



Phytochemical analysis of *Pistia stratiotes* by GC-MS analysis

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Abstract

The present study was aimed to carry out the detailed phytochemical analysis of the leaves of *Pistia stratiotes*. Qualitative phytochemical screening of the aqueous and methanolic extracts of the leaves revealed the presence of many components such as aroma agent, vitamin E, vitamin K, vitamin D, carcinogens, steroid hormones and cholesterol. GC-MS analysis was also carried out to detect the phytoconstituents present in the methanolic extract of the leaves *P. stratiotes*.

Keywords: *Pistia stratiotes*, methanol, GC-MS

1. Introduction

Plants have been used as traditional medicine for several thousand years. It is used as herbal drugs in treatment of diseases found among all sections of people in India. The world market for herbal medicine including herbal products and raw materials has been estimated to have an annual growth rate between 5 and 15%. Consequently an imperative need exists to connect the ethno pharmacological information with the newest drug discovery technologies and scientific efforts in order to discover new active and natural metabolites. Plants are the storehouses and sources of safer and cheaper chemicals. Herbal preparations have an important role in disease control due to their antioxidant and anti-microbiological activities [7]. The hormones, antibiotics, vitamins and several other chemicals have been tested as growth promoters and antibacterial agents and for other purposes in mariculture. And also these chemicals have positive effects on the fishes and shrimps [5]. Green leaves form a rich source of dietary fibers, nutraceuticals, vitamins (vitamin A, vitamin C, riboflavin and folic acid), and minerals (iron, phosphorus and calcium) These active components of plant products promote various activities like growth promotion, appetite stimulation, antistress activity, tonic and immune stimulation in fin fish and shrimp [4, 8]. Therefore, this work is mainly aimed to evaluate the phytochemical constituents of aquatic weed *P. stratiotes* (medicinal plant) and their biological activities.

2. Materials and methods

Collection of experimental plant

The aquatic weed, *P. stratiotes* were collected from local pond of Pazhaiyakalay, Tuticorin District, Tamil Nadu, India. This plant was identified and authenticated in Department of Botany at VO Chidambaram College, Tuticorin, Tamil Nadu, India.

Preparation of extract of GC-MS

The leaves of *P. stratiotes* were washed using fresh water for 3-4 times in lab to remove debris, epiphytes and adhered dirt

particles. Then the leaves of *P. stratiotes* were dried at room temperature for 7 days. After 7 days these samples were powdered. Required quantity of sample powder was weighed and transferred to round bottom flask and treated with methanol in a Soxhlet apparatus. This process lasted for 24 hours and maintained at $45 \pm 47^\circ\text{C}$ temperature. The extract was collected and evaporated to dryness by using vacuum distillation unit. The methanol extract thus obtained was then subjected to GC-MS analysis.

GC-MS analysis

The leaves of *P. stratiotes* sample with bio-activity were selected to perform the gas chromatography-mass spectrometry (GC-MS) analysis. The samples were prepared for GC-MS analysis by following procedure. 50g of powdered sample was dissolved in 50ml of methanol. One micro liter of sample was injected into the gas chromatography (GC Thermo, Trace Ultra 5.0, Thermo MS DSQ II). Separation of compound was achieved using ZB5 MS Column (30 mts x 0.25mm x 0.25 micro m). The oven temperature was elevated from 70°C to 260°C at a rate of $6^\circ\text{C}/\text{min}$. The carrier gas Helium was passed through at a flow rate of 1.0 ml/min. The run time was 3.15 to 43.02 minutes. The compounds are identified with the help of NIST Libraries based on their molecular mass.

3. Results

GC-MS is one of the best techniques to identify the active plant extract. GC-MS of methanolic extract of *P. stratiotes* showed peaks indicates the presence of seven phytochemical constituents. In the present study, the phytochemical constituents of *P. stratiotes* were successively extracted using methanolic solvents ranging in polarity (33) Table (1) showed activity of phytocomponents identified in the methanolic extract of *P. stratiotes*. These various phytochemical properties which contributes to the medicinal activity of the plant, where the medicinal activity includes anti-inflammatory property, anti-microbial property, anti-oxidant property, anti-diuretic property and anticancer property, and

the phytochemical includes aroma agent, vitamin E, vitamin K, vitamin D, carcinogens, steroid hormones and cholesterol. And also active principles of methanolic extract of *P. stratiotes* phytochemicals are detected with their retention time (RT), molecular formula, molecular weight (MW) and concentration (%) were presented in Table (2). They were identified as Trideutero methyl ethyl ether (5.62%),

Tetradecane (2.83%), Trans-2-fluoro-3-(trimethylsilyl) octanolide (3.66%), Phytol acetate (4.20%), 2-Hexadecan-1-01, 3,7,11,15-tetramethyl (11.27%), Glycerol 1-Palmitate (5.64%) and 2,6,10,14,18,22-Tetra-Cosahexane (3.31%) respectively and their RT, MW concentration were 4.63, 60, 5.26, 9.60, 198, 2.83, 15.94, 232, 3.66, 18.65, 3.38, 4.20, 25.15, 296, 11.27, 32.83, 330, 5.64, 36.80, 410 and 3.31 respectively.

