

## Article

# *Anabasis articulata* (Forssk.) Moq: A Good Source of Phytochemicals with Antibacterial, Antioxidant, and Antidiabetic Potential

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## Supplementary File

**Table S1.** Major phytochemical compounds identified in fraction A of *A. articulata* and their various parameters.

| Retention time (min) | Molecular mass (g/mol) | Molecular formula   | %Area | Area        | Peak height | Compound name                |
|----------------------|------------------------|---|-------|-------------|-------------|------------------------------|
| 3.18                 | 87                     | C <sub>4</sub> H <sub>9</sub> NO                            | 0.34  | 43384913.99 | 3301173.37  | Acetdimethylamide            |
| 6.13                 | 116                    | C <sub>4</sub> H <sub>8</sub> N <sub>2</sub> O <sub>2</sub> | 0.00  | 416041.0    | 142054.22   | N-Nitrosomorpholine          |
| 22.80                | 390                    | C <sub>24</sub> H <sub>38</sub> O <sub>4</sub>              | 0.01  | 1071457.11  | 486644.85   | 1,2-Benzenedicarboxylic acid |
| 22.80                | 278                    | C <sub>16</sub> H <sub>22</sub> O <sub>4</sub>              | 0.01  | 1071457.11  | 486644.85   | Mono(2-ethylhexyl) phthalate |
| 22.80                | 390                    | C <sub>24</sub> H <sub>38</sub> O <sub>4</sub>              | 0.01  | 1071457.11  | 486644.85   | Bis(2-ethylhexyl) phthalate  |

**Table S2.** Major phytochemical compounds and their parameters identified in fraction B of *A. articulata*.

| Retention time (min) | Molecular mass (g/mol) | Molecular formula  | Area % | Area       | Peak height | Compound name                 |
|----------------------|------------------------|--|--------|------------|-------------|-------------------------------|
| 6.15                 | 190                    | C <sub>7</sub> H <sub>14</sub> N <sub>2</sub> O <sub>2</sub> S | 0.00   | 545346.31  | 147100.04   | N-Acetyl-l-methioninamide     |
| 6.15                 | 116                    | C <sub>5</sub> H <sub>12</sub> N <sub>2</sub> O                | 0.00   | 545346.31  | 147100.04   | 2-Propanamine                 |
| 13.22                | 206                    | C <sub>14</sub> H <sub>22</sub> O                              | 0.01   | 1244394.35 | 419011.73   | Phenol, 2,4-di-tert-butyl     |
| 18.01                | 428                    | C <sub>31</sub> H <sub>56</sub>                                | 0.00   | 333580.17  | 201943.96   | Benzene, (1-dodecyltridecyl)- |
| 18.01                | 358                    | C <sub>26</sub> H <sub>46</sub>                                | 0.00   | 333580.17  | 201943.96   | Benzene, (1-hexyltetradecyl)- |
| 18.01                | 260                    | C <sub>19</sub> H <sub>32</sub>                                | 0.00   | 333580.17  | 201943.96   | Benzene, (1-hexylheptyl)-     |
| 19.66                | 298                    | C <sub>19</sub> H <sub>38</sub> O <sub>2</sub>                 | 0.01   | 1020939.00 | 571661.96   | Isopropyl Palmitate           |

|       |     |  |      |              |             |                                    |
|-------|-----|--|------|--------------|-------------|------------------------------------|
| 20.21 | 296 | C <sub>19</sub> H <sub>36</sub> O <sub>2</sub> | 0.01 | 1136112. 80  | 346764.23   | 10-Octadecenoic acid, methyl ester |
| 20.78 | 308 | C <sub>22</sub> H <sub>44</sub>                | 0.01 | 1106327. 24  | 545734.08   | 1-Docosene                         |
| 21.45 | 312 | C <sub>19</sub> H <sub>36</sub> O <sub>3</sub> | 0.04 | 5008111. 95  | 581962.66   | Methyl ricinoleate                 |
| 22.29 | 478 | C <sub>32</sub> H <sub>62</sub> O <sub>2</sub> | 0.00 | 394588.26    | 205719.11   | Oleic acid, tetradecyl ester       |
| 22.82 | 390 | C <sub>24</sub> H <sub>38</sub> O <sub>4</sub> | 0.10 | 13672399 .66 | 13672399.66 | Diisooctyl phthalate               |

**Table S3.** List of major components and their parameters identified in fraction C of *A. articulata*.

| Retention time (RT) | Molecular mass (g/mol) | Molecular formula   | Area % | Area        | Peak height | Compound name                 |
|---------------------|------------------------|---|--------|-------------|-------------|-------------------------------|
| 3.28                | 132                    | C <sub>4</sub> H <sub>8</sub> N <sub>2</sub> O <sub>3</sub> | 0.12   | 9646066. 72 | 920854.34   | Asparagine                    |
| 18.09               | 428                    | C <sub>31</sub> H <sub>56</sub>                             | 0.01   | 680297.28   | 303315.64   | entacosane, 13-phenyl         |
| 18.09               | 358                    | C <sub>26</sub> H <sub>46</sub>                             | 0.01   | 680297.28   | 303315.64   | Eicosane, 7-phenyl            |
| 18.09               | 246                    | C <sub>18</sub> H <sub>30</sub>                             | 0.01   | 680297.28   | 303315.64   | Dodecane, 6-phenyl            |
| 18.99               | 270                    | C <sub>17</sub> H <sub>34</sub> O <sub>2</sub>              | 0.01   | 680297.28   | 303315.64   | Palmitic acid, methyl ester   |
| 19.74               | 298                    | C <sub>19</sub> H <sub>38</sub> O <sub>2</sub>              | 0.02   | 1900738. 29 | 1069011.97  | Isopropyl Palmitate           |
| 21.19               | 258                    | C <sub>16</sub> H <sub>34</sub> S                           | 0.01   | 588569.28   | 284675.46   | tert-Hexadecanethiol          |
| 21.49               | 312                    | C <sub>19</sub> H <sub>36</sub> O <sub>3</sub>              | 0.06   | 4798752. 56 | 1232061.04  | Methyl ricinoleate            |
| 22.25               | 422                    | C <sub>28</sub> H <sub>54</sub> O <sub>2</sub>              | 0.01   | 704407.97   | 357520.57   | Decyl oleate                  |
| 22.25               | 534                    | C <sub>36</sub> H <sub>70</sub> O <sub>2</sub>              | 0.01   | 704407.97   | 357520.57   | Oleic acid, octadecyl ester   |
| 22.25               | 324                    | C <sub>21</sub> H <sub>40</sub> O <sub>2</sub>              | 0.01   | 704407.97   | 357520.57   | Elaidic acid, isopropyl ester |
| 22.88               | 390                    | C <sub>24</sub> H <sub>38</sub> O <sub>4</sub>              | 0.11   | 8499930. 38 | 3479760.69  | Diisooctyl phthalate          |
| 22.88               | 278                    | C <sub>16</sub> H <sub>22</sub> O <sub>4</sub>              | 0.11   | 8499930. 38 | 3479760.69  | Mono(2-ethylhexyl) phthalate  |

