RESEARCH ARTICLE

PHYTO – COMPONENT ASSAY OF SINGLE HERBAL SIDDHA DISTILLATE “CHUKKU THEENEER” THROUGH GC-MS

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ABSTRACT

Background: Theeneer (herbal distillates) are getting much popularity in siddha clinical practice. Dry ginger is been extensively used in Siddha formulations in various forms and one of the key ingredient in numerous compound distillate formulations. The Aqueous distillate prepared from the single raw drug, Chukku has not been evaluated with Gas Chromatography studies.

Objectives: To Screen the bio active principles of Chukku Theeneer for validating its Therapeutic applications.

Methods: The single raw drug, dry ginger was distilled as per the procedures evident in the classical Siddha literatures and the sample is studied through GC-MS analysis.

Results: The Distillate from dry ginger (Chukku Theeneer) was found colorless, with pleasant aroma and pungent taste, traditionally these marks its genuine quality. GC-MS studies revealed the presence of mostly aromatic compounds, organic acids, Aldehydes and phenolic intermediate compounds from the distillate. A total 24 compounds has been identified with many of them like ar turmerone, oleic acid, tri decanoic acid, hexa decanoic acid, octacosane, tetracosane, heptacosane has reported pharmacological activities which may support the traditional usage of Chukku Theeneer for wide variety of medical conditions.

Key words: Siddha medicine, Theeneer, Chukku Theeneer, Gastric & Cardio vascular health

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INTRODUCTION

Theeneer or herbal distillates are formulations in which raw drug particularly specific parts of herbs are subjected to distillation process by using traditional apparatus called Valai iyanthram (1). The method selectively extracts water soluble and volatile compounds from the herbal part. Numerous single herbal and polyherbal distillate formulations are mentioned in siddha medicine. Chukku Theeneer is one among the formulation. (Table. 1, Fig. A) Chukku is the dried rhizome of Zingiber officinale belonging to family Zingiberacea widely cultivated in India. The fresh rhizomes are collected and its buds and roots will be removed, soaked overnight in water, decorticated, sometimes treated with lime, and dried. In the case of dry ginger, the outer skin is scrapped off. Dried drug consist of sympodi cally branched laterally compressed pieces of horizontal growing rhizome known as “races or hands”, 5 to 12 cm in length, 3-5 cm in height and 1-2 cm in thickness, the surface is marked with circular closely placed leaf scar ad small circular root scars at places, clearly visible on unpeeled or partially peeled pieces of rhizomes, surface of the latter one is rough, longitudinally striated and somewhat fibrous at places attached with the fragments of cork and with a small depression of bud scar at the tip of the fingers.

Chukku Theeneer: Chukku is included in numerous polyherbal distillate formulations effectively indicated for Gastro intestinal conditions like diarrhea, dysenteries,
Table 1 General Description of Chukku (1-7)

<table>
<thead>
<tr>
<th>Color</th>
<th>Externally pale buff to brownish in color.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Odor</td>
<td>Aromatic and characteristic.</td>
</tr>
<tr>
<td>Taste</td>
<td>Pungent</td>
</tr>
<tr>
<td>Potency</td>
<td>Hot</td>
</tr>
<tr>
<td>Division</td>
<td>Pungent</td>
</tr>
<tr>
<td>Chemical Constituents</td>
<td>The rhizome contains 1-4% essential oil and an oleoresin (5.3-8.6%). Alphazingiberene, ar-curcumene, hexa hydrocurcumin, Betasessquiphellandrene, Beta bisabolene camphone, phellandrene, citral, citronellol, geranial, linalool, bisabolene, limonene, desmeth hexa hydro curcumin, cineole, borneoizingiberole, and cineole. Monoterpane aldehydes and alcohols are also present.</td>
</tr>
</tbody>
</table>

