Research Article

Gas chromatography/mass spectrometry analysis of one Ayurvedic skin oil, Eladi Kera Thailam

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ABSTRACT

Introduction: This study aims to know the types of biomolecules present in Eladi Kera Thailam and to correlate their possible medicinal roles supporting Eladi Kera Thailam's role as medicine. **Methods:** Eladi Kera Thailam was bought from a standard Ayurvedic vendor at Chennai and subjected to gas chromatography/mass spectrometry (GC/MS) analysis by standard procedures. The medicinal roles of the biomolecules indicated in the GC/MS profile were screened for their various medicinal roles using Dr. Duke's phytochemical and ethnobotanical data and other data. **Results:** The presence of some important biomolecules such as dodecanoic acid, 2,3-dihydroxypropyl ester, dodecanoic acid, 2-hydroxy-1-(hydroxymethyl) ethyl ester, octadecanoic acid, 2,3-dihydroxypropyl ester, and dodecanoic acid, 1,2,3-propanetriyl ester does have medicinal roles which contribute to Eladi Kera Thailam as a medicine for skin ailments. **Conclusions:** The GC/MS profile indicated the presence of some important biomolecules which have medicinal properties contributing to the role of Eladi Kera Thailam as a skin cure medicine. The study is a step in the direction of understanding the molecular mechanism of contemporary and alternative medicines.

KEY WORDS: 1,2,3-propanetriyl ester, 2,3-dihydroxypropyl ester and dodecanoic acid, 2,3-dihydroxypropyl ester, 2-hydroxy-1-(hydroxymethyl) ethyl ester, Dodecanoic acid, Eladi Kera Thailam, Gas chromatography/mass spectrometry, Octadecanoic acid

INTRODUCTION

Due to advent of multidrug-resistant microbes, severe side effects of molecular medicines, and lack of affordability due to their high costs of these medicines, there is an urgent need to understand the molecular mechanism of the action of Ayurvedic and other forms of alternative medicines to bring them to the mainstream of medicinal practices. Slowly, there has been some work coming up in this regard and more and reports are pouring in, which is welcome sign.[1-11] The present study is a step in this direction, which deals with the gas chromatography/mass spectrometry (GC/MS) analysis of one Ayurvedic oil, known as, Eladi Kera Thailam.

Eladi Kera Thailam is used for the treatment of skin diseases such as urticarial, scabies, itches, ringworm infection, and allergic dermatitis for external application only. This medicine is prepared using as many as 26 plants and plant parts known as Kalka Dravyas, which are ground to fine powder one part each. The names of the plants are mentioned below. *Elettaria cadamomum*, *Amomum subulatum*, *Hydnocarpus laurifolia*, *Saussurea lappa*, *Callicarpa macrophylla*, *Nardostachys jatamansi*, *Coleus zeylanicum*, *Anisomeles malabarica*, *Angelica archangelica*, *Cinnamomum zeylanicum*, *Valeriana wallichii*, *Taxus baccata*, *Myristica fragrans*, *Commiphora myrrha*, *Ostrea edulis*, *Capparis sepiaria*, *Cedrus deodara*, *Aquilaria agallocha*, *Pinus longifolia*, *Crocus sativus*, *Costus speciosus*, *Commiphora mukul*, *Shorea robusta*, *Boswellia serrate*, *Calophyllum inophyllum,* and *Mesua ferrea*.

The powders are mixed with 416 parts water to make a paste. Coconut oil, 104 parts, is mixed with the kalka paste and heated gently till the water gets evaporated. It is cooled and filtered to get pure Eladi Kera Thailam.

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METHODS

Eladi Kera Thailam was obtained from standard Ayurvedic vendor at Chennai and was subjected to GC/MS analysis by standard procedure.

Instrument: GC (Agilent: GC: (G3440A) 7890A. MS/MS: 7000 Triple Quad GC/MS) was equipped with MS detector.

Sample Preparation

One hundred microliter sample dissolved in 1 ml of suitable solvents. The solution stirred vigorously using vortex stirrer for 10 s. The clear extract was determined using GC for analysis.

