**Natural compounds from** ***Clerodendrum* spp. as possible therapeutic candidates against SARS-CoV-2: an *in silico* investigation**

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**Running Title:** Exploring the inhibitory potential of the phytocompounds from *Clerodendrum* spp. against SARS-CoV-2: an *in silico* analysis

**Supplementary material**

**Table S1**. Collection sites of twelve different *Clerodendrum* species.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Name of the plant****species** | **Collection Site** | **District****(State)** | **Latitude** | **Longitude** |
| *Clerodendrum indicum* | NBU campus | Darjeeling(West Bengal) | 26º42’ N | 88º21’ E |
| *Clerodendrum inerme* | NBU campus | Darjeeling(West Bengal) | 26º42’ N | 88º21’ E |
| *Clerodendrum japonicum* | NBU campus | Darjeeling(West Bengal) | 26º42’ N | 88º21’ E |
| *Clerodendrum splendens* | NBU campus | Darjeeling(West Bengal) | 26º42’ N | 88º21’ E |
| *Clerodendrum speciaosum* | NBU campus | Darjeeling(West Bengal) | 26º42’ N | 88º21’ E |
| *Clerodendrum thomsoniae* | NBU campus | Darjeeling(West Bengal) | 26º42’ N | 88º21’ E |
| *Clerodendrum infortunatum* | NBU campus | Darjeeling(West Bengal) | 26º42’ N | 88º21’ E |
| *Clerodendrum serratum* | Azra, Guwahati | Kamrup(Assam) | 26º18’ N | 91º73’ E |
| *Clerodendrum colebrookianum* | Azra, Guwahati | Kamrup(Assam) | 26º18’ N | 91º73’ E |
| *Clerodendrum chinense* | NBU campus | Darjeeling(West Bengal) | 26º42’ N | 88º21’ E |
| *Clerodendrum bracteatum* | Lataguri | Jalpaiguri(West Bengal) | 26º7’ N | 88º77’ E |
| *Clerodendrum trichotomum* | Azra, Guwahati | Kamrup(Assam) | 26º18’ N | 91º73’ E |

