



## GC MS ANALYSIS OF THAALISAATHI CHOORANAM (TSC) – A SIDDHA POLYHERBAL FORMULATION

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### ABSTRACT

The present study deals with the Gas Chromatography Mass Spectrometry (GC MS) analysis of Thaalisaathi Chooranam(TSC), a poly herbal Siddha formulation widely used in Siddha system medicine for Respiratory diseases like bronchitis, cough, common cold, asthma, fever and digestive disorders<sup>1</sup>. Though the individual herbs used in the formulation have the previous record of standardization, there is no evidence of the molecules present in the physical form of the study drug TSC and hence this study was aimed. TSC is a powder form of medicine (Chooranam) and it is a combination of 28 types of different herbs. All the ingredients were procured from reputed raw drug store and botanically authenticated by the Medicinal botanist of National Institute of Siddha, Chennai. Purification was done individually as per the Siddha classical literature and the formulation was prepared as per the procedure mentioned in Sastric Siddha text Siddha vaidhya thirattu. The prepared drug was subjected to analysis. The derived GC MS analysis results were indicated that the presence of forty three bio molecules in the formulation and it may serve as a bench mark to identify the real combination and efficacy of Thaalisaathi chooranam (TSC) in further studies by any researcher

### KEYWORDS

Thaalisaathi chooranam, TSC, Siddha medicine, Chooranam, Respiratory diseases, GC/MS GC MS, Gas Chromatography.

### 1. INTRODUCTION

Siddha medicine is an indigenous system of medicine practiced in South India and other Tamil speaking countries like Sri Lanka, Malaysia and Singapore. World Health Organization endorsed Siddha system of medicine as a codified medical system. As compared to the allopathic drugs these medicines have proved to be cost effective, easily available and can be easily prepared<sup>1</sup>. According to the WHO, 2002 report, about 70 – 80% of the world's population depends on local and alternative medicines which are available as local herbs and other salts for their primary health care<sup>2</sup>. Even though, the formulations of Siddha medicines are well documented and time- tested standard preparations, it is the need of the hour to document standardization procedures based on current analytic techniques to prevent adulteration and to maintain quality control on par with contemporary medical world<sup>3</sup>

*Thaalisaathi chooranam* (TSC) is a polyherbal formulation prescribed in the management of respiratory disorders of adults and children. Literatures Review of the ingredients of TSC revealed that the drugs are having good anti-allergic, bronchodilator, expectorant, anti-inflammatory, anti-pyretic activities<sup>3, 4</sup>. But the compound form of the medicine Thaalisaathi chooranam (TSC) has not been established by through standardization procedure for to identify the bio molecules present in the medicine for its global acceptance. So the author interested to do Gas Chromatography Mass Spectrometry (GC MS) to get the complete molecular picture of the study drug TSC

### 2. MATERIAL AND METHODS

#### 2.1 Plant materials

All the ingredients were procured from reputed raw drugs store in Chennai and authenticated by Medicinal Botanist of National Institute of Siddha for its genuinity. The list of the ingredients of Thaalisaathi chooranam (TSC) is given in Table - 1

2.2 Purification of raw drugs of Thaalisaathi chooranam (TSC)

All ingredient were purified as follows (Table – 2) as per the purification method mentioned in Sastric Siddha literature and in accordance with Siddha Formulary of India

#### 2.3 Preparation of Thaalisaathi chooranam (TSC)

was prepared After purification process, all the materials were completely dried, then powdered separately and sieved by white cloth which is mentioned as Vasthirakayam in classical Siddha text. The sieved ingredient powders were mixed thoroughly to the study drug Thaalisaathi chooranam (TSC) and stored in a clean and air tight glass container.

#### 2.4 GC MS Analysis of Thaalisaathi chooranam (TSC)5

##### Sample preparation

Thaalisaathi chooranam (TSC) was extracted with 500ml of 90% ethanol by using soxhlet apparatus until the extraction was completed. After the completion of the extraction process, the extract was filtered and the solvent was removed by distillation under reduced pressure. It was used for GC-MS analysis.

