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## IDENTIFICATION OF PHYTOCONSTITUENTS PRESENT IN *EPIPREMNUM AUREUM* (LINDEN AND ANDRE) G. S. BUNTING BY GC-MS

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**ABSTRACT: Introduction:** Chromatographic purification methanolic extract of *Epipremnum aureum* (Linden and Andre) G. S. Bunting by Gas Chromatography-Mass Spectrometry (GC-MS) was done to analyze the phytochemical constituents for further pharmacological uses. **Methods:** Ten grams of fresh leaves of plant sample was subjected to solvent extraction with methanol and analyzed by GC-MS on a GCMS-2010 Shimadzu instrument with a Restek-5MS column (5% diphenyl- 95% dimethyl polysiloxane, 30m × 0.25mm ID × 0.25µm df). The compounds were separated using helium as carrier gas at a constant flow 1.21ml/min. **Results:** It provided peaks of thirty different phytochemical compounds with major components namely 12-Methyl-E,E-2,13-octadecadien-1-ol (4.56%), Lanceol, cis (4.59%), alpha.,2,6,6-tetramethyl- (19.28%), 8-Octadecanone (7.27%), Dibutyl phthalate (16.75%), Phytol (4.28%), vitamin E (8.00%) and gamma-Sitosterol (8.07%). Ten compounds are reported to have antioxidant, anti-inflammatory, diuretic, antiulcer, antimicrobial, antifungal and pesticide activities based on Dr. Duke's phytochemical and ethnobotanical database. **Conclusion:** This work will help to identify and isolate these bioactive compounds having pharmaceutical and therapeutic value. In the present study, methanolic extract of the leaves of *E. aureum*, an ornamental plant was analyzed using mass spectrometry. Through these results, we can conclude that *E. aureum* not only as ornamental foliage can also be exploited to isolate and characterize important bioactive compounds for pharmaceutical and industrial applications.

**Keywords:** *Epipremnum aureum*, Phytochemicals, GC-MS, Bioactivity, Vitamin E

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**INTRODUCTION:** *Epipremnum aureum* (Linden and Andre) Bunting (family Araceae) is an evergreen herbaceous shrub, commonly used as popular ornamental foliage. Crude stem extracts of *E. aureum* (*Pothos aurea*) inhibits the growth of bacteria and fungi, has broad-spectrum antimicrobial potential and may be used in the management of microbial infections<sup>1</sup>.

Aerial roots and leaves of *E. aureum* have great potential for antimicrobial activity<sup>2</sup>. Phytochemical analysis of the methanol extracts of leaves of *E. aureum* shows the presence of secondary metabolites such as alkaloids, tannins, flavonoids, triterpenoids, and saponins. Preliminary screening of antibacterial efficacy indicates the medicinal importance of the plant in control of highly pathogenic bacteria, *i.e.* *Salmonella* species as well as resistant pathogenic bacteria like *P. aeruginosa*<sup>3</sup>. Till date, there are not characterization reports available on the detailed phytochemical analysis of this foliage by mass spectrometric techniques. Presence of alkaloids present in this ornamental foliage by GC-MS is reported<sup>4</sup>.

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Thus this manuscript is focused on more important bio-constituents other than alkaloids through GC-MS and comparison of their biological activities based on Dr. Duke's phytochemical and ethnobotanical database<sup>5</sup>.

The identified components will be a great tool in the field of biomedicine. The aim of the current study is to strongly highlight *Pothos (E. aureum)* that has been used only as ornamental foliage till now, can further be targeted for pharmacological and therapeutic studies based on phytoconstituents that are going to be reported for the first time in this article.

## MATERIALS AND METHODS:

### Collection and Preparation of Plant Material:

Plant material was collected from Jaipur and authenticated as *Epipremnum aureum* (Linden and Andre) G.S. Bunting by the Botanical Survey of India, Jodhpur. The samples were washed thoroughly in running tap water to remove soil particles and other adhered debris and finally rinsed with sterile distilled water. The whole plant was air dried for 24 h and further used for extraction.

