

# Preparation and Standardization of Siddha Herbal Formulation *Bhavana Panchankula Thailam*

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## ABSTRACT

**Introduction:** Antenatal period is an important phase in women's life. Antenatal care is significant to ensure the pregnant women and her foetus are in good health. Certain food and behaviour may affect her pregnancy. Siddha system of medicine assures good antenatal care. According to Siddha literature *Theraiyar Thaila Varga Churukkam*, have quoted many thailam preparations for both internal and external use. *Bhavana Panchankula Thailam* which is one among them is specially indicated for antenatal care and also for various other diseases like *Ganachudu*, *Karupachudu*, *Siruneer Paathai Thabitham*, *Sarrira Varatchi*, *Marunthugalin Ushnam* and *Malachikal*. The aim of the study is to standardize the components of *Bhavana Panchankula Thailam*.

**Aim:** To validate the components of *Bhavana Panchankula Thailam* and interpret the components with possible medical roles.

**Materials and methods:** *Bhavana Panchankula Thailam* was prepared as per Siddha literature. The oil was analyzed by using physico-chemical analysis, FT-IR, ICP-OES, and GC-MS.

**Result and Conclusion:** Characterization plays a major role to identify the nature of the drug by physico-chemical analysis, FT-IR analysis shows the presence of functional groups, ICP-OES for presence of heavy metals. The instrumental analysis GC-MS study for "*Bhavana Panchankula Thailam*" shows the presence of Free Fatty Acids.

**Keywords:** *Bhavana Panchankula Thailam*, GC-MS, Free Fatty Acids, physico-chemical analysis, FT-IR, ICP-OES.

## INTRODUCTION

Siddha medicine is one of the most ancient medical systems of India. Siddha is the mother medicine of ancient Tamil's of peninsular South India. The word siddha means established truth. The persons who were associated with establishing such a siddha school of thought were known as Siddhars. They recorded their mystic findings in medicine, yoga and astrology in tamil. Fundamental principles of siddha include theories of five elements (*Aimbootham*), and 3 humoral forces (*Mukuttam*). The eight methods of examination (*Envagai Theruvugal*) are used to determine diagnosis, etiology, treatment and prognosis. Siddhars were of the concept that a healthy soul can only be developed through a healthy body. So, they developed methods and medication that are believed to strengthen their physical body thereby their souls. Modes of siddha treatment include 32 types of internal medicines and 32 types of external applications. Herbal drugs are given in the forms like *Chooranam*, *Leghiyam*, *Maathirai*, *Thailam*, and mineral preparations in the form of *Parpam*, *chenthuram*. External methods like *Thokkanam*, and surgical methods like *Attaival* and *Karanool* are also used for treatment. There are various siddha medications have been formulated by siddhars for different pregnancy signs and symptoms. The most important among them is *Bhavana Panchankula thailam*; as mentioned in siddha text book (*Theraiyar*

*Thaila Varga Churukkam*) it helps in improvement of foetus health and growth. It is prescribed at a dosage of 10 ml (5ml in morning and 5ml in evening). This study is aimed at validating the components of *Bhavana Panchankula Thailam*.

## 2.MATERIALS AND METHODS

### 2.1 PREPARATION OF BHAVANA PANCHANKULA THAILAM:

**Table:1 Ingredients of Bhavana Panchankula Thailam**

S.No	Name of the drug	Tamil name	Botanical name	Part used	Quantity
1	Castor bean	Aamanakku	Ricinus communis	Seed	1kg
2	Aloe vera	Katralai	Aloe barbedensis	Gel	Sufficient quantity
3	King coconut	Sevilaneer	Cocus nucifera var.aurantiaca	Tender coconut water	4 kgs
4	Fermented rice water	Nisi neer			Sufficient quantity

Castor seeds were soaked in fermented rice water for a night, next day it is washed with pure water and sun dried. Then Aloe vera is smashed and juice is collected. sun dried castor seeds are then again soaked in Aloe vera juice for a day. Next day it is boiled,

strained and washed with pure water. Then it is dried in sun and smashed. To obtain oil one part of smashed seeds, four parts of tender coconut is added and boiled to get *Bhavana Panjankula Thailam* (fig.1)



**Fig:1, Preparation of Bhavana Panchankula Thailam**

### 2.2 PHYSICOCHEMICAL ANALYSIS

Physicochemical properties such as Density, Moisture, Acid Value, Free fatty acid, Colour, PH of *Bhavana Panchankula Thailam* was studied to evaluate the compositional quality of oil.