Pharmacological Actions
- Anti spasmodic
- Stimulant
- Sialogogue
- Stomachic
- Carminative
- Digestive
- Sudorific
- Diaphoretic
- Anti hyper cholesteramic
- Anti oxidant
- Anti – inflammatory
- Anti – thrombolic
- Hypoglycemic
- Anti microbial
- Anti fungal
- Anti neoplastic
- Gastro protective
- Analgesic
- Anti pyretic
- Anti- Platelet aggregation activity
- Hepato protective

Indications in Siddha Medicine
- Eravippu (Wheezing)
- Gunnam (Gastro intestinal conditions)
- Vayappattu (Abdominal distension due to gaseous disturbances)
- Kapha Suram (Phlegmatic fever)
- Kazhchil (Diarrhoeal diseases)
- Oozhi noi (cholera)
- Seriyamai (Dyspepsia’s)
- Vayu (Gaseous disturbances)
- Kasam (cough)
- Diseases of the head, Soolai (Painful affections)
- Moslam (Hemorrhoids)
- Vatham (Rheumatic ailments)
- Chevi vali (otalgia)
- Marbu vali (chest pain) etc.

dyspepsia’s, Respiratory ailments and phlegmatic affections (16). One of the traditionally acclaimed single herbal formulation is Chukku Theeneer. It is given as a supportive digestive tonic that improves appetite and taste especially after dysentery affections, phlegmatic fevers and dyspepsia’s. On regular basis it expels excess phlegm and relieves Mantham (weak digestion). The distillate can alleviate respiratory conditions like wheezing. Chukku Theeneer is also been administered for improving health and to relieve painful affections in Rheumatic conditions.

Aim and Objectives

To Screen the bio active principles of Chukku Theeneer for validating its Therapeutic applications.

MATERIALS AND METHODS

Ingredient Details

Chukku (Dried rhizome of Zingiber officinale)

Method of Preparation of Distillate Sample (Fig. C & D) (Ramachandran, 2015)

The raw drug was collected from a reputed country drug shop after it was purified, skin peeled, sun dried and coarsely powdered. For 250 g of coarse powder of dry ginger 10 parts of water was mixed (2.5L litres) and kept for 3 days. On the 4th day the entire mixture was transferred to a traditional still for distillation.
Gas Chromatography- Mass Spectrometry (GC-MS) (Hans-Joachim Hubschmann, 2015)

The sample prepared has been analyzed through GC-MS to determine the volatile and organic compounds present in it. This is a preliminary step for the pharmacological establishment of the drug.

RESULTS

The organoleptic parameters of Chukku Theeneer complies the quality of a good grade distillate in terms of color, aroma, taste and volatile tinge and this directly reflects the proper extraction of Bio active compounds.

GC-MS reports of Chukku Theeneer (Fig E, Table 2)

The Gas chromatography of the distillate spotted a total of 24 compounds belonging to alkyl aldehyde group, hetero aromatic group, phenolic group and its intermediate compounds, Sesquiterpene, organic fatty acids and higher alkane group.

DISCUSSION

There are so many factors determining the quality of a herbal distillate, from choosing the genuine raw drugs, its processing, selection of vessels used for distillation and the mode of heat application (12). Pre processing or prior procedures are done like purification to reduce any adversity of the drug, and soaking in suitable media. The herbal drug parts are crushed or coarse powdered when used as dry and soaked in water media or other media as explained in the classical texts. The period of soaking allows maximum dissolution of aqueous solvents into the media thereby improving the quality and efficacy of the distillate (10). Dry ginger used in this distillate has been preprocessed or purified as evident in the texts, crushed well, and soaked in water for a period of 3 days. Distillation is a lengthy and slow process and this need to be considered to extract the entire profile of the volatile and organic molecules present in the herbal part. The mode of heat application in another side determines the extraction value of the volatile compounds. The degree of heat applied influences the distillate. Starting in low flame as mentioned in the Siddha texts is very ideal to preserve the delicate and fragile aromatic compounds to be collected as such (13). High heat in the initial stage of distillation quickly transforms or decomposes the active compounds to its derivatives or neutral compounds having lesser bioactivity.

