COMPOSITION OF THE ESSENTIAL OIL FROM MIMOSA PUDICA LINN.

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ABSTRACT

Objectives: The objectives of this study were to determine the composition of the essential oil obtained from Mimosa pudica L. (Mimosaceae).

Methods: The essential oil of M. pudica was obtained by hydrodistillation using a Clevenger apparatus, and the chemical composition was determined by gas chromatography-mass spectrometry analysis.

Results: About 23 compounds were identified from the essential oil which constitutes about 98.92% of the oil. Among the compounds identified, phthalic acid dioctyl ester (27.76%), α-linolenic acid (20.34%), and cinnamaldehyde (16.24%) are the major compounds. α-linolenic acid is an n-3 fatty acid.

Conclusion: α-linolenic acid is one of the essential fatty acids, which is necessary for health and cannot be produced within the human body. M. pudica L. (Mimosaceae) appears to be a promising herb to undergo a wide exploration.

Keywords: Essential oil, Mimosa pudica Linn., Mimosaceae, Gas chromatography-mass spectrometry analysis, Fatty acids.

INTRODUCTION

Mimosa pudica Linn. belongs to the family Fabaceae is a small-sized tree and is used in Ayurvedic medicine. The leaves are very sensitive, both pinnae and leaflets folding when touched [1,2]. It is commonly distributed in roadside, walkway, marsh and hillside areas, so this plant is neglected weed growing in dumps [3]. M. pudica relieves “Oduvaatham” a kind of vaatha disease [4]. Recently, extracts of M. pudica Linn. were found a multitude of therapeutic properties. Diuretic [4], psoriasis cure [5], swelling, wounds healing [6], antioxidant, antimicrobial, anti-inflammatory [7], anti-diabetic, anticancer, cardiovascular disease [8], hypolipidemic, antimicrobial activity [9], anticonvulsant [10], antimalarial, anti-fertility, fistula [11], cough, influenza [12], systemic infections, snakebite areas [13], hepatoprotective activity [14], antidepressant [15], leprosy, hypoglycemic, pulmonary tuberculosis, neurothnia [16], atherosclerosis, hyperglycemic [17], and various urogenital infections [18] have been attributed in different parts of M. pudica. Regarding the secondary metabolite potential of M. pudica, it has been reported that it contains nitrogen-containing compounds, phenolic compounds, steroles, fatty compounds, and rich source of flavonoids [19]. M. pudica Linn. is famous for its anticancer alkaloid mimosine [20] and includes a kind of 5-deoxyflavonols, particularly. Many phytoconstituents were reported from the plant leaves, seed, stem, root, and the whole aerial parts of M. pudica [21-24]. Even though a good number of phytoconstituents were isolated and characterized, the chemical composition of the essential oil was not yet carried out. Knowledge of the chemical constituents of plants is desirable to discover new therapeutic agents and to find the actual significance of folkloric remedies [25]. In the present work, the essential oil has been obtained from M. pudica Linn., and its chemical composition was determined.

METHODS

Plant material and essential oil extraction

The fresh leaves of M. pudica Linn. were collected from Coimbatore, South India, during the winter season in the month of January 2018. The authentication of the plant was done by the Botany Department, Karpagam Academy of Higher Education, Coimbatore, and a voucher specimen was preserved.

The fresh aerial part (1 kg) leaves of M. pudica were subjected to hydrodistillation using Clevenger type apparatus (4 × 3 l = 12 l). The resulted aqueous layer from the Clevenger apparatus was collected and extracted with petroleum ether (4 × 25 ml) and dried over anhydrous sodium sulfate and then concentrated in a water bath to yield a slight yellowish oil (0.26% v/w).

Gas chromatography-mass spectrometry (GC-MS) analysis

GC-MS along with an ESI system with the ionization energy of 70 eV was utilized for analysis. Helium (99.99%) was used as carrier gas, with the flow rate of 1 ml/min. The injection port temperature was set at 250°C, and initial column temperature was kept at 40°C for 1 min and then gradually increased to 230°C at the flow rate of 3°C/min. The components were identified by comparing their mass spectra with those in the GC-MS library and literature and by comparing their relative retention times by those of authentic samples on the HP-5 MS capillary column.

RESULTS AND DISCUSSION

Biological activities of aromatic plants are in part attributed to essential oils which are used as flavoring additives to cosmetics, disinfection agents, and medicinal means for a long time. The essential oil was obtained from M. pudica Linn. by hydrodistillation using a Clevenger type apparatus, and the composition is determined by GC-MS analysis for the 1st time. The result is exhibited in the Table 1. Twenty-three compounds were identified from the essential oil which constitutes about 98.92% of the oil. Among the compounds identified, phthalic acid dioctyl ester (27.76%), α-linolenic acid (20.34%), and cinnamaldehyde (16.24%) are the major compounds. α-linolenic acid is an n-3 fatty acid. It is one of two essential fatty acids because they are necessary for health and cannot be produced within the human body.