GC/MS Protocol

The GC MS column: Column DB5 MS (30 mm × 0.25 mm ID × 0.25 µm, composed of 5% phenyl 95% methyl poly siloxane), Electron impact mode at 70 eV; helium (99.999%) was used as carrier gas at a constant flow of 1 ml/min injector temperature 280°C; axillary temperature: 290°C; and ion source temperature 280°C.

The oven temperature was programmed from 50°C (isothermal for 1.0 min), with an increase of 40°C/min, to 170°C (isothermal for 4.0 min), then 10°C/min to 310°C (isothermal for 10 min) fragments from 45 to 450 Da. Total GC running time is 32.02 min. The compounds are identified by GC/MS Library (National Institute of Standards and Technology and Wiley).

RESULTS

Table 1 indicates the details of GC/MS profile of Eladi Kera Thailam. Figure 1 indicates the GC/MS graph representing the various peaks corresponding to each molecule present in the oil. Table 2 indicates the medicinal values of each compound observe in the GC/MS profile of Eladi Kera Thailam.

The GC/MS profile of Eladi Kera Thailam indicated important biomolecules such as dodecanoic acid, 2,3-dihydroxypropyl ester, dodecanoic acid, 2-hydroxy-1-(hydroxymethyl) ethyl ester, octadecanoic acid, 2,3-dihydroxypropyl ester, and dodecanoic acid, 1,2,3-propanetriyl ester. All these molecules have almost similar medicinal roles such as acidifier, arachidonic acid inhibitor, increase aromatic amino acid carboxylase activity, and inhibit production of uric acid. Dodecanoic acid, 2-hydroxy-1-(hydroxymethyl) ethyl ester, however, is indicated to have additional medicinal roles such as 17-beta-hydroxysteroid dehydrogenase inhibitor, aryl hydrocarbon hydroxylase inhibitor, and testosterone hydroxylase inducer.

Production of allergic reactions and inflammation in the body is due to the synthesis of prostaglandins using arachidonic acid precursors by two enzymes, Cox 1 and Cox 2. These enzymes are activated, whenever there is a production of pro-inflammatory cytokines or ROS due to injury or infection. The molecules mentioned above inhibit arachidonic acid, thus preventing skin allergy and inflammation.

Similarly, the decarboxylation of L-Dopa and 5-hydroxytryptophane by increased aromatic amino acid carboxylase activity by the molecules present in Eladi Kera Thailam leads to the formation of catecholamines such as dopamine, norepinephrine, epinephrine, and serotonin which increase the blood circulation in the affected areas, reducing allergic reaction, itching, inflammation, and pain.

17-beta-hydroxysteroid dehydrogenase enzymes help in the formation of steroid hormones, both estrogens and androgens, from their precursors in different cells and tissues. Steroids function as anti-inflammatory and anti-allergic by acting on the immune system and often used for extreme cases such as asthma and arthritis. The presence of dodecanoic acid, 2-hydroxy-1-(hydroxymethyl) ethyl ester in Eladi Kera Thailam works as an inhibitor of 17-beta-hydroxysteroid dehydrogenase, thus reducing or stopping the formation of steroids, thus saving the immune system of adverse side effects of steroids.

Aryl hydrocarbon hydroxylase is an enzyme which converts the polycyclic hydrocarbons to their carcinogenic counterparts. The presence of Dodecanoic acid, 2-hydroxy-1-(hydroxymethyl) ethyl ester, in Eladi kera thailam functions as an inhibitor for this enzyme, thus protecting the skin from the xenobiotics which are usually present in the body due to food, pollution, drugs etc. Another role of this molecule is as testosterone hydroxylase inducer, which works to eliminate the role of testosterone, again a steroid.