**Table S4.** Major phytochemical compounds and their parameters identified in fraction D of *A. articulata*.

| Retention time (RT) | Molecular mass (g/mol) | Molecular formula   | Area % | Area         | Peak height | Compound name   |
|---------------------|------------------------|---|--------|--------------|-------------|---|
| 9.17                | 136                    | C <sub>9</sub> H <sub>12</sub> O                                | 0.44   | 2730076. 55  | 486447.80   | Phenethyl alcohol, á-methyl                               |
| 11.98               | 177                    | C <sub>11</sub> H <sub>15</sub> NO                              | 0.20   | 1259580. 89  | 468584.80   | Benzyl-3-hydroxypyrrolidine                               |
| 14.89               | 222                    | C <sub>12</sub> H <sub>14</sub> O <sub>4</sub>                  | 0.17   | 1068281. 67  | 278449.71   | Diethyl Phthalate   |
| 15.79               | 223                    | C <sub>9</sub> H <sub>13</sub> N <sub>5</sub> O <sub>2</sub>    | 1.83   | 11259232 .47 | 2473842.30  | 2,6-Dimethyl-pyridine-3,5-dicarboxylic acid, dihydrazide  |
| 15.79               | 223                    | C <sub>10</sub> H <sub>9</sub> NO <sub>3</sub> S                | 1.83   | 11259232 .47 | 2473842.30  | Methoxycarbonyl-2-methoxyphenyl isothiocyanate            |
| 16.12               | 348                    | C <sub>14</sub> H <sub>28</sub> F <sub>3</sub> O <sub>4</sub> P | 0.10   | 594434.25    | 151973.27   | Phosphoric acid, dibutyl 3-trifluoromethyl-3-pentyl ester |
| 16.40               | 282                    | C <sub>18</sub> H <sub>34</sub> O <sub>2</sub>                  | 0.03   | 213490.32    | 121076.06   | Oleic Acid  |

|       |     |   |      |            |            |   |
|-------|-----|---|------|------------|------------|---|
| 17.77 | 251 | C <sub>12</sub> H <sub>13</sub> NO <sub>5</sub>               | 0.25 |            | 371405.90  | 4-Acetylaminothalic acid, dimethyl ester                              |
| 17.77 | 251 | C <sub>12</sub> H <sub>13</sub> NO <sub>5</sub>               | 0.25 | 1510981.99 | 371405.90  | Benzene-1,3-dicarboxylic acid, 5-acetylamino-, dimethyl ester         |
| 18.15 | 444 | C <sub>28</sub> H <sub>44</sub> O <sub>4</sub>                | 0.51 | 3167087.78 | 1195028.44 | (2-Phenyl-1,3-dioxolan-4-yl) methyl (9E)-9-octadecenoate              |
| 20.90 | 340 | C <sub>22</sub> H <sub>44</sub> O <sub>2</sub>                | 0.32 | 1968742.62 | 729758.88  | 1-Heneicosyl formate  |
| 22.70 | 352 | C <sub>21</sub> H <sub>24</sub> N <sub>2</sub> O <sub>3</sub> | 0.30 | 1828910.15 | 327967.98  | 18,19-Secoyohimban-19-oic acid,                                       |
| 22.70 | 340 | C <sub>21</sub> H <sub>28</sub> N <sub>2</sub> O <sub>2</sub> | 0.30 | 1828910.15 | 327967.98  | Cleavamine, 18 $\alpha$ -carboxy-3,4 $\alpha$ -dihydro-, methyl ester |

**Table S5.** Major phytochemical compounds and their parameters identified in the oil fraction of *A. articulata*.

| Retention time (RT) | Molecular mass (g/mol) | Molecular formula                 | Area % | Area       | Peak height | Compound name                    |
|---------------------|------------------------|-----------------------------------|--------|------------|-------------|----------------------------------|
| 7.42                | 113                    | C <sub>6</sub> H <sub>11</sub> NO | 0.01   | 851036.36  | 308481.86   | 1-Piperidinecarboxaldehyde       |
| 7.42                | 113                    | C <sub>7</sub> H <sub>15</sub> N  | 0.01   | 1851036.36 | 308481.86   | (1-Ethyl-propenyl)-dimethylamine |

**Table S6.** Antibacterial potential of crude extract, oil, and purified fraction of *A. articulata*.

| Microbial strain          | %Zone of Inhibition (mm) |                 |                 |                 |                 |                 |                               |
|---------------------------|--------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-------------------------------|
|                           | Crude extract            | Oil Fraction    | Fraction A      | Fraction B      | Fraction C      | Fraction D      | Ampicillin (positive control) |
| <i>Escherichia coli</i>   | 11 $\pm$ 0.5***          | 24 $\pm$ 1.3*** | 15 $\pm$ 0.3*** | 11 $\pm$ 1.3*** | 18 $\pm$ 2.5*** | 11 $\pm$ 0.9*** | 34 $\pm$ 0.3                  |
| <i>Shigella dysentery</i> | 19 $\pm$ 1.0***          | 20 $\pm$ 1.8*** | 16 $\pm$ 0.9*** | 0               | 16 $\pm$ 0.4*** | 19 $\pm$ 1.2*** | 32 $\pm$ 0.6                  |
| <i>Salmonella typhi</i>   | 10 $\pm$ 2.0***          | 16 $\pm$ 2.3*** | 19 $\pm$ 1.5*** | 0               | 0               | 16 $\pm$ 2.0*** | 30 $\pm$ 0.2                  |

The data is represented as Mean  $\pm$  SEM, n=3. Values are significantly different as compared to positive control \*\*\* $P$  < 0.001.

**Table S7.** Antioxidant potential (DPPH and ABTS) of *A. articulata* crude extract, hexane, and subsequent fractions.

| Sample        | Concentration ( $\mu$ g/mL) | %DPPH Scavenging    | IC <sub>50</sub> ( $\mu$ g/mL) | %ABTS Scavenging    | IC <sub>50</sub> ( $\mu$ g/mL) |
|---------------|-----------------------------|---------------------|--------------------------------|---------------------|--------------------------------|
| Crude extract | 1000                        | 88.45 $\pm$ 0.97**  | 90                             | 84.35 $\pm$ 0.86*** | 50                             |
|               | 500                         | 73.68 $\pm$ 0.71**  |                                | 75.58 $\pm$ 0.84*** |                                |
|               | 250                         | 66.93 $\pm$ 0.74*** |                                | 63.91 $\pm$ 0.57*** |                                |
|               | 125                         | 58.48 $\pm$ 0.63*** |                                | 59.53 $\pm$ 0.37**  |                                |
|               | 62.5                        | 47.75 $\pm$ 0.56*** |                                | 52.69 $\pm$ 0.78*   |                                |
| Fraction A    | 1000                        | 73.69 $\pm$ 0.32*** | 200                            | 86.48 $\pm$ 0.85*** | 75                             |
|               | 500                         | 71.31 $\pm$ 0.45*** |                                | 78.79 $\pm$ 0.81*** |                                |
|               | 250                         | 69.20 $\pm$ 0.12*** |                                | 72.45 $\pm$ 0.79**  |                                |
|               | 125                         | 62.38 $\pm$ 0.14**  |                                | 63.47 $\pm$ 0.67*   |                                |
|               | 62.5                        | 53.61 $\pm$ 0.21*** |                                | 49.89 $\pm$ 0.47**  |                                |
| Fraction B    | 1000                        | 82.60 $\pm$ 0.43*** | 62                             | 75.49 $\pm$ 0.57*** | 110                            |
|               | 500                         | 78.90 $\pm$ 0.35*** |                                | 66.90 $\pm$ 0.38*** |                                |
|               | 250                         | 71.34 $\pm$ 0.65**  |                                | 59.48 $\pm$ 0.27*** |                                |
|               | 125                         | 57.16 $\pm$ 0.56*** |                                | 51.38 $\pm$ 0.42*** |                                |
|               | 62.5                        | 50.12 $\pm$ 0.55*** |                                | 43.95 $\pm$ 0.37*** |                                |
| Fraction C    | 1000                        | 42.80 $\pm$ 0.54*** | 1200                           | 79.59 $\pm$ 0.39*** | 118                            |

|               |      |                          |     |               |    |
|---------------|------|--------------------------|-----|---------------|----|
|               | 500  | 34.11±0.87***            |     | 71.48±0.62*** |    |
|               | 250  | 30.41±0.83***            |     | 64.78±0.69*** |    |
|               | 125  | 24.88±0.35***            |     | 57.74±0.48*** |    |
|               | 62.5 | 21.56±0.67***            |     | 48.37±0.68*** |    |
| Fraction D    | 1000 | 53.08±0.76***            | 250 | 85.95±0.61*** | 99 |
|               | 500  | 52.34±0.24***            |     | 74.64±0.58*** |    |
|               | 250  | 50.36±0.88***            |     | 67.86±0.95*** |    |
|               | 125  | 49.77±0.85***            |     | 60.29±0.82**  |    |
|               | 62.5 | 47.88±0.63***            |     | 55.35±0.91**  |    |
| Oil Fraction  | 1000 | 91.43±0.88 <sup>ns</sup> | 45  | 82.17±0.84*** | 71 |
|               | 500  | 84.65±0.65*              |     | 79.41±0.43**  |    |
|               | 250  | 78.24±0.32 <sup>ns</sup> |     | 64.52±0.39*** |    |
|               | 125  | 60.56±0.54**             |     | 58.58±0.23*** |    |
|               | 62.5 | 56.37±0.98**             |     | 50.54±0.73**  |    |
| Ascorbic acid | 1000 | 94.88±0.96               | 30  | 91.11±0.68    | 32 |
|               | 500  | 86.59±0.81               |     | 83.42±0.43    |    |
|               | 250  | 78.64±0.63               |     | 78.35±0.73    |    |
|               | 125  | 69.14±0.34               |     | 65.15±0.61    |    |
|               | 62.5 | 62.87±0.45               |     | 57.14±0.33    |    |

