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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,

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Table. 1 General Description of *Chukku* (2-7)

Color	Externally pale buff to brownish in color.
Odor	Aromatic and characteristic.
Taste	Pungent
Potency	Hot
Division	Pungent
Chemical Constituents	The rhizome contains 1-4% essential oil and an oleoresin (5.3-8.6%). Alphasgingiberene, ar-curcumene, hexa hydrocurcumin,
Major Alkaloids	Betasiquiphellandrene, Beta bisabolene camphene, phellandrene, citral, citronellol, geranial, linalool, bisabolene, limonene, desmeth hexa hydro curcumin, cineole, borneolzingiberole, and cineole. Monoterpene aldehydes and alcohols are also present
Minor Alkaloids	Numerous monoterpene and Sesquiterpene hydrocarbons and their corresponding dehydration products (oxygenated derivatives in volatile oil), paradols, gingerdols, gingerdiacetates, gingerdiones, 6-ginger sulfonic acid, gingerenones and a number of diarylhepatanoids, diterpenes, ginger glycolipids A, B & C.
Pharmacological Actions	Anti spasmodic, Stimulant, Sialogogue, Stomachic, Carminative, Digestive, Sudorific, Diaphoretic, Anti hyper cholestaremic, Anti oxidant, Anti – inflammatory, Anti- thrombotic, Hypoglycemic, Anti-microbial, Anti fungal, Anti neoplastic, Gastro protective, analgesic, Anti pyretic, Anti- Platelet aggregation activity, Hepato protective.
Indications in Siddha Medicine	<i>Eraippu (Wheezing)</i> , <i>Gunmam</i> (Gastro intestinal conditions), <i>Vayiruppisam</i> (Abdominal distension due to gaseous disturbances) <i>Kapham</i> (Phlegmatic diseases), <i>Kapha Suram</i> (Phlegmatic fever), <i>Kazhichil</i> (Diarrhoeal diseases), <i>Oozhi noi</i> (cholera), <i>Seriyamai</i> (Dyspepsia's), <i>Vayu</i> (Gaseous disturbances), <i>kasam</i> (cough). Diseases of the head, <i>Soolai</i> (Painful affections), <i>Moolam</i> (Hemorrhoids), <i>Vatham</i> (Rheumatic ailments), <i>Chevi vali</i> (otalgia), <i>marbu vali</i> (chest pain) etc.

**Fig. A Dry Ginger (Raw)****Fig. B Dry Ginger (Coarse powder)****Fig. C Period of Soaking****ppp
Fig. D Distillation using Traditional Still**

dyspepsia's, Respiratory ailments and phlegmatic affections⁽¹⁰⁾. 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 (2.5Litres) 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.

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.