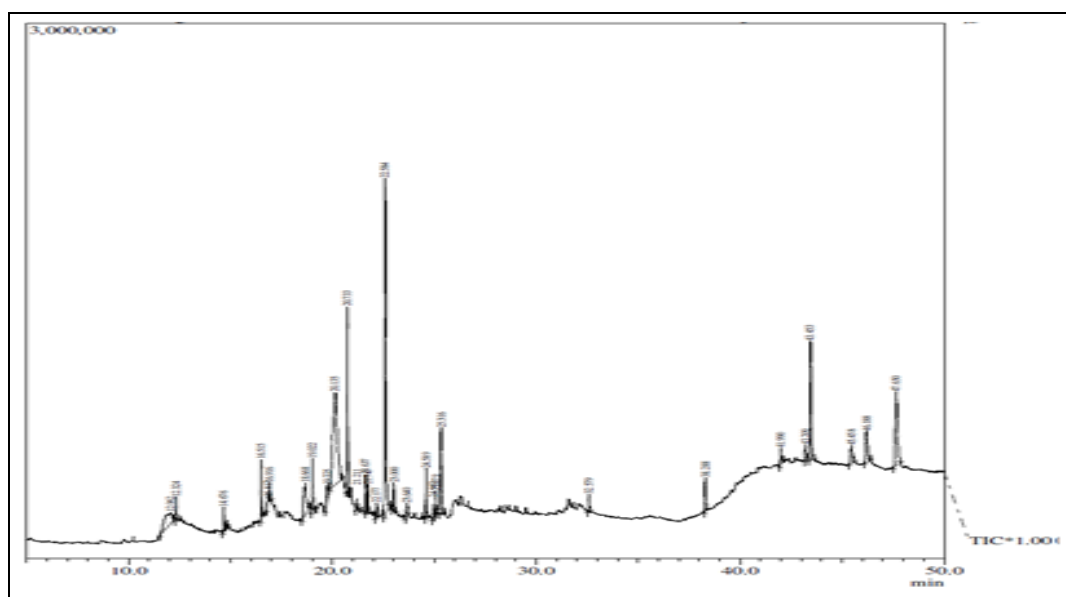
**Plant Sample Extraction:** Fresh leaves of *Epipremnum aureum* (10g) were crushed using liquid nitrogen. Extraction was done with methanol purchased from Merck (Darmstadt, Germany) thrice for three consecutive days at 28 °C (100 ml × 3). The extract was filtered twice with Whatman filter No. 1, combined and concentrated at 40 °C in a water bath to 100 ml.

### Gas Chromatography-Mass Spectrum analysis

**(GC-MS):** The crude extract was analyzed with a Shimadzu 2010 GC combined with a mass selective detector (MSD) using an Rtx<sup>®</sup>-5MS silica capillary column (30m, 0.25mm i.d., 0.25 µm phase thickness) (Restek, Bellefonte, PA, USA). The oven temperature was increased from 100°C to 250°C at 5 °C min<sup>-1</sup> and held for 5 min at 250°C, then increased from 250°C to 280°C at 10°C min<sup>-1</sup> and held for 10 min at 280°C. The injector temperature was 250 °C with normal injection mode. MSD was operated at EI mode at 70ev, and full scan data (*m/z* 40-600) was collected. The flow rate of carrier gas helium was 1.21 ml min<sup>-1</sup>. Sample (2µl) was injected by autosampler (Shimadzu 2010).

**Identification of Components:** Identification of the compounds was based on retention times, GC-MS library comparisons from WILEY (The Wiley<sup>®</sup> Registry of Mass Spectral Data, John Wiley and Sons, Inc., Electronic data Division, New York, USA), National Institute Standard and Technology (NIST) and literature data. The name, molecular weight, and structure of the components of the test materials were ascertained.