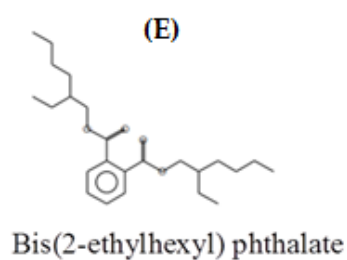
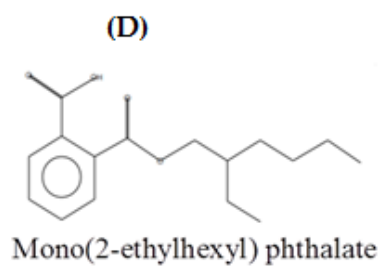
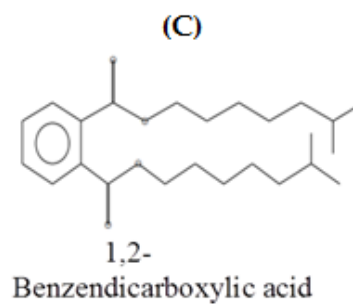
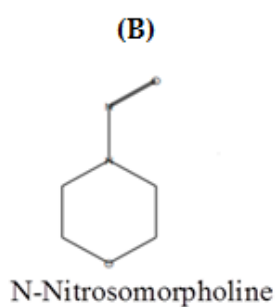
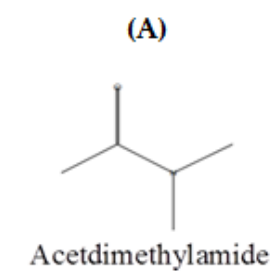
The data is represented as Mean ± SEM, n=3. Values are significantly different as compared to positive control \* $P < 0.05$ , \*\* $P < 0.01$ , \*\*\* $P < 0.001$ .

**Table S8**  $\alpha$ -glucosidase and  $\alpha$ -amylase inhibition of *A. articulata* crude extract and subsequent purified fractions at various concentrations.

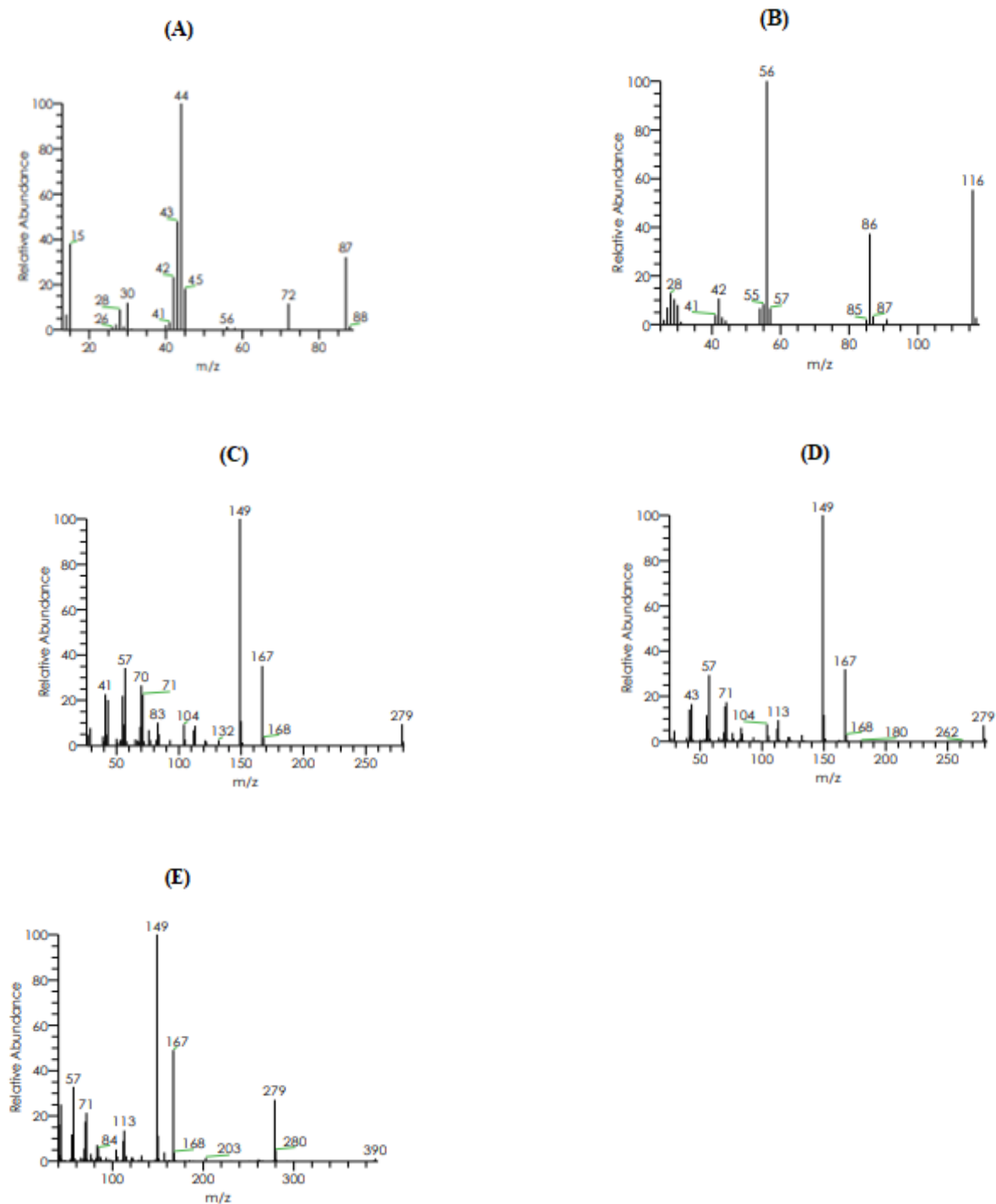
| Sample     | Concentration (µg/mL) | % $\alpha$ -Glucosidase inhibition | IC <sub>50</sub> (µg/mL) | % $\alpha$ -Amylase inhibition | IC <sub>50</sub> (µg/mL) |
|------------|-----------------------|------------------------------------|--------------------------|--------------------------------|--------------------------|
|            |                       | Mean ±SEM                          |                          | Mean ±SEM                      |                          |
| Met- Ext   | 1000                  | 85.32±0.20**                       | 32                       | 83.98±0.21*                    | 34                       |
|            | 500                   | 81.89±0.09 <sup>ns</sup>           |                          | 81.29±0.08*                    |                          |
|            | 250                   | 70.25±0.65**                       |                          | 70.32±0.34**                   |                          |
|            | 125                   | 67.45±0.34*                        |                          | 65.38±0.36**                   |                          |
|            | 62.5                  | 68.23±1.34*                        |                          | 62.28±0.67*                    |                          |
| Fraction A | 1000                  | 62.15±0.84***                      | 200                      | 59.34±0.89***                  | 240                      |
|            | 500                   | 58.92±0.98***                      |                          | 52.67±0.16***                  |                          |
|            | 250                   | 51.08±0.64***                      |                          | 49.32±0.23***                  |                          |
|            | 125                   | 46.18±0.56***                      |                          | 43.65±0.56***                  |                          |
|            | 62.5                  | 43.25±1.78***                      |                          | 32.78±0.78***                  |                          |
| Fraction B | 1000                  | 78.51±0.45***                      | 60                       | 81.32±0.09**                   | 58                       |
|            | 500                   | 70.32±0.73***                      |                          | 78.61±0.30***                  |                          |
|            | 250                   | 65.57±0.03***                      |                          | 62.56±0.13***                  |                          |
|            | 125                   | 59.28±1.03***                      |                          | 59.18±0.07***                  |                          |
|            | 62.5                  | 53.58±1.08***                      |                          | 52.98±0.15***                  |                          |
| Fraction C | 1000                  | 72.57±0.92***                      | 120                      | 74.52±0.13***                  | 180                      |
|            | 500                   | 69.52±0.45***                      |                          | 69.88±0.71***                  |                          |
|            | 250                   | 55.88±0.18***                      |                          | 61.65±0.23***                  |                          |
|            | 125                   | 51.78±0.15***                      |                          | 57.32±0.91***                  |                          |
|            | 62.5                  | 47.31±1.02***                      |                          | 50.54±0.37***                  |                          |

