ABSTRACT

Objective: The objective of this study was to analyze GC–MS analysis of whole plant methanolic extract of Dryopteris hirtipes from Dryopteridaceae family.

Methods: Gas chromatography and mass spectrometry analysis of whole plant extract was carried out with instrument GC–MS.

Results: The methanolic extract of D. hirtipes reveals to identify more known and unknown bioactive compounds. In this study, seven major bioactive compounds were identified such as Stigmast-5-en-3-ol(56.65%), Phytol (5.39%), Lanost -8-en-3-ol-(3 β)(3.18%), Neophytadiene(2.68%), Tri-o-trimethylsilyl N-heptafluorobutyryl derivative of terbutaline(2.19%), 1H-Imidazole 2-methanol(1.28%), and 8A-(2,4-Dimethyl-1-nitro-o-pent-2-yl) dioxytocopherol(1.0%) and low concentrations of compounds like hexadecanoic acid(0.6%).

Conclusion: These identified compounds are having active pharmacological properties such as antimicrobial property, hypotension, anti-inflammatory, anti-tumor, anti-cancer, anti-hepatitis, analgesic, and antipyretic properties. However, D. hirtipes is a rare pteridophyte and used to cure many diseases, and so there need further studies to isolate and identify the specific active compounds present in it.

Keywords: Gas chromatography–mass spectrometry, Dryopteris hirtipes, Pteridophytes, Bioactive compounds.
Table 1: GC–MS Analysis in methanolic extract of D. hirtipes

| S. No. | RT  | Name of the compound                       | Molecular formula | Molecular weight | Area % | Biological reports                                           |
|--------|-----|---------------------------------------------|-------------------|------------------|-------|-------------------------------------------------------------|
| 1      | 16.271 | Neophytadiene                              | C_{20}H_{38}O_{20} | 278.524         | 2.68  | Analgesic, antipyretic, anti-inflammatory, antioxidant, and antimicrobial activity |
| 2      | 18.965 | Phytol                                     | C_{20}H_{40}O_{20} | 128.1705        | 5.39  | Antimicrobial, anticancer, anti-inflammatory activity        |
| 3      | 22.433 | 1H-Imidazole-2-methanol                    | C_{4}H_{6}N_{2}O_{2} | 98.10           | 1.28  | Antihypertensive, anti-inflammatory                          |
| 4      | 24.161 | Stigmast-5-en-3-ol                         | C_{29}H_{50}O_{20} | 414.718         | 56.65 | Act as hypotension, reduce blood glucose level, antiarthritics, antiulcer activity |
| 5      | 24.679 | 8A-(2,4-dimethyl-1-nitrilo-pent-en-yl)dioxy| C_{40}H_{67}NO_{4} | 625.973         | 1.0   | Antioxidant property                                        |
| 6      | 24.791 | Lanost-8-en-3-ol(3 beta)                   | C_{30}H_{52}O_{20} | 428.733         | 3.18  | Anti-inflammatory, antitumor, anti-cancer, anti-hyper, lipidaemia, antihepatitis |
| 7      | 26.915 | Tri-o-trimethylsilyl N-heptafluorobutyl derivative of terbutaline | C_{12}H_{19}NO_{3} | 225.288         | 2.19  | Anti-inflammatory, antiasthma drug                           |

RESULTS AND DISCUSSION

Chromatogram of GC–MS studies on bioactive components in methanolic extract of D. hirtipes showed the presence of major seven compounds, and the other complex mixture components related to the peaks were determined. The active principles with their retention time (RT), molecular weight (MW), molecular formula, and concentration (Peak area %) in Table 1 and Figure 2. The most prevailing compounds found to be Stigmast-5-en-3-ol (56.65%), Phytol(5.39%), Lanost-8-en-3-ol(3.18%), Neophytadiene(2.68%), Tri-o-trimethylsilyl N-Heptafluorobutyl derivative of terbutaline (2.19%), 1H-Imidazole-methanol(1.8%), and 8A-(2,4-Dimethyl 1-nitrilo-pent-en-yl)dioxy) tocopherone (1.0%), bioactive compounds represented in Figure 3.
The diverse active components have been considered to have a wide range of activities which may be used to cure various diseases.

Stigmast-5-en-3-ol (56.65%) is a derivative of phytosterol and it has the tendency to reduce blood level of glucose, acts as anti-inflammatory, anti-pyretic, anti-arthritis, and anti-ulcer activity were reported in their findings [15-19]. Phytol (5.39%) is a diterpene with antimicrobial properties against many bacterial strains and also possesses antioxidant, anti-inflammatory properties in the methanolic extract of A. capillus-veneris [20,21] reported in ethanolic extract of Jatropha gossypifolia and also reported the bioactive compound in ethanolic extracts of Christella dentata [22]. Lanost-8-en-3-ol-3β, a steroid family, possess that anti-inflammatory, anti-tumor, anticancer, and anti-hepatitis activity were reported [23,24].

The presence of bioactive compound neophyadiene (2.68%) a hydrocarbons possess anti-inflammatory, antioxidant, and disinfectant activity which were reported [22,25,26] in their research findings. 1H-imidazole-2-methanol contains a special pharmacological properties such as antidepressants and anti-inflammatory properties which were identified and suggested their findings performed in benzene/ethanol extracts in oil tea cake [27].

8A-(2,4-Dimethyl-1-nitilo-pent-2-yl)-dioxy)-tocopherone components that it possess antioxidant property reported [28]. The phyto-components present in D. hirtipes may contribute the major proportion and trace amounts of compounds like hexadecanoic acid that possesses such as an analgesic, anti-inflammatory, antioxidant, anticancer, and antidepressants. These natural components should be explored for the beneficiary in the fields of medical and pharmacy.

CONCLUSION

In the present study, seven major known chemical constituents and some unknown chemical constituents have been identified from the whole plant in the methanolic extract of D. hirtipes Linn. In those, seven bioactive compounds show the medicinal properties to treat various ailments. Further investigation is required for the analysis of specified compounds in D. hirtipes which may lead to explore the development of the new drug to the society.

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AUTHORS’ CONTRIBUTIONS
The author processed the main concepts of this work, experimental data design, drafted the manuscript, interpreting results, and discussion and submit the corrected version to be published.

CONFLICTS OF INTEREST
The author declares that there are no conflicts of interest regarding the publication of this site.

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