Earlier GC-MS analysis was carried out on the methanol extract of M. pudica Linn., and 19 compounds were identified and reported.
Table 1: Composition of the essential oil obtained from M. pudica Linn.

| Compound name                  | Molecular formula | Molecular weight | Retention index (%) |
|--------------------------------|-------------------|------------------|---------------------|
| Ethanol 2-methoxy acetate      | C₆H₁₀O₂           | 118              | 766 (7.1)           |
| Phthalic acid diocetyl ester   | C₁₁H₁₂O₄          | 390              | 2832 (27.76)        |
| Methyl octylester              | C₁₀H₂₀O₂          | 144              | 992 (0.36)          |
| 3-Pinanone                     | C₁₀H₁₆O₂          | 152              | 1109 (1.9)          |
| α-Linolenic acid               | C₁₅H₂₄O₃          | 278              | 2191 (20.34)        |
| Phytol                         | C₁₇H₃₄O₂          | 296              | 2045 (4.08)         |
| n-Hexadecanoic acid            | C₁₇H₃₂O₄          | 256              | 1968 (2.74)         |
| Dibutyl phthalate              | C₂₃H₂₄O₄          | 278              | 2037 (0.7)          |
| 1,7-Di-tert-butyl-1-oxaspiro (4,5) deca-6,9-diene-2,8-dione | C₂₃H₃₀O₃ | 276 | 2081 (1.68)          |
| 1,2-Benzenedicarboxylic acid, bis (2-methyl)propyl ester | C₂₁H₂₈O₄ | 278 | 1908 (0.38) |
| Tetradecanoic acid             | C₁₄H₂₈O₂          | 228              | 1769 (0.5)          |
| 1-Pentadecene                  | C₁₅H₃₀O₂          | 210              | 1502 (0.38)         |
| Dodecanoic acid                | C₁₄H₂₈O₂          | 200              | 1570 (3.36)         |
| 1,6,10-Dodecatrien-3-ol, 3,7,11-trimethyl- | C₂₃H₄₀O₂ | 222 | 1564 (0.62) |
| Phenol, 2,4-bis (1,1-dimethyl)ethyl- | C₁₇H₂₂O₄ | 206 | 1555 (0.86) |
| 3-Buten-2-one, 4-{2,6,6-trimethyl-1-cyclohexen-1-yl} | C₁₇H₂₆O₂ | 192 | 1457 (0.8) |
| Phenol, 2-methoxy-3-(2-propenyl)- | C₁₇H₂₆O₂ | 164 | 1392 (0.86) |
| 2-Methoxy-4-vinylphenol        | C₁₃H₁₄O₂          | 150              | 1293 (5.1)          |
| Indole                         | C₁₀H₈N            | 117              | 1174 (0.56)         |
| Cinnamaldehyde                 | C₁₇H₁₆O₂          | 132              | 1189 (16.24)        |
| 2,3-Dihydrobenzofuran          | C₁₅H₁₂O₂          | 120              | 1036 (1.44)         |
| Benzene methanol               | C₁₂H₁₀O₂          | 108              | 1036 (0.43)         |
| 3-Hexen-1-ol                   | C₇H₁₀O₂           | 100              | 868 (2.08)          |

Myo-inositol (46.61%), squalene (18.21%), and Vitamin E (12.76%) were the major compounds [26]. In another study, the GC-MS of the oil extract of M. pudica Linn. showed that the presence of N-diallylglycine, dl-diallyl-d-valine, dl-alanin, dl-alanin ethyl ester, 1-alanin ethyl amide, 9, 12-octadecadienoic acid (Z, Z), methyl ester, 9, 12-octadecanoic acid, methyl ester, 11, 13-ecosadienoic acid, methyl ester; and meglumine was reported [27]. In the present study, the major compounds identified from the essential oil were entirely different from the volatile constituents present in the methanol extract [26] or the oil extract of M. pudica Linn. [27]. Alpha-linolenic acid is popular for preventing and treating diseases of the heart and blood vessels. It is used to prevent heart attacks, lower high blood pressure, lower cholesterol, and reverse "hardening of the blood vessels" (atherosclerosis) [28]. Cinnamaldehyde possesses antibacterial and antifungal activities and restricts the harmful blood platelet clotting.

CONCLUSION

M. pudica is traditionally very important herb having many important pharmacological activities. Many important phytocomponents responsible for the activity were identified in the essential oil by GC-MS. Among the compounds identified, phthalic acid diocetyl ester (27.76%), α-linolenic acid (20.34%), and cinnamaldehyde (16.24%) are the major compounds. This proves the therapeutic importance of the plant. Such type of systematic information about the plant is useful for the researchers.

AUTHORS’ CONTRIBUTIONS

Vismayavisan TK and Dharani J have carried out the work and prepared the manuscript. Sripathi R helped in the GC-MS analysis and S. Ravi has guided and has done modification and editing of the manuscript.

CONFLICTS OF INTEREST

The authors declared that they have no conflicts of interest.

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