The aromatic compounds are collected at different phases of distillation point and this mainly depends on the molecular weight of the phyto compounds. Molecules which are lighter escapes out first followed by heavier molecules (Compounds having higher no: of carbon atoms ranging from 15 -50) at the later phases. The distillation of dry ginger was carried out initially with slow flame then to mid flame towards the last phases. From the picture which we got from the GC-MS studies we can assume that alkyl aldehydes (eg: heptanal, nonanal, 2- decenal), Hetero aromatic compound (eg: 2 Pentyl furan), phenol compounds (eg: 2-Methoxy-4-vinylphenol, Phenol, 2,4-bis (1,1-dimethylethyl), aromatic Sesquiterpene (tumerone) has been collected during the 1st phases of distillation, then followed by organic fatty acids (eg: oleic acid), and finally higher alkanes (eg: heptacosane, nonacosane, hexa atria contane, tetra tetra contane) were extracted and collected slowly during the last phases of distillation. Out of the 24 compounds spotted in the GC-MS, many of them like ar turmerone, oleic acid, tri decanoic acid, hexa decanoic acid, Octacosane, tetracosane, heptacosane has reported pharmacological activities. The detailed review of the same was listed in Table 3.
<table>
<thead>
<tr>
<th>Peak No:</th>
<th>Retention Time:</th>
<th>Peak Intensity Rank:</th>
<th>Mol. Wt:</th>
<th>Name:</th>
<th>Mol. Formula:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3.9</td>
<td>22</td>
<td>320</td>
<td>Benzyl oxy tri decanoic acid</td>
<td>C_{20}H_{32}O_{3}</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Peak No:</th>
<th>Retention Time:</th>
<th>% Peak Area:</th>
<th>Peak Intensity Rank:</th>
<th>Mol. Wt:</th>
<th>Name:</th>
<th>Mol. Formula:</th>
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<tr>
<td>2</td>
<td>4.3</td>
<td>1052026</td>
<td>21</td>
<td>114</td>
<td>Hexane, 2,4-dimethyl-</td>
<td>C_{8}H_{18}</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Peak No:</th>
<th>Retention Time:</th>
<th>Peak Intensity Rank:</th>
<th>Mol. Wt:</th>
<th>Name:</th>
<th>Mol. Formula:</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>5</td>
<td>18</td>
<td>78</td>
<td>Dimethyl Sulfoxide</td>
<td>C_{2}H_{6}O_{5}</td>
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</table>

<table>
<thead>
<tr>
<th>Peak No:</th>
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<th>Peak Intensity Rank:</th>
<th>Mol. Wt:</th>
<th>Name:</th>
<th>Mol. Formula:</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>6</td>
<td>18</td>
<td>104</td>
<td>Styrene</td>
<td>C_{8}H_{8}</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Peak No:</th>
<th>Retention Time:</th>
<th>Peak Intensity Rank:</th>
<th>Mol. wt:</th>
<th>Name:</th>
<th>Mol. Formula:</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>7.6</td>
<td>23</td>
<td>112</td>
<td>2-Heptenal, (Z)-</td>
<td>C_{7}H_{12}O</td>
</tr>
</tbody>
</table>