|              |      |               |     |               |     |
|--------------|------|---------------|-----|---------------|-----|
| Fraction D   | 1000 | 70.61±0.91*** | 140 | 72.51±0.02*** | 200 |
|              | 500  | 63.59±0.08*** |     | 69.41±0.04*** |     |
|              | 250  | 54.12±0.67*** |     | 59.91±0.38*** |     |
|              | 125  | 49.04±0.71*** |     | 51.31±0.15*** |     |
|              | 62.5 | 43.25±0.90*** |     | 47.18±0.76*** |     |
| Oil Fraction | 1000 | 61.14±0.49*** | 180 | 58.14±0.75*** | 220 |
|              | 500  | 58.82±0.19*** |     | 53.61±0.92*** |     |
|              | 250  | 50.08±0.04*** |     | 48.22±0.49*** |     |
|              | 125  | 45.28±0.92*** |     | 40.55±0.07*** |     |
|              | 62.5 | 41.34±0.28*** |     | 37.18±0.16*** |     |
| Acarbose     | 1000 | 87.65±0.71    | 30  | 85.99±0.44    | 32  |
|              | 500  | 83.05±0.65    |     | 83.61±0.58    |     |
|              | 250  | 78.90±1.02    |     | 76.85±0.96    |     |
|              | 125  | 71.83±0.99    |     | 70.47±0.78    |     |
|              | 62.5 | 65.15±0.75    |     | 64.89±0.71    |     |

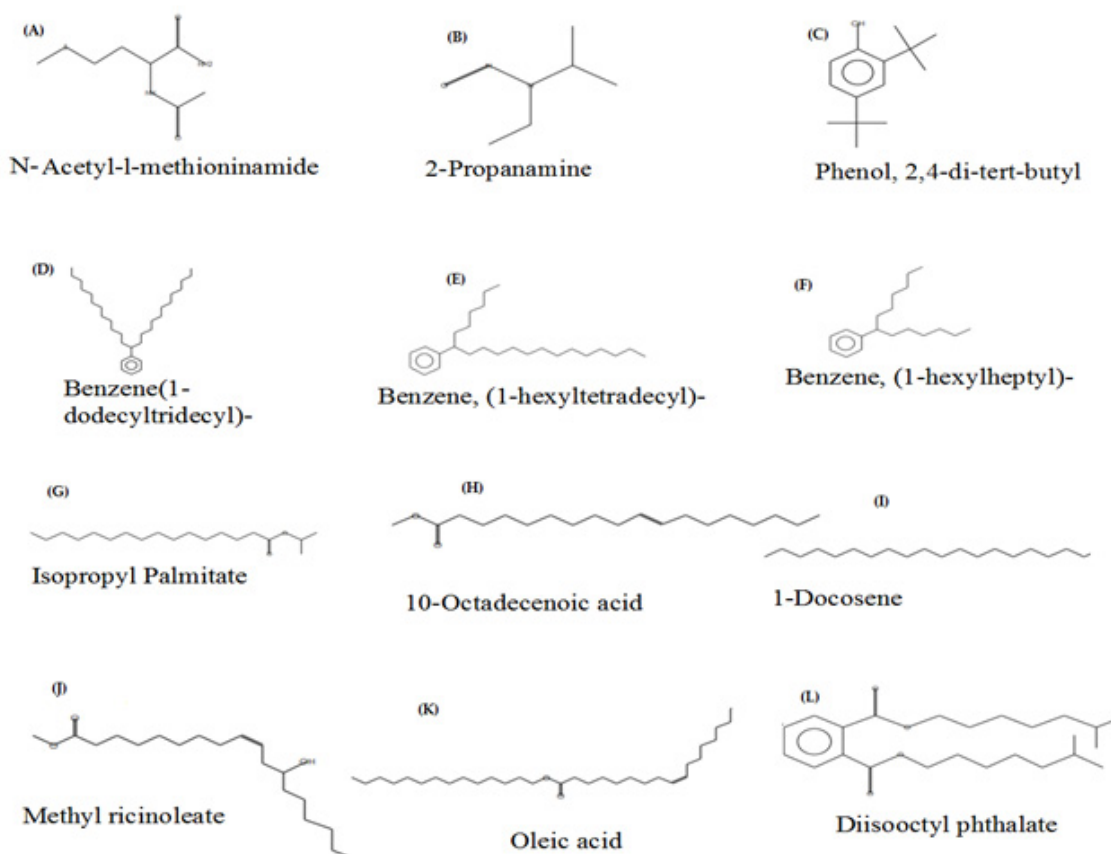
The data is represented as Mean ± SEM, n=3. Values are significantly different as compared to positive control \* $P < 0.05$ , \*\* $P < 0.01$ , \*\*\* $P < 0.001$ .



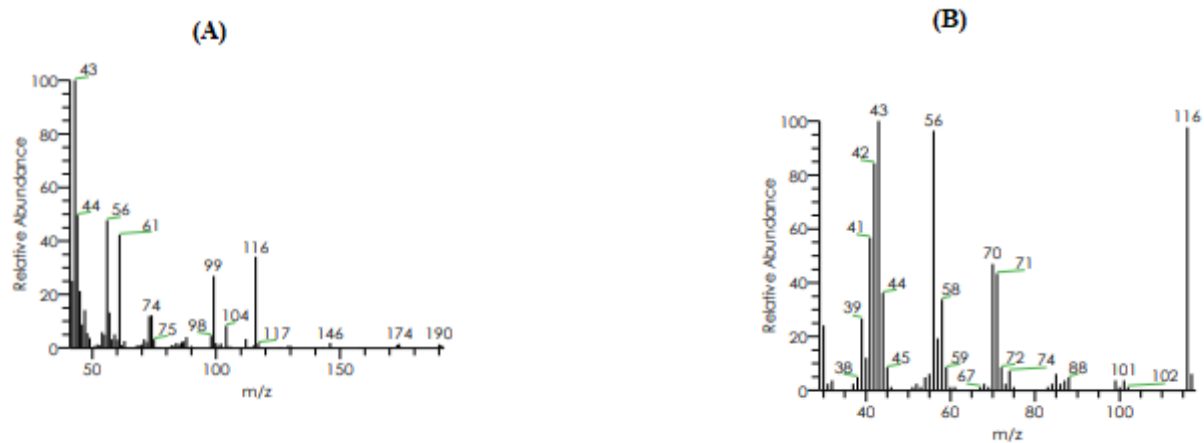
**Figure S1.** Major phytochemical compounds identified in fraction A of *A. articulata*.



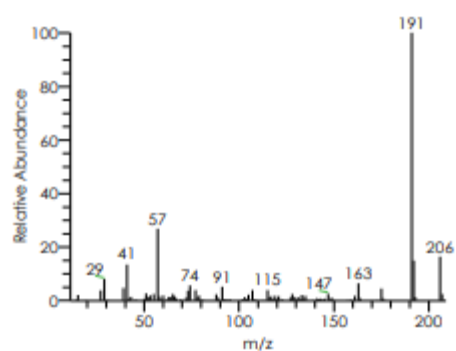
**Figure S2.** Individual mass fragmentation patterns of each compound: **A)** Acetdimethylamide **B)** N-Nitrosomorpholine **C)** 1,2-Benzenedicarboxylic acid **D)** Mono(2-ethylhexyl) phthalate **E)** Bis(2-ethylhexyl) phthalate.



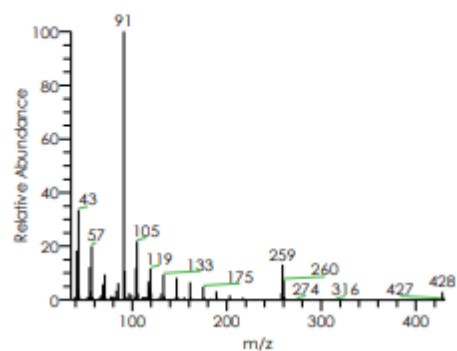
**Figure S3.** Major phytochemical compounds identified in fraction B of *A. articulata*.



