



ISSN: 0976-3376

Available Online at <http://www.journalajst.com>

ASIAN JOURNAL OF  
SCIENCE AND TECHNOLOGY

Asian Journal of Science and Technology  
Vol. 09, Issue, 05, pp.8176-8180, May, 2018

## RESEARCH ARTICLE

### ANALYSIS OF BIOACTIVE COMPOUNDS FROM SINGLE HERBAL *SIDDHA* DISTILLATE “VASAMBU DRAVAGAM” THROUGH GC-MS

<sup>1</sup>, \*Vinayak, S., <sup>2</sup>Thangadurai, K., <sup>3</sup>Gayatri R., and <sup>4</sup>AnilSundaresan

<sup>1</sup>Siddha Physician, General Secretary, International Research Foundation for Siddha Science (INFOS),  
Kannur, Kerala, India

<sup>2</sup>Associate Professor, Department of Maruthuvam, National Institute of Siddha, Chennai 600047,  
Tamil Nadu, India

<sup>3</sup>PG Scholar, Department of Noinadal, National Institute of Siddha, Chennai 600047, Tamil Nadu, India

<sup>4</sup>Head of the Department & Chief Medical Officer, Department of Holistic Medicine, Apollo Clinic,  
Kannur, Kerala, India

#### ARTICLE INFO

##### Article History:

Received 15<sup>th</sup> February, 2018  
Received in revised form  
19<sup>th</sup> March, 2018  
Accepted 10<sup>th</sup> April, 2018  
Published online 30<sup>th</sup> May, 2018

##### Key words:

Siddha medicine,  
Theeneer,  
Vasambu Dravagam,  
GC-MS,  
Asarone, Silicic acid.

#### ABSTRACT

**Background:** *Theeneer*, the hydro distillate formulations of *Siddha* medicine is getting popularity and wide clinical acceptance owing to its faster therapeutic outcome. The raw drugs single or compound is preprocessed and subjected to distillation by following the traditional parameters mentioned in the *siddha* texts. *Vasambu* (*Acoruscalamus* Linn.) is a well known herb that has very reputed use in Traditional system like *Siddha* medicine and other Ethno medicinal practices. The rhizome part is distilled for its medicinal purposes and is termed as *Vasambu Dravagam*. The drug is indicated in *siddha* medicine for correcting the vitiations of three humors namely *Vazhi*, *azhal* and *Iyyam* (*Vatham*, *pitham* and *Kapham*).

**Objectives:** The present study aims in preparing the distillate of *Acoruscalamus* rhizome and to analyze the drug with GC-MS (Gas chromatography Mass Spectrometry).

**Methods:** The Rhizome part of *Vasambu* (*Acoruscalamus* Linn.) was distilled after following the preprocedures and further the distillate were analyzed for screening the active components.

**Results:** *Vasambu Theeneer* was colorless with slight peculiar nauseating odor, and having mild sweet and pungent taste. Through GC-MS a total of 4 compounds were identified from *Acorus* distillate. Predominant peak belonging to 4-[4-(1-Phenyl-1H-1, 2, 4-triazol-5-yl)-1, 3-thiazol-2-yl] pyridine then asarone, Silicic acid and 2-(2-Benzothiazolyl)-3-[4-(dimethylamino) phenyl] acrylonitrile.

**Discussion:** Asarone and the volatile siloxane silicic acid is the active component of this *Acorus* distillate which has reputed Pharmacological activity in deciding the outcome of the drug..

**Conclusion:** *Vasambu Dravagam* and its possibility in clinical aspects for broad spectrum of diseases may be supported with this preliminary screening and interpretations.

Copyright©2018, Xiao-Fei Gao et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

#### INTRODUCTION

Hydro distillate formulations in *siddha* medicine are superior in terms of quality and potency. The terminology *Theeneer*<sup>(1)</sup> is attributed to extracts of herbal raw materials in aqueous nature with sharp potency. They are potential healers for specific ailments and some are used in a broad spectrum way to manage varieties of medical conditions. One of the fundamental principle by which the *siddha* system is established is the concept of *Mukutram*, the Trihumoral theory. A perfect physiological ratio of all the 3 humors namely *vazhi*, *azhal* and *iyyam* promote healthy well being of an individual free from diseases or degeneration<sup>(2)</sup>.

\*Corresponding author: Vinayak, S.,

Siddha Physician, General Secretary, International Research Foundation for Siddha Science (INFOS), Kannur, Kerala, India.

