International Journal of Botany Studies
www.botanyjournals.com
ISSN: 2455-541X
Received: 04-01-2022, Accepted: 19-01-2022, Published: 04-02-2022
Volume 7, Issue 2, 2022, Page No. 156-162

Review article on the siddha herbs used as immune boosters

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Abstract
Siddha system of medicine is a distinct therapeutic science with many single drugs and compound formulations used to enhance the immune system. Immune response is a necessary self defence mechanism that protect the host from infectious organisms. In this modern world diagnosis and treatment of fever is a challenging task. In Siddha system of medicine "Fever" is classified into 64 types and each type has been prescribed with specific medications. In recent times, people are suffering with different kinds of fever like dengue, chickenguniya and now the entire world is suffering with the pandemic caused by Covid-19. Siddha formulations mentioned in the texts are not the only cure for fever but it stimulates & strengthens the immune system of the body. Many medicinal plants are popularly used in Siddha system of medicine to increase the body's immunity. Some of them are Chukku (Zingiber officinale), Thippili (Piper longum), Kirambu (Syzygium aromaticum), Sirukanjori (Tragia involucrata), Karimulli vaer (Barleria prionitis), Kadukkai (Terminalia chebula), Adathodai (Justicia adathoda), Karpooravalli (Anisochilus carnosus), Koshtam (Costus speciosus), Seenthil kodi (Tinospora cordifolia) included as ingredients of various Siddha formulations indicated for Suram (Fever), Irumal (Cough), Swasakasam (Bronchial Asthma), Ilaippu (Tuberculosis), Neer Erichal (Burning micturition), Gunma Soolai (Spasmodic pain) etc. Preclinical and Clinical studies done by the pharmacologists confirmed the antioxidant, antimicrobial, anti-inflammatory, antispasmodic, antipyretic, immuno-modulating activities of the above mentioned plants. These herbs build up our immunity and make our body to combat against pathogenic organisms. This review of literature study explores especially the immuno stimulatory effect of these herbs which substantiates the siddha textual evidences.

Keywords: 64 types of fever, Covid-19, Siddha herbs, Pharmacological study, Immunity, Immuno modulator

Introduction
Siddha system of medicine is the oldest traditional system of healing that originated in Southern part of India. It is based on a combination of ancient medicinal practices and spiritual disciplines as well as alchemy and mysticism. It treats not only the body but also the mind and soul. It is based on three vital humors such as vatham, pitham, kapham. It comprises of 32 internal and 32 external types of medicine. *Kayakarpam* a unique treatment procedure in Siddha system of medicine has its importance in the prevention of cell damage and immune boosting activity. Recent data have shown that antioxidant benefits of the active ingredients from Siddha herbs and medications in this field which may represent an attractive source of drug discovery against Immuno depressing aliments. During the diseased, disease recovery process or aging, a progressive decline in the immune system occurs over time, which increases vulnerability to many inflammatory associated disease.
Fever is the response of immune system, In Siddha system fever is classified into 64 types and each type has been prescribed with specific medications, these medicines not only cures impairment but also build up the *Immunity*. Siddha herbs has the ability to prevent us from various infirmity by strengthening the immune system.

1. Immunity
The term *immunity* defines body's natural defense system against a vast array of diseases and disorders. Remarkably sophisticated and advanced among vertebrates, the complex immune system is capable to generate a limitless variety of cells and molecules to arrest enormous spectrum of infections and undesirable substances. *Immuno modulators* refer to those substances capable of inducing, amplifying and inhibiting any component or phase of the immune system. *Immuno stimulators* and *Immunosuppressant* are two types of immunomodulators are known for use. In fact, *Immuno pharmacology* is a newer branch of pharmacology concerned with immunomodulators. Administration of immuno stimulators as in the case of AIDS and use of Immuno suppressor in cases of an exaggerated response of an immune system is appreciating to reconstitute the normal immune system and increase the longevity of life. *Immunology* is one of the rapidly developing fields of biomedical research, holds great promises concerning various ailments.