### 2.3 FT-IR ANALYSIS

Fourier Transform Infrared Spectrophotometer (FT-IR) is perhaps the most powerful tool for identifying the types

of chemical bonds/functional groups present in the phytochemicals. The wavelength of light absorbed is the salient feature of the chemical bonds seen in the annotated spectrum. By interpreting the infrared absorption spectrum, the chemical bonds in a compound can be determined.

### 2.4 ICP-OES ANALYSIS

Inductively Coupled Plasma Optical Emission spectroscopy (ICP-OES) is an

analytical technique used to determine how much of certain elements are in a sample. The ICP-OES principle uses the fact that atoms and ions can absorb energy to move electrons from the ground state to an excited state.

## 2.4 GC/MS ANALYSIS

GC/MS analysis, is an analytical method that combines the features of gas chromatography and mass spectrometry to identify different substances within a sample component matrix. GCMS analysis identifies the various constituents in *Bhavana Panchankula Thailam* and lists how much of each constituent is present as a percentage.

## 3 RESULTS

### 3.1 PHYSICO-CHEMICAL ANALYSIS OF BHAVANA PANCHANKULA THAILAM

[ Values are mean of three determinations  $\pm$  SEM]

Table: 2, Physico chemical analysis

S.no	Parameters	Values
1	Density	1.30 $\pm$ 0.150gm/cubic cm.
2	Moisture	8.90 $\pm$ 0.120%
3	Acid value	81.70 $\pm$ 0.21mg/g
4	Free fatty acid	35.20 $\pm$ 0.340%
5	Colour	Pale yellow
6	pH	6.90