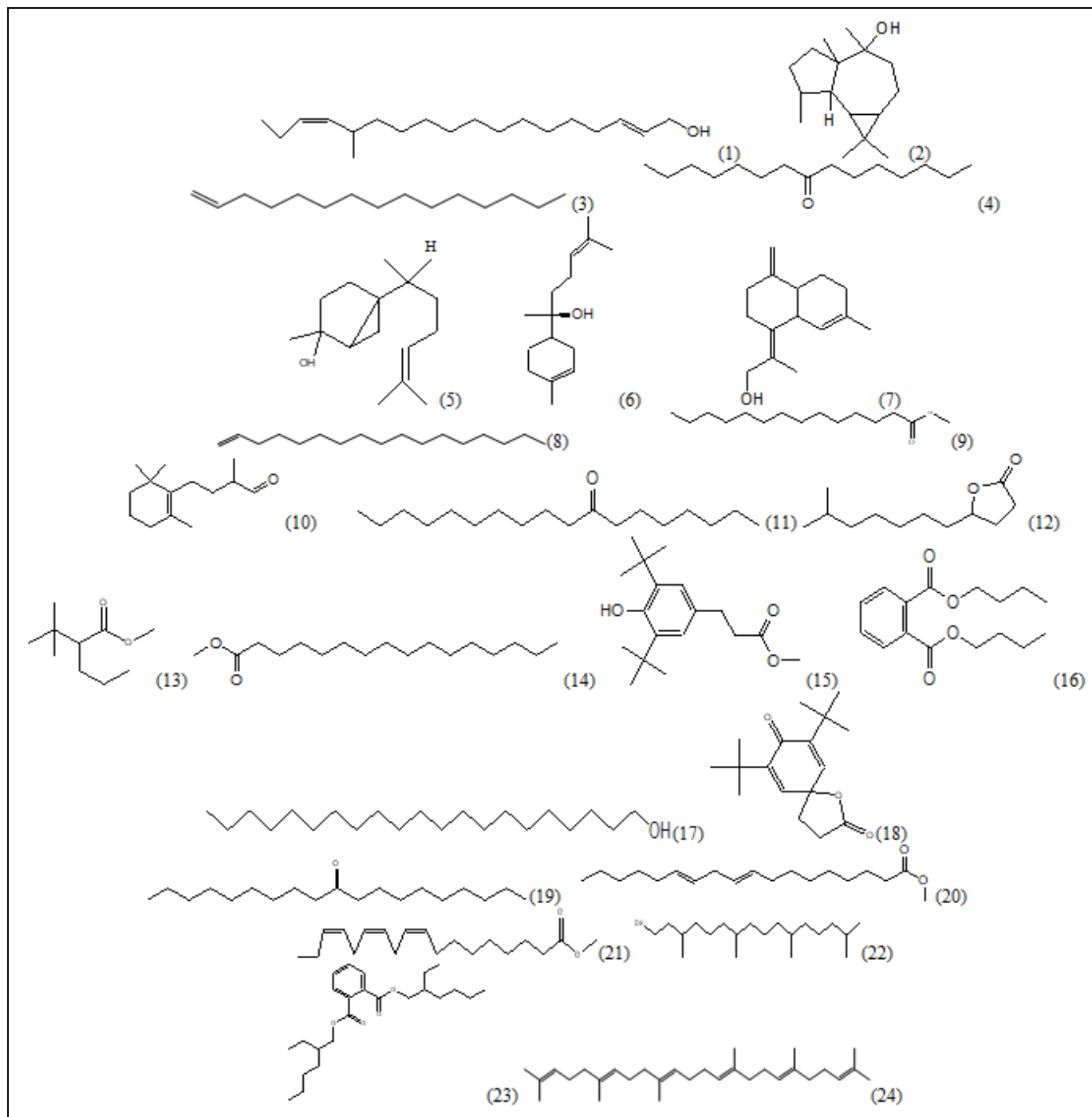
**RESULTS AND DISCUSSION:** For the discovery of novel drugs, the essential information regarding the chemical constituents is generally provided by the qualitative phytochemical screening of plant extract<sup>6</sup>. The spectrum for the phytoconstituents of the methanolic leaf extract of *E. aureum* was determined using GC-MS **Fig. 1**.