2. Materials and methods
The information about importance of immune boosting siddha herbs, pharmacological and phytochemicals studies of these siddha herbs were collected from the authorised articles and siddha literatures by using electronic search.

Result and discussion

1. Immune boosting herbs

Immune boosting is a process, which alters the immune system of an organism by interfering with its immune functions. This interference results in immuno-stimulation. An *Immune booster* is any substance that helps to regulate the immune system. This *"regulation"* is a normalization process, so that an immune booster helps to optimise immune response. Keeping this in view, major efforts have to be directed to boost the immune system, to permit effective treatment of various ailments associated with immune system and thus the development of a safe and effective immune boosters.

Table 1: Immune boosting herbs

S. No	Botanical name	Tamil name	Family	Part used
1.	*Zingiber officinale*	Chukku	Zingiberaceae	Dried Rhizome
2.	*Piper longum*	Thippili	Piperaceae	Fruit
3.	*Syzygium aromaticum*	Kirambu	Myrtaeceae	Flower bud
4.	*Tragia involucrata*	Sirukanjori	Euphorbiaceae	Root
5.	*Barleria* prionitis	Karimulli vaer	Acanthaceae	Root
6.	*Terminalia chebula*	Kadukkai	Combretaceae	Fruit rind
7.	*Justicia adathoda*	Adathodai	Acanthaceae	Leaves
8.	*Anisochilus carnosus*	Karpooravalli	Lamiaceae	Leaves
9.	*Costus speciosus*	Koshtam	Costaceae	Root
10.	*Tinospora cordifolia*	Seenthil kodi	Menispermaceae	Stem

2. Zingiber *officinale*

Z. officinale (Zingiberaceae) is a lasting spice known as Chukku in Siddha, It is a dried medication comprises of sympodially branched along the side growing rhizome is seen dispersed in tropical Asia. Shogaol and gingerols the primary constituents of the Volatile oil of this rhizome is liable for its flavour [1]. The rhizome have mitigating, Anti- hyperglycemic, Anti- emetic and Immunomodulatory properties. The significant phytochemicals revealed from fundamental oil of the rhizome are 6-shogaol, 6-gingerol and α-zingiberene. It has mitigating, hepatoprotective, cell reinforcement and is utilized in colic, hemorrhoids, illnesses of throat and aggravation. [2] Major Siddha arrangements utilizing Z. officinale as a fixing incorporates in Agathi ennei, Chukku thailam, kabasura kudineer, Milaku thailam, Nelikaai ilakam, pooranathi ilakam, Thalisathi choornam, Vilvathi ilakam. [25]

Taste: Pungent

Therapeutic uses: Anemia, asthma, cough, dyspepsia, diarrhoea, fever, flatus, heartburns, peptic ulcer, sinusitis

Table 2: *Zingerber officinale*

S. No	Chemical constituents	Bio-activity
1.	β-Phellandrene	Anti-bacterial
2.	Zingiberol	Anti-cancerous
3.	α-Zingiberene	Anti-cancerous
4.	Ar-Curcumine	Anti-oxidant, anti-microbia
5.	β-Bisabolene	Cytotoxicity against breast cancer cells
6.	GingerenonesA, B and C	Anti-fungal
7.	Isogingerenone B	Anti-fungal
8.	Hexahydrocurcumin	Anti-inflammatory, antioxidant
9.	Gingerdiols	Anti-microbial
10.	β-Eudesmol	Anti-inflammatory
11.	Nerolidol	Anti-inflammatory
12.	α-Pinene	Anti-inflammatory, anti-microbial
13.	Farnesol	Apoptotic
14.	6-Shogaol	Anti-inflammatory, anti-cancerous, antioxidant
15.	6- Gingerol	Anti-inflammatory, anti-cancerous, antioxidant

3. Piper longum

P. longum (Piperaceae) is known as Thippili in Siddha. The plant is a thin climber appropriated in the warmer area of India and lower slopes of Bengal. The significant phytochemicals present in this medication are Piperine, Piperlongumine, Piperlonguminine, Methyl-3,4,5-trimethoxy cinnamate [3, 4, 5] P. longum possesses Antibacterial, Antifungal, Anthelmintic and Immunomodulatory properties. The ethanol presence shows Anti- depressent, alkaloids acquired from the fruit shows Anti- hyperlipedemic, the amides got from the plant shows Anti-platelet action and Piperedine shows against stoutness activities.

