

# GC MS/MS analysis of Bioactive Compounds in Alcoholic Seed Extract of *Gauzuma ulmifolia* Lam

Sivakami Sundari Ponnusamy\*, Shanaz Banu, Murugan Vedigounder, Dhanashree Narayanswamy

## ABSTRACT

**Introduction:** *Gauzuma ulmifolia* Lam. (GU) belonging to the family *Malvaceae*, commonly called Bastard Cedar is native to tropical American countries. It was introduced into India more than 100 years ago. **Methods:** In the present study, alcoholic seed extract of *Gauzuma ulmifolia* Lam. was subjected to GC MS/MS analysis and chemical compounds were characterized. **Results:** Totally sixteen compounds were characterized. Chemical analysis of the extract showed that it includes bioactive compounds like D-Asarinin (65.02 %), 2,6-Bis (3,4-methylenedioxyphenyl)-3,7-dioxabicyclo (3.3.0) octane (20.12 %), 1-Dodecanone, 2-(imidazol-1-yl)-1-(4-methoxyphenyl) (7.54 %) and o-Anisic acid, tridec-2-ynyl ester (3.33 %) as major constituents. Minor components such as Vitamin E,  $\gamma$  - Tocopherol, Ergost-5-en-3-ol, (3 $\beta$ ), Hexadecanoic acid, methyl ester is also present. **Conclusion:** Based on the above results, the seeds of this plant could possess oxygen (92.27 %), hydrocarbon (0.19 %) and nitrogen (7.54 %) derivatives of volatile principle. This is the first-time report on the composition of seed of GU.

**Key words:** *Gauzuma ulmifolia*, Alcoholic extract, GC MS/MS analysis, D-Asarinin, Vitamin E.

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## INTRODUCTION

*Gauzuma ulmifolia* Lam. (GU) is widely distributed in tropical America from Mexico to the northern part of Argentina and the middle part of Brazil. It has been naturalized to the local climatic conditions. This species has high economic importance. GU grows to 30 m in height and 30-40 cm in diameter with a rounded crown and drooping foliage. Bark is grey or grey-brown becoming furrowed and rough with age. Young branches are covered with stellate hairs. Leaves are simple, alternate, with serrate margins, 5-7 cm long. Flowers are yellow-brown, about 1 cm long in 3-5 cm long axillary inflorescences. The fruit is a round or elliptic 5 celled capsule that opens at the apex. When the fruit is ripe, it is black and contains 40-80 seeds, each 3-5 mm in diameter. There is approximately 100 g of clean seed in 1Kg of fruits and 1,50,000 clean seeds per Kg.<sup>1</sup>

The use of the plant is well documented in the traditional literature as a remedy for various ailments, such as bronchitis, burns, diarrhoea, asthma, inflammation, alopecia, diuretic, astringent and venereal diseases.<sup>2</sup> Previous investigations of the chemical composition of GU have indicated the occurrence of flavon-3-ol procyanidins,<sup>2</sup> nitrile and a glucoside, menisdaurin.<sup>8</sup> This plant was reported to have anti-oxidant,<sup>3</sup> anti-diabetic,<sup>4,5</sup> hypotensive,<sup>6</sup> vasorelaxant, antiulcer,<sup>7</sup> anti-bacterial<sup>9,10</sup> and antiviral<sup>11</sup> activity.

Considering all these facts, the present study was designed to investigate the presence of chemical composition of the seed extract.

## MATERIALS AND METHODS

The fruits of *Gauzuma ulmifolia* Lam. was collected and dried at 60 °C for 24 hrs. The dried fruits were pulverized manually to remove the seeds. The seeds were purified and stored in air tight container.