Hundreds of diseases are categorized on the basis of deranged *kutram* (humors) or either due to its combined vitiations. It is the goal of the *siddha* practitioner to provide the best symptomatic relief, and simultaneously to treat the root cause of the disease, thereby to maintain the equilibrium of the trihumors. A drug which is capable of balancing all the three (*MukutraSama Porul*) is considered very superior and is prescribed as the finest supportive therapy along with other medications.<sup>(3)</sup> So many herbal distillates either single or compound formulations are been used in *siddha* practice with its notable indication or property in balancing the deranged humors. The distillate from the rhizome of *Acoruscalamus* is one such simple classical preparation. *Vasambu* (*Acoruscalamus* Linn.) belonging to family Araceae is a well known herb that has very reputed use in Traditional system like *Siddha* medicine and other Ethnomedicinal practices.

Table. 1 General Description of *Vasambu* (4-8)

Color	Externally purplish brown to light brown Internally white
Odor	Characteristic
<i>Suvai</i> (Taste)	<i>Karppu</i> (Pungency)
<i>Thanmai</i> (Potency)	<i>Veppam</i> (Hot)
<i>Pirivu</i> (Division)	<i>Karppu</i> (Pungent)
Chemical Constituents	Acorenone, isocalamendiol, Asarone, betasaron, monoterpene hydrocarbons, Sequestrine ketones, eugenol, isoeugenolmethylester, Linalool, elemicin, acetophenone, dehydroabietic acid, a- Ursolic acid, Nonanoic acid, Fatty acids like oleic, linoleic, Linolenic acid (George et al, 1986) palmitic, palmitoleic, stearic and myristic acids.
Pharmacological Actions	Anti-oxidant, Antiperiodic, Antifungal, Anthelmintic, Carminative, Disinfectant, Emetic, Germicide, Insecticide, Sedative, Stomachic, Stimulant, Tonics, Tranquilizer.
Indications in Siddha Medicine	Toxic bites, <i>pun</i> (ulcers), <i>Valippu</i> (Convulsions), <i>Gunmam</i> (Gastro intestinal ailments), <i>Rakthapitham</i> (Bleeding disorders), <i>Soolai</i> (Painful affections), <i>Muppini</i> (Delirium), <i>Irumal</i> (Cough), <i>Pleehanoi</i> (Diseases of Spleen), <i>Silipatham</i> (Elephantiasis), <i>Kriminoi</i> (Helmenthiasis) <i>Naakkupirahchi</i> (Stammering), <i>Vayu</i> (Gaseous disturbances) <i>Seriyamai</i> (Dyspepsia), <i>Kazhichil</i> (Diarrhoeal diseases), <i>Sori</i> , <i>Sirangu</i> , <i>Kushttam</i> (Scabies & other skin diseases), <i>Muraikaychal</i> (Periodic fever) etc.



Fig A. Raw Acoruscalamus



Fig. B. Period of soaking Fig. C. Distillation procedures

This perennial plant has creeping and extensively branched aromatic rhizome. Therapeutic potential is mainly attributed to its rhizome part. The rhizome part is distilled for its medicinal purposes and is termed as *Vasambu Dravagam* <sup>(9)</sup>. The drug is indicated for correcting the vitiations of three humors namely *Vazhi*, *azhal* and *Iyyam* (*Vatham*, *pitham* and *Kapham*) moreover the distillate is been traditionally used in *Siddha* practice for improving digestion, bowel regulation and for relieving flatus.

**Aim and objectives:** The present study aims in preparing the distillate of *Acoruscalamus* rhizome and to analyze the drug with GC-MS (Gas chromatography Mass Spectrometry).

The study may help to assess the efficacy of the drug for further clinical validations.

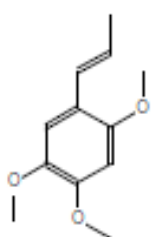
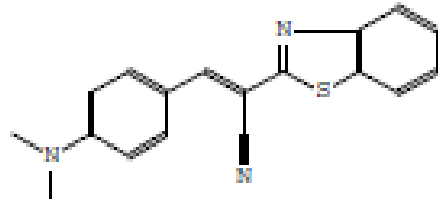
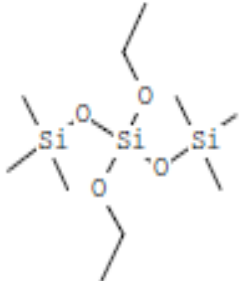
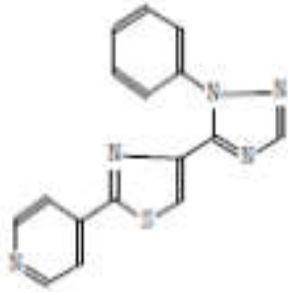
## MATERIAL AND METHODS

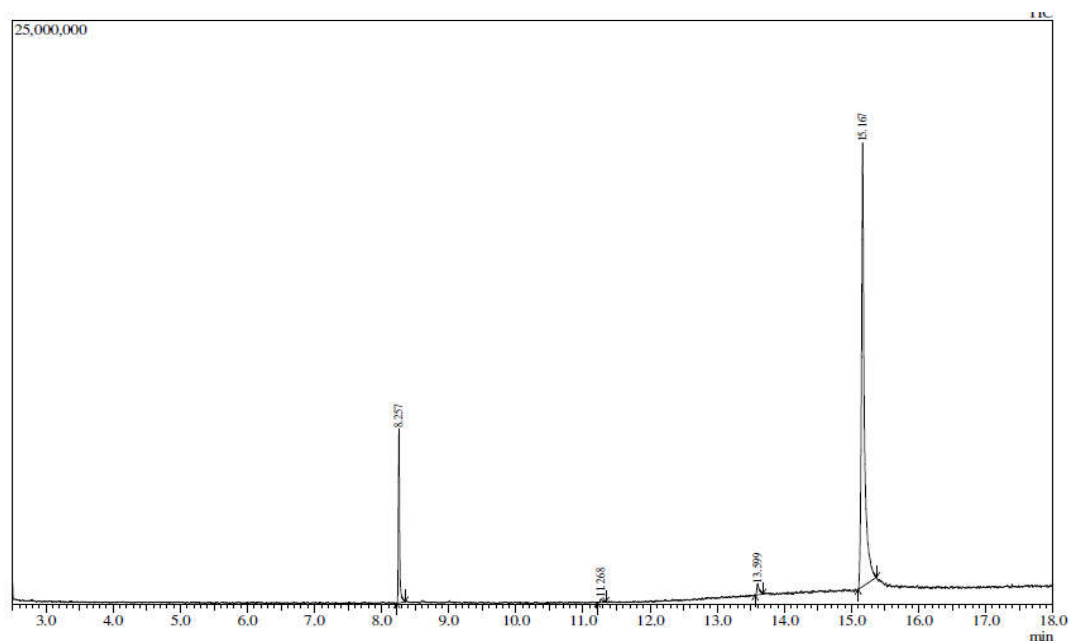
- Ingredient Details:** *Vasambu* (dried rhizome of *Acoruscalamus*) (Fig. A)
- Method of Preparation of Distillate Sample** (Fig. B & C) <sup>(9)</sup>: The dried rhizomes (300 g) were crushed well, mixed with 10 parts of pure water (3 liters) taken in a porcelain jar and soaked for a period of 3 days. On the 4<sup>th</sup> day the entire contents were transferred to a traditional still to initiate distillation. The distillate collected was preserved for analysis.

Table 2. Gas Chromatograph Report of *Vasambu Dravagam*.

Peak no	Retention Time	%Peak Area	Peak Intensity Rank	Mol. Wt	Name of the Compound	Chemical Formula
1	8.25	13.71	2	208	<i>Asarone</i>	C <sub>12</sub> H <sub>16</sub> O <sub>3</sub>
2	11.26	0.54	4	305	2-(2-Benzothiazolyl)-3-[4-(dimethylamino) phenyl] acrylonitrile.	C <sub>18</sub> H <sub>15</sub> N <sub>3</sub> S
3	13.59	1.69	3	296	<i>Silicic acid</i>	C <sub>10</sub> H <sub>28</sub> O <sub>4</sub> Si <sub>3</sub>
4	15.16	84.06	1	305	4-[4-(1-Phenyl-1H-1,2,4-triazol-5-yl)-1,3-thiazol-2-yl]pyridine	C <sub>16</sub> H <sub>11</sub> N <sub>5</sub> S

Table 3. Bioactive compounds of *Vasambu Dravagam*

<p><i>Asarone</i></p> 	<p>2-(2-Benzothiazolyl)-3-[4-(dimethylamino) phenyl] acrylonitrile.</p> 
<p><i>Silicic acid</i></p> 	<p>4-[4-(1-Phenyl-1H-1,2,4-triazol-5-yl)-1,3-thiazol-2-yl]pyridine</p> 

Fig. D. Gas Chromatography of *Vasambu Dravagam*

C. **Gas Chromatography- Mass Spectrometry (GC-MS)** <sup>(10)</sup>: GC-MS is a sophisticated tool used in the separation, identification and quantitation of volatile and organic compounds present in the hydro distillate. GC-MS analysis of the distillate was performed with Agilent 7890B GC connected to 5977A MSD along with NIST Ver.2.1 MS data library Specification.

## RESULTS

*Vasambu Dravagam* was colorless with slight nauseating odor and mild sweet and pungent taste.

**GC- MS reports of *Vasambu Dravagam* (Fig D, Table. 2):** The Gas chromatogram of *Vasambu Dravagam* revealed 4

prominent peaks with retention time ranging from 8.25 to 15.16. The detailed report of the compounds retention time (RT), Peak intensity rank, Molecular weight, name, chemical formula chemical structure and its pharmacological activities were presented in Table 2 & 3.

**Table 3. Pharmacological significance of compounds spotted in *Vasambu Dravagam*<sup>(11-14)</sup>**

Compounds	Activity
Asarone	1. Anticonvulsant
	2. Antipyretic
	3. Anti Spasmodic
	4. Cardio-depressant
	5. CNS-Depressant
	6. Cryoprotective.
	7. Emetic
	8. Fungicide
	9. Myo relaxant
	10. Hypothalamic Depressant
	11. Insecticidal
	12. Neuroprotective
	13. Sedative
	14. Tranquilizer
Silicic acid	1. Anti diabetic

## DISCUSSION

An in depth knowledge of phytochemicals present in herbs is very much crucial for establishing the clinical significance of traditional formulations. The Analytical studies of *Vasambu Dravagam* the distillate prepared from the rhizome of *Acorus calamus* shown 4 compounds and out of this Asarone and Silicic acid has wide report on its pharmacological activities. Asarone (2, 4, 5- trimethoxy -1 – propenyl benzene) is one of the principle bioactive constituent present in *Acorus* species especially in its rhizome. Asarone is also present as higher concentration in, *Daucus carota* seeds, fruits of *Piper cubeba* and roots of *sassafras albidum*.<sup>(11)</sup> The intermediate compounds of asarone alpha and beta asarone have validated pharmacological activities. In a study the protective effect of alpha asarone were assessed against doxorubicin (DOX) induced nephritic syndrome in rats. The study revealed improvement in renal functions with simultaneous reduction in proteinuria, dyslipidemia and hypoalbuminemia. In addition to that an improved level of antioxidant activities was observed in renal tissues. The study supports its Nephroprotective, Hypolipidemic, Anti Inflammatory and Antioxidant activities (Sutariya and Saraf, 2018)<sup>(15)</sup>. In studies on standard animal seizure models alpha asaronol an active constituent derived from alpha Asarone demonstrated anticonvulsant and neuroprotective effects (Heet *al.*, 2018). Various other Researches on alpha asarone indicate its anti nociceptive, Hypnotic and anxiolytic effects (Guiet *al.*, 2018)<sup>(16)</sup>. While on the other intermediate the phenylpropanoid Beta asarone has been established for its Anti depressant, Anthelmintic, antibacterial, anti anxiety, anti Alzheimer's, anti Parkinson's, anti epileptic, anti cancer, anti hyperlipidemic, antithrombotic, anticholestatic and radio protective properties (Chelinet *al.*, 2017)<sup>(17)</sup>. Silicic acid is one of the forms of element silicon generally found in soils which is easily up taken by the plant roots (Heatheret *al.*, 2007)<sup>(18)</sup>. Silicic acid is also named as orthosilicic acid is a common constituent present in so many herbal parts including leaves of *Oryza sativa* and *Maclurapomifera*<sup>(19)</sup>. These compounds exist as volatile siloxanes (Kathirvet *al.*, 2014)<sup>(20)</sup> in plant parts easily

extracted by hydro distillation. The drug may act in a multiple clinical associations or either expressed traditionally in terms of perfect balancer of health.

## Conclusion

A herbal drug is a potential reservoir of thousands of active components. The extraction value of the constituents mainly depends on the solubility of the medium and the methods used during its preparation. Water soluble compounds are best extracted by soaking or boiling the raw drugs. Hydro distillates extract potent volatile and other organic compounds from the plant material. As a matter of fact It's inapplicable to isolate and study each component from a hydro distillate but the principle compounds which decides the outcome of its efficacy can be screened by sophisticated analytical techniques like GC-MS. We can predict the therapeutic potential of distillates to a greater extent by identifying such marker compounds and its intermediates or derivatives. From the study we may conclude the possibility of using the single herbal siddha distillate *Vasambu Dravagam* as a drug of choice for broad-spectrum of clinical associated conditions. As GC-MS is only one of the analytical steps for the standardization of the drug, further studies have to be carried out for validating the safety and efficacy of this distillate.

