Original Article

The GC-MS Study of the Ayurvedic Formulation "Dhanwantharam Thailam" Used for Rheumatism

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ABSTRACT

Background: The scientific validity of contemporary and alternative medicinal practices, such as Ayurveda and Siddha, holds significant importance in today's context. **Aim and Objective:** The present study employs gas chromatography-mass spectrometry (GC-MS) analysis to investigate a pain-relieving Ayurvedic oil, Dhanwantharam Thailam, aiming to establish correlations between its medicinal activity and the biomolecules it contains. **Materials and Methods:** Procured sample from a reputable Ayurvedic vendor in Chennai, Dhanwantharam Thailam underwent GC-MS analysis using standard procedures. **Results and Discussion:** The resulting profile revealed the presence of crucial molecules like oleic acid, dodecanoic acid, 1,2,3-propanetriyl ester, ethenyl ester, and 9,12-octadecadienoyl chloride (Z, Z), aligning with the medicinal properties attributed to Dhanwantharam Thailam. **Conclusion:** The identification of these biomolecules supports the role of Dhanwantharam Thailamas an effective pain-relieving oil.

KEYWORDS: *1, 2, 3-propanetriyl ester, ayurvedic, Dhanwantharam Thailam, dodecanoic acid, GC-MS, oleic acid*

INTRODUCTION

Although medical science is advancing rapidly, the sufferings of the population the world over have not decreased. This is due to the advent of resistant microbes,

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severe side effects of molecular medicines, unaffordable costs of treatment, and other factors like pollution, food habits, etc., Thus, there is an obvious need to remove this lacuna by subjecting these medicines to thorough tests in light of modern research about their pharmacological, pharmacokinetic, and toxicity standards. There is existing literature on this approach, and further research in this area is deemed necessary.[1] The current investigation focuses on exploring the molecular composition and potential therapeutic role of Dhanwantharam Thailam, an Ayurvedic oil, through gas chromatography-mass spectrometry (GC-MS) analysis. Dhanwantharam Thailam is recognized for its anti-inflammatory, analgesic, anti-rheumatic, and nervine tonic properties, particularly for Vata and Kapha mixed with Vata conditions. Its applications include treating conditions such as rheumatoid arthritis, osteoarthritis, spondylitis-induced neck and back pain, as well as neurological issues like neuritis, neuralgia, paralysis, and facial palsy. The oil is utilized for massages in women and children and incorporated into Ayurvedic treatments like Dhara and Basti.[2]

Internally, it is recommended to alleviate fever, bloating, and urinary diseases, and it has reported benefits in treating infertility.[3] The preparation of Dhanwantharam Thailam follows the Ayurvedic treatise Sahasrayoga Tailayoga Prakarana 1, Ashtanga Hridayam.

The ingredients of Dhanwantharam Thailam include *Sida cordifolia* root (4.608 kg) the main ingredient, boiled with 36.64 L of water and reduced to 4.608 L. Then, cow milk (4.608 L) is added. Various plants and plant parts, such as *Hordeum vulgare, Ziziphus jujube, Dolichos biflorus,* Dashamoola (a group of ten roots), *Aegle marmelos, Premna mucronata, Oroxylum indicum, Stereospermum suaveolens, Gmelina arborea, Solanum indicum, Solanum xanthocarpum, Tribulus terrestris, Desmodium gangeticum,* and *Uraria picta*, are taken in equal parts to make a total weight of 768 grams. These are boiled with 6.144 L of water to reduce to 768 ml.

A paste is made from 6 g each of various ingredients, including *Polygonatum cirrhifolium, Polygonatum verticillatum, Cedrus deodara, Rubia cordifolia, Fritillaria roylei, Lilium polyphyllum, Pterocarpus santalinus, Hemidesmus indicus, Saussurea lappa, Valeriana wallichii, Malaxis acuminate, Manilkara hexandra,* rock salt*, Convolvulus pluricaulis, Acorus calamus, Aquilaria agallocha, Boerhavia diffusa, Withania somnifera, Asparagus racemosus, Ipomoea mauritiana, Glycyrrhiza glabra, Terminalia chebula, Terminalia bellirica, Emblica officinalis, Teramnus labialis, Phaseolus trilobus, Elettaria cardamomum, Cinnamomum camphora*, and *Cinnamomum tamala* in *Sesamum indicum* oil.

These constituents are mixed and heated until the oil is formed. After cooling, the oil is filtered and packed. If the process is repeated 101 times, the resulting product is known as Dhanwatara Thaila Avatarana, which is intended for ingestion under the strict supervision of a specialist. Manufacturers of this thaila include Arya Vaidya Sala – Kottakkal, Pankajakasthuri.

Materials and Methods

Dhanwantharam Thailam was obtained from a reputable Ayurvedic vendor located in Chennai. Ensuring the authenticity and standard quality of the product is crucial for accurate analysis. The GC-MS analysis was conducted using the Agilent GC system (model: G3440A) coupled with a mass spectrometry detector (model: 7000 Triple Quad GC/MS). The gas chromatograph separated the components of the sample based on their volatility. The GC conditions, such as temperature programming and flow rates, were optimized for efficient separation. The mass spectrometer, a model 7000 Triple Quad GC/MS, detects and identifies individual compounds based on their mass-to-charge ratio. It provides detailed information about the molecular structure of the components present in the sample. The analysis followed a standard procedure, ensuring consistency and reliability in the results. Standard operating protocols for sample preparation, injection, chromatographic separation, and mass spectrometric detection were adhered to throughout the experiment. The results obtained from the GC-MS analysis were interpreted by comparing the retention times in the National Institute of Standards and Technology (NIST) and WILEY libraries to identify the specific biomolecules present in Dhanwantharam Thailam.

