

Pharmacological Actions of Contents of Kabasura Kudineer- A Siddha Formulation for Fever with Respiratory Illness

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ABSTRACT

Siddha system of medicine is a distinct therapeutic science with many single drugs and compound formulations used for treating a broad spectrum of ailments. Siddha categorizes the fever manifested by viral infestation into 64 types and it has developed medicines for each type. *Kapacurak / Kabasurak Kutinir* (KK) described in the *Citta Vaittiyattirattu* is the best promising polyherbal formulation of plant origin for curing viral infections especially with flu-like symptoms. As per Siddha system of medicine *Kapacuram* is defined as a fever with upper and lower respiratory catarrh. KK is one of the medicines advised for prevention of Coronavirus (COVID-19) outbreak in India by Ministry of AYUSH, Govt. of India. KK also emerged to be a popular traditional medicine for swine flu as well. The current review recapitulates active phytochemicals of all the 15 herbal drug ingredients in KK with the aim to provide it support for usage in flu-like viral infections spreading over the world in the scenario of having no modern medicines. Interestingly, out of 15 herbal ingredients in KK, *Zingiber officinale* rhizome, *Andrographis paniculata* whole plant, *Syzygium aromaticum* flower bud, *Cyperus rotundus* tuber, *Sida acuta* roots and *Saussurea costus* root have been proved to exhibit antiviral activities. All the ingredients have been proved to possess antiinflammatory activities. Three proved to have antipyretic potential and five each proved to possess analgesic and immunomodulatory activities. There are ingredients with antiasthmatic and antispasmodic supporting its use in respiratory illnesses such as that caused by COVID-19. The study supports the usage of KK as a traditional Siddha medicine against respiratory illnesses with flu-like symptoms characteristic of SARS-CoV-2.

Key words: AYUSH, *Citta Vaittiyattirattu*, COVID-19, Flu-like symptoms, Respiratory illness, SARS, Traditional medicine.

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INTRODUCTION

Today the human population world over is facing various kinds of virus like corona virus with many of them without an effective medication. These viruses formed due to combination of more than one viral gene in a non-human host are highly contagious when enter into human

beings. Scientists and the medical society world over have succeeded in finding medicines for viral infections like malaria, hepatitis, herpes, H1N1 but have not yet achieved success for dengue, chikungunya and novel corona (COVID-19) viruses. This virus has a single stranded RNA as the genetic material surrounded by helical



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envelope resembling the shape of corona.¹ Middle East Respiratory Syndrome coronavirus lead to the death of approximately 39% of the infected people.^{2,3} As of 4th October 2020 there are 38.4 million cases worldwide with the death rate crossing one million. In India, over 500000 new cases are reported per week since late-August bringing the cumulative counts to an excess of 6.5 million cases and 100000 deaths which accounts to 10% of global total.⁴

Coronaviruses (CoVs) are the largest group of known positive-sense RNA viruses having an extensive range of natural hosts. Since these viruses emerge periodically and unpredictably and spread at a very rapid rate inducing serious infectious diseases, they have turned out to be a serious risk to mankind. The symptoms associated with the upper and lower respiratory tracts like cough, fever and headache are visualized during viral infections.⁵

The herbal medicines which make use of natural products with minimal side effects have made a comeback. They are getting recognized due to pharmacological evidence of safety and efficacy, development of standardized dosage forms and quality control measures.⁶ Siddha system of medicine is a distinct science and a unique art of healing originated and flourished in South India and practiced both

in traditional and hereditary method. This system recognizes 32 kinds of preparations each for internal administration as well as external applications. There are many single drugs and compound formulations which are based on herbals, animals and metallo-mineral compounds and are used for treating a broad spectrum of ailments. There are more than thousands of authentic works in addition to manuscripts and palm leaf scripts extant. Siddha medicines which do not cause any adverse effects are popular in Southern India for treating several viral diseases like chicken pox, mumps, influenza, dengue and prophylaxis.⁷

In various traditional systems of Indian medicine the poly herbal formulations are favoured with respect to single drug therapies.^{8,9} The pharmacological actions of herbs are evident only in the combination with other herbs and are described in the classic literatures.¹⁰ *Kapacurak Kutinir* (KK) a poly herbal Siddha formulation is described in the manuscript *Citta Vaittiyattirattu* and is used for curing phlegmatic fever and fever with symptoms of flu.¹¹ KK contains fifteen herbal drugs (Table 1) which are mixed in equal quantities to prepare the decoction. The ingredients are powdered coarsely and mixed well. 35 g of this powder is then mixed with three liters of water, boiled and reduced to its half volume.

Table 1: Ingredients of Kapacurak Kutinir.

SN	Botanical Name	Part used	Taste ¹²	Therapeutic uses ¹²
1.	<i>Zingiber officinale</i> Roscoe	Dried Rhizome	Pungent	Anemia, asthma, cough, dyspepsia, diarrhoea, fever flatus, heartburns, peptic ulcer, sinusitis,
2.	<i>Andrographis paniculata</i> Burm.f.Nees	Whole plant	Highly bitter	Arthritis, fever, sinusitis, syncope
3.	<i>Syzygium aromaticum</i> (L.) Merril. And Perry	Flower bud	Pungent	Diarrhea, dysentery, dyspepsia, earache, sinusitis, toothache, vomiting
4.	<i>Cyperus rotundus</i> L.	Rhizome	Bitter	Hypertension, fever, thirst
5.	<i>Sida acuta</i> Burm. f.	Root	Astringent	Arthritis, diarrhea, fever, itching, scabies
6.	<i>Rotheca serrata</i> (L.) Steane and Mabb.	Root	Slightly bitter	Asthma, fever, myalgia, sinusitis
7.	<i>Piper longum</i> L.	Fruit	Pungent	Anemia, asthma, cough, headache, phlegm throat infection
8.	<i>Justicia adathoda</i> L.	Leaves	Bitter	Asthma, bleeding dysentery, cough, fever, throat infection
9.	<i>Plectranthus amboinicus</i> (Lour.) Spreng.	Leaf	Pungent	Cough pox, phlegm, sinusitis, rhinitis
10.	<i>Terminalia chebula</i> (Gaertn.) Retz.	Fruit rind	Bitter astringent followed by sweet	Diabetes, fistula, jaundice, leucorrhea, liver diseases, piles, stomatitis, vitiligo, vomiting
11.	<i>Tinospora cordifolia</i> (Willd.) Miers ex Hook.f and Thoms	Stem	Bitter	Diabetes, diarrhoea, fever, hypertension, skin diseases
12.	<i>Saussurea lappa</i> (Falc.) Lipsh	Tuber	Slightly bitter	Abscess, asthma, fever, piles, wounds
13.	<i>Tragia involucrata</i> L.	Root	Slightly astringent	Asthma, cough, eczema, fever, itching, skin diseases
14.	<i>Anacyclus pyrethrum</i> (L.) Lag.	Root	Sweet	Arthritis, dental problem, dryness of tongue, epilepsy, fever, tonsillitis
15.	<i>Hygrophila auriculata</i> (K. Schum.) Heine	Root	Slightly bitter	Anemia, edema, sinusitis, urinary tract infection

This is recommended to take twice or thrice daily not exceeding 60 ml.¹ The current study encompasses the scientific details of phytochemical constituents, their pharmacology and the biological activities present in all the fifteen herbals used as the ingredient of KK.

Zingiber officinale Roscoe

Z. officinale (Zingiberaceae) is a perennial herb known as *Chukku* in Siddha, dried drug consists of sympodially branched laterally compressed pieces of horizontal growing rhizome is seen distributed in tropical Asia.¹² Shogaol and gingerols the main constituents of the volatile oil of this rhizome is responsible for its flavor.¹³ The rhizome possess anti inflammatory, anti hyperglycemic, anti emetic and immunomodulatory properties¹⁴ (Table 2).

The major phytochemicals reported from essential oil of the rhizome are 6-shogaol, 6-gingerol and α -zingiberene. It has anti-inflammatory, hepatoprotective, antioxidant¹⁵ and is used in colic, haemorrhoids, diseases of throat and inflammation.¹² Major Siddha preparations using *Z. officinale* as an ingredient includes *Agathiennei*, *Cukkutailam*, *Kapacurakutininir*, *Kapadailakam*, *Milakutailam*, *Nellikaiilakam*, *Pooranathiilakam*, *Talaticururanam*, *Vihvatiilakam* etc.¹¹

Andrographis paniculata Burm.f.Nees

A. paniculata (Acanthaceae) is known as *Nilavembu* in Siddha is a herb reaching upto a height of 30-110 cm with glabrous leaves and white flowers with purple

spotted petals. It is seen as a common weed in South India and also present in states of Assam, Missoram and Himachal Pradesh.³¹ It is used to cure malaria, leucoderma, jaundice, abscess, woulds and eczema.³² Diterpenoids andrographolide are major bioactive components. The compounds from the plant have been reported to have anti-inflammatory,³³ anti-cancer,³⁴ anti-microbial,³⁵ and hepatoprotective,³⁶ anti-viral activities³⁷ (Table 3). Major Siddha preparations using *A. paniculata* as an ingredient includes *Kapacurak kutinir*, *Nilavempuk kutinir*, *Vatacurak kutinir* etc.¹¹

Syzygium aromaticum (L.) Merrill. and Perry

S. aromaticum (Myrtaceae), is known as *Ilavankam* in Siddha. It is mostly used as a spice to flavor all kinds of foods and has other medicinal values too. The dried flower buds mostly used as a spice having medicinal values occurs throughout South India.⁴⁷ The phytochemicals present in this drug belongs to the class sesquiterpenes, monoterpenes and oxygenated compounds.⁴⁸ The drug possess anti-carcinogenic,⁴⁹ growth inhibitory,⁵⁰ anti-thrombic activity,⁵¹ anthelmintic, anti-asthma and other allergic disorders, anti-inflammatory, antioxidant, antiviral and anti-parasitic properties,⁵² and insulin like activities⁵³ (Table 4).

Major Siddha preparations using *S. aromaticum* as an ingredient includes *Amukkara curanam*, *Carapunkavilatiilakam*, *Elaticcuranam*, *Incivatakam*,

Table 2: Bioactivities of phytochemical constituents in *Zingiber officinale*.

Constituents	Class	Bioactivity	Reference
β -Phellandrene	Monoterpene	Anti-bacterial	16
Zingiberol	Sesquiterpene alcohol	Anti-cancerous	17
α -Zingiberene	Sesquiterpene	Anti-cancerous	18
Ar-Curcumine		Anti-oxidant, anti-microbial	19
β -Bisabolene		Cytotoxicity against breast cancer cells	20
GingerenonesA, B and C	Diarylheptenon	Anti-fungal	21
Isogergerenone B		Anti-inflammatory, antioxidant	22
Hexahydrocurcumin			22
Gingerdiols	Phenols	Anti-microbial	23
β -Eudesmol	Sesquiterpene	Anti-inflammatory	24
Nerolidol			25
α -Pinene	Monoterpene	Anti-inflammatory, anti-microbial	26
Farnesol	Alcohol	Apoptotic	27
6-Shogaol	Phenol	Anti-inflammatory, anti-cancerous, antioxidant	22-29
6- Gingerol			30

Table 3: Bioactivities of phytochemical constituents in *Andrographis paniculata*.

Constituents	Class	Bioactivity	Reference
Bis-andrographolide	Terpene	Anti-HIV	38
14-deoxy-11,12-didehydro andrographolide		Anti-fungal	39
Neoxyandrographiside		Anti-fungal	
Ninandrographolide		Immunostimulant	40
Oxygenatedflavones	Flavonoid	Anti-bacterial	41
OroxylinA		Anti-cancer	42
β -Sitosterol-D-glucoside	Phytosterol	Anti-inflammatory	43
Ninandrographolide	Terpene	Immunostimulant	40
Myristicacid	Fattyacid	Anti-bacterial	44
Eugenol	Ether-alcohol	Antiseptic	45
Andrographolide	Diterpene	Anti-inflammatory, anti-cancerous, anti-microbial and hepatoprotective	33,34
Tritriacontane	Hydrocarbon	Antioxidant	46

Table 4: Bioactivities of phytochemical constituents in *Syzygium aromaticum*.

Constituents	Class	Bioactivity	References
p-Cymene	Monoterpene	Antioxidant, hepatoprotective	48
5-Hexene-2 one	Hydrocarbon (HOC)	Anti-cancerous	54
Thymol		Anti-bacterial, antifungal	55
Eugenol		Anti-inflammatory, antioxidant	56
Guaiol	Hydrocarbon (HOC)	Antibacterial, antioxidant	57
Nootkatin	Sesquiterpene	Anticarcinogenic	49
Isolongifolanone			
Hexadecanoic acid	Hydrocarbon (LOC)	Anti-inflammatory	58
Octadecanoic acid butyl ester	Hydrocarbon (HOC)	Acaricidal	59
Dodecatrienoic acid		Anti inflammatory	58
Caryophyllene oxide	Hydrocarbon (LOC)	Anti-cancerous, analgenic	60
Vitamin E acetate	Hydrocarbon (HOC)	Hepatoprotective	61
Gallic acid	Benzoic acid	Anti inflammatory, anti diabetic, anti cancer	62
Kaempferol	Stigma sterol	Antimicrobial	
β Carryophyllene	Sesquiterpene	Antiulcer	

*Iracameluku, Kantakarasayanam, Nantimeluku, Puramattirai, Uli mattarai.*¹¹

Cyperus rotundus L.

C. rotundus (Cyperaceae) is a perennial sedge plant and is known as *Koraiikkizhangu* in Siddha. This is seen distributed all over India.⁶³ The drug is used as anti microbial, cytotoxic, larvicidal,⁶⁴ anti-inflammatory⁶⁵ and anti-malarial⁶⁶ activities (Table 5). This drug also possess analgesic, antispasmodic, astringent, diaphoretic, diuretic properties and is used as tonic and vermifuge.⁶³

Major Siddha preparations using *C. rotundus* as an ingredient includes *Athimathura mathirai, Adathodai chooranam, Civatai chooranam, Cukkutailam, Kapadaillakam,*

*Sanjeevi theenir, Chandraprakasa mathirai, Kapacurak kutinir, Thathu pushti kulikai, Parangichakkai chooranam, Milagu thailam.*¹¹

Sida acuta Burm.f.

S. acuta (Malvaceae) and is known as *Vattatiruppi* in Siddha.⁷⁵ This is a common weed of waste plains and grows gregariously and is present in the tropical regions in India. The whole plant is effective in treating snake bites and haemorrhagic effects of *Bothrops atrox* venom,⁷⁶ and is also used for the treatment of urinary infections.⁷⁷ The drug possess antimalarial activity,⁷⁸ anti-ulcer,⁷⁹ wound healing, hepatoprotective activity,⁸⁰ cardiovascular activity,⁸¹ hepatoprotective,⁸² antioxidant,⁸³ hypoglycemic

Table 5: Bioactivities of phytochemical constituents in *Cyperus rotundus*.

Constituents	Class	Bioactivity	References
Vitexin	Flavonoid	Anti-viral, anti-cancerous	67,68
Isokobusone	Sesquiterpene	Anti-inflammatory	69
Isocyperol		Anti-inflammatory	70
α -Cyperone		Selective cytotoxic, anti-inflammatory, neuroprotective	71
Cyperene		Apoptotic, anti-oxidant, anti-bacterial	72,73
β -Selinene	Hydrocarbon	Anti-microbial, antioxidant	74
Copadiene	Sesquiterpene	Anti-malarial	66
Kobusone		Anti-inflammatory, analgesic	64
Cyperenone		Antiulcer	54
Eugenol	Ether-alcohol	Antiseptic	45

Table 6: Bioactivities of phytochemical constituents in *Sida acuta*.

Constituents	Class	Bioactivity	Reference
Vasicine	Alkaloid	Antibacterial	77
Ephedrine			
Cryptolepine			
Ecdysterone	Steroid	Anti-diabetic, hepato-protective	93
Sistosterol		Cytotoxic, anti-microbial	94
β - Stigmasterol		Anti-inflammatory	95
Campesterol	Polysterol	Cytotoxic, anti-inflammatory	96
Evofofin	Phenyl propene	Anti-microbial	97
Scopoletin	Hydroxycoumarin	Anti-inflammatory	98
4-ketopinoresinol	Lignan	Anti-oxidant	99
Loliolid	Monoterpenoidhydroxylactone	Oxidative stress protection, anti melanogenic	100

activity,⁸⁴ anticancer,⁸⁵ analgesic and anti-inflammatory activities⁸⁶ (Table 6).

The phytochemical present in this species are vasicine, ephedrine and cryptolepine, ecdysterone, β -sistosterol, stigmaterol, campesterol, tannins, phenolic compounds, evofolin-A and B, scopoletin, loliolid and 4-ketopinoresinol, polyphenol, sesquiterpene and flavonoids.⁸⁷⁻⁹⁰ Isolated pure form of alkaloids from *Sida acuta* and their synthetic derivatives have antihypertensive, antiarrhythmic, antimalarial and anticancer activities.⁹¹ Tannin obtained from this plant is used to cure ailments like leucorrhoea, rhinorrhea and diarrhea.⁹²

Major Siddha preparations using *S. acuta* as an ingredient is *Kapacurak kutinir*.¹¹

***Rotheca serrata* (L.) Steane and Mabb.**

R. serrata (syn. *Clerodendrum serratum*), (Verbenaceae) is a shrub and is known as *Ciruteku* in Siddha.¹⁰¹ It is found upto an altitude of 1200m in lower Himalayas distributed in Kumaun, West Bengal and Bihar.¹⁰² The major chemical constituents present are D-Mannitol, gamma-sitosterol, stigmaterol, glucose, oleanolic, queretaroic and serratagenic acid.¹⁰³⁻¹⁰⁷ It shows

antiasthmatic antispasmodic,¹⁰⁸ antinociceptive, anti-inflammatory and antipyretic activities¹⁰⁹ (Table 7).

Major Siddha preparations using *R. serrata* as an ingredient includes *Carapunakavihtailakam*, *Iracakantimeluku*, *Kappacurak kutinir*, *Nocit tailam*, *Parankipattai rasayanam*, *Vata curak kutinir* etc.¹¹

***Piper longum* L.**

P. longum (Piperaceae) is known as *Tippili* in Siddha.¹¹⁴ The plant is a slender climber distributed in the warmer region of India and lower hills of Bengal.¹¹⁵ The major phytochemicals present in this drug are piperine, piperlongumine, piperlonguminine, methyl-3,4,5-trimethoxy cinnamate.¹¹⁶⁻¹¹⁸ *P. longum* possesses antibacterial,¹¹⁹ antifungal,¹²⁰ anthelmintic,¹²¹ bioavailability enhancing properties,¹²² and immunomodulatory effects.¹²³ The benzene extract of the fruit shows anti fertility activity,¹²⁴ ethanol extract shows anti depressant,¹²⁵ alkaloids obtained from the fruit shows anti hyperlipidemic,¹²⁶ the amides obtained from the plant shows anti platelet activity,¹²⁷ and piperidine shows anti obesity¹²⁸ activities (Table 8). Major Siddha preparations using *P. longum* as an ingredients includes *Astapairavam*, *Atatotaaney*,

Table 7: Bioactivities of phytochemical constituents in *Rotheca serrata*.

Constituents	Class	Bioactivity	Reference
D-Mannitol	Alcohol	Diuretic	108
Serratagenic acid	Triterpenoid	Antibacterial	109
Stigmaterol	Steroid alcohol	Anti-inflammatory	110
Queretaroic acid	Triterpenoid	Anti-tumour, anti-fungal, anti-inflammatory	111
Oleanolic acid			
Gamma-sitosterol	Sterol	Antioxidant	112
Verbacoside		Anti proliferative	113
Betulin	Terpene	Anti-fungal	

Table 8: Bioactivities of phytochemical constituents in *Piper longum*.

Constituents	Class	Bioactivity	Reference
Piperine	Alkaloid	Antitumour, antioxidant, anti-inflammatory, anti microbial, hepatoprotective	123
Piperlongumine		Analgesic, anti-inflammatory, antimelanogenic	115
Piperlonguminine		Hipolipidemic	
Methyl-3,4,5-trimethoxy cinnamate	Cinnamate	Anti-tubercular	129

*Carapunkarlvatilakam, Cukket thailam, Culaikkutaram, Kapacurak kutinir, Kecariilakam, Noccitthailam, Pinacattbailam, Uluntuttbailam, Vilvatiilakam.*¹¹

***Justicia adhatoda* L.**

J. adhatoda (Acanthaceae) is known as *Atatotai* in Siddha.¹³⁰ A sub-herbaceous perennial shrub found throughout the year in plains and sub Himalayan tracts of India, ascending up to 1200m altitude and is used in almost all traditional medicinal systems in India.¹³¹ It is used for curing cough, cold, bronchial asthma, intestinal worm, skin disease, diarrhea, dysentery and tuberculosis.¹³² The plant possess anti-viral,¹³³ hypoglycaemic,¹³⁴ abortifacient,¹³⁵ anti-inflammatory,¹³⁶ antibacterial,¹³⁷ and cytotoxic activities¹³⁸ (Table 9).

Major Siddha preparations using *J. adhatoda* as an ingredient includes *Atatotaikkutinir, Atatotaimanappaku, Atattotaaney, Kakkuvaniilakam and Kapacurak kutinir.*¹¹

***Plectranthus ambonicus* (Lour.) Spreng.**

P. ambonicus (syn. *Coleus aromaticus*) (Lamiaceae) and is known as *Karpuravalliillai* in Siddha.¹⁴⁶ It is an erect,

succulent, perennial herb arising from horizontal rhizome, found in tropical and sub-tropical regions of India.¹⁴⁷

The major phytochemicals present are carvacrol, thymol, cyperene, γ -terpinene, caryophyllene, terpinolene, α -terpinene, β -terpineol, ethyl salicylate, quercetin and luteolin.¹⁴⁸⁻¹⁵³ The drug shows antibacterial, antiviral,

Table 9: Bioactivities of phytochemical constituents in *Justicia adhatoda*.

Constituents	Class	Bioactivity	Reference
Vasicine	Alkaloid	Antimicrobial, antioxidant, cytotoxic	138
Vasicinone	Quinazoline alkaloid	Neuroprotective	139
Adhvasinone	Quinazole	Antibacterial	140
Kaempferol	Flavanoid	Anticancerous	141,142
Quercetin	Flavonoid	Antioxidant	143,144
<i>p</i> -coumaric acids	Cinnamic acid	Anti melanogenic	145

Table 10: Bioactivities of phytochemical constituents in *Plectranthus ambonicus*.

Constituents	Class	Bioactivity	Reference
Carvacrol	Monoterpene	Antimicrobial	157
Thymol		Antibacterial	158
Cyperene	Sesquiterpene	Antimicrobial	157-159
γ -Terpinene	Terpene		
<i>p</i> -Cymene	Monoterpene		
Caryophyllene	Sesquiterpene		
β -Selinene			
1,8-Cineole	Monoterpene	Anti-inflammatory	160,161
Spathulenol	Sesquiterpene	Antioxidant, anti-inflammatory, anti-proliferative, anti-mycobacterial	
Terpinen-4-ol	Terpinol	Insecticidal	
Salvigenin	Flavones	Antimicrobial	161
Cirsimaritin			
Chrysoeriol			
Terpinolene	Monoterpene	Antinociceptive , anti-inflammatory	162
α terpinene	Essential oils	Antifungal	163
B-Terpineol	Terpineol		
Ethyl salicylate	Ester		
6-Methoxygenkwanin	Flavones	Antimicrobial	164
Quercetin		Anticancerous	165
Luteolin			166
Apigenin			

antifungal,¹⁴⁸ antileptic activities.¹⁵⁴ It is used in respiratory disorders, digestive disorders, insect bites, fevers, oral protection and curing of skin diseases^{155,156} (Table 10).

Major Siddha preparations using *P. ambonicus* as an ingredient includes *Kanattailam* and *Kapacurak kutinir*.¹¹

***Terminalia chebula* (Gaertn.) Retz**

T. chebula (Combretaceae) is known as *Katukkey* in Siddha. Plant is seen distributed throughout the deciduous forests and extends southwards at 300 to 900m altitude.¹⁶⁷

The major chemical constituents present are tannins, chebulagic acid, ellagic acid, gallic acid, syringic acid etc.^{168,169} The fruit pericarp shows cytoprotective, cardiogenic, antimutagenic and antifungal properties.¹⁷⁰⁻¹⁷³ The drug shows anti viral activity against HSV 2¹⁷⁴ (Table 11).

Major Siddha preparations using *T. chebula* as an ingredient includes *Anantapairavam*, *Cittatienney*, *Incivatakam*, *Karicalai ilakam*, *Nocittbailam*, *Pavanakkatukai*, *Tutuvalainey*, *Venpucaninney*.¹¹

***Tinospora cordifolia* (Willd.) Miers ex Hook. F and Thoms**

T. cordifolia (Menispermaceae) is known as *Cintilantu* in Siddha. This climber is found throughout tropical region of India upto 1,200 m elevations.¹⁸⁰

The major constituents present in this drug are sesquiterpene, tinocordifolin, tinosponone, cordioside, columbin, glycosides, alkaloids etc.¹⁸¹⁻¹⁸⁵ The drug helps in reduction of liver toxicity,¹⁸⁶ and possesses antiulcer,¹⁸⁷ cardioprotective,¹⁸⁸ immunomodulatory, antimalarial and antileprotic activities.^{189,190} It is immunosuppressant, anti-inflammatory, analgesic, antipyretic, antioxidant and hepatoprotective activities¹⁹¹⁻¹⁹⁴ (Table 12).

Major Siddha preparations using *T. cordifolia* as an ingredient includes *Cintilcuranam*, *Cintilney*, *Kapacuranamkutinir*.¹¹

***Saussurea costus* (Falc.) Lipsh.**

S. costus (Asteraceae) is known as *Kottam* in Siddha. This perennial herb is distributed in Himalayas, Kashmir, Himachal Pradesh, Uttaranchal and Sikkim.¹⁹⁸

Table 11: Bioactivities of phytochemical constituents in *Terminalia chebula*.

Constituents	Class	Bioactivity	Reference
Tannins	Polyphenol	Antioxidant	175
Chebulagic acid	Benzopyrantannin	Immunomodulator	176
Ellagic acid	Phenol	Anti-inflammatory, antioxidant	177
Gallic acid	Polyphenol	Antioxidant	178
Syringic acid		Antioxidant, antimicrobial, anti-inflammatory, anti-endotoxic, neuro-hepato protective	179

Table 12: Bioactivities of phytochemical constituents in *Tinospora cordifolia*.

Constituents	Class	Bioactivity	Reference
Tinocordifolin	Sesquiterpene	Antioxidant	195
Tinosponone		Anti-inflammatory	196
Cordioside	Di terpene		
Columbin			197

Table 13: Bioactivities of phytochemical constituents in *Saussurea costus*.

Constituent	Class	Bioactivity	Reference
Costunolide	Sesquiterpene	Anti-inflammatory, anti-viral, anti-tumor	203
Hexadecaterinal	Aldehyde	Anti-ulcer, hepatoprotective	204
Dehydrocostus lactone	Ketone	Anti-microbial, anti-neoplastic	205
Elemol	Alcohol	Immunosuppressive	206

The major chemical components present are costunolide and dehydrocostus lactone.^{199,200} Antifungal, anthelmintic, anti-asthmatic, anti-diabetic, antiviral, antimicrobial and larvicidal activities are present for this drug^{201,202} (Table 13).

Major Siddha preparations using *S. costus* as an ingredient includes *Amirtatikkulikai*, *Cintilney*, *Itivallati*, *Kanattbailam*, *Kecariilakam*, *Nocittbailam*, *Tutuvaliney*, *Vatacurakketunir*, *Venpucani Ilakam*.¹¹

Tragia involucrata Linn.

T. involucrata (Euphorbiaceae) is an evergreen hispid shrub known as *Cirukoncori* in Siddha. This plant possesses scattered stinging hairs and is seen commonly distributed all over India.²⁰⁷

Traditionally the plant is used for curing gastropathy, pruritic skins eruptions, vomiting. The whole plant is analgesic,²⁰⁸ the root extract have anti-inflammatory,²⁰⁹ and anti-diabetic activities.²¹⁰ The aqueous extracts of the leaves of *T. involucrata* possess antimicrobial and anti-inflammatory activity while the methanol extract possess wound healing property.^{211,212} The plant also possesses anti-hyperglycaemic and anti-

hyperlipidaemic,²¹³ antiepileptic,²¹⁴ anti-inflammatory activity,²¹⁵ hepatoprotective,²¹⁶ wound healing,²¹⁷ and antihistaminic activities²¹⁸ (Table 14).

Major Siddha preparations using *T. involucrata* as an ingredient includes *Kapacurakketunir*, *Pitta curakketunir*, *Tutuvaliney* and *Vatacurakketunir*.¹¹

Anacyclus pyrethrum (L.) Lag.

A. pyrethrum (Asteraceae) is known as *Akarakaram* in Siddha.²²¹ It is perennial procumbent herb native to North Africa and is cultivated at the elevation of 900m in Jammu and Kashmir.²²²

The phyto constituents present in this drug belongs to the class of amides, isoflavones and alkaloids.²²³⁻²²⁶ The drug possesses adaptogenic and immunomodulatory,²²⁷ anticonvulsant,²²⁸ antidepressant,²²⁹ antidiabetic,²³⁰ androgenic and spermatogenic,²³¹ and antibacterial activities²³² (Table 15).

Major Siddha preparations using *A. pyrethrum* as an ingredient includes *Carapunkavivatiilakam*, *Ematantakkulikai*, *Kapacurakketunir*, *Korocanaimatari*, *Nantimelaku*, *Tutuvaliney*, *Vacantakucumakaram* etc.¹¹

Table 14: Bioactivities of phytochemical constituents in *Tragia involucrata*.

Constituents	Class	Bioactivity	Reference
10,13-Dimethoxy-17 tetradecahydro-1 <i>H</i> -cyclopenta[a] phenanthrene	Methyl ester	Anti-inflammatory	219,220
Stigmasterol	Phytosterol	Antimicrobial	
Quercetin	Flavanol		
Rutin			
3-(2,4- dimethoxyphenyl)-6,7-dimethoxy-2,3- dihydrochromen-4-one	Chromene		
5- hydroxyl-1-methylpiperdin-2-one	Piperdin	Antihistamine	218

Table 15: Bioactivities of phytochemical constituents in *Anacyclus pyrethrum*.

Constituents	Class	Bioactivity	Reference
Pellitorine	Alkaloid	Anti-diabetic, anti-cancerous, anti-bacteria, anti-inflammatory	230
Anacyclin	Amide	Anti-inflammatory	225
Sesamin		Anti-cancerous	
Daidzein	Isoflavone	Anti tumour	233,234
Genistein		Anti-cancerous	
Coumestrol	Sterol	Antioxidant	235
Formononetin	Isoflavone	Anti-inflammatory	236
Biochanin		Anti-inflammatory, neuroprotective	237
Dodeca-2E,4E-dienoic acid isobutylamide	Alkylamide	Anti protozoal	238

***Hygrophila auriculata* (K. Schum.) Heine**

H. auriculata (Acanthaceae) is known as *Mulli* in Siddha. The plant is a spiny, stout annual herb with hairy branches, swollen nodes encircled by thorns and leaves. Commonly found growing in marshy areas, wetlands and along water courses throughout the plains in India.²³⁹ The roots and aerial parts of the plant is used and possesses anthelmintic,²⁴⁰ CNS activity,²⁴¹ antimotility,²⁴² haematinic effect,²⁴³ antipyretic,²⁴⁴ diuretic effects.²⁴⁵ The drug also exhibits hypoglycaemic,²⁴⁶ antinociceptive,²⁴⁷

antioxidant and hepatoprotective,²⁴⁸ antibacterial,²⁴⁹ and antitumour activities²⁵⁰ (Table 16).

Major Siddha preparations using *H. auriculata* as an ingredient includes *Carapunkavilvatiilakam*, *Kapacurakutininir* and *Tutuvalainey*.¹¹

Interestingly all the ingredient which constitutes the KK has been proven to be highly effective against many viruses and has the potential to cure respiratory tract diseases and check inflammations. The studies are summarized in Table 17.

DISCUSSION

The periodic spread of serious infectious viral diseases like ARS-CoV, MERS-CoV and the latest 2019-nCoV has become a serious threat to the human virus. This outbreak becomes more severe as there are no approved vaccines or drugs for the treatment of CoV infections and there exists a range of animal reservoirs for CoVs and recombinant CoVs. The need of the hour is the development of broadly protective universal vaccines which can ensure the ultimate protection but the procedure is time consuming.

There has been an increase in the intensive studies of antivirals from plants which can be successful in

Table 16: Bioactivities of phytochemical constituents in *Hygrophila auriculata*.

Constituents	Class	Bioactivity	Reference
Lupeol	Triterpene	Cytotoxic	251,252
Stigmasterol	Steroid alcohol	Anti-inflammatory	
Betulin	Triterpene	Neuro protective	253,254
Asteracanthine	Alkaloid	Antioxidant	255,256
Palmitic acid	Fatty acid	Antimicrobial	257,258
Stearic acid		Antibacterial	257-259
Uronic acid	Carboxylic acid	Inhibitory	260

Table 17: Pharmacology of ingredients related to symptoms related to viral infections.

S. No.	Botanical name	Antiviral studies
1.	<i>Zingiber officinale</i>	Antirhinoviral sesquiterpene isolated from rhizomes. Anti-viral activity against human respiratory syncytial virus in human respiratory tract cell lines ²⁶¹
2.	<i>Andrographis paniculata</i>	Neoandrographolide is an immunostimulant agent ²⁶²
3.	<i>Syzygium aromaticum</i>	Euginin isolated is used against Human herpes virus ²⁶³
4.	<i>Cyprepis rotundus</i>	Used in respiratory disorders ²⁶⁴
5.	<i>Sida acuta</i>	Cryptolepine shows anti-inflammatory activity ²⁶⁵
6.	<i>Rotheca serrata</i>	anti-anaphylactic, antipyretic and mast cell stabilizing effect ²⁶⁶
7.	<i>Piper longum</i>	Longumosides and amide alkaloids against Human hepatitis B virus ²⁶⁷
8.	<i>Justicia adhatoda</i>	Treating cold, cough, chronic bronchitis and asthma ²⁶⁸
9.	<i>Plectranthus ambonicus</i>	Anti-HIV [155], anti-inflammatory activity ²⁶⁹
10.	<i>Terminalia chebula</i>	Chebulagic acid and punicalagin (Hydrolyzable Tannins) prevents the entry and spread of Human herpes virus (HSV-1 and HSV-2) entry and spread ²⁷⁰
11.	<i>Tinospora cordifolia</i>	For treating hyperactive respiratory disorders such as asthma and cough ²⁷¹
12.	<i>Saussurea lappa</i>	costunolide and dehydrocostuslactone showed antiviral activity against Hepatitis B virus (HBV) in Human hepatoma Hep3B cells ²⁷²
13.	<i>Tragia involucrata</i>	ethyl ester obtained from root extract has anti-inflammatory activity ²⁷³
14.	<i>Anacyclus pyrethrum</i>	Pellitorine possesses anti-inflammatory activity ²⁷⁴
15.	<i>Hygrophila auriculata</i>	Stigmasterol possesses anti-inflammatory activity ²⁷⁵

Table 18: Pharmacological activities of ingredients of Kapacurak Kutinir.

Herbal Drugs in KK	Antibacterial	Anti-viral	Anti-inflammatory	Antioxidant	Hepatoprotective	Anti-cancer	Neuroprotective	Antimicrobial	Anti-parasitic	Anti-asthmatic	Anti-malarial	Antihelminthic	Antidiabetic	Antifungal	Antispasmodic	Antipyretic	Analgesic	Cytoprotective	Immunomodulatory	Anticonvulsant	Antihyperglycemic	Abortifacient	Wound healing	Hypoglycaemic	Cytotoxic	Antiseptic	Antimelanogenic
<i>Zingiber officinale</i>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<i>Andrographis paniculata</i>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<i>Syzygium aromaticum</i>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<i>Cyperus rotundus</i>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<i>Sida acuta</i>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<i>Rotheca serrata</i>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<i>Piper longum</i>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<i>Terminalia chebula</i>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<i>Tinospora cordifolia</i>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<i>Saussurea costus</i>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<i>Anacyclus pyrethrum</i>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<i>Plectranthus ambonicus</i>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<i>Tragia involucrata</i>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<i>Justicia adhatoda</i>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<i>Hygrophila auriculata</i>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

treating various viral diseases. Billions of people are getting affected all over the world with various viruses like human hepatitis viruses, picornaviruses, human immunodeficiency virus, rota virus, corona virus etc. There are a number of naturally found compounds that have been identified against medically important viruses, which together contribute to annual infections of over billion peoples. In cases of pneumonia associated with CoV, accumulation of cells and fluids occurs in the respiratory tract owing to the cytokine production and inflammatory responses.⁵ So its clear that we require a medication which will be helpful to inhibit the immune responses without putting the host defense under strain. The COVID pandemic originated is spreading at an alarming rate world over. The treatment provided by the Chinese medical team includes oxygen therapy, anti viral and antibacterial treatments. Lung clearing detoxification soup prepared by a polyherbal decoction with *Zingiber*, *Ephedra*, *Glycyrrhiza*, *Prunus*, *Cinnamomum*, *Tussilago*, *Citrus* and *Belamcanda* as the main ingredients is also recommended during clinical treatment period. With the severity of fever associated with the infection different polyherbal decoctions as per the Chinese traditional medicines are also recommended.²⁷⁶

Siddha system of medicine emphasizes on neutralizing and normalizing the three humors of the body which makes our immunity in turn increasing the resistant and immunity power of the body in dealing with viral infections. KK has been proven to be very effective in controlling the swine flu and also in boosting the immune system of the body against H1N1.²⁷⁷ The symptoms of 2019 nCoV virus infection have close resemblance to that of swine flu and other phlegmatic diseases like cough, nasal congestion, fevers, shivering, diarrhea and body pain. The herbs in this decoction are loaded with curative and preventive biological activities. The aqueous extract of KK has proved its anti-inflammatory effects.²⁷⁸

The detailed review of the phytochemical constituents and the pharmacological activities of the fifteen herbal drugs used for the preparation of this decoction tabulated data makes it evident that they possess antibacterial, anti-viral, anti-inflammatory, antioxidant, antimicrobial, anti-parasitic, anti-asthmatic, anti-malarial, anthelmintic, anti-diabetic, antifungal, antispasmodic, antipyretic, analgesic, anti-cancer, antidepressant, anticonvulsant, anti-hyperglycemic, abortifacient, cytoprotective, hepatoprotective, immunomodulatory, larvicidal, neuroprotective, hypoglycaemic and wound healing activities (Table 18). This Siddha formulation which is safe, cheap and efficient with multiple benefits can be proposed to be an ideal choice of preventive

measure for a broad spectrum of viral infections affecting respiratory system. Kutineer is an aqueous extraction prepared by heat. The compounds used for elucidation of pharmacological properties in this study were extracted using different organic solvents. Hence compounds may slightly vary when a kutineer is prepared as the polarity of organic solvents and water at high temperatures will be different. The various compounds from individual ingredients might also react and produce complex artifacts while they are boiled with water. Such chemical changes occurring during preparation of decoctions are unknown till date and need research by hyphenated analytical and statistical tools.

There are new evidences that active constituents of KK are effective in combating coronavirus due to their interactions with spike protein, as proved by *in silico* models and also molecular docking studies.²⁷⁹⁻²⁸² The said study has used major components of the medicine for finding the efficacy; while this study is collection of every constituent reported from ingredients of KK. This paper will serve as platform for further research in lines of docking to find more evidences supporting KK for its therapeutic efficacy. During this study it has been observed that there is difference of opinion among Siddha experts about botanical source of some of the ingredients used to make KK; this study followed the composition as mentioned in Siddha Formulary of India.¹¹

CONCLUSION

To deal with the demanding situation such as pandemic we can propose effective therapeutic measures using the accumulated traditional knowledge of that particular region. Traditional therapies derived from herbs are usually complex of various phytochemicals and hence their pharmacology and the synergistic activity may give relief from symptoms when used either alone or in combination with antiviral therapies available. *Kapacurak Kutinir* can be an efficient drug in managing the ill effects of viral diseases affecting respiratory system due to promising anti-inflammatory, antiviral, immunoprotective and analgesic activities of the ingredient herbal along with several other medicinal benefits giving synergistic healing.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

ABBREVIATIONS

KK: *Kapacurak kutinir*; **nCoV:** Novel Corona Virus; **CNS:** Central Nervous System.

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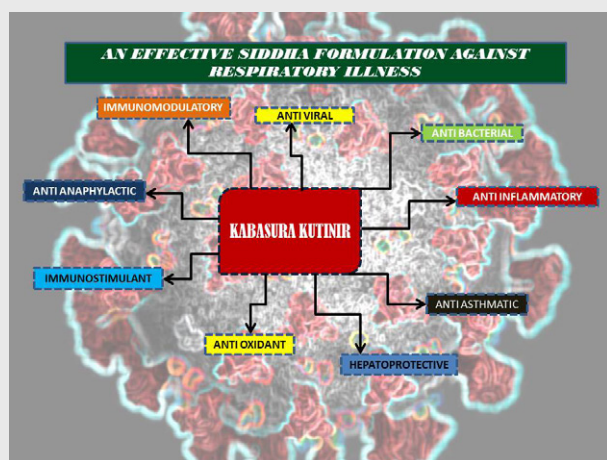
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PICTORIAL ABSTRACT



SUMMARY

Presently periodic spread of severe infectious viral diseases is seen all over the world and posing threats to human population. Siddha system of medicine has a variety of poly herbal formulations used to treat a variety of diseases. *Kapacurak kutinir* a poly herbal Siddha formulation is used for curing phlegmatic fever and fever with symptoms of flu. Fifteen herbal drugs which constitute this kutinir have an immense potential with effective bioactivities. KK helps in increasing the immunity power of the body making it more resistant to viral infections. Majority of the ingredients possesses anti-asthmatic and antispasmodic activities which supporting its usage in respiratory illnesses such as that caused supports by COVID-19. This review substantiates the effectiveness of *Kabasura kutinir* in managing viral infections causing flu like symptoms and respiratory distress.

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