**FIG. 1: MASS SPECTROMETRIC ANALYSIS OF METHANOL EXTRACT OF LEAVES OF *E. AUREUM***

Thirty compounds have been detected **Table 1** namely 12-Methyl-E,E-2,13-octadecadien-1-ol (1), 1, 1, 4, 7-Tetramethyldecahydro-1h cycloprop [e] azulen -4-ol (2), 1-Pentadecene (3), 8-Pentadecanone (4), cis-sesquisabinene hydrate (5),  $\alpha$ -Bisabolol (6), Lanceol, cis (7), 1-Heptadecene (8), Isopropyl myristate (9), 1-Cyclohexene-1-butanal,  $\alpha$ ,2,6,6-tetramethyl- (10), 8-Octadecanone (11), 10-Methylundecan-4-olide (12), Methyl 2-tert-butylpentanoate (13), Hexadecanoic acid, methyl ester (14), Benzenepropanoic acid, 3,5-bis(1,1-

dimethylethyl)-4-hydroxy-, methyl ester (15), Dibutyl phthalate (16), 1-Heneicosanol (17), 7,9-Di-tert-butyl-1-oxaspiro(4, 5)deca-6, 9-diene-2, 8-dione (18), 10-Nonadecanone (19), 9, 12-Octadecadienoic acid, methyl ester (20), Linolenic acid, methyl ester (21), Phytol (22), 1, 2-Benzenedicarboxylic acid (23), Squalene (24),  $\gamma$ -Tocopherol (25), Cholesterol (26), Vitamin E (27), Dihydrobrassicasterol (28), Stigmasta-5,22-dien-3-ol (29) and  $\gamma$ -Sitosterol (30). Structures of these compounds are shown in **Fig. 2**.