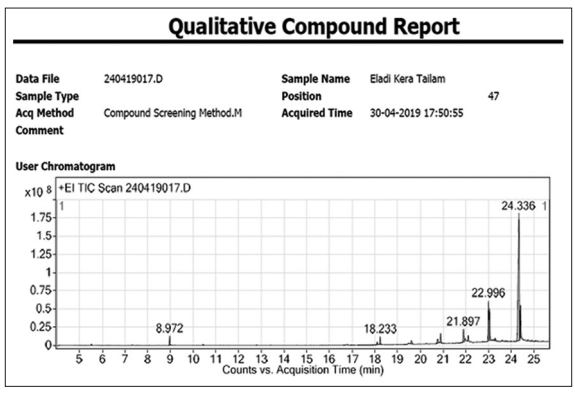

Figure 1: The gas chromatography/mass spectrometry graph of Eladi Kera Thailam with various important peaks

Table 1: The types of molecules, retention time, peak area, peak height, and molecular mass of the GC/MS graph obtained for Eladi Kera Thailam

Retention time	Name of molecule	Area	Height	Mass
8.97	Dodecanoic acid	19,062,886	12,760,844	200.2
18.10	Prylic anhydride	7,102,125	3,726,977	270.2
18.23	Dodecanoic acid, 2,3-dihydroxypropyl ester	19,449,321	10,766,505	274.2
20.89	Dodecanoic acid, 2-hydroxy-1-(hydroxymethyl) ethyl ester	27,180,057	13,201,153	456.4
21.90	Azacyclohexane, 1-BOC-3-formamide	45,518,776	17,891,829	228.1
22.11	Octadecanoic acid, 2,3-dihydroxypropyl ester	17,891,829	7,735,219	358.3
23.05	Dodecanoic acid, 1,2,3-propanetriyl ester	93,177,662	43,664,429	638.5
23.29	Heptasiloxane, 1,2,3,3,5,5,7,7,9,9,11,11,13,13-tetradecamethyl-	9,124,653	3,439,143	504.2
24.40	Lauric anhydride	52,436,875	43,604,557	382.3

GC/MS: Gas chromatography/mass spectrometry

Table 2: The types of molecules present in the GC/MS profile of Eladi Kera Thailam and their possible medicinal roles

Name of the molecule	Possible medicinal roles
Caprylic anhydride	Not known
Dodecanoic acid, 2,3-dihydroxypropyl ester	Acidifier, acidulant, arachidonic acid inhibitor, increase aromatic amino acid carboxylase activity, inhibits production of uric acid
Dodecanoic acid, 2-hydroxy-1-(hydroxymethyl) ethyl ester	17-beta-hydroxysteroid dehydrogenase inhibitor, aryl hydrocarbon hydroxylase inhibitor, testosterone hydroxylase inducer, acidifier, arachidonic acid inhibitor, increase aromatic amino acid carboxylase activity, inhibits production of uric acid
Azacyclohexane, 1-BOC-3-formamide	Not known
Octadecanoic acid, 2,3-dihydroxypropyl ester	Acidifier, acidulant, arachidonic acid inhibitor, increase aromatic amino acid carboxylase activity, inhibits production of uric acid
Dodecanoic acid, 1,2,3-propanetriyl ester	Acidifier, acidulant, arachidonic acid inhibitor, increase aromatic amino acid carboxylase activity, inhibits production of uric acid
Heptasiloxane, 1,2,3,3,5,5,7,7,9,9,11,11,13,13-tetradecamethyl-	Not known
Lauric anhydride	Not known

GC/MS: Gas chromatography/mass spectrometry

Thus, it is clear that Eladi Kera Thailam does contain some important biomolecules which serve the purpose, for which this medicine is made. It is enigmatic as to why so many herbs are used for the preparation of this oil although only few compounds are indicated in the GC/MS profile. It is interesting to further probe into the representative role of each herb vis-a-vis the role of the medicine. This medicine is an example of the synergistic and holistic effect of so many herbs toward one ailment.

There is a dearth of reports on this aspect of this oil. Lakshmi, 2014, reported the case history of the hypersensitivity of this oil on one patient.[12] Tambekar and Dahikar, 2010, have reported the antibacterial potential of some Ayurvedic preparations.[13] The present workers are also working in this regard on some other Ayurvedic oils.

CONCLUSIONS

Thus, from the above discussion, it is clear that Eladi Kera Thailam contains some very important biomolecules which clearly indicate its role as an effective remedy for skin ailments.

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