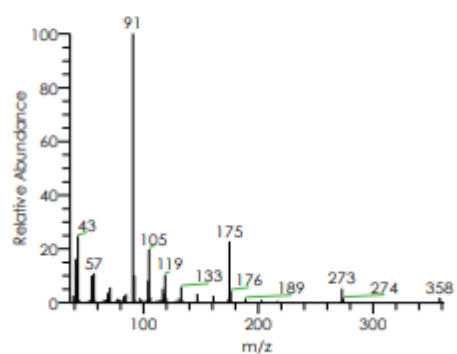
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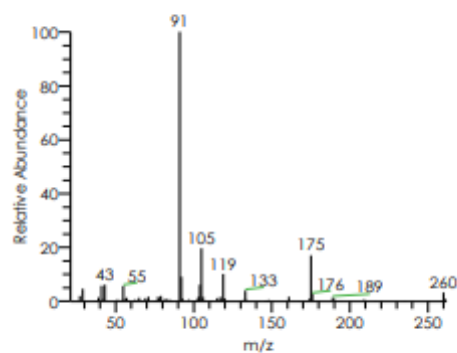
(D)



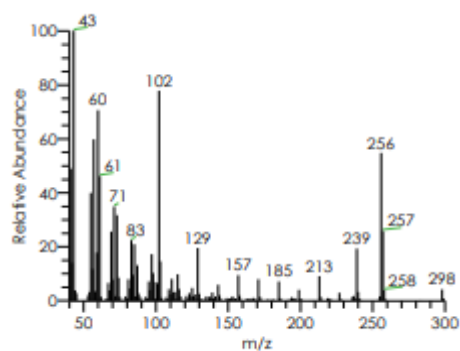
(E)



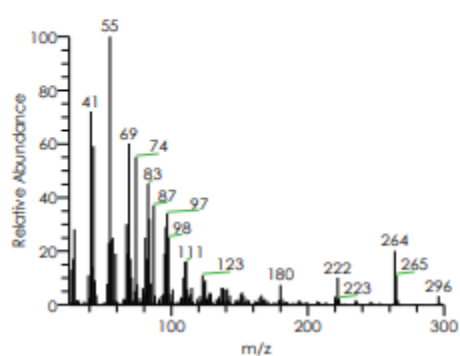
(F)



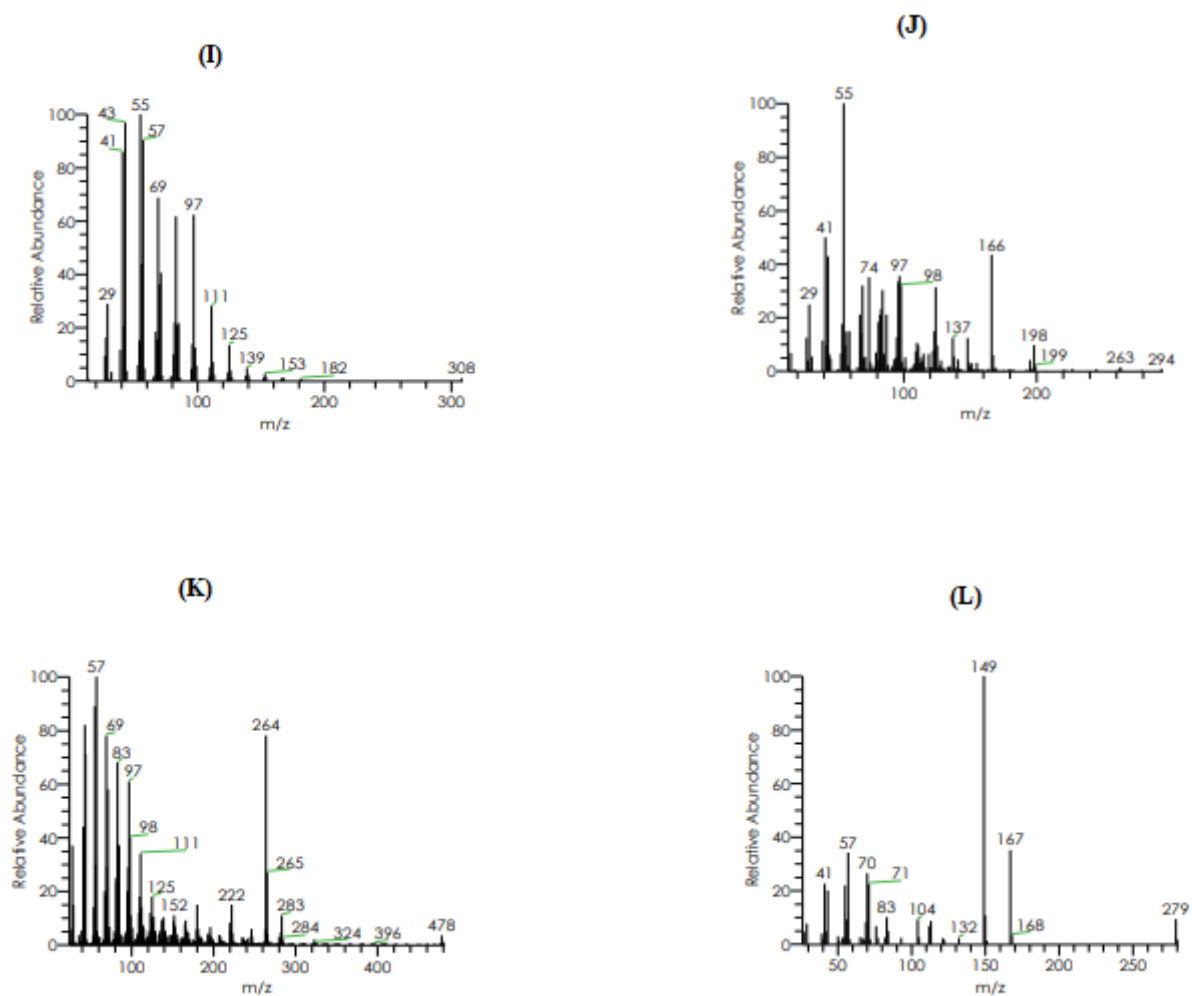
(G)



(H)







**Figure S4.** Individual mass fragmentation patterns of each compound: **A)** N-Acetyl-L-methioninamide **B)** 2-Propanamine **C)** Phenol, 2,4-di-tert-butyl **D)** Benzene, (1-dodecyltridecyl) **E)** Benzene, (1-hexyltetradecyl) **F)** Benzene, (1-hexylheptyl) **G)** Isopropyl Palmitate **H)** 10-Octadecenoic acid, methyl ester **I)** 1-Docosene **J)** Methyl ricinoleate **K)** Oleic acid, tetradecyl ester **L)** Diisooctyl phthalate.