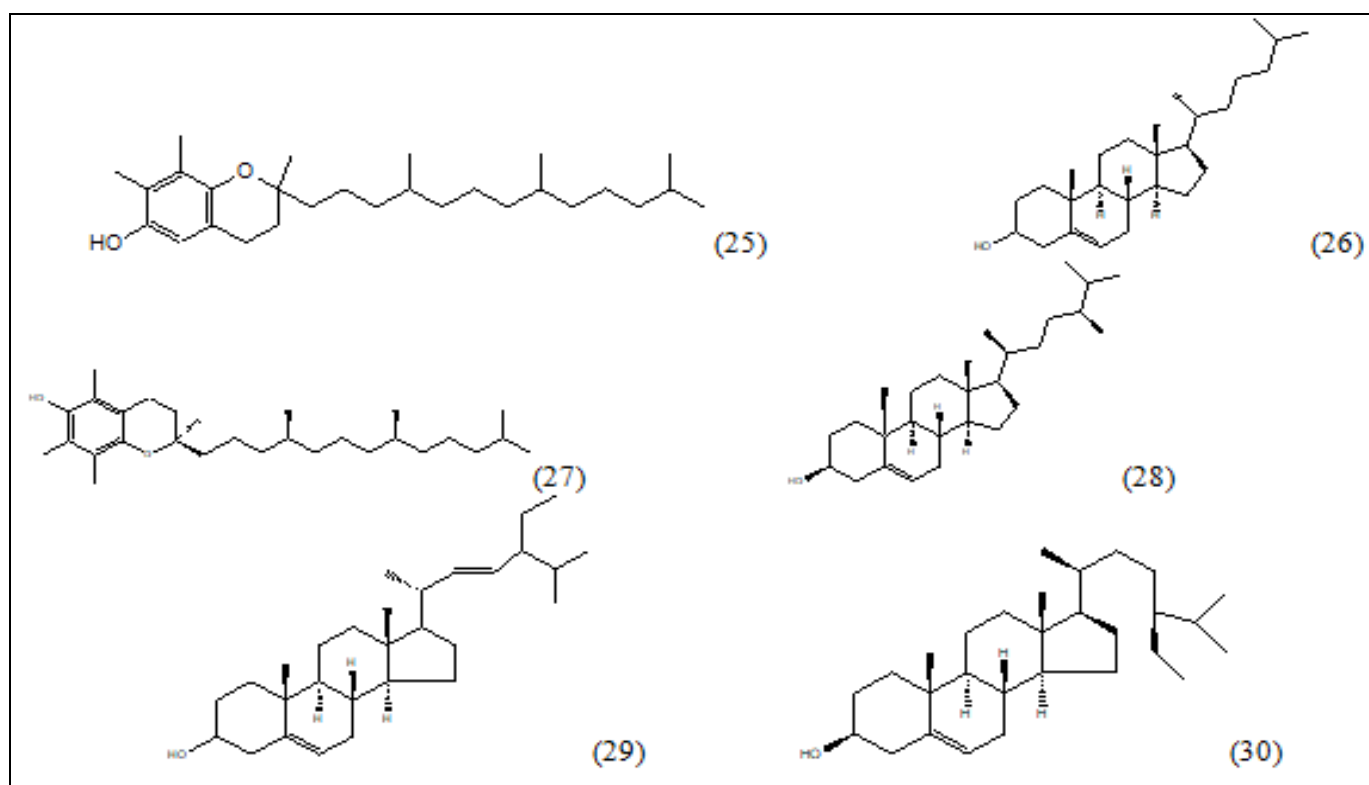


FIG. 2: COMPOUNDS IDENTIFIED IN THE METHANOL EXTRACT OF LEAVES OF *E. AUREUM* BY GC-MS

Ten compounds out of thirty compounds are reported to have biological activity **Table 1**. The activity prediction is based on Dr. Duke's Phytochemical and Ethnobotanical databases and available literature. Hexadecanoic acid methyl ester present in leaves is reported to have anti-inflammatory, hypocholesterolemic, cancer preventive, hepatoprotective, nematicide, insectifuge, antihistaminic, antiemetic, antiacne, alpha-reductase inhibitor, antiandrogenic and antiarthritic activities<sup>7</sup>. 10-Nonadecanone has anticancer properties<sup>8</sup>. Phytol has various activities such as antimalarial, antioxidant, antitumor, anti-inflammatory, anticancer, antifungal and antibacterial against *S. typhi*, chemopreventive diuretic, against joint dislocation, against headache, against hernia, as a stimulant and in vaccine formulations<sup>7, 9</sup>. Squalene, a triterpene, is antibacterial, antioxidant, antitumor, cancer-

preventive, chemopreventive, immunostimulant, lipoxygenase-inhibitor, perfumery, pesticide and is used in sunscreen. Phytol and squalene were identified in the ethanol leaf extract of *Aloe vera*<sup>10</sup> and *Vitex negundo*<sup>11</sup>.  $\gamma$ -Tocopherol possesses anti-CRP, antiatherosclerotic, anticancer, anti-inflammatory, antioxidant, antiprostaglandin, antitumor, cardioprotective, cyclooxygenase-inhibitor, hypocholesterolemic activities. Phytosterols are known to have antioxidant and hypocholesterolemic activities. Vitamin E has analgesic, antiaging, antidiabetic, anti-inflammatory, antioxidant, antiparkinsonian, antiproliferant, antitumor, apoptotic, cancer-preventive, and many other activities. Presence of vitamin E and squalene is also reported in the ethanolic leaf extract of *Allamanda cathartica* by GC-MS<sup>12</sup>.

TABLE 1: COMPOUNDS IDENTIFIED IN THE METHANOL EXTRACT OF LEAVES OF *E. AUREUM*

| Peak | R. Time | Name  | Library | Nature of Compound | Mol. Formula                      | Mol. Weight | Area % | Activity*            |
|------|---------|---|---------|--------------------|-----------------------------------|-------------|--------|----------------------|
| 1    | 12.062  | 12-Methyl-E,E-2,13-octadecadien-1-ol                    | NIST11  | Alcohol            | C <sub>19</sub> H <sub>36</sub> O | 280         | 4.56   | No activity reported |
| 2    | 12.324  | 1,1,4,7-Tetramethyldecahydro-1h-cycloprop[e]azulen-4-ol | WILEY8  | Alcohol            | C <sub>15</sub> H <sub>26</sub> O | 222         | 1.11   | No activity reported |
| 3    | 14.676  | 1-Pentadecene   | NIST11  | Alkene             | C <sub>15</sub> H <sub>30</sub>   | 210         | 0.88   | Antitumor            |