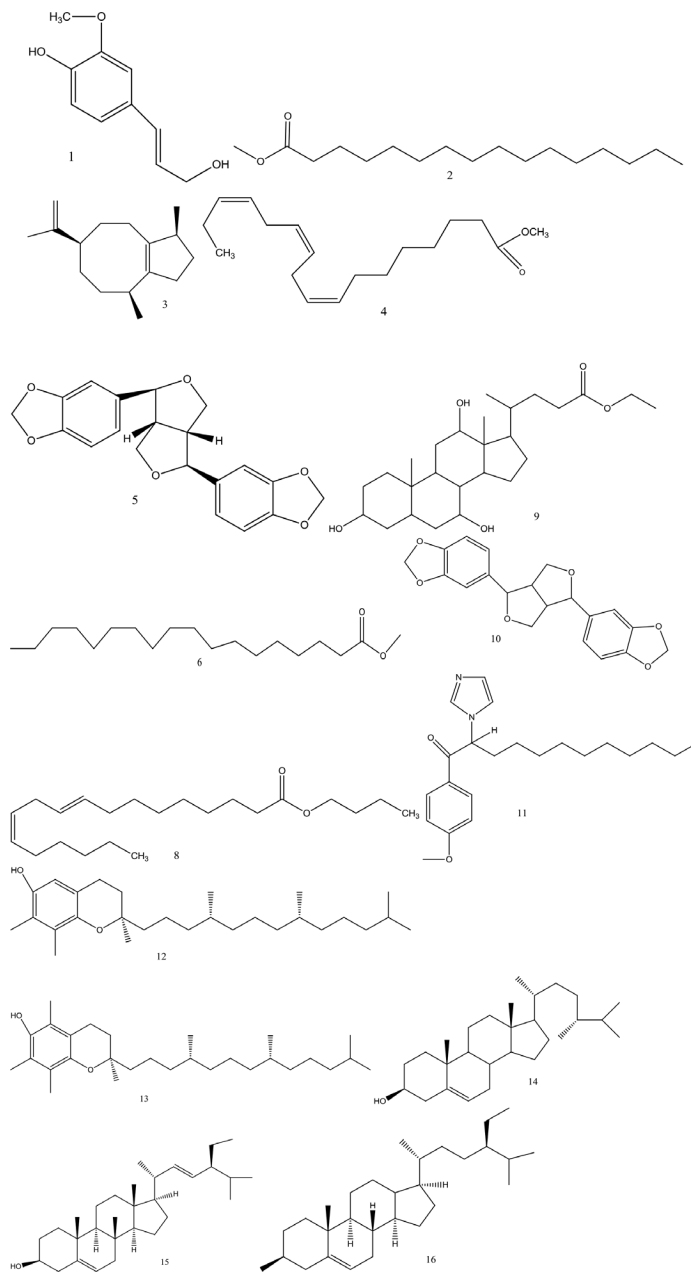
The GU seed was extracted with ethanol and analyzed through Gas Chromatography- Mass Spectrometry/ Mass Spectrometry for identification of different components.<sup>12</sup>

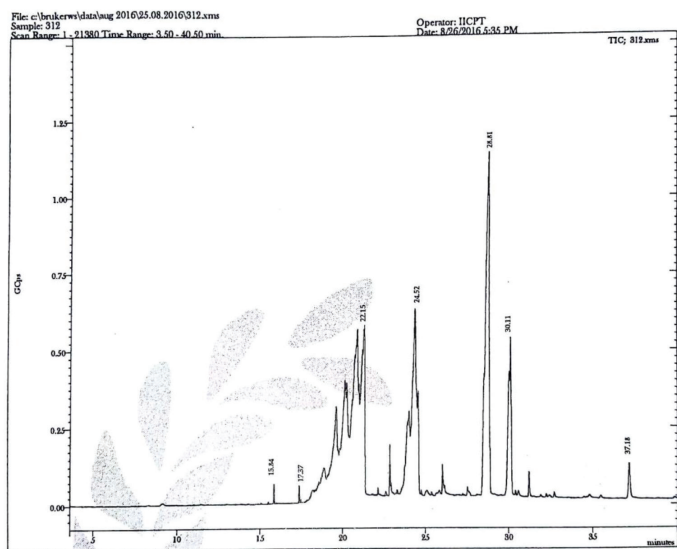
The analyses of the alcoholic extract were run on 436-GC Bruker operating in the EI mode at 70 eV, equipped with a split/splitless injector (280°C). Column BR-5MS (5% Dimethyl polysiloxane), 30 m × 0.2 mm ID × 0.25  $\mu$ m df). Oven temperature was programmed as follows, 110°C hold for 3.50 min, then increased upto 200°C at the rate of 10°C per min with no hold, then increased upto 280 °C at the rate of 5°C per min for 12 min hold. Carrier gas (1 ml/min), Split 10:1, Sample injected was 2  $\mu$ l and Injector temperature was 280°C. Total GC running time was 40.50 min. TQ Quadrupole Mass Spectrometer detector and Software MS Work station 8 was used for the analysis.<sup>11</sup>

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Table 1: List of compounds identified in *Gauzuma ulmifolia* Lam.