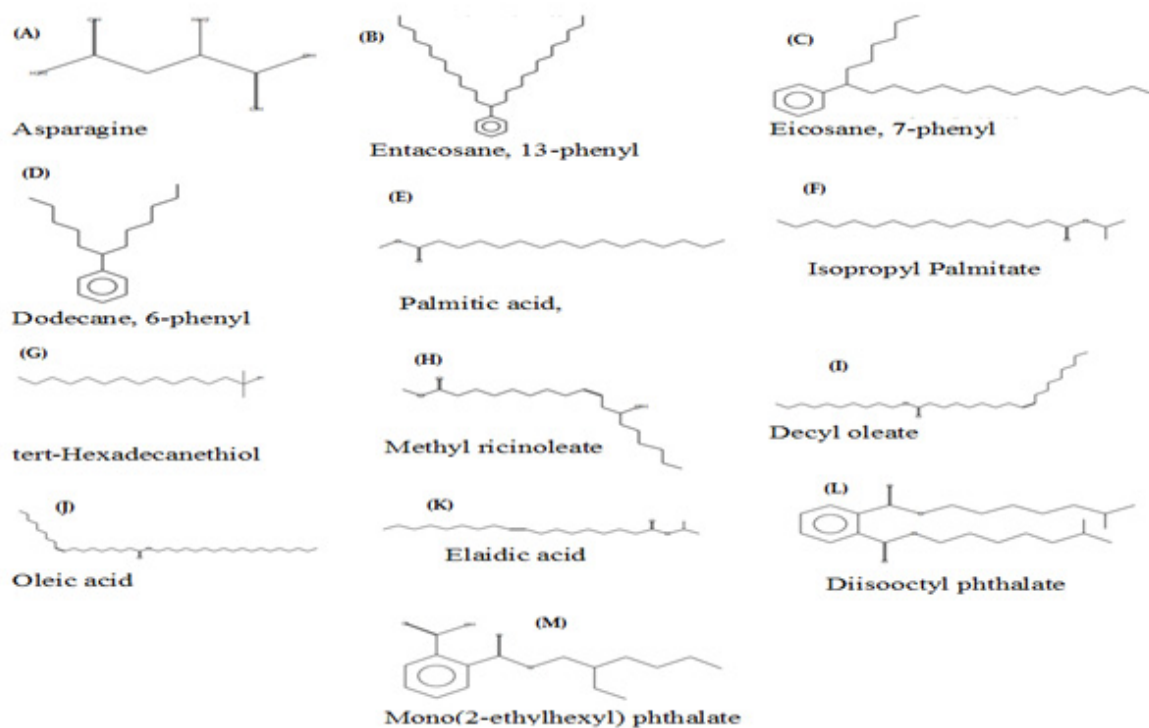
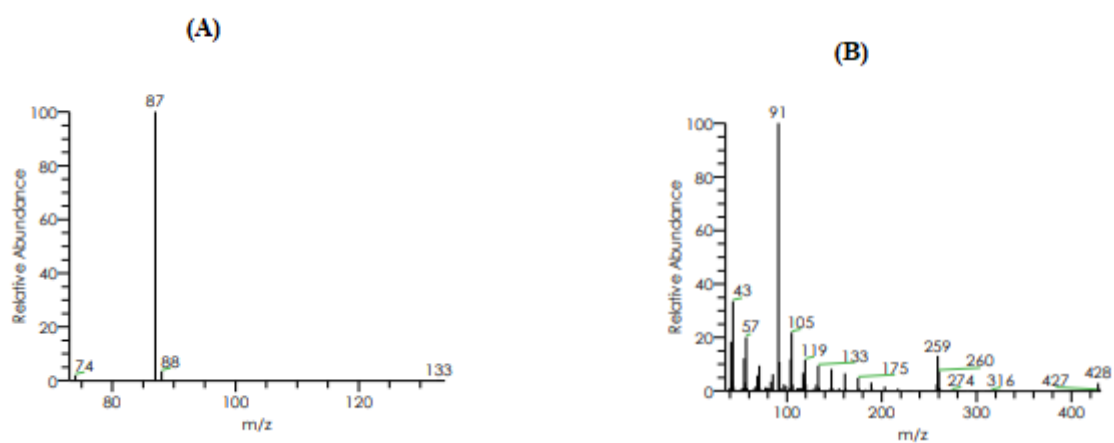
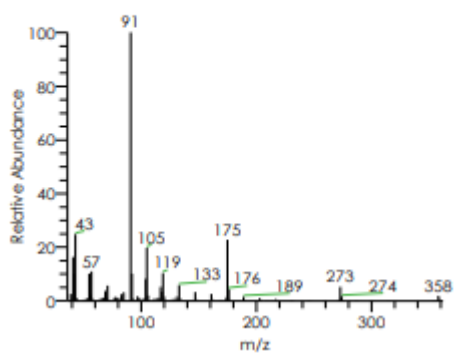
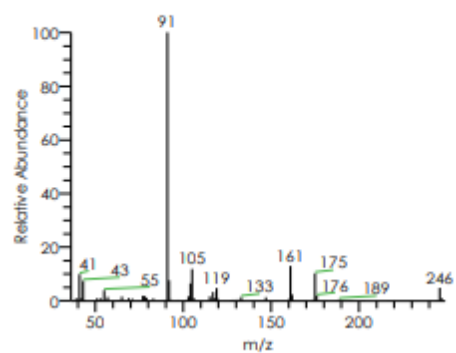
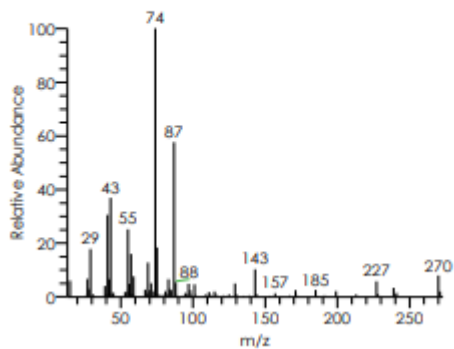
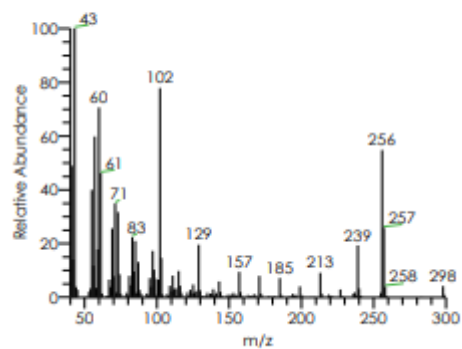
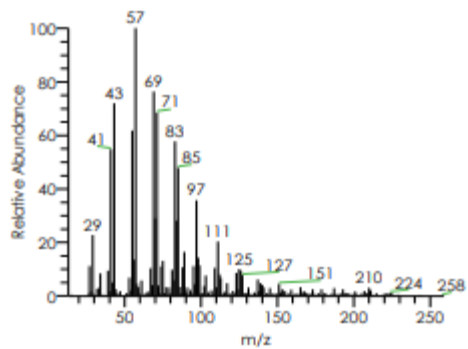
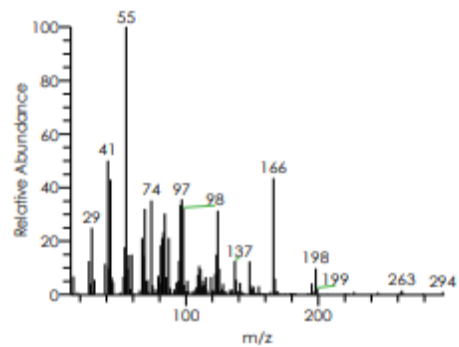
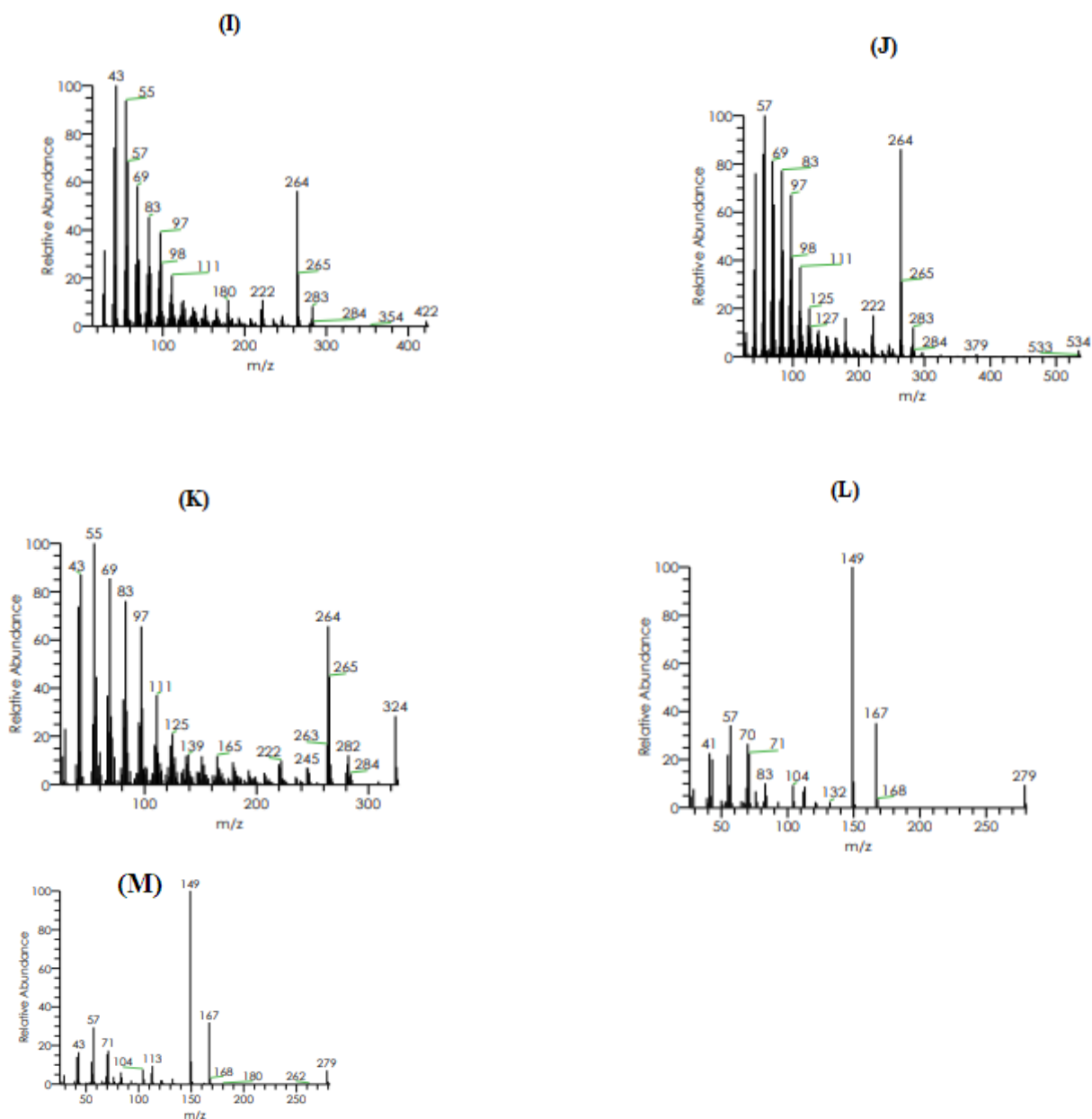