GC-MS analysis was carried out on Perkin Elmer Clarus 500 GC system. Column type used was capillary column Elite-5 (Crossband 5% Phenyl 95% dimethylpolysiloxane). Column length was 30m and Column id was at 250  $\mu$ m. Total GC run time was 54.5 minutes. Injector temperature 280°C and operating in electron impact mode at 70 eV; helium (99.999%) was used as carrier gas at a constant flow of 1ml/min and an injection volume of 2.0 $\mu$ L. EI was employed in the split ratio of 1:10 and the injector temperature was 280°C; Transfer line and source temperature at 200°C, 160°C respectively. The oven temperature was programmed from 60°C (isothermal for 2 min), with an increase of 150°C/min, ending with a 5 min isothermal at 280°C. Mass spectra were taken at 70 eV; a scan interval of 0.5 s and fragments from 40 to 550amu. Interpretation on mass spectrum of GC-MS was done using the software database NIST2005 and Turbomass ver5.2.0. The relative percentage amount of each component was

calculated by comparing its average peak area to the total areas.

### 3. RESULTS AND DISCUSSION

Raw materials for this polyherbal formulation Thaalisaathi choornam (TSC) were procured from reputed raw drug store from Chennai and the same was authenticated by Medicinal botanist of National Institute of Siddha. Physical form of medicine i.e Chooranam was prepared after purification of each and every ingredients as per Sastric Siddha literature. (Table 2)

Ethnolic extract of Thaalisaathi chooranam (TSC) was prepared as test sample. Perkin Elmer Clarus 500 GC MS system used for analysis of the study drug TSC. Interpretation on mass spectrum of

GC-MS was done using the software database NIST2005 and Turbomass ver5.2.0. Gas Chromatography-Mass Spectroscopy(GCMS) is the best technique to identify the bioactive constituents of long chain hydrocarbons, alcohols, acids, ester, alkaloids, steroids, amino and nitrogen compound of a polyherbal formulation. The present research revealed that the Siddha formulation Thaalisaathi chooranam (TSC) having 43 different types of biologically active molecules. Depicts the retention time, names of the compounds, molecular formula, molecular weights and % peak values of the identified molecules were given in Table - 3. Intensive literature review of the study drug reflected that, there is no report of Gas Chromatography and Mass Spectrum analysis to identify the chemical compounds TSC.

**able. 1: Ingredients Thaalisaathi chooranam (TSC)<sup>7,8,9</sup>**

Sl.no	Tamil name	Botanical name	Part used	Quantity
1.	Thaleesapathiri	Taxus baccata L	Leaf	10 gm
2.	Lavangapattai	Cinnamomum zeylanicum BL.	Bark	10 gm
3	Elam	Elettaria cardamomum MATON	Seed	10 gm
4	Chukku	Zingiber officinale ROSC	Rhizome	10 gm
5	Athimathuram	Glycyrrhiza glabra L.	Root	10 gm
6	Perungayam	Ferula foetida L.	Resin	10 gm
7	Nellimulli	Phyllanthus emblica L Syn : Emblica officinalis GAERTN	Dried fruit	10 gm
8	Koshtam	Saussurea lappa C.B.CL.	Root	10 gm
9	Thippili	Piper longum L.	Fruit	10
10	Seeragam	Cuminum cyminum L	Seed	10 gm
11	Sathakuppai	Anethum sowa KURZ. Syn: Peucedanum graveolens BENTH	Seed	10 gm
12	Karunseeragam	Nigella sativa L.	Seed	10 gm
13	Thippilikattai	Piper longum L.	Stem	10 gm
14	Kirambu	Syzygium aromaticum L	Buds	10 gm
15	Saathipathiri	Myristica fragrans HOUT	Aril	10 gm
16	Karkadakasirungi	Rhus succedanea L.	Leaf galls	10 gm
17	Saathikkai	Myristica fragrans HOUT	Fruit	10 gm
18	Thantrikkai	Terminalia bellerica ROXB	Fruit	10 gm
19	Kadukkai	Terminalia chebula RETZ & WILLD	Fruit	10 gm
20	Sadamanjil	Nardostachys jatamansi DC.	Root, ubers	10 gm
21	Milagu	Piper nigrum L	Fruit	10 gm
22	Sirunaagapoo	Mesua ferrea L	Flower	10 gm
23	Shanpagamokku	Michelia champaca L	Flower bud	10 gm
24	Vaividangam	Embelia ribes BURM.	Seed	10 gm
25	Lavangapathiri	Cinnamomum tamala NEES & EBERM	Aril	10 gm
26	Omam	Trachyspermum ammi L	Seed	10 gm
27	Thaniya	Coriandrum sativum L.	Seed	60 gm
28	Cane sugar	Saccharum officinarum L.	Granules	120 gm

**Table. 2: Purification method of Thaalisaathi chooranam (TSC)<sup>7,8,9</sup>**

Sl.No	Tamil name	Botanical name	Purification method
1.	Thaleesapathiri	Taxus baccata L	Dried in sunlight after removing all unwanted physical particles
2.	Lavangapattai	Cinnamomum zeylanicum BL.	Dried in sunlight after removing all unwanted physical particles
3	Elam	Elettaria cardamomum MATON	Dried in sunlight after removing all unwanted physical particles
4	Chukku	Zingiber officinale ROSC	Added two parts of limestone for one part of ginger and water as needed after that the ginger alone washed with water, dried finally peeling the outer skin
5	Athimathuram	Glycyrrhiza glabra L.	Washed in pure water and sliced as small portion then dried
6	Perungayam	Ferula foetida L.	Fried in a pan
7	Nellimulli	Phyllanthus emblica L Syn : Emblica officinalis GAERTN	Boiled by adding required quantity of milk then the seeds were removed and dried
8	Koshtam	Saussurea lappa C.B.CL.	Dried in sunlight after removing all unwanted physical particles
9	Thippili	Piper longum L.	Soaked in Leadwort juice (Plumbago resea Linn.) for twenty four minutes and dried in sunlight
10	Seeragam	Cuminum cyminum L	Dried in sunlight after removing all unwanted physical particles
11	Sathakuppai	Anethum sowa KURZ. Syn: Peucedanum graveolens BENTH	Dried in sunlight after removing all unwanted physical particles
12	Karunseeragam	Nigella sativa L.	Dried in sunlight after removing all unwanted physical particles and fried in a pan to turned as golden colour
13	Thippilikattai	Piper longum L.	Removed the horns and dried
14	Kirambu	Syzygium aromaticum L	Dried in sunlight after removing all unwanted particles
15	Saathipathiri	Myristica fragrans HOUT	Dried in sunlight after removing all unwanted particles
16	Karkadakasirungi	Rhus succedanea L.	Fried in almond oil
17	Saathikkai	Myristica fragrans HOUT	Peeled the outer skin after sliced as small portion and dried
18	Thantrikkai	Terminalia bellerica ROXB	Soaked in Thaazhaivizhuthi juice for three hours then removed seeds and dried
19	Kadukkai	Terminalia chebula RETZ & WILLD	Soaked in rice water, filtered and dried
20	Sadamanjil	Nardostachys jatamansi DC.	Dried in sunlight after removing all unwanted physical
21	Milagu	Piper nigrum L	Soaked in Butter milk for three hours and dried
22	Sirunaagapoo	Mesua ferrea L	Dried in sunlight after removing all unwanted particles
23	Shanpagamokku	Michelia champaca L	Dried in sunlight after removing all unwanted particles
24	Vaividangam	Embelia ribes BURM.	Dried in sunlight after removing all unwanted particles
25	Lavangapathiri	Cinnamomum tamala NEES & EBERM	Dried in sunlight after removing all unwanted particles
26	Omam	Trachyspermum ammi L	Soaked in lime water and dried

27	Thaniya	Coriandrum sativum L.	Steamed in water and dried
28	Cane sugar	Saccharum officinarum L.	Checked for unwanted materials

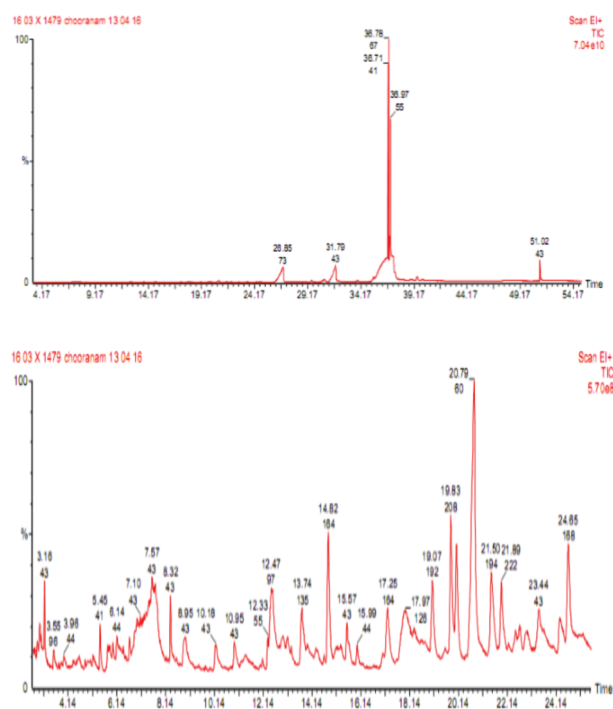
**Table. 3: GC MS Analysis results of Talisapatradi Churnam**

S.No.	Peak Name	Retention time	Peak area	%Peak area
1.	Name: Ethyl N-hydroxyacetimidate Formula: C4H9NO2 MW: 103	3.16	4658683	0.0732
2.	Name: Furfural Formula: C5H4O2 MW: 96	3.55	2121623	0.0333
3.	Name: 2-Furanmethanol Formula: C5H6O2 MW: 98	3.96	1409464	0.0221
4.	Name: 2,4-Dihydroxy-2,5-dimethyl-3(2H)- furan-3-one Formula: C6H8O4 MW: 144	5.98	1243828	0.0195
5.	Name: Cyclohexene, 1-methyl-4-(1- methylethylidene)- Formula: C10H16 MW: 136	6.66	1652314	0.0260
6.	Name: 4-Carene Formula: C10H16 MW: 136	7.57	2874591	0.0452
7.	Name: Nonane, 2-methyl- Formula: C10H22 MW: 142	8.32	7301717	0.1147
8.	Name: Cyclopentanone, dimethylhydrazone Formula: C7H14N2 MW: 126	8.95	11041012	0.1735
9.	Name: 4H-Pyran-4-one, 2,3-dihydro-3,5- dihydroxy-6-methyl- Formula: C6H8O4 MW: 144	10.18	8194110	0.1288
10.	Name: Octanoic Acid Formula: C8H16O2 MW: 144	10.95	5838624	0.0918
11.	Name: 2-Butanone, 4-phenyl- Formula: C10H12O MW: 148	12.12	1919885	0.0302
12.	Name: 2-Furancarboxaldehyde, 5- (hydroxymethyl)- Formula: C6H6O3 MW: 126	12.47	17460588	0.2744
13.	Name: 1-Phenylpropene-3,3-diol diacetate Formula: C13H14O4 MW: 234	12.95	3225729	0.0507
14.	Name: Thymol Formula: C10H14O MW: 150	13.74	9840890	0.1546
15.	Name: Phenol, 2-methoxy-3-(2-propenyl)- Formula: C10H12O2 MW: 164	14.82	22362440	0.3514
16.	Name: Bicyclo[7.2.0]undec-4-ene, 4,11,11- trimethyl-8- methylene-[1R-(1R*,4Z,9S*)]- Formula: C15H24 MW: 204	15.99	2412087	0.0379
17.	Name: Phenol, 2-methoxy-4-(1-propenyl)-, (E)- Formula: C10H12O2 MW: 164	17.25	16957434	0.2665
18.	Name: 1,2,3-Benzenetriol Formula: C6H6O3 MW: 126	17.97	32462098	0.5101
19.	Name: 1,3-Benzodioxole, 4-methoxy-6-(2- propenyl)- Formula: C11H12O3 MW: 192	19.07	15989099	0.2513

20.	Name: Benzene, 1,2,3-trimethoxy-5-(2-propenyl)- Formula: C12H16O3 MW: 208	19.83	22169358	0.3484
21.	Name: 2-Tridecenal, (E)- Formula: C13H24O MW: 196	20.06	16522134	0.2596
22.	Name: Dodecanoic acid Formula: C12H24O2 MW: 200	20.79	91706368	1.4411
23.	Name: Phenol, 2,6-dimethoxy-4-(2-propenyl)- Formula: C11H14O3 MW: 194	21.49	22121862	0.3476
24.	Name: Apiol Formula: C12H14O4 MW: 222	21.89	14902406	0.2342
25.	Name: Patchoulene Formula: C15H24 MW: 204	22.96	6080562	0.0956
26.	Name: Tridecanoic acid Formula: C13H26O2 MW: 214	23.44	11924511	0.1874
27.	Name: 2-Cyclohexen-1-one, 2-hydroxy-6-methyl-3-(1-methylethyl)- Formula: C10H16O2 MW: 168	24.31	8357313	0.1313
28.	Name: 3-Decen-2-one, 3-methyl- Formula: C11H20O MW: 168	24.65	21124028	0.3320
29.	Name: Tetradecanoic acid Formula: C14H28O2 MW: 228	26.85	1542262656	24.2361
30.	Name: Eudesma-5,11(13)-dien-8,12-olide Formula: C15H20O2 MW: 232	29.52	94197432	1.4803
31.	Name: 5-Isopropyl-2,8-dimethyl-9-oxatricyclo[4.4.0.0(2,8)]decan-7-one Formula: C14H22O2 MW: 222	30.50	63386860	0.9961
32.	Name: Naphtho(2,3-b)furan-2(3H)-one, decahydro-8a-methyl-3,5-bis(methylene)-, (3aR-(3aà,4aà,8aà,9aà))- Formula: C15H20O2 MW: 232	30.72	133866024	2.1037
33.	Name: n-Hexadecanoic acid Formula: C16H32O2 MW: 256	31.79	1405598080	22.0885
34.	Name: 7-Octadecenoic acid, methyl ester Formula: C19H36O2 MW: 296	33.87	31612540	0.4968
35.	Name: 6-Octadecenoic acid, (Z)- Formula: C18H34O2 MW: 282	36.78	823209280	12.9364
36.	Name: 6-Octadecenoic acid, (Z)- Formula: C18H34O2 MW: 282	36.97	1359128320	21.3582
37.	Name: Gingerol Formula: C17H26O4 MW: 294	38.86	59202840	0.9304
38.	Name: 2-(3,4-Methylenedioxyphenyl)cyclohexanone Formula: C13H14O3 MW: 218	39.46	142009152	2.2316
39.	Name: Eicosen-1-ol, cis-9- Formula: C20H40O MW: 296	39.98	43898756	0.6899

**Table. 2: Purification method of Thaalisaathi chooranam (TSC)<sup>7,8,9</sup>**

40.	Name: Benzenepropanoic acid, 4-methoxy- á-methyl- Formula: C11H14O3 MW: 194	45.77	26945698	0.4234
41.	Name: Phenol, 4-[2,3-dihydro-7-methoxy-3- methyl-5-(1-propenyl)-2-benzofuranyl]-2- methoxy- Formula: C20H22O4 MW: 326	47.67	47174408	0.7413
42.	Name: Piperine Formula: C17H19NO3 MW: 285	48.69	16484287	0.2590
43.	Name: Dihydroqinghaosu Formula: C15H24O5 MW: 284	51.02	190639984	2.9958

**Chromatogram****Figure 1: GC MS Chromatogram of Thaalisaathi chooranam (TSC)****4. CONCLUSION**

Thaalisaathi chooranam (TSC), is a commonly prescribing Siddha formulation for the ailments of respiratory diseases and gastro intestinal disorders was extensively studied for its active bio molecules by using GC MS analysis. The encouraging results showed that the presence of 43 active molecules and it would be adding evidence for the curative effect of prescribing this medicine since ancient years. This study outcome will be a boon for the young researchers of Indigenous medicine and herbal scientists.

**5. ACKNOWLEDGEMENTS**

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**6. CONFLICTS OF INTEREST**

There are no conflicts of interest from the author

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