S.No.	RT	Name of the Compound	Molecular Formulae	Molecular Weight	Peak Area %
1	12.97	4-((1E)-3-Hydroxy-1-propenyl)-2-methoxyphenol	C <sub>10</sub> H <sub>12</sub> O <sub>3</sub>	180	0.01
2	15.06	Hexadecanoic acid, methyl ester	C <sub>17</sub> H <sub>34</sub> O <sub>2</sub>	270	0.01
3	15.84	α-Guaiene	C <sub>15</sub> H <sub>24</sub>	204	0.19
4	17.37	9, 12-Octadecadienoic acid, methyl ester	C <sub>19</sub> H <sub>34</sub> O <sub>2</sub>	294	0.18
5	18.86	1,3-Benzodioxole, 5,5'-(tetrahydro-1H, 3H-furo[3,4-c]furan-1,4-diyl) bis-, [1S-(1α, 3αα, 4β, 6αα)]-D-Asarinin	C <sub>20</sub> H <sub>18</sub> O <sub>6</sub>	354	65.02
6	22.87	9,12,15-Octadecatrienoic acid, methyl ester, (Z, Z, Z)-	C <sub>19</sub> H <sub>32</sub> O <sub>2</sub>	292	0.80
7	24.52	o-Anisic acid, tridec-2-ynyl ester	C <sub>21</sub> H <sub>30</sub> O <sub>3</sub>	330	3.33
8	26.07	Butyl 9, 12-octadecadienoate	C <sub>22</sub> H <sub>40</sub> O <sub>2</sub>	336	0.66
9	27.55	Ethyl iso-allocholate	C <sub>26</sub> H <sub>44</sub> O <sub>5</sub>	436	0.15
10	28.81	2,6-Bis(3,4-methylenedioxyphenyl)-3,7-dioxabicyclo (3.3.0)octane	C <sub>20</sub> H <sub>18</sub> O <sub>6</sub>	354	20.12
11	30.11	1-Dodecanone, 2-(imidazol-1-yl)-1-(4-methoxyphenyl)-	C <sub>21</sub> H <sub>32</sub> N <sub>2</sub> O <sub>2</sub>	356	7.54
12	31.22	γ-Tocopherol	C <sub>28</sub> H <sub>48</sub> O <sub>2</sub>	416	0.47
13	32.75	Vitamin E	C <sub>29</sub> H <sub>50</sub> O <sub>2</sub>	430	0.11
14	34.81	Ergost-5-en-3-ol, (3β)-	C <sub>28</sub> H <sub>48</sub> O	400	0.12
15	35.49	Stigmasterol	C <sub>29</sub> H <sub>48</sub> O	412	0.07
16	37.18	β-Sitosterol	C <sub>29</sub> H <sub>50</sub> O	414	1.22

Figure 1: Structure of compounds identified in Ethanolic extract of *Gauzuma ulmifolia* Lam.



**Figure 2:** GC-MS/MS Chromatogram of Ethanolic extract of GU.

Library used NIST Version- 11; Inlet line temperature 290°C, Source temperature 250°C, Electron energy 70 eV, Mass scan (m/z) 50- 500 amu, Solvent Delay was 0 - 3.5 min and Total MS running time was 40.50 min.

## RESULTS AND DISCUSSION

The different compounds identified in the alcoholic extract of GU, along with their molecular formulae, molecular weight and the % peak area are listed in Table 1. A total of 16 compounds were identified and the structures of these compounds are predicted in Figure 1. Their GC-MS/MS chromatogram has been shown in Figure 2.

Among the various compounds identified, 2,6-Bis(3,4-methylenedioxyphenyl)-3,7-dioxabicyclo (3.3.0) octane, commonly known as D-Asarinin, Vitamin E,  $\gamma$  - Tocopherol have been reported to possess antihypertensive, oxidative stress management<sup>13</sup> and hyperlipidemic activities.<sup>14</sup>

Further, some phytosterols like Ergost-5-en-3-ol, (3 $\beta$ )-, commonly known as Campesterol is known to inhibit intestinal absorption of cholesterol.<sup>15</sup> Stigmasterol, a precursor in manufacturing of semisynthetic progesterone and vitamin D<sub>3</sub>, also an intermediate in biosynthesis of androgens, estrogens and corticoids.<sup>16,17</sup>  $\beta$ - Sitosterol, a potential dietary phytosterol for prevention and therapy for human cancer.<sup>18</sup>

## CONCLUSION

The present study was focused on characterization of bioactive compounds of alcoholic extract of seeds of GU by GC MS/ MS analysis and the 16 compounds identified are responsible for the various pharmacological actions shown by GU. Therefore, the above results confirmed *Gauzuma ulmifolia* Lam. as a new valuable component for food and nutraceutical applications in the promotion of health.

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## ABBREVIATION USED

**GU:** *Gauzuma ulmifolia*; **GC MS/MS:** Gas Chromatography -Mass Spectrometry/Mass Spectrometry; **m/z:** Mass to charge ratio.

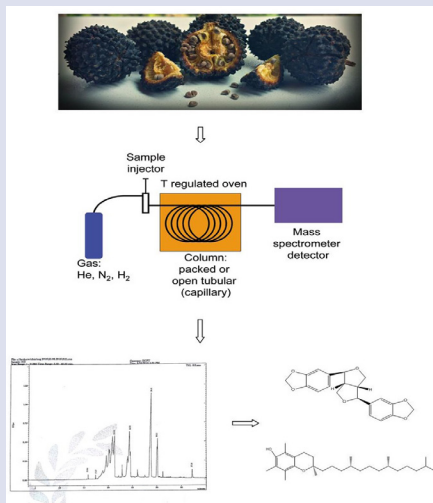
## CONFLICT OF INTEREST

The authors declare that we do not have any conflict of interest.

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## GRAPHICAL ABSTRACT



## SUMMARY

- The present study has highlighted on the chemical profile of the seeds of GU for the first time by GC MS/MS method. A total of 16 compounds with their proportions have been identified. Further exploration on isolation of these phytoconstituents may develop many novel compounds with potent medicinal properties.

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