**Table S2.** List of phytocompounds identified in twelve *Clerodendrum* spp. leaf extract by GC-MS analysis.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sl. No.** | **Identified compounds** | **Formula** | **Molecular****weight (Daton)** | **Retention time (minute)** |
| ***Clerodendrum trichotomum*** |
|  | Taraxerol | C30H50O | 426 | 17.80 |
|  | Lupeol | C30H50O | 426 | 32.72 |
|  | Phytol | C20H40O | 295 | 35.10 |
|  | Friedelin | C30H50O | 426 | 39.83 |
|  | Clerosterol | [C29H48O](https://pubchem.ncbi.nlm.nih.gov/search/#query=C29H48O) | 412 | 46.14 |
|  | Sitosterol | [C29H50O](https://pubchem.ncbi.nlm.nih.gov/search/#query=C29H50O) | 414 | 46.63 |
|  | Betulinic acid | [C30H48O3](https://pubchem.ncbi.nlm.nih.gov/search/#query=C30H48O3) | 456 | 51.86 |
|  | Stigmasterol | C29H48O | 411 | 52.84 |
| ***Clerodendrum indicum*** |
|  | 24,25-Dihydroxyvitamin D | C27H44O3 | 415 | 18.23 |
|  | Benzeneethanol, 4-hydroxy- (Tyrosol) | C8H10O2 | 137 | 19.19 |
|  | Phytol | C20H40O | 295 | 33.93 |
| ***Clerodendrum inerme*** |
|  | Phenol, 3,5-bis(1,1-dimethylethyl)- | C14H22O | 205 | 21.31 |
|  | 1-Dodecanol, 3,7,11-trimethyl- | C15H32O | 227 | 21.81 |
|  | Hexadecanoic acid (PALMITIC ACID) | C16H32O2 | 255 | 32.68 |
|  | 9,12,15-Octadecatrienoic acid, methyl ester, (Z,Z,Z)- (Linolenic acid, methyl ester) | C19H32O2 | 291 | 33.65 |
|  | Phytol | C20H40O | 295 | 34.10 |
|  | Squalene | C30H50 | 409 | 45.15 |
|  | Heptacosane | C27H56 | 379 | 48.68 |
|  | Ethyl iso-allocholate | C26H44O5 | 435 | 50.40 |
| ***Clerodendrum japonicum*** |
|  | Phenol, 3,5-bis(1,1-dimethylethyl)- | C14H22O | 205 | 38.71 |
| ***Clerodendrum splendens*** |
|  | Hexadecanoic acid (Palmitic acid) | C16H32O2 | 255 | 32.68 |
|  | Phytol | C20H40O | 295 | 34.10 |
|  | Squalene | C30H50 | 409 | 45.16 |
|  | Heptacosane | C27H56 | 379 | 46.70 |
|  | Ethyl iso-allocholate | C26H44O5 | 435 | 51.96 |
| ***Clerodendrum speciaosum*** |
|  | Azelaic acid | C9H16O4 | 187 | 27.88 |
|  | Hexadecanoic acid (Palmitic acid) | C16H32O2 | 255 | 32.73 |
|  | 9,12-Octadecadienoic acid (Z,Z)- (Linoleic acid) | C18H32O2 | 279 | 35.66 |
|  | Eicosanoic acid | C20H40O2 | 311 | 39.46 |
|  | Heptacosane | C27H56 | 379 | 43.30 |
|  | Hentriacontane | C31H64 | 435 | 46.10 |
|  | Stigmasterol | C29H48O | 411 | 51.99 |
| ***Clerodendrum thomsoniae*** |
|  | Butanedioic acid | C4H6O4 | 117 | 16.42 |
|  | Azelaic acid | C9H16O4 | 187 | 27.88 |
|  | Hexadecanoic acid (Palmitic acid) | C16H32O2 | 255 | 32.75 |
|  | Eicosanoic acid | C20H40O2 | 311 | 39.47 |
|  | Squalene | C30H50 | 409 | 45.18 |
|  | Heptacosane | C27H56 | 379 | 48.69 |
|  | α-Tocopherol | C29H50O2 | 429 | 49.54 |
|  | Stigmasterol | C29H48O | 412 | 52.00 |
| ***Clerodendrum infortunatum*** |
|  | R-Limonene | C10H16O3 | [184](https://pubchem.ncbi.nlm.nih.gov/search/#query=C10H16O3) | 10.03 |
|  | Catechol | C6H6O2 | 110 | 13.19 |
|  | Hexadecanoic acid  | C16H32O2 | 255 | 31.05 |
|  | Phytol | C20H40O | 295 | 33.94 |
|  | Betulin | C30H50O2 | 442 | 47.54 |
| ***Clerodendrum serratum*** |
|  | Hexadecanoic acid | C16H32O2 | 255 | 32.72 |
|  | Linolenic acid, methyl ester | C19H32O2 | 291 | 33.65 |
|  | Phytol | C20H40O | 295 | 34.11 |
|  | Squalene | C30H50 | 409 | 45.16 |
|  | Heptacosane | C27H56 | 379 | 51.87 |
|  | Stigmasterol | C29H48O | 411 | 53.16 |
| ***Clerodendrum colebrookianum*** |
|  | Hexadecanoic acid | C16H32O2 | 255 | 31.71 |
|  | Linolenic acid, methyl ester | C19H32O2 | 291 | 33.66 |
|  | Squalene | C30H50 | 409 | 45.16 |
|  | Heptacosane | C27H56 | 379 | 46.07 |
|  | Stigmasterol | C29H48O | 411 | 52.81 |
| ***Clerodendrum chinense*** |
|  | Hexadecanoic acid | C16H32O2 | 255 | 32.72 |
|  | Phytol | C20H40O | 295 | 34.06 |
|  | 9,12-Octadecadienoic acid (Z,Z)- (Linoleic acid) | C18H32O2 | 279 | 35.66 |
|  | Squalene | C30H50 | 409 | 45.16 |
|  | Stigmasterol | C29H48O | 411 | 51.98 |
| ***Clerodendrum bracteatum*** |
|  | Trachylobane | C20H32 | 271 | 31.71 |
|  | Hexadecanoic acid  | C16H32O2 | 255 | 32.74 |
|  | 1-Heptatriacotanol | C37H76O | 535 | 37.10 |
|  | Retinoic acid | C20H28O2 | 299 | 41.41 |
|  | Squalene | C30H50 | 409 | 45.16 |
|  | Heptacosane | C27H56 | 379 | 48.69 |
|  | Stigmasterol | C29H48O | 411 | 52.84 |