### SEM-singularity expansion

### 3.2 FUNCTIONAL GROUP ANALYSIS OF BHAVANA PANCHANKULA THAILAM BY FTIR SPECTRUM

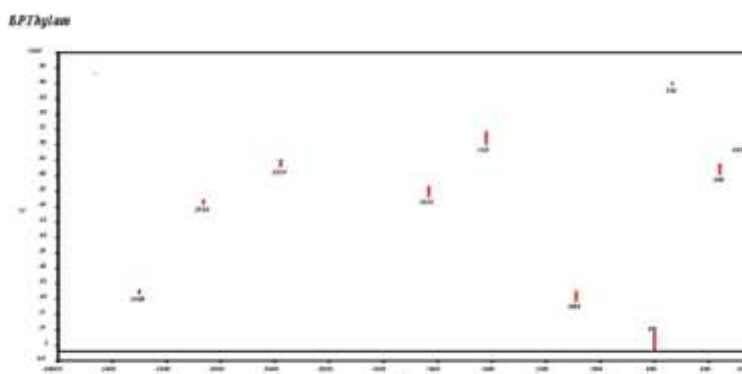


Fig: 2 FTIR analysis

Table: 3, FT-IR Interpretation of *Bhavana Panchankula Thailam*

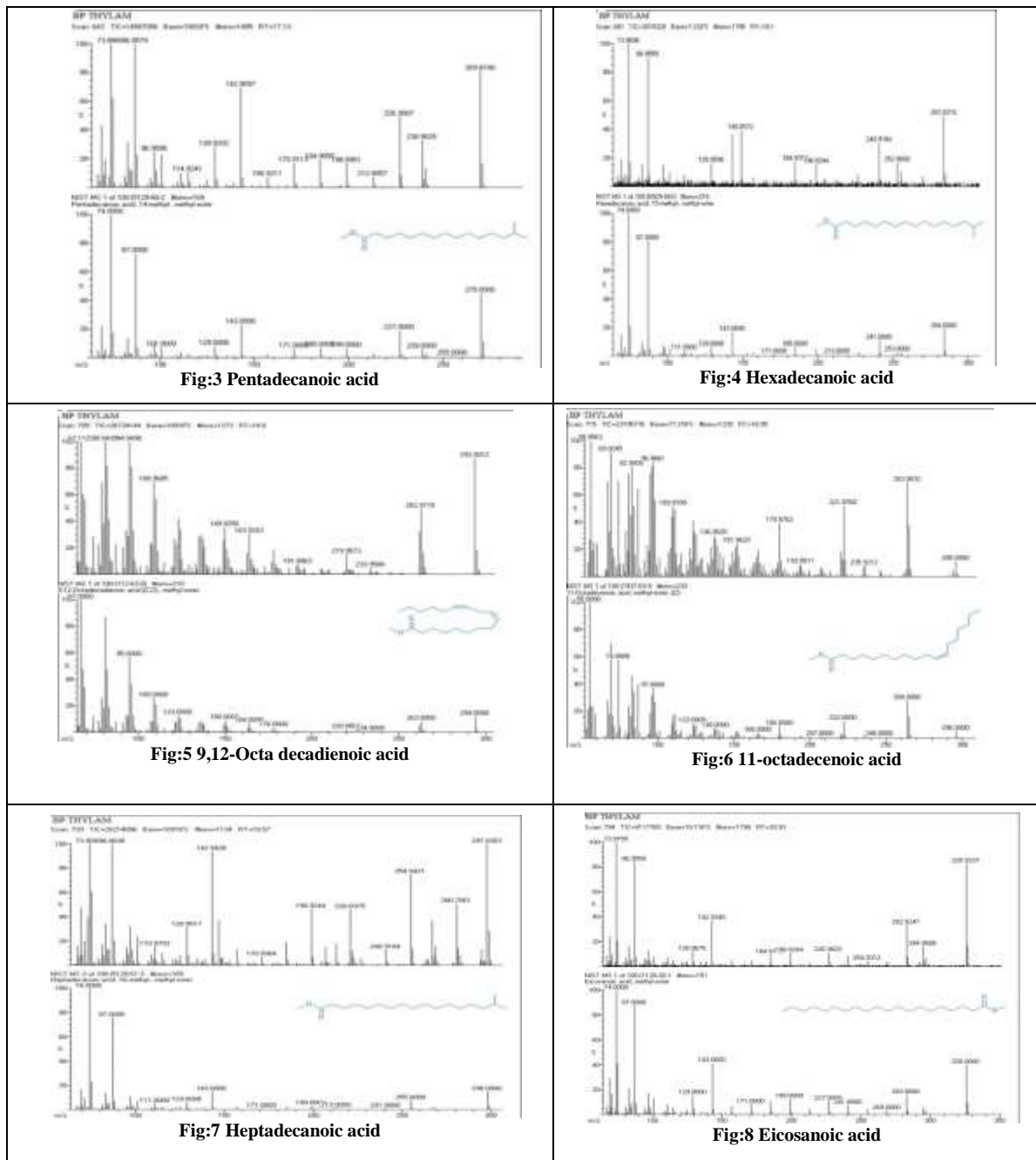
Peak	Frequency cm <sup>-1</sup>	Type of Vibrartion	Type of bond	Functional Group
482				Alkyl halides
560	690-515	Strong	C-Br	Alkyl halides
736	730-665	Strong	C=C Bending	Alkene
801	840-790	Medium	C=C Bending	Alkene
1090	1124-1087	Strong	C-O Stretching	Secondary Alcohol
1421	1440-1395	Medium	O-H Bending	Carboxylic Acid
1632	1650-1600	Medium	C=C Stretching	conjugated Alkene
2357	2400-2000	Strong	O=C=O Stretching	Carbon dioxide
2926	3000-2840	Medium	C-H Stretching	Alkane
3400	3400-3300	Medium	N-H Stretching	Aliphatic primary amine