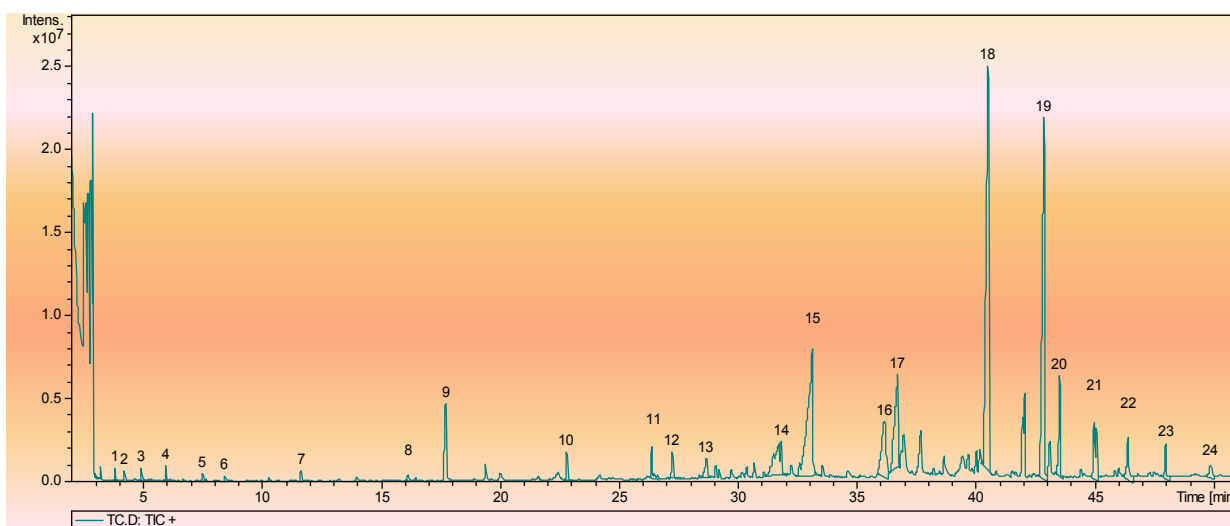
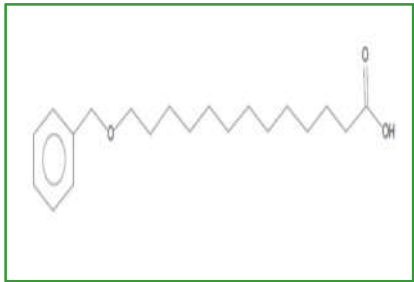
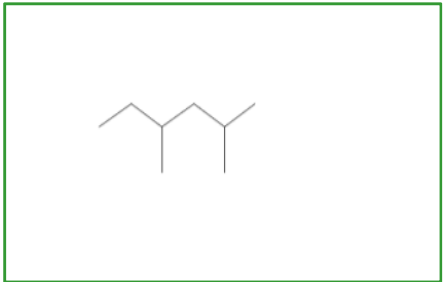
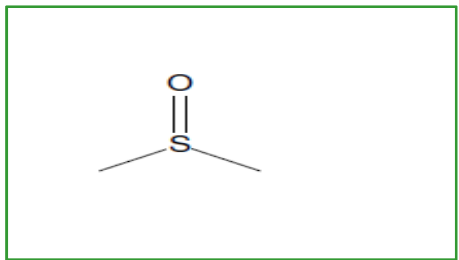
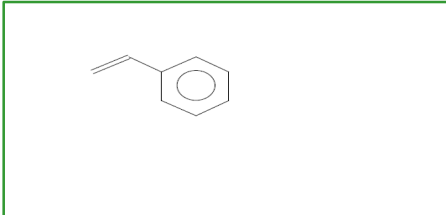
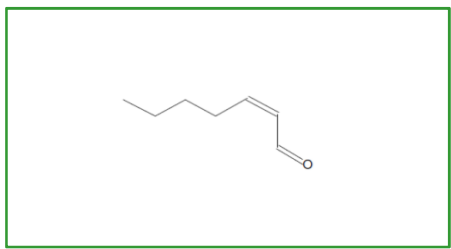


Fig E. Gas Chromatograph of *Chukku Theeneer*.

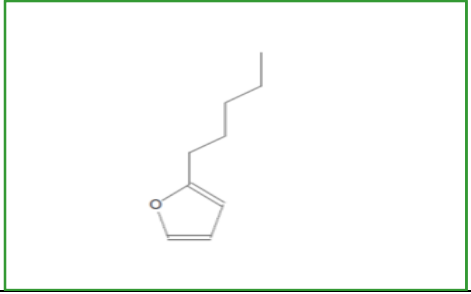
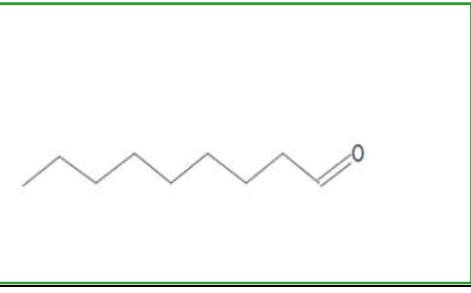
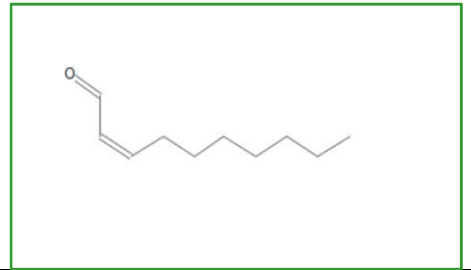
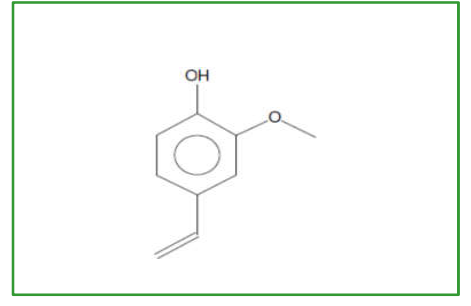
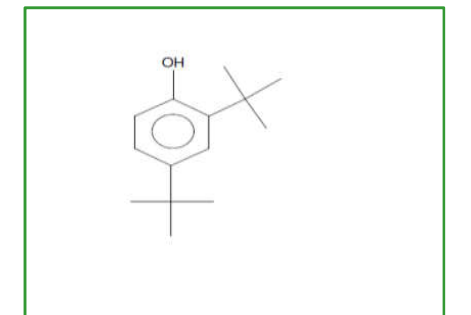
DISCUSSION

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 (Vinayak *et al.*, 2017). 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. There are so many factors determining the quality of a herbal distillate, from choosing the genuine raw drugs, its

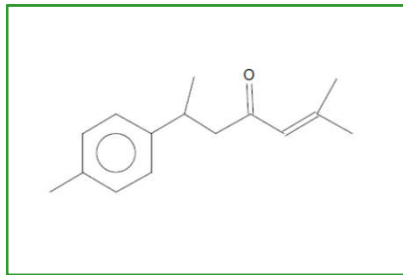
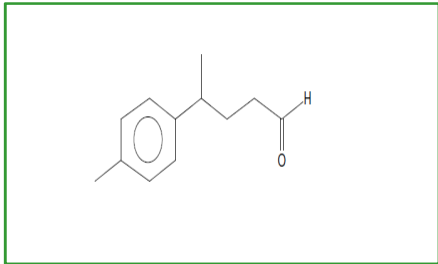
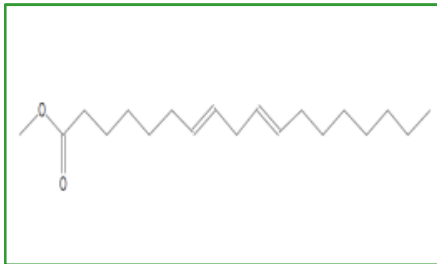
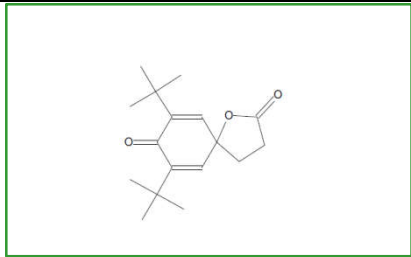
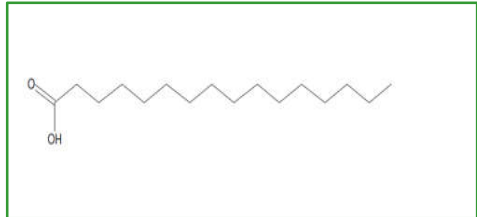
The aromatic compounds are collected at different phases of distillation point and this mainly depends on the molecular weight of the phyto compounds. Molecules which are lighter escapes out first followed by heavier molecules (Compounds having higher no: of carbon atoms ranging from 15 -50) at the later 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 (turmerone) 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, hexatriacontane, tetracontane) 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.

1		
Peak No:	1	
Retention Time:	3.9	
Peak Intensity Rank:	22	
Mol. Wt:	320	
Name:	<i>Benzyl oxy tri decanoic acid</i>	
Mol. Formula:	$C_{20}H_{32}O_3$	
2		
Peak No:	2	
Retention Time:	4.3	
% Peak Area:	1052026	
Peak Intensity Rank:	21	
Mol. Wt:	114	
Name:	<i>Hexane, 2,4-dimethyl-</i>	
Mol. Formula:	C_8H_{18}	
3		
Peak No:	3	
Retention Time:	5	
Peak Intensity Rank:	18	
Mol. Wt:	78	
Name:	<i>Dimethyl Sulfoxide</i>	
Mol. Formula:	$C_2H_6O_5$	
4		
Peak No:	4	
Retention Time:	6	
Peak Intensity Rank:	18	
Mol. Wt:	104	
Name:	<i>Styrene</i>	
Mol. Formula:	C_8H_8	
5		
Peak No:	5	
Retention Time:	7.6	
Peak Intensity Rank:	23	
Mol. wt:	112	
Name:	<i>2-Heptenal, (Z)-</i>	
Mol. Formula:	$C_7H_{12}O$	

Continue

6		
Peak No:	6	
Retention Time:	8.5	
Peak Intensity Rank:	24	
Mol. wt:	138	
Name:	<i>Furan, 2-pentyl</i>	
Mol. Formula:	$C_9H_{14}O$	
7		
Peak No:	7	
Retention Time:	11.7	
Peak Intensity Rank:	20	
Mol. wt:	142	
Name:	Nonanal	
Mol. Formula:	$C_9H_{18}O$	
8		
Peak No:	8	
Retention Time:	16.2	
Peak Intensity Rank:	17	
Mol. wt:	154	
Name:	<i>2-Decenal, (Z)-</i>	
Mol. Formula:	$C_{10}H_{18}O$	
9		
Peak No:	9	
Retention Time:	17.7	
Peak Intensity Rank:	10	
Mol. wt:	150	
Name:	<i>2-Methoxy-4-vinylphenol</i>	
Mol. Formula:	$C_9H_{10}O_2$	
10		
Peak No:	10	
Retention Time:	22.8	
Peak Intensity Rank:	15	
Mol. wt:	206	
Name:	<i>Phenol, 2,4-bis(1,1-dimethylethyl)-</i>	
Mol. Formula:	$C_{14}H_{22}O$	

Continue

11		
Peak No:	11	
Retention Time:	26.4	
Peak Intensity Rank:	11	
Mol. wt:	216	
Name:	<i>Ar-turmerone</i>	
Mol. Formula:	$C_{15}H_{20}O$	
12		
Peak No:	12	
Retention Time:	27.2	
Peak Intensity Rank:	16	
Mol. wt:	176	
Name:	<i>Benzenebutanal, gamma,4-dimethyl-</i>	
Mol. Formula:	$C_{12}H_{16}O$	
13		
Peak No:	13	
Retention Time:	27.2	
Peak Intensity Rank:	13	
Mol. wt:	228	
Name:	<i>Tetra decanoic acid</i>	
Mol. Formula:	$C_{14}H_{28}O_2$	
14		
Peak No:	14	
Retention Time:	31.8	
Peak Intensity Rank:	6	
Mol. wt:	276	
Name:	<i>7,9-Di-tert-butyl-1-oxaspiro(4,5)deca-6,9-diene-2,8-dione</i>	
Mol. Formula:	$C_{17}H_{24}O_3$	
15		
Peak No:	15	
Retention Time:	33.1	
Peak Intensity Rank:	3	
Mol. wt:	256	
Name:	<i>n-Hexadecanoic acid</i>	
Mol. Formula:	$C_{16}H_{32}O_2$	