Continue…………….
<table>
<thead>
<tr>
<th>Peak No</th>
<th>Retention Time</th>
<th>Peak Intensity Rank</th>
<th>Mol. wt</th>
<th>Name</th>
<th>Mol. Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>8.5</td>
<td>24</td>
<td>138</td>
<td>Furan, 2-pentyl</td>
<td>C₉H₁₄O</td>
</tr>
<tr>
<td>7</td>
<td>11.7</td>
<td>20</td>
<td>142</td>
<td>Nonanal</td>
<td>C₉H₁₈O</td>
</tr>
<tr>
<td>8</td>
<td>16.2</td>
<td>17</td>
<td>154</td>
<td>2-Decenal, (Z)-</td>
<td>C₁₀H₁₈O</td>
</tr>
<tr>
<td>9</td>
<td>17.7</td>
<td>10</td>
<td>150</td>
<td>2-Methoxy-4-vinylphenol</td>
<td>C₉H₁₀O₂</td>
</tr>
<tr>
<td>10</td>
<td>22.8</td>
<td>15</td>
<td>206</td>
<td>Phenol, 2,4-bis(1,1-dimethylethyl)-</td>
<td>C₁₄H₂₂O</td>
</tr>
</tbody>
</table>

Continue ……………….
<table>
<thead>
<tr>
<th>Peak No</th>
<th>Retention Time</th>
<th>Peak Intensity Rank</th>
<th>Mol. wt</th>
<th>Name</th>
<th>Mol. Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>26.4</td>
<td>11</td>
<td>216</td>
<td>Ar-turmerone</td>
<td>C\textsubscript{15}H\textsubscript{20}O</td>
</tr>
<tr>
<td>12</td>
<td>27.2</td>
<td>16</td>
<td>176</td>
<td>Benzenebutanal, (\gamma)-methyl-4-dimethyl-</td>
<td>C\textsubscript{12}H\textsubscript{16}O</td>
</tr>
<tr>
<td>13</td>
<td>27.2</td>
<td>13</td>
<td>228</td>
<td>Tetra decanoic acid</td>
<td>C\textsubscript{14}H\textsubscript{28}O\textsubscript{2}</td>
</tr>
<tr>
<td>14</td>
<td>31.8</td>
<td>6</td>
<td>276</td>
<td>7,9-Di-tert-butyl-1-oxaspiro(4,5)deca-6,9-diene-2,8-dione</td>
<td>C\textsubscript{17}H\textsubscript{24}O\textsubscript{3}</td>
</tr>
<tr>
<td>15</td>
<td>33.1</td>
<td>3</td>
<td>256</td>
<td>(n)-Hexadecanoic acid</td>
<td>C\textsubscript{16}H\textsubscript{32}O\textsubscript{2}</td>
</tr>
</tbody>
</table>

Continue ...............
Table 3  Pharmacological significance of compounds spotted in Chukku Theeneer (14-33)

<table>
<thead>
<tr>
<th>Compounds</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nonanal</td>
<td>Anti Bacterial, Anti Fungal</td>
</tr>
<tr>
<td>2-decenal</td>
<td>Nematicidal</td>
</tr>
<tr>
<td>Nonacosane, Octacosane, Tetratetracontane</td>
<td>Anti-inflammatory, Anti oxidant</td>
</tr>
<tr>
<td>Hexa decannic acid, Oleic acid</td>
<td>Anti-Atherogenic, Anti-inflammatory</td>
</tr>
<tr>
<td>Phenol, 2,4-bis(1,1-dimethylethyl)-</td>
<td>Anti Fungal, Anti microbial, Anti oxidant</td>
</tr>
<tr>
<td>Ar-Turmerone</td>
<td>Anti Malarial, Anti-Inflammatory, Anti-platelet property.</td>
</tr>
<tr>
<td></td>
<td>Anti Convulsant, Anti- dermatophytic, Anti Venom</td>
</tr>
<tr>
<td></td>
<td>Anti-depressant, Anti Tumor, Hypoglycemic, Immuno modulator</td>
</tr>
</tbody>
</table>
Conclusion

With the simple study we can conclude that the volatile aromatic, organic compounds and its derivatives present in the distillate has promising pharmacological background in areas of cardio Vascular health, Gastrology, Immunology and oncology. Hence the distillate may be promoted as a drug of choice and regular supplement for wide range of medical conditions after further safety and efficacy validations.

REFERENCES


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