|    |        |   |        |  |  |     |       |   |
|----|--------|---|--------|--|--|-----|-------|---|
| 4  | 16.515 | 8-Pentadecanone   | NIST11 | Ketone                                 | C <sub>15</sub> H <sub>30</sub> O              | 226 | 2.25  | No activity reported  |
| 5  | 16.817 | cis-sesquisabinene hydrate  | NIST11 | Phenol                                 | C <sub>15</sub> H <sub>26</sub> O              | 222 | 0.38  | No activity reported  |
| 6  | 16.916 | α-Bisabolol   | WILEY  | Monocyclic<br>sesquiterpene<br>alcohol | C <sub>18</sub> H <sub>32</sub> O              | 264 | 0.51  | Analgesic, antiarthritic, anti-bacterial, anti-inflammatory, anti-septic, anti-pyretic, antispasmodic, anti-tuberculosis, antiulcer, candidicide, cicatrisant, cosmetic, fungicide, musculotropic, perfumery, pesticide, protisticide, vulnerary  |
| 7  | 18.668 | Lanceol, cis  | NIST11 | Alcohol                                | C <sub>15</sub> H <sub>24</sub> O              | 220 | 4.59  | No activity reported  |
| 8  | 19.022 | 1-Heptadecene   | NIST11 | Alkene                                 | C <sub>17</sub> H <sub>34</sub>                | 238 | 1.86  | No activity reported  |
| 9  | 19.725 | Isopropyl myristate   | WILEY  | Ester                                  | C <sub>17</sub> H <sub>34</sub> O <sub>2</sub> | 270 | 1.26  | No activity reported  |
| 10 | 20.135 | 1-Cyclohexene-1-butanal,<br>α,2,6,6-tetramethyl-                                  | NIST11 | Aldehyde                               | C <sub>14</sub> H <sub>24</sub> O              | 208 | 19.28 | No activity reported  |
| 11 | 20.733 | 8-Octadecanone  | NIST11 | Ketone                                 | C <sub>18</sub> H <sub>36</sub> O              | 268 | 7.27  | No activity reported  |
| 12 | 21.211 | 10-Methylundecan-4-olide  | NIST11 | Ketone                                 | C <sub>12</sub> H <sub>22</sub> O <sub>2</sub> | 198 | 0.43  | No activity reported  |
| 13 | 21.637 | Methyl 2-tert-butylpentanoate   | WILEY  | Ester                                  | C <sub>10</sub> H <sub>20</sub> O <sub>2</sub> | 172 | 1.60  | No activity reported  |
| 14 | 21.747 | Hexadecanoic acid, methyl<br>ester  | NIST11 | Ester                                  | C <sub>17</sub> H <sub>34</sub> O <sub>2</sub> | 270 | 0.99  | Anti-inflammatory, antiarthritic, antiacne, hypocholesterolemic, cancer preventive, hepatoprotective, antiandrogenic, nematicide, insectifuge, antieczemic, anti-histaminic, α reductase inhibitor  |
| 15 | 22.177 | Benzenepropanoic acid, 3,5-<br>bis(1,1-dimethylethyl)-4-<br>hydroxy-,methyl ester | NIST11 | Ester                                  | C <sub>18</sub> H <sub>28</sub> O <sub>3</sub> | 292 | 0.60  | No activity reported  |
| 16 | 22.584 | Dibutyl phthalate   | NIST11 | Ester                                  | C <sub>16</sub> H <sub>22</sub> O <sub>4</sub> | 278 | 16.75 | No activity reported  |
| 17 | 23.000 | 1-Heneicosanol  | NIST11 | Alcohol                                | C <sub>21</sub> H <sub>44</sub> O              | 312 | 1.32  | No activity reported  |
| 18 | 23.640 | 7,9-Di-tert-butyl-1-<br>oxaspiro(4,5)deca-6,9-diene-<br>2,8-dione                 | NIST11 | Ketone                                 | C <sub>17</sub> H <sub>24</sub> O <sub>3</sub> | 276 | 1.03  | No activity reported  |
| 19 | 24.589 | 10-Nonadecanone   | NIST11 | Ketone                                 | C <sub>19</sub> H <sub>38</sub> O              | 282 | 2.02  | Anticancer  |
| 20 | 24.952 | 9,12-Octadecadienoic acid,<br>methyl ester  | NIST11 | Ester                                  | C <sub>19</sub> H <sub>34</sub> O <sub>2</sub> | 294 | 0.49  | No activity reported  |
| 21 | 25.079 | Linolenic acid, methyl ester  | NIST11 | Ester                                  | C <sub>19</sub> H <sub>32</sub> O <sub>2</sub> | 292 | 0.93  | Insectifuge, pesticide  |
| 22 | 25.316 | Phytol  | NIST11 | acyclic<br>diterpene<br>alcohol        | C <sub>20</sub> H <sub>40</sub> O              | 296 | 4.28  | Antimicrobial, anti-inflammatory, against hernia, anticancer, diuretic, antifungal against antibacterial <i>Salmonella typhi</i> , antitumor, against joint dislocation, against headache, antimalarial, antioxidant, chemopreventive, use in vaccine formulations, stimulant and in vaccine formulations |
| 23 | 32.579 | 1,2-Benzenedicarboxylic acid  | WILEY  | Ester                                  | C <sub>24</sub> H <sub>38</sub> O <sub>4</sub> | 390 | 0.74  | No activity reported  |
| 24 | 38.288 | Squalene  | NIST11 | Triterpene                             | C <sub>30</sub> H <sub>50</sub>                | 410 | 1.71  | Antibacterial, antioxidant,   |