Results

The GC-MS profile of Dhanwantharam Thailam provides comprehensive details such as retention time, potential compound types, molecular formulae, molecular mass, and percentage peak area as depicted in the GC-MS profile. Metabolite identification was accomplished by cross-referencing retention time and fragmentation patterns with mass spectra from the NIST spectral library stored in the GC-MS software (version 1.10 beta, Shimadzu). Additionally, the pharmaceutical roles of each biomolecule were determined by consulting Dr. Duke's Phytochemical and Ethnobotanical Database (National Agriculture Library, USA) and other relevant sources, as outlined in Table 1.[4]

Table 1: Indicates the details of the GC-MS profile of Dhanwantharam Thailam

Retention time	Molecules	Medicinal role
16.239	Oleic acid	Acidifier, acidulant, arachidonic acid inhibitor increase aromatic amino acid decarboxylase activity and inhibit the production of uric acid.
17.63	9,12-octadecadienoyl chloride (Z, Z)	Increases zinc bioavailability and zinc provider
18.443	Dodecanoic acid and 1,2,3-propanetriyl ester	Acidifier, acidulant, arachidonic acid inhibitor increase aromatic amino acid decarboxylase activity and inhibit the production of uric acid.
18.683	Dodecanoic acid and ethenyl ester	Acidifier, acidulant, arachidonic acid inhibitor increase aromatic amino acid decarboxylase activity and inhibit the production of uric acid.
20.404	Heptasiloxane, 1,1,3,3,5,5,7,7,9,9,11,11,13,13-tetradecamethyl-	Not known
20.709	1,3-Benzodioxole, 5,5'-(tetrahydro-1H,3H-furo[3,4-c] furan-1,4-diyl) bis-, [1S-(1.alpha.,3a.alpha.,4.beta.,6a.alpha.)]-	Not known
21.096	Carbamic acid, N-[1,1-bis (trifluoromethyl) ethyl]-, 4-(1,1,3,3-tetramethylbutyl) phenyl ester	Not known
23.03	Dodecanoic acid and 1,2,3-propanetriyl ester	Acidifier, acidulant, arachidonic acid inhibitor increase aromatic amino acid decarboxylase activity, and inhibit the production of uric acid.

Discussion

The integration of Ayurvedic knowledge with modern GC-MS analysis serves as a model for bridging traditional wisdom and scientific exploration. This has implications for the development of integrative healthcare approaches that combine the strengths of traditional medicine with evidence-based practices. The presence of some important molecules such as oleic acid, 1,2,3-propanetriyl ester, dodecanoic acid, ethenyl ester, dodecanoic acid, and 1,2,3-propanetriyl ester have similar properties such as acidifier, acidulant, arachidonic acid inhibitor, increase aromatic amino acid decarboxylase activity, inhibit the production of uric acid, and the above properties are acclaim to be its medicinal uses. The inhibition of arachidonic acid renders the inactivation of Cox 1 and Cox 2 enzymes, thus stopping the synthesis of prostaglandins. Thus, these molecules present in Dhanwantharam Thailam function as non-steroidal anti-inflammatory drugs (NSAIDs), thus reducing pain. The molecules 9,12-octadecadienoyl chloride (Z, Z) has properties such as increased zinc bioavailability and zinc provider. An increase in aromatic amino acid decarboxylase activity leads to an increase in the production of catechol amines, which causes mood elevation, stress relief, and increased blood circulation in the affected areas due to inflammation or arthritis easing, the pain and inflammation. It is interesting to find that this thailam is made of so many plants, but only a few molecules are observed in the GC-MS, and their mechanism of action is almost similar. The use of so many ingredients is enigmatic and further probe into the mechanism of action is warranted.

Dhanwantharam Thailam's traditional uses are deeply rooted in Ayurvedic principles, as described in classical Ayurvedic texts. It is specifically formulated to balance the Vata and Kapha doshas, making it invaluable for musculoskeletal disorders and neurological conditions.[5] The chemical composition of Dhanwantharam Thailam such as oleic acid, dodecanoic acid, and 9,12-octadecadienoyl chloride (Z, Z), aligns with its traditional uses and therapeutic efficacy.[6] Dhanwantharam Thailam is extensively utilized in Ayurvedic therapies, including massages for women and children, Dhara, and Basti. Its application in these therapeutic procedures underscores its versatility and efficacy in promoting overall well-being.[7] In conclusion, Dhanwantharam Thailam's importance is underscored by its rich traditional heritage, therapeutic versatility, and scientific validation, as evidenced by references from classical Ayurvedic texts and contemporary research studies.

Conclusion

Dhanwantharam Thailam's importance lies in its multifaceted therapeutic applications, dosha-balancing properties, traditional formulation rooted in Ayurvedic principles, and potential contribution to integrative healthcare practices. Its rich history and diverse benefits make it a cornerstone of the holistic approach to health and well-being. Dhanwantharam Thailam is validated mostly as non-steroidal anti-inflammatory molecules by its GC-MS analysis for overall improvement of the affected areas by reducing pain and inflammation.

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Conflicts of interest

There are no conflicts of interest.

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