### 3.3 ICP-OES OF BHAVANA PANCHANKULA THAILAM: (PERKIN ELMER OPTIMA 5300 DV ICP-OES)

**Table: 4, ICP-OES of Bhavana Panchankula Thailam**

ELEMENTS	ELEMENTS SYMBOL	WAVE LENGTH(mm)	CONCENTRATION
Aluminium	Al	396.152	BDL
Arsenic	As	188.979	BDL
Carbon	C	193.030	344.123mg/L
Calcium	Ca	315.807	BDL
Cadmium	Cd	228.802	BDL
Chlorine	Cl	725.670	BDL
Copper	Cu	327.393	BDL
Iron	Fe	238.204	BDL
Mercury	Hg	253.652	BDL
Lead	Pb	220.353	BDL
Phosphorous	P	213.617	126.341mg/L
Sulfur	S	180.731	01.254 mg/L

### 3.4 GAS CHROMATOGRAPHY- MASS SPECTROMETRY ANALYSIS OF BHAVANA PANCHANKULA THAILAM



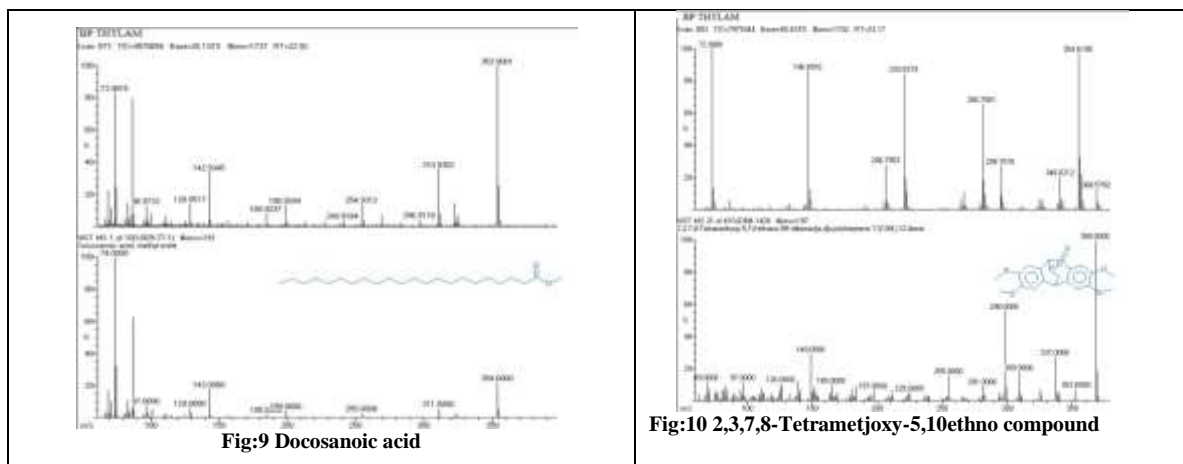


Table: 5, Free Fatty Acids of Bhavana Panchankula Thailam

RETENSION TIME	NAME OF THE MOLECULE	THE MOLECULAR FORMULA	MOLECULAR WEIGHT	BASE PEAK
17.13	Pentadecanoic acid, 14-methyl	C <sub>16</sub> H <sub>34</sub> O <sub>2</sub>	256.42	100%
18.1	Hexadecanoic acid, 15-methyl	C <sub>17</sub> H <sub>34</sub> O <sub>2</sub>	270.5	7.2%
18.8	9,12-Octadecadienoic acid (z,z)	C <sub>18</sub> H <sub>32</sub> O <sub>2</sub>	280.4	100%
18.95	11-Octadecenoic acid	C <sub>19</sub> H <sub>36</sub> O <sub>2</sub>	296.5	77.2%
19.07	Heptadecanoic acid, 16-methyl	C <sub>19</sub> H <sub>38</sub> O <sub>2</sub>	298.5	100%
20.93	Eicosanoic acid	C <sub>21</sub> H <sub>42</sub> O <sub>2</sub>	326.5	19.1%
22.92	Docosanoic acid	C <sub>23</sub> H <sub>46</sub> O <sub>2</sub>	354.6	26.1%
23.17	2,3,7,8-tetramethoxy-5,10-ethano-5H-dibenzo(a,d)cycloheptene-11(10H),12-dione			45.4%