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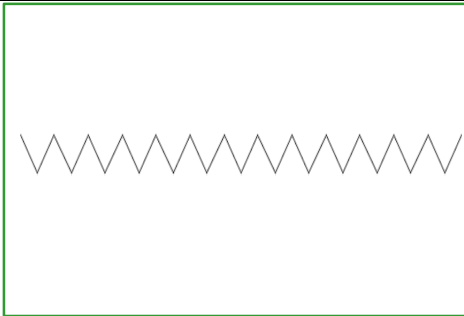
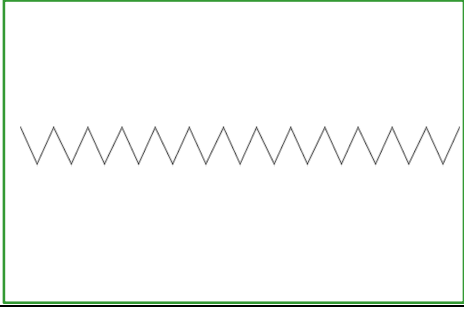
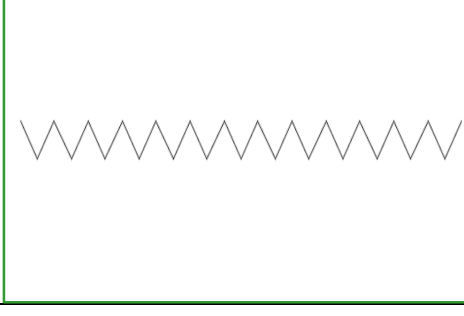
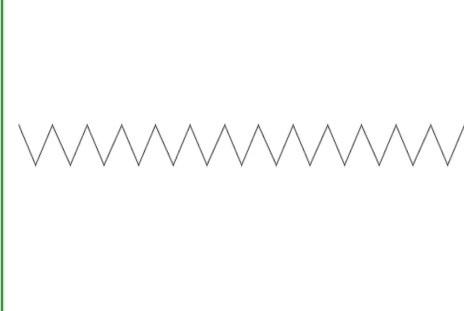
21		
Peak No:	21	
Retention Time:	44.9	
Peak Intensity Rank:	7	
Mol. wt:	394	
Name:	<i>Octacosane</i>	
Mol. Formula:	$C_{27}H_{58}$	
22		
Peak No:	22	
Retention Time:	46.3	
Peak Intensity Rank:	9	
Mol. wt:	506	
Name:	<i>Hexatriacontane</i>	
Mol. Formula:	$C_{36}H_{74}$	
23		
Peak No:	23	
Retention Time:	47.9	
Peak Intensity Rank:	12	
Mol. wt:	408	
Name:	<i>Nonacosane</i>	
Mol. Formula:	$C_{29}H_{60}$	
24		
Peak No:	24	
Retention Time:	49.7	
Peak Intensity Rank:	14	
Mol. wt:	618	
Name:	<i>Tetratetracontane</i>	
Mol. Formula:	$C_{44}H_{90}$	

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

Compounds	Activity
<i>Nonanal</i>	Anti Bacterial, Anti Fungal,
<i>2- decenal</i>	Nematicidal
<i>Nonacosane, Octacosane, Tetratetracontane</i>	Anti inflammatory, Anti oxidant
<i>Hexa decanoic acid</i> (<i>Palmitic acid</i>), <i>Oleic acid</i>	Anti- Atherogenic, Anti- inflammatory Anti Tumor, Hypotensive Hypocholesterolemic, Immuno modulator
<i>Phenol, 2,4-bis(1,1-dimethylethyl)-</i>	Anti Fungal, Anti microbial, Anti oxidant, Anti Malarial.
<i>Ar- Turmerone</i>	Anti- Inflammatory, Anti- Platelet property. Anti Convulsant, Anti- dermatophytic, Anti Venom Anti- depressant, Anti Tumor, Hypoglycemic, Immuno modulator

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.

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