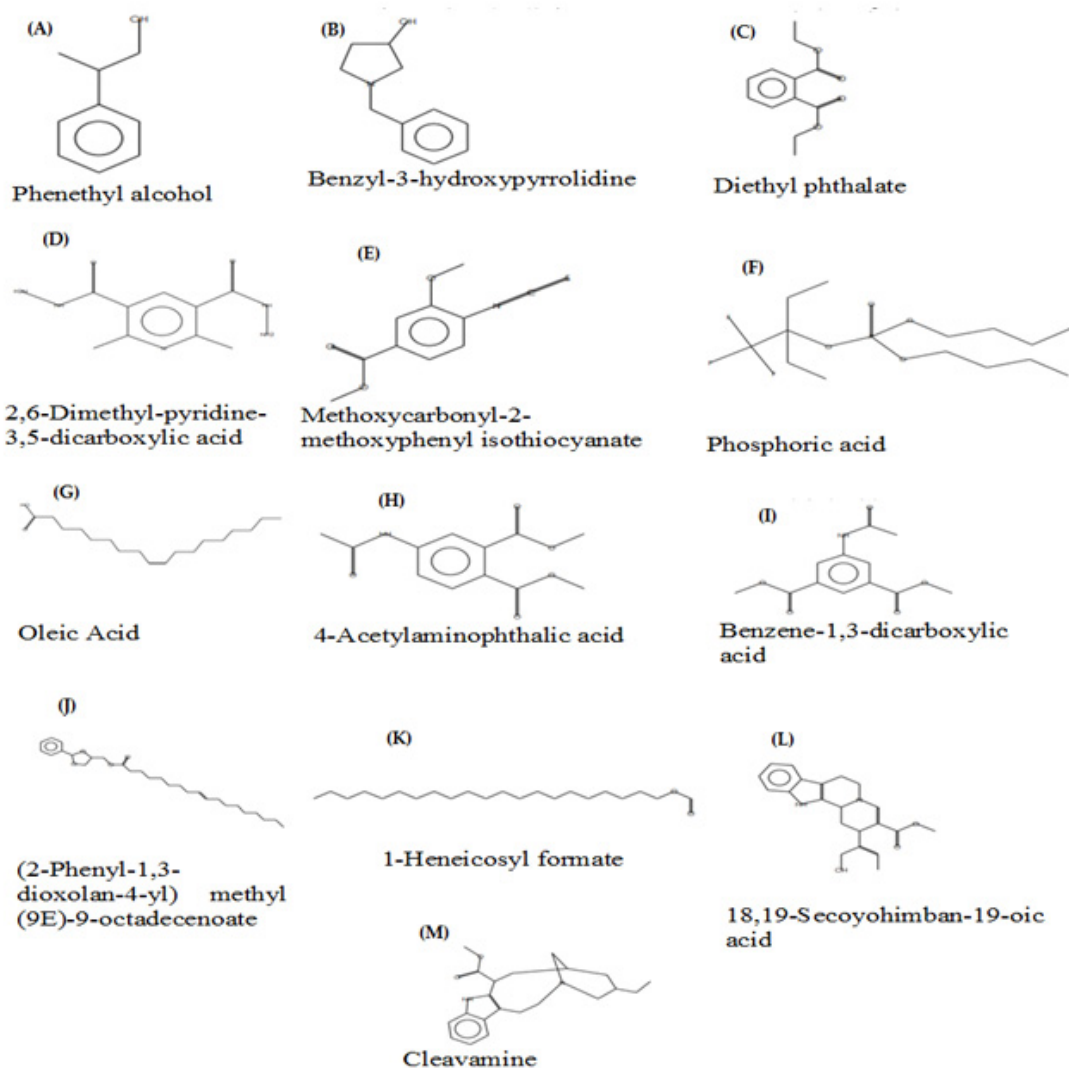
Figure S5. Major phytochemical compounds identified in fraction C of *A. articulata*.



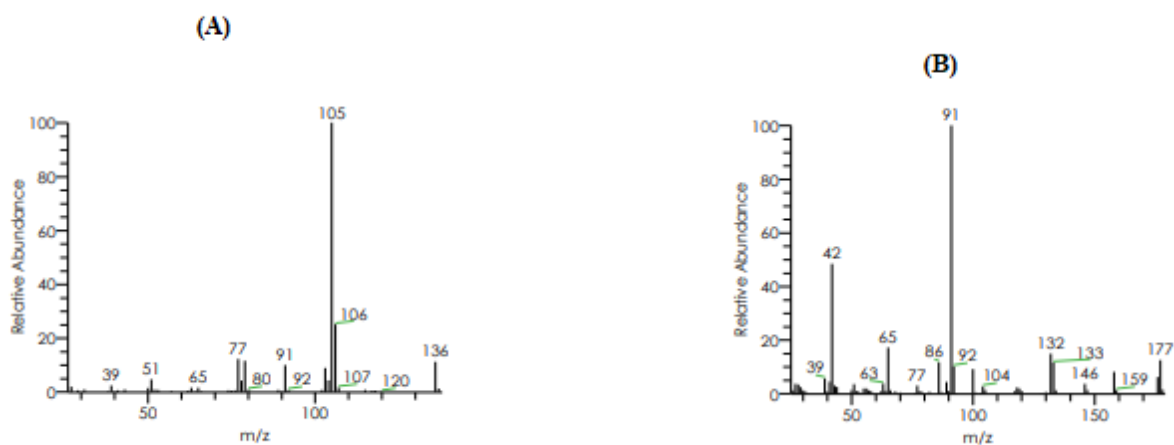
**(C)****(D)****(E)****(F)****(G)****(H)**



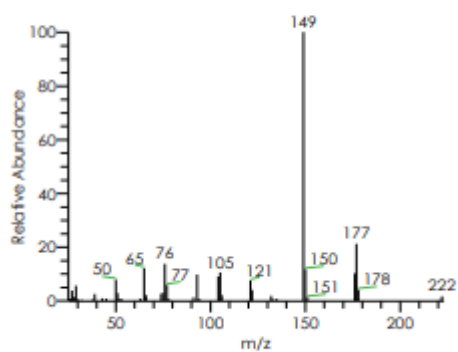
**Figure S6.** Individual mass fragmentation patterns of each compound: **A)** Asparagine **B)** entacosane, 13-phenyl **C)** Eicosane, 7-phenyl **D)** Dodecane, 6-phenyl **E)** Palmitic acid, methyl ester **F)** Isopropyl Palmitate **G)** tert-Hexadecanethiol **H)** Methyl ricinoleate **I)** Decyl oleate **J)** Oleic acid, octadecyl ester **K)** Elaidic acid, isopropyl ester **L)** Diisooctyl phthalate **M)** Mono(2-ethylhexyl) phthalate.