|    |        |                          |        |              |  |     |      |   |
|----|--------|--------------------------|--------|--------------|--|-----|------|---|
| 25 | 41.990 | $\gamma$ -Tocopherol     | NIST11 | Phenol       | C <sub>28</sub> H <sub>48</sub> O <sub>2</sub> | 416 | 0.91 | antitumor, cancer-preventive, chemopreventive, immunostimulant, lipoxygenase-inhibitor, perfumery, pesticide, sunscreen   |
| 26 | 43.209 | Cholesterol              | NIST11 | Sterol       | C <sub>27</sub> H <sub>46</sub> O              | 386 | 1.17 | AntiCRP, Antiatherosclerotic, anticancer, anti-inflammatory, antioxidant, antiprostaglandin, antitumor, cardioprotective, cyclooxygenase-inhibitor, hypocholesterolemic   |
| 27 | 43.453 | Vitamin E                | NIST11 | Vitamins     | C <sub>29</sub> H <sub>50</sub> O <sub>2</sub> | 430 | 8.00 | Antioxidant   |
| 28 | 45.458 | Dihydrobrassicasterol    | NIST11 | Sterol       | C <sub>28</sub> H <sub>48</sub> O              | 400 | 1.83 | Analgesic, anti-aging, anti-alzheimer, anti-dermatitic, antidiabetic, anti-inflammatory, anti-leukemic, anti-osteoarthritis, anti-oxidant, anti-parkinsonian, anti-proliferant, anti-spasmodic, anti-stroke, anti-sunburn, anti-tumor, apoptotic, cancer-preventive, hypocholesterolemic, immunostimulant |
| 29 | 46.188 | Stigmasta-5,22-dien-3-ol | WILEY8 | Sterol       | C <sub>29</sub> H <sub>48</sub> O              | 412 | 3.20 | No activity reported  |
| 30 | 47.650 | $\gamma$ -Sitosterol     | NIST11 | Plant sterol | C <sub>29</sub> H <sub>50</sub> O              | 414 | 8.07 | No activity reported  |

**CONCLUSION:** In the present study, methanolic extract of the leaves of *Epipremnum aureum*, an ornamental plant was analyzed using mass spectrometry. Through these results, we can conclude that *E. aureum* not only as ornamental foliage can also be exploited to isolate and characterize important bioactive compounds for pharmaceutical and industrial applications.

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**CONFLICT OF INTEREST:** Nil

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