Major siddha arrangments utilizing P. longum as an ingredient incorporates are Astabairavam, chukku thailam, kulavikoondu kudineer, kabasura kudineer, Nochi thailam, Vilvathi ilakam [25].

Taste: Pungent
Therapeutic uses: Anemia, asthma, cough, headache, phlegm throat infection

Table 3: *Piper longum*

S. No	Chemical constituents	Bio-activity
1.	Piperine	Antitumour, antioxidant, anti-inflammatory, anti-microbacterial, hepatoprotective
2.	Piperlongumine	Analgesic, anti-inflammatory,Anti-melanogenic
3.	Piperlonguminine	Hipolipidemic
4.	Methyl-3,4,5 trimethoxy cinnamate	Anti –tubercular

4. Syzygium aromaticum

S. aromaticum (Myrtaceae) is known as Kirambu in Siddha. It is used to enhance a wide range of food sources and has other restorative qualities as well. The dried flower buds for the most part utilized as a flavor having therapeutic qualities occurs all through South India. The phytochemicals present in this drug has a place with the class Sesquiterpenes, Monoterpenes and Oxygenated compounds [6]. The Drug have Anti-cancerous, Anti-thrombic activity, Anthelmintic, Anti- asthmatic, Antioxidant, Antiparasitic, Antiviral, Anti-hypersensitive (anti-allergic or inflammatory) properties and insulin like activities [7].

Major Siddha arrangements utilizing S. aromaticum as a fixing incorporates in Amukura chooranam, Elathi chooranam, Inji vadagam, kandhaga rasayanam, Nandhi melugu, Poora mathirai [25].

Table 4: *Syzygium aromaticum*

S. No	Chemical constituents	Bio-activity
1.	p-Cymene	Antioxidant, hepatoprotective
2.	5-Hexene-2 one	Anti-cancerous
3.	Thymol	Anti-bacterial, antifungal
4.	Eugenol	Anti-inflammatory, antioxidant
5.	Guaiol	Antibacterial,Antioxidant
6.	Nootkatin	Anticarcinogenic
7.	Isolongifolanone	Anticarcinogenic
8.	Hexadecanoic acid	Anti-inflammatory
9.	Octadecanoic acid butylester	Acaricidal
10.	Dodecatrienoic acid	Acaricidal
11.	Caryophyllene oxide	Anti-cancerous,analgenic
12.	Vitamin E acetate	Hepatoprotective
13.	Gallic acid	Anti-inflammatory, anti-diabetic, anti-cancer
14.	Kaempferol	Antimicrobial
15.	β Carryophylene	Antiulcer

Taste: Pungent
Therapeutic uses: Diarrhea, dysentery, dyspepsia, earache, sinusitis, toothache, vomiting

5. Tragia involucrata

T. involucrata (Euphorbiaceae) is an evergreen hispid shrub known as Sirukanjori in Siddha. Sirukanjori possesses dispersed stinging hairs and is seen regularly distributed all over India. Traditionally the plant is utilized for restoring gastropathy, Pruritic skins ejections, eruption and vomiting. The entire plant is Analgesic, the root shows anti-inflammatory and anti-diabetic activities. The watery concentrates of the leaves of T. involucrate have antimicrobial, while the methanol extract have wound mending property. The Plant additionally has against hyperglycaemic, antiepileptic, hepatoprotective, and Antihistaminic actions [8, 9].