Table 1: Activity of Phyto-components identified in the methanol extract of *Pistia stratiotes*

S.No.	Name of the compound	Molecular Formula	Activity
1	Trideutero Methyl Ethyl Ether	C ₃ H ₅ D ₃ O	Anti inflammatory and antioxidant
2	Tetradecane	C ₁₄ H ₃₀	Anti microbial
3	Trans-2-fluoro-3-(trimethylsilyl) Octanocide	C ₁₁ H ₂₁ FO ₂ Si	Aroma agent/ Flavoring agent
4	Phytol, acetate	C ₂₂ H ₄₂ O ₂	Vitamin E, Vitamin K
5	2-Hexadecan-1-01, 3, 7, 15-tetramethyl (R-[R*, R*-E])-(CAS)	C ₂₀ H ₄₀ O	Anti-inflammatory, Anti oxidant, Immunomodulatory, Anti-diuretic and Anti-cancer
6	Glycerol 1- Palmitate	C ₁₉ H ₃₈ O ₄	Metabolic responses to hepatotoxicants and carcinogens
7	2,6,10,14,18,22 Tetracosahexane	C ₃₀ H ₅₀	Steroid hormones, Cholesterol, Vitamin D

Table 2: Phyto-components detected in the methanol extract of leaf *Pistia stratiotes*

S. No.	RT	Name of the compound	Molecular Formula	MW	Peak Area %
1	4.63	Trideutero Methyl Ethyl Ether	C ₃ H ₅ D ₃ O	60	5.62
2	9.60	Tetradecane	C ₁₄ H ₃₀	198	2.83
3	15.94	Trans-2-fluoro-3-(trimethylsilyl) Octanocide	C ₁₁ H ₂₁ FO ₂ Si	232	3.66
4	18.65	Phytol, acetate	C ₂₂ H ₄₂ O ₂	338	4.20
5	25.15	2-Hexadecan-1-01, 3, 7, 15-tetramethyl (R-[R*, R*-E])-(CAS)	C ₂₀ H ₄₀ O	296	11.27
6	32.83	Glycerol 1- Palmitate	C ₁₉ H ₃₈ O ₄	330	5.64
7	36.80	2,6,10,14,18,22 Tetracosahexane	C ₃₀ H ₅₀	410	3.31

4. Discussion

This study demonstrate that GC-MS analysis of methanolic extract of *P. stratiotes* reveals the presence of fatty acids and antioxidants compounds. Based on this study, it can be concluded that methanolic extract of *P. stratiotes* was good source of natural antioxidants. Medically it has antiseptic, antitubercular, antidysenteric, anti-eczema, anti-leprosy, anti-ulcers, anti-piles, anti-syphilis, anti-kidney afflications, anti-anemic, anti-hematuria properties and anti-bladder compounds. Leaves are rich in vitamin A, C and B. GC-MS is the best technique to discover the bioactive constituents of long chain hydrocarbons, alcohols, acids, esters, alkaloids, steroids, amino acid and nitro compounds [6]. Similarly the present seven compounds have been identified from methanolic extract of the stem of *P. stratiotes* by Gas chromatography-Mass spectrometry (GC-MS) analysis. Among the identified phytochemicals: antioxidant, and vitamin A, C and B had the property of nutritional activity. The herbal products: Stressor-I and Stressor-II enriched Artemia fed with *Penaeus indicus*, the growth and efficiencies are significantly increased and reduces the osmotic stress [2]. The growth performance, diet utilization efficiency and haematological indices in the *Oreochromis niloticus* fingerlings significantly enhanced with dietary ginseng herb (Ginsana G115) [1]. Immuno-medicinal plants have ability to inhibit the generation of oxygen anions and to scavenge free radicals. The best example explained that *Picrorhizakurooa* which is used as antistress compound for shrimps. In the same way immunostimulant is a chemical drug, stressor (or) action. The immunostimulant enhances the defense mechanisms (or) immune response. The herbal growth promoters help to induce

the transcription rate, this process lead to increased RNA, total amino acid and finally increase production of proteins in the cells [3].

5. Conclusion

Based on the study, GC-MS is frequently applied to characterize the chemical complexity of analytical sample based on its separation and identification capacity. Recent developments in GC-MS technology have facilitated global metabolomics approaches in order to approach biological functions and perturbations of biological systems and for diagnostics and quality assessment purposes. However, isolation of individual phytochemical constituents and subjecting it to biological activity will definitely give fruitful results. Therefore, it could be concluded that *P. stratiotes* contains various bioactive compounds.

6. Reference

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