified the phytochemical compositions present in the chloroform seed extract of *S. molle* collected from the Kingdom of Lesotho by GC-MS analysis. To the best of our knowledge this is the first report of this kind on the chloroform seed extract of *S. molle*.

Conflict of interest

The authors declare no conflict of interest, financial or otherwise.

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