Major Siddha arrangements utilizing T. involcurata as an ingredient incorporates are kabasura kudineer, Nilavembu kudineer, Pittasura kudineer, Thuthuvalai nei and vadhasura kudineer [25].

Taste: Slightly astringent
Therapeutic uses: Asthma, cough, eczema, fever, itching, skin diseases

Table 5: *Tragia involucrata*

S. No	Chemical constituents	Bio-activity
1.	10,13-Dimethoxy-17 tetradecahydro-1H-cyclopenta[a] phenanthrene	Anti-inflammatory
2.	Stigmosterol	Antimicrobial
3.	Quercetin	Antimicrobial
4.	Rutin	Antimicrobial
5.	3-(2,4- dimethoxyphenyl)-6,7- dimethoxy-2,3- dihydrochromen-4-one	Antimicrobial
6.	5- hydroxyl-1-methylpiperdin-2-one	Antihistamine

6. Barlaeria prionitis

B. prionitis (Acanthaceae) is known as karu mulli in Siddha. It is a shrub, native to Island and Mainland Southeast Asia, China, the Indian Subcontinent, the Arabian Peninsula and northeastern Africa. The significant compound constituents present are phenylethanoid glycoside, barlerinoside, shanzhiside methyl ester, barlerin, lupulinoside and it shows expectorant, tonic and diuretic. It is used for the treatment of various diseases like toothache, fever, inflammation, gastrointestinal disorders. It also added as a ingredient in kabasura kudineer [25].

Taste: Slightly bitter

Therapeutic uses: Anemia, edema, sinusitis, urinary tract infection

Table 6: *Barleria prionitis*

S. No	Chemical constituents	Bio-activity
1.	Acetylbarlerin	Antimicrobial,Antioxidant
2.	Barlerin	Antimicrobia,Anitoxidant
3.	Shanzhiside methyl ester	Antimicrobia
4.	Verbascoside	Antimicrobia
5.	Balarenone	Antimicrobia
6.	Pipataline	Antimicrobia
7.	Methanolic extract	Antifungal
8.	6-O-trans-p-coumaroyl-8-O-acetylshanzhiside methyl ester	Antiviral
9.	Dichloromethane	Anti-inflammatory

7. Terminalia chebula

T. chebula (Combretaceae) is known as Kadukkai in Siddha. Plant is seen conveyed all through the forest of southwards at 300 to 900m altitude.The significant compound constituents present are tannins, Chebulagic acid, ellagic acid, gallic acid, syringic acid Etc. The natural product pericarp shows cytoprotective, Cardiotonic, antimutagenic and antifungal Properties. The medication shows hostile to viral action against HSV [10, 11, 12, 13, 14].

Major Siddha arrangements utilizing T.chebula as a fixing includes Anadhabairavam, siddhadhi ennei, Inji vadagam, karisalai Ilakam, Nochi thailam, Bavana kadukkai, Thuthuvalai nei, Venpusani nei. [25]

Taste: Bitter astringent followed by sweet

Therapeutic uses: Diabetes, fistula, jaundice, leucorrhea, liver diseases, piles, stomatitis, vitiligo, vomiting

Table 7: *Terminalia Chebula*

S. No	Chemical constituents	Bio-activity
1.	Tannins	Antioxidant
2.	Chebulagic acid	Immunomodulator
3.	Ellagic acid	Anti-inflammatory, antioxidant
4.	Gallic acid	Antioxidant
5.	Syringic acid	Antioxidant, antimicrobial, anti-inflammatory, anti-endotoxic, neuro-hepato protective

3.8 ***Justicia adathoda***

J. adhatoda (Acanthaceae) is known as Adathodai in Siddha. A sub-herbaceous enduring bush found over time in fields and sub-Himalayan regions of India, ascending up to 1200m elevation and is utilized in practically all traditional therapeutic frameworks in India. It is utilized for Curing cough, cold, bronchