

COULD SIDDHA MEDICINE BE A SOLUTION TO ‘POOR PEOPLE’S DISEASE’, THE TUBERCULOSIS?***Baskaran Sivaraj¹ and Naansi Agnes Leo²**¹MD (Siddha), MSc Epidemiology.²MD (Siddha).***Correspondence for Author: Baskaran Sivaraj**

MD (Siddha), MSc Epidemiology.

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ABSTRACT

Tuberculosis is an infectious and highly fatal disease. Till date TB is a challenge to both developing and even the developed countries. The reason may be suggested that, more the treatment aspect we develop, the more the resistant to it, the organism produces. In addition, nutrition plays a vital role in under developed countries. This review portrays about the traditional system of medicine, the Siddha system in eradicating tuberculosis and its complications. It has a plenty of medicines unexplored in it. Certain medicines are explored and used in combinations with other medicines. This review helps in exploring such herbal medicines which possesses its way of action against TB.

KEYWORDS: Siddha, Ayush, Indian medicine, Anti-Tubercular, TB, Herbs, Anti-microbial.**INTRODUCTION**

Tuberculosis is an infectious, highly fatal disease and till date it is a challenge to WHO and national governments of both developing and developed countries. After so many years from the discovery of ATT drugs, (Streptomycin – 1945-46, Isoniazid-1952, Rifampycin – 1957) couldn't eliminate TB.^[1]

Despite the statement of WHO that the TB death rate reduced 45% from 1990 -2010, 8.6 million people fell ill with TB and 1.3 million died from TB in the year 2012. Over 95% of TB deaths occur in low- and middle-income countries, and it is among the top three causes of death for women aged from 15 to 44.^[2]

The WHO, estimated that in 2012 India had 27000 deaths due to TB alone. 42000 deaths occurred by TB along with HIV. The prevalence was 28 lakhs in 2012, (230 per 100000 people) and the incidence was 22 lakhs (176 per 100000 people).^[3]

Besides the above facts, the drug resistance of the bacteria is the another threat. About 450000 people developed MDR-TB in the world in 2012. More than half of these cases were in India, China and the Russian Federation. It is estimated that about 9.6% of MDR-TB cases had XDR-TB.^[2]

In India alone, 21000 (2.2%) new cases diagnosed as MDR TB, 43000 (15%) cases diagnosed as MDR TB while retreatment. In a cohort study, it showed 28% MDR TB and 39% INH resistance.^[3]

The Siddha system of traditional medicine is practiced in Tamilnadu, Kerala of South India, Srilanka and other regions of the world where tamil people lives. *Yugi Vaidhiya Sindhamani*, an age-old Siddha text which describes the etiology, signs, symptoms and complication of diseases and classified the diseases accordingly. *Kaasa Roga Nithaanam*, and *Kshaya Roga Nithaanam* in it describes respiratory diseases including Pulmonary Tuberculosis.^[4]

Moreover, lot of Siddha medical literatures portrays medicines indicated for TB and other respiratory illness. Some medicinal plants and traditional medicines revealing their anti mycobacterial activity, and its a gift for the scientific world in developing new ATT drugs.

Tab.1.Medicinal Plants indicated for Respiratory illness including Pulmonary Tuberculosis in Siddha System Of Medicine^[5]

Botanical Name of the medicinal plants	Family	Tamil name
<i>Acacia nilotica or Acaia arabica</i>	Mimosaceae	<i>Karuvel</i>
<i>Acacia pinnata or Mimosa rubicaulis</i>	Mimosaceae	<i>Indu</i>
<i>Acalypha indica</i>	Euphorbiaceae	<i>Kuppaimeni</i>
<i>Adatoda vasica or Justicia beddomi</i>	Acanthaceae	<i>Adathodai</i>
<i>Allium cepa</i>	Alliaceae	<i>Vengayam</i>
<i>Aloe litteralis</i>	Liliaceae	<i>Kariyabolam</i>
<i>Alpinia galangal</i>	Zingiberaceae	<i>Citrarathai</i>
<i>Alpinia officinarum</i>	Zingiberaceae	<i>Perarathai</i>
<i>Anethum graveolens</i>	Apiaceae	<i>Chatakuppai</i>
<i>Anisochilus carnosus</i>	Lamiaceae	<i>Karpooravalli</i>
<i>Azima tetracantha</i>	Salvadoraceae	<i>Changan</i>
<i>Bacopa monnieri</i>	Scrophulariaceae	<i>Birami</i>
<i>Boerhavia diffusa</i>	Nyctaginaceae	<i>Mookkirattai</i>
<i>Calotropis gigantea</i>	Asclepiadaceae	<i>Erukku</i>
<i>Coccinia grandis or Coccinia indica</i>	Cucurbitaceae	<i>Kovai</i>
<i>Commiphora myrrha</i>	Burseraceae	<i>Vaalandirabolam</i>
<i>Costus speciosus</i>	Costaceae	<i>Kottam</i>
<i>Curcuma zedoaria</i>	Zingiberaceae	<i>Kichilikkizangu</i>
<i>Dodonea viscosa</i>	Sapindaceae	<i>Viraali</i>
<i>Evolvulus alsinoides</i>	Convolvulaceae	<i>Vishnukiranthi</i>
<i>Ferula asafoetida</i>	Apiaceae	<i>Perungayam</i>
<i>Garcinia xanthochymus</i>	Clusiaceae	<i>Pachilai</i>
<i>Glycyrrhiza glabra</i>	Fabaceae	<i>Athimathuram</i>
<i>Hedyotis tuberula or Oldenlandia umbellata</i>	Rubiaceae	<i>Impooral</i>
<i>Leucas aspera</i>	Lamiaceae	<i>Thumbai</i>
<i>Moringa oleifera</i>	Moringaceae	<i>Murungai</i>
<i>Mukia madaraspatana</i>	Cucurbitaceae	<i>Musumusukkai</i>
<i>Nardostachys grandiflora or jatamasi</i>	Valerianaceae	<i>Sataamaanji</i>
<i>Nelumbo nucifera</i>	Nelumbonaceae	<i>Thaamarai</i>
<i>Ocimum sanctum</i>	Lamiaceae	<i>Thulasi</i>
<i>Oscimum album</i>	Lamiaceae	<i>Kanjankorai</i>
<i>Papaver somniferum</i>	Papaveraceae	<i>Abini</i>
<i>Pergularia daemia or extensa</i>	Asclepiadaceae	<i>Uththamani</i>
<i>Piper cubeba</i>	Piperaceae	<i>Vaalmilaku</i>
<i>Piper longum</i>	Piperaceae	<i>Thippili</i>
<i>Piper nigrum</i>	Piperaceae	<i>Milaku</i>
<i>Rhus succedanea or Toxicodendron succedaneum</i>	Anacardiaceae	<i>Karakatakasingi</i>
<i>Ruta graveolense or chalapensis</i>	Rutaceae	<i>Aruvatha or satahaappu</i>
<i>Shorea robusta</i>	Dipterocarpaceae	<i>Kungiliyam</i>
<i>Solanum nigrum</i>	Solanaceae	<i>Manathakkali</i>
<i>Solanum surrntense</i>	Solanaceae	<i>Kandangathiri</i>
<i>Solanum torvum</i>	Solanaceae	<i>Chundai</i>
<i>Solanum trilobatum</i>	Solanaceae	<i>Thoothuvalai</i>
<i>Styrax benzoin</i>	Styracaceae	<i>Saambirani</i>
<i>Taxus buccata or Abies spectabilis</i>	Taxaceae	<i>Thalisapaththiri</i>
<i>Tephrosia purpurea</i>	Fabaceae	<i>Kollukkai velai or Kozhunji</i>
<i>Terminalia bellerica</i>	Combretaceae	<i>Thandri</i>
<i>Terminalia chebula</i>	Combretaceae	<i>Kadukkai</i>
<i>Trianthema decandra</i>	Aizoaceae	<i>Sathichaaranai</i>
<i>Vitex negundo</i>	Lamiaceae	<i>Nochi</i>
<i>Vitis vinifera</i>	Vitaceae	<i>Thiraatchai</i>

Tab.2. Antimycobacterial Activity of Some Medicinal Plants Against H37Rv Strain

Plant	Extract	RLU reduction (in %)	CFU Inhibition %	Concentration	Assay
A.vasica	Water		70	4% v/v	Calorimetri BacT/ALERT 3D ^[6]
	Hexane		96.76 ± 3.74	100 µg/ml	Agar dilution method ^[7]
	Ethanol		70.16± 2.40	100 µg/ml	Agar dilution method ^[7]
Vasicine Acetate		99.96	-----	100 µg/ml	LRP assay ^[7]
A.cepa	Water		35	4% v/v	Calorimetri BacT/ALERT 3D ^[6]
	Water		-	50 µg/ml	MABA ^[8]
	Ethanol		-	100 µg/ml	MABA ^[8]
A.satvum	Water		63	4% v/v	Calorimetri BacT/ALERT 3D ^[6]
Piper longum	Methanal	49.28±1.38	-----	100 µg/ml	LRP assay ^[9]
Piper nigrum	Methanol	15.34±0.79	-----	500 µg/ml	LRP assay ^[9]
	Acetone			100 µg/ml	MABA ^[10]
	Mixture of Acetone and Ethanol extract			25 µg /ml of Acetone+50µg/ml of Ethanol extract	MABA ^[10]
Solanum Trilobatum	Water		90(relative to control)	500 µg/ml With 90% Inhibition	Broth Micro Dilution Method ^[6]
	Methanol	33.32±0.82	-----	500 µg/ml	LRP assay ^[9]
Oscimum sanctum	Methanol	47.42±1.62	-----	500 µg/ml	LRP assay ^[9]
Phyllanthus emblica	Methanol	80.39±2.31	-----	500 µg/ml	LRP assay ^[9]
Glycyrhiza glabra	Ethanol			500µg/ml	BACTEC Assay ^[11]
	Hexane			Not Active (>1000µg/ml)	BACTEC Assay ^[11]
	Ethyl acetate			250µg/ml	BACTEC Assay ^[11]
Glabridin				29.16±3.61	BACTEC Assay ^[11]
Alpinia Galanga	Acetone			100 µg/ml	MABA ^[12]
	Ethanolic			50 µg/ml	MABA ^[12]
	Ethanol		98% inhibition in Lung Cell line culture	100 µg/ml	Intracellular Assay ^[13]
Solanum Torvum (Methyl Caffiate)	Methanol		No turbidity	8 µg/ml	Broth-micro dilution assay ^[14]
Ruta graveolense	Methanol	87.24±2.86	---	500 µg/ml	LRP Assay ^[9]
Tephrosea purpurea	Methanol	83.83±1.89		500 µg/ml	LRP Assay ^[9]

Tab.3. Antimycobacterial Activity of Some Medicinal Plants Against MDR Strain

Plant	Extract	RLU reduction (in %)	CFU Inhibition %	Concentration	Assay
A.vasica	Water		86 (R,INH,OF, STR,KAN)	4% v/v	Calorimetri BacT/ALERT 3D ^[6]
Vasicine Acetate	----	-----	97.3(INH,RF)	200 µg/ml	Agar dilution method ^[7]
Vasicine Acetate	-----	97.68 (INH,RF)		200 µg/ml	LRP Assay ^[7]
A.cepa	Water		79(R,INH,OF, STR,KAN)	4% v/v	Calorimetri BacT/ALERT 3D ^[6]
A.satvum	Water	-----	72(R,INH,OF, STR,KAN)	4% v/v	Calorimetri BacT/ALERT 3D ^[6]
Piper longum	Ethyl acetate	-----	--	39 µg/ml	Kirby Bauer Disk

					Diffusion method ^[15]
-DO-	Methanal	35.60±1.43		100 µg/ml	LRP assay ^[9]
Piper nigrum		57.83±1.24		500 µg/ml	LRP assay ^[9]
	Acetone			100 µg/ml	MABA ^[10]
	Mixture of Acetone and Ethanol extract			25 µg /ml of Acetone+50µg/ml of Ethanol extract	MABA ^[10]
Solanum trilobatum	Water		90(relative to control)	500 µg/ml With 90% Inhibition	Broth Micro Dilution Method ^[16]
	Methanol	28.09		100 µg/ml	LRP assay ^[9]
Oscimum Sanctum	Methanol	72.37±1.75	-----	500 µg/ml	LRP assay ^[9]
Phyllanthus emblica	Methanol	69.39±2.54	-----	500 µg/ml	LRP assay ^[9]
Alpinia Galanga	Acetone	----		100 µg/ml	MABA ^[11]
	Ethanolic	----		50 µg/ml	MABA ^[11]
	Ethanol	----	97.74% inhibition in Lung Cell line culture	100 µg/ml	Intracellular Assay ^[11]
Solanum torvum (Methyl Caffiate)	Methnol	-----	No turbidity	8 µg/ml	Broth-micro dilution Assay ^[14]
Ruta graveolense	Methanol	98.23±2.41	----	500 µg/ml	LRP Assay ^[9]
Tephrosea purpurea	Methanol	70.68±1.73	-----	500 µg/ml	LRP Assay ^[9]
Mukia Maderaspatana	Methanol	54.79±1.36	-----	500 µg/ml	LRP Assay ^[9]
Vitex leucoxylian	Methanol	54.51±1.75	-----	500 µg/ml	LRP Assay ^[9]

DISCUSSION

Adathoda vasica shows significant antimycobacterial activity against both the H37Rv and MDR mycobacterium strains in various extracts.^[6] In addition, the alkaloids isolated from the plant also possess the same activity. The notable point is that it proved its antimycobacterial activity in various methods of antimycobacterial assay. The plant is commonly used in Siddha and Ayurvedha system of medicine for Bronchial asthma and other respiratory diseases like bronchitis etc.

Allium cepa shows mild antimycobacterial activity against H37Rv in a study.^[6] At the mean time it shows significant activity against MDR Mycobacterium in the same study. But it shows significant activity against both the strain H37Rv and MDR strains in another study.^[8] Even though it is mentioned as expectorant in Siddha medicine, in practice it is not the firstly preferred drug for respiratory diseases.

Allium sativum, eventhough, shows significant activity against both H37Rv and MDR strains, it is more active against MDR strain than H37Rv strain. *Allium sativum* mentioned as expectorant in Siddha medicine and indicated for chronic cough, wheeze and breathlessness. *Poondu thaen* (a drug containing mixture of *Allium sativum* juice and honey) used for throat infections and tonsillitis.

Piper longum, one of the common herb used in Siddha and Ayurvedha medicine. The methonal extract shows moderate activity against H37Rv and mild activity against MDR strain in a study.^[9] It shows significant activity against MDR strain in another study done.^[15] *Piper longum* is one of the ingredients in a popular compound drug called *Trikatuku chooranam* used both in Siddha and Ayurvedha system of Medicine. When the Trikatu choorna given with Rifampicin, it reduces the dose of rifampicin into 200 mg for the TB treatment, and the CSIR formed a new combination Rifampicin+ Trikatu and named it “ Risorin ”.^[16]

Piper nigrum commonly known as pepper, shows mild activity against H37Rv strain but shows significant activity against MDR strain.^[9] In another study done, it showed significant activity in 100µg/ml acetone extract. But, showed very significant activity at 25µg/ml mixture of acetone and methanol extract.^[10] Pepper also one of the three ingredients of *Trikatuku chooranam*. It is either used alone or in the form of *Trikatuku chooranam* for all types of respiratory diseases in Siddha Medicine.

Solanum trilobatum (*Thoothuvalai* in Tamil), a plant, commonly used in Siddha medicine for respiratory infections. The plant showed 90% reduction in Mycobacterium growth when compared with control drug, against both H37Rv and MDR strains.^[16] The plant showed significant activity against MDR-TB than H37-Rv strain in another study.^[10] Leaves, fruits, whole plant,

root are indicated for cough, phlegm in chest, breathlessness, and fever in Siddha medicine. This plant is also a commonly used herb for respiratory illness as home remedies.

Ocimum sanctum is a plant considered as a holy plant by hindus (a religion), and every common man in India believes that it is good for cough and common cold. The *Ocimum sanctum* showed moderate activity against H37Rv strain and significant activity against MDR strain in a study.^[9]

Phyllanthus emblica is a popular and commonly used herb in Siddha and Ayurveda Medicine. The fruit of *Phyllanthus emblica* is considered equivalent with metal and mineral drugs in Siddha medicine. The fruit of *Phyllanthus emblica* shows significant activity against both the strains H37Rv and MDR mycobacterium.^[9]

Alpinia galangal showed its antimycobacterial activity against H37Ra and MDR-TB strain as Acetone extract in 100 µgm concentration by MABA assay.^[11] Interestingly, the plant showed its significant activity by inhibiting the colony forming units by 98% against both strains in intracellular study.^[11]

Solanum torvum, in the form of Methyl caffiate – a derivative from the same plant showed its significant antimicrobial activity against both strains at a least concentration i.e, 8µg/ml by Broth-micro dilution assay.^[16] Eventhough, it is mentioned for respiratory illness in Siddha medicine, it is commonly used as an anthelmintic in practice.

Ruta graveolens or *Ruta chalepensis* showed highly significant antimycobacterial activity against H37Rv and MDR-TB strains.^[9] But, this drug not commonly used as a single drug for respiratory illness. *Tephrosea purpuria* also showed its significant activity against the both strain in the same study.^[9] It is also not a common drug using alone for respiratory illness.

Methanol extract *Mukia maderaspatana* and *Vitex leucoxytan* showed moderate activity against MDR-TB bacilli but not against H37Rv.^[9]

Necessity to explore traditional medicine in the treatment of TB

Even after spending huge money and manpower TB is not eliminated from the world. Still there is lack of an effective and promising drug to treat TB in short term. All the developing countries are struggling to obtain a new drug or to get an effective, short term drug with no adverse effects for TB. Hence, the immediate necessary action is to study the above discussed Siddha medicines in humans. The drugs may be tested either in the traditional/practicing form or it may be in the extract or powdered form. In accordance with ICMR guidelines, any drug from Indian System of Medicine, which is in practice could be tested directly at phase II.^[17] And so studying the traditional medicine would be less cost, on

comparison a study with a new chemical entity. This review lays down such traditional medicines which has much effective actions against TB. Exporing those medicines further can pave way to a TB free world.

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