## REFERENCES

- Anaivariananthan, Gunapadam thathujeeva vaguppu, Directorate of Indian Medicine & Homeopathy. Page. 70.
- Dr. K Uthamarayan, Siddha maruthvangachurukkam. 2<sup>nd</sup> edition, 2006, Department of Indian Medicine and Homeopathy. Page. 168.
- Dr. Durairasan, Siddha Hygeine and Preventive Medicine, 1993, 3<sup>rd</sup> edition, Department of Indian Medicine and Homeopathy. Page. 259.
- K. S. Murugesu mudhaliyar, Gunapadam-mooligai vaguppu, 2nd edition, 2008, Directorate of Indian Medicine and Homeopathy. Page. 787.
- Chidambarathanupillai S, Porul panbu nool (mooligai vaguppu) part 1, 1st edition, 2007, Siddha medical literature Research centre. Page no. 121.
- Rajput SB, Tonge MB, Karuppaiyil SM. An overview on traditional uses and pharmacological profile of *Acorus calamus* Linn. (Sweet flag) and other *Acorus* species. *Phytomedicine*. 2014; 21(3): 268-76.
- R. Balakumbhahan, K. Rajamani, K. Kumanan. *Acorus calamus*: An overview. *Journal of Medicinal Plants Research*. 2010; 4(25): 2740-2745.
- Parki A, Chaubey P, Prakash O, Kumar R, Pant AK. Seasonal variation in Essential oil compositions and antioxidant properties of *Acorus calamus*. *Medicines (Basel)*. 2017; 4(4)
- Ramachandran SP, Nandeesar sarva kalai jnanam-1000, Thamarai Noolakam Page no. 48 - 49.
- Gas Chromatography a Mini Review. S. Pravallika. *Research and reviews Journal of Pharmaceutical Analysis*. 2016; 5(2):55-62.
- Duke, James A. 1992. *Handbook of Phytochemical constituents of GRAS herbs and other economic plants*. Boca Raton, FL. CRC Press.
- Chang W, Teng J. Combined application of tenuigenin and Beta Asarone improved the efficacy of memantine in

- treating moderate to severe Alzheimer's disease. *Drug Des Devel Ther.* 2018; 12:455-462.
13. He X, Bai Y, Zeng M, Zhao Z, Zhng Q, Xu N, Qin F, Wei X, Zhao M, Wu N, Li Z, Zhang Y, Fan TP, Zheng X. Anticonvulsant activities of alpha asaronol ((E)-3'-Hydroxyasarone), an active constituent derived from alpha asarone. *Pharmacol Rep.* 2018; 70 (1): 69-74.
  14. Gui Y, Lia A, Zhang J, Li G, Guo Q, Zou W. Alpha asarone alleviated chronic constriction injury- induced Neuropathic pain through inhibition of spinal endoplasmic reticulum stress in Liver X Receptor- Dependent manner. *AnesthAnalg.* 2018.
  15. Sutariya B, Saraf M. Alpha asarone reduce proteinuria by restoring antioxidant enzymes activities and regulating necrosis factor kB signaling pathway in doxorubicin (DOX) induced nephritic syndrome. *Biomed Pharmacother.* 2018; 98:318-324.
  16. Gui Y, Lia A, Zhang J, Li G, Guo Q, Zou W. Alpha asarone alleviated chronic constriction injury- induced Neuropathic pain through inhibition of spinal endoplasmic reticulum stress in Liver X Receptor- Dependent manner. *AnesthAnalg.* 2018.
  17. Chelian R, Pandey V, Mohammed Z. Pharmacology and toxicology of alpha and beta asarone: A review of preclinical evidence. *Phytomedicine.* 2017; 32: 41-58.
  18. Heather A, Curie, Carole C, Perry. Silica in Plants: Biological, Biochemical and Chemical studies. *Ann Bot.* 2007; 100(7): 1383-1389.
  19. The Wealth of India raw materials. 1948-1976. Publication and information Directorate, CSIR, New Delhi. 11 Volumes.
  20. A. Kathirvel, A. K Rai, G.S. Maurya, V. Sujatha. *Dryopteris cochleata* rhizome: A nutritional source of essential elements, phytochemicals, antioxidants and antimicrobials. *Int J Pharm Pharm.* 2014. Sci; 6(2): 179-188.

\*\*\*\*\*