**Table S3**.Display of binding energy scores of the phytochemicals of *Clerodendrum* spp. with the SARS-CoV-2 proteins.

|  |  |
| --- | --- |
| **Ligands** | **Binding energy scores (kcal/mol)** |
| **RBD of SARS-CoV-2 spike protein (6LZG)** | **SARS-CoV-2 protease Mpro (6LU7)** | **SARS-CoV-2 RdRp (7BV2)** |
| Lupeol | -6.5 ± 0.02 | -6.7 ± 0.02 | -6.5 ± 0.02 |
| Betulinic acid | -6.6 ± 0.03 | -6.4 ± 0.01 | -6.4 ± 0.01 |
| Betulin | -6.4 ± 0.01 | -6.1 ± 0.02 | -6.5 ± 0.02 |
| α-Tocopherol | -6.2 ± 0.02 | -6.5 ± 0.01 | -6.4 ± 0.01 |
| Phytol | -4.6 ± 0.01 | -5.3 ± 0.01 | -4.6 ± 0.01 |
| Clerosterol | -6.0 ± 0.03 | -6.7 ± 0.02 | -5.8 ± 0.03 |
| Sitosterol | -6.1 ± 0.02 | -6.8 ± 0.02 | -5.9 ± 0.01 |
| Benzeneethanol, 4-hydroxy- (Tyrosol) | -4.3 ± 0.02 | -4.2 ± 0.02 | -3.4 ± 0.01 |
| 24,25-Dihydroxyvitamin D | -6.0 ± 0.01 | -6.9 ± 0.01 | -6.3 ± 0.02 |
| Phenol, 3,5-bis(1,1-dimethylethyl)- | -5.4 ± 0.02 | -5.8 ± 0.03 | -4.6 ± 0.03 |
| 1-Dodecanol, 3,7,11-trimethyl- | -4.4 ± 0.03 | -4.9 ± 0.02 | -4.0 ± 0.01 |
| Hexadecanoic acid (Palmitic acid) | -4.4 ± 0.01 | -4.2 ± 0.01 | -3.7 ± 0.02 |
| Linolenic acid, methyl ester | -3.9 ± 0.01 | -4.9 ± 0.02 | -4.0 ± 0.02 |
| Heptacosane | -4.7 ± 0.02 | -4.9 ± 0.03 | -3.8 ± 0.02 |
| Ethyl iso-allocholate | -6.2 ± 0.01 | -6.5 ± 0.01 | -5.6 ± 0.01 |
| Squalene | -5.7 ± 0.03 | -6.3 ± 0.02 | -5.1 ± 0.01 |
| Azelaic acid | -4.1 ± 0.03 | -4.5 ± 0.01 | -3.7 ± 0.01 |
| 9,12-Octadecadienoic acid (Z,Z)- (Linoleic acid) | -4.4 ± 0.01 | -4.3 ± 0.02 | -4.1 ± 0.03 |
| Eicosanoic acid | -4.0 ± 0.02 | -4.3 ± 0.01 | -3.6 ± 0.01 |
| Hentriacontane | -4.3 ± 0.01 | -4.6 ± 0.02 | -3.7 ± 0.02 |
| Butanedioic acid | -3.5 ± 0.02 | -3.4 ± 0.02 | -3.2 ± 0.02 |
| Catechol | -4.3 ± 0.02 | -3.8 ± 0.02 | -3.1 ± 0.02 |
| R-Limonene | -5.1 ± 0.01 | -4.9 ± 0.03 | -4.3 ± 0.01 |
| 1-Heptatriacotanol | -3.8 ± 0.02 | -4.2 ± 0.02 | -3.3 ± 0.01 |
| Retinoic acid | -5.3 ± 0.01 | -5.7 ± 0.01 | -4.8 ± 0.02 |
| Trachylobane | -5.8 ± 0.02 | -6.5 ± 0.02 | -6.4 ± 0.02 |



**Figure S1.** GC-MS chromatogram of *Clerodendrum indicum*



**Figure S2.** GC-MS chromatogram of *Clerodendrum inerme*



**Figure S3.** GC-MS chromatogram of *Clerodendrum japonicum*

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**Figure S4.** GC-MS chromatogram of *Clerodendrum splendens*



**Figure S5.** GC-MS chromatogram of *Clerodendrum speciaosum*

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**Figure S6.** GC-MS chromatogram of *Clerodendrum thomsoniae*

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**Figure S7.** GC-MS chromatogram of *Clerodendrum infortunatum*

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**Figure S8.** GC-MS chromatogram of *Clerodendrum serratum*



**Figure S9.** GC-MS chromatogram of *Clerodendrum colebrookianum*

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**Figure S10.** GC-MS chromatogram of *Clerodendrum chinense*

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**Figure S11.** GC-MS chromatogram of *Clerodendrum bracteatum*

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**Figure S12.** GC-MS chromatogram of *Clerodendrum trichotomum*