4. DISCUSSION

PHYSICO-CHEMICAL ANALYSIS: The density of sample is 1.30±0.150 gm/cubic cm. The moisture of sample is 8.90+0.120%. The acid value of sample is 81.70+0.21mg/g. The colour of sample is Pale yellow. The pH of sample is 6.90.

ICP-OES ANALYSIS: ICP-OES analysis for the sample (*Bhavana Panchankula Thailam*) indicates the presence of elements with their concentration such as Carbon(344.123mg/L), Phosphorous(126.341mg/L), Sulphur (01.254 mg/L) and elements such as Aluminium, Arsenic, Calcium, Copper, Iron, Mercury and Lead are present below the detection (Table:4). In *Bhavana Panchankula Thailam* there are no presence of heavy metals and hence it is safe for the pregnant women for consumption.

FT-IR ANALYSIS: In the FT-IR spectra analysis, *Bhavana Panchankula Thailam* exhibits the peak value at the wave number of

482,560,736,801,1090,1421,1632,2357,2926,3400 having C-Br,C=C, Bending, C=C Bending, C-O Stretching, O-H Bending, C=C Stretching , O=C=O Stretching, C-Stretching, N-H Stretching. This indicates the presence of some organic functional groups such as Alkyl halides, Alkene, Alkene, Secondary Alcohol, Carboxylic Acid, Conjugated Alkene, Carbon dioxide, Alkane, Aliphatic primary amine. (Table:3)

GC-MS AANALYSIS: GCMS analysis of *Bhavana panchankula thailam* shows presence various long chain fatty acids (Table: 5). Their trivial name and possible medical roles have been explained in below table. (Table: 6)



**Table: 6, Trivial name and possible Medical Roles of Free Fatty Acids in Bhavana Panchankula Thailam**

S. No	SYSTEMATIC NAME	TRIVIAL NAME	POSSIBLE MEDICAL ROLES
1	Pentadecanoic acid, 14-methyl	Pentadecyclic acid	anti-inflammatory, immunomodulatory and antifibrotic activities, substitute for Omega 3 FAs
2	Hexadecanoic acid, 15-methyl	Palmitic acid	Palmitoylation, palmitoylethanolamide (PEA) biosynthesis, and in the lung an efficient surfactant activity
3	9,12-Octadecadienoic acid(z,z)	Linoleic acid	Reducing the incidence of Vascular endothelial dysfunction, inhibitory effects on $\alpha$ glucosidase activity, PIHT, Prevention of pre-eclampsia.
4	Octadecenoic acid	Oleic acid	stimulates system A amino acid transport in primary human trophoblast cells, Anti-oxidant, anti-cancer, anti-inflammatory activity.
5	Heptadecanoic acid, 16-methyl	Marigarcic acid	Act on gestational and early postnatal brain development, reduced disease risks for CHD and T2D
6	Eicosanoic acid	Arachidic acid	Not known
7	Docosanoic acid	Behenic acid	Serve as medifood in type II diabetes mellitus.

## 5.CONCLUSION

All the parameters and result of this study provides quality standards for Bhavana Panchankula Thailam representing its source from herbal origin. This can be utilized for the overall quality check over its preparation and formulation.

### Declaration by Authors

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**Conflict of Interest:** The authors declare no conflict of interest.

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