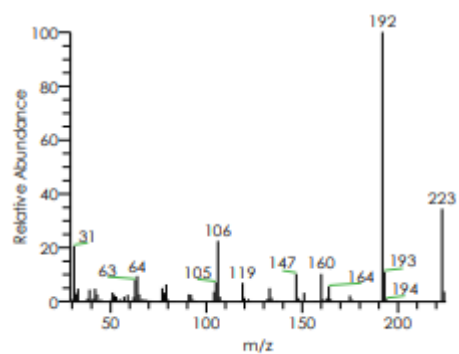
**Figure S7.** Major phytochemical compounds identified in fraction D of *A. articulata*.



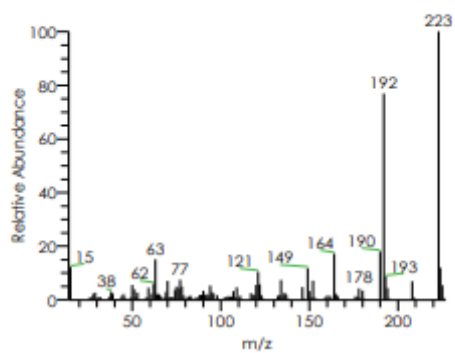
(C)



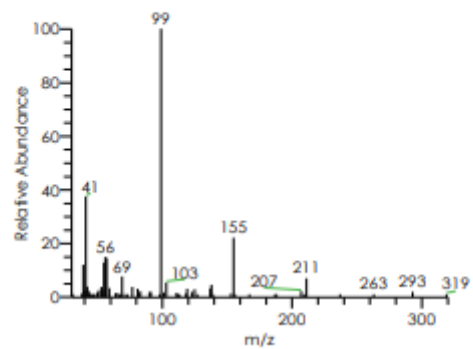
(D)



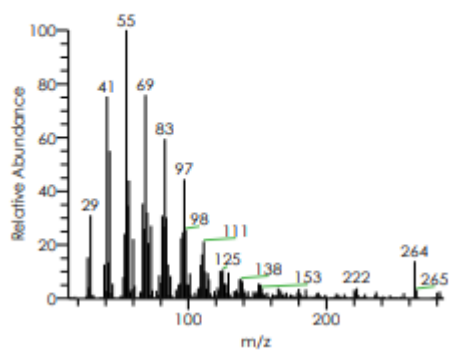
(E)



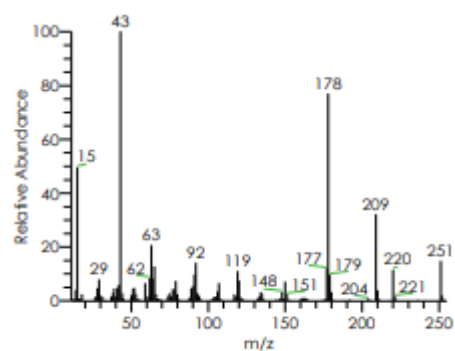
(F)

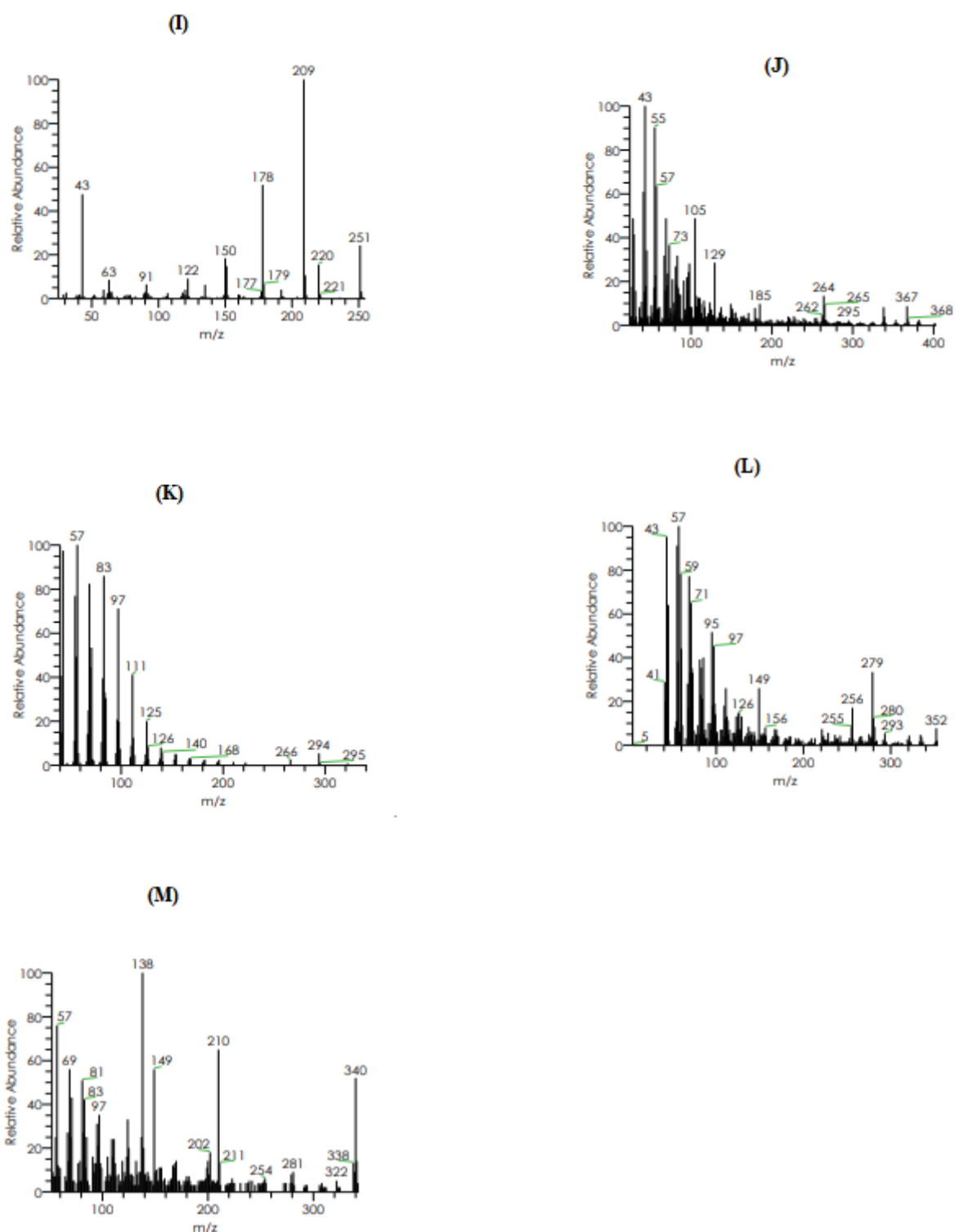


(G)



(H)





**Figure S8.** Individual mass fragmentation patterns of each compound: **A)** Phenethyl alcohol,  $\alpha$ -methyl **B)** Benzyl-3-hydroxypyrrolidine **C)** Diethyl Phthalate **D)** 2,6-Dimethyl-pyridine-3,5-dicarboxylic acid, dihydrazide **E)** Methoxycarbonyl-2-methoxyphenyl isothiocyanate **F)** Phosphoric acid, dibutyl 3-trifluoromethyl-3-pentyl ester **G)** Oleic Acid **H)** 4-Acetylamino-phthalic acid, dimethyl ester **I)** Benzene-1,3-dicarboxylic acid **J)** (2-Phenyl-1,3-dioxolan-4-yl) methyl (9E)-9-octadecenoate **K)** 1-Heneicosyl formate **L)** 18,19-Secoyohimban-19-oic acid **M)** Cleavamine, 18 $\alpha$ -carboxy-3,4 $\alpha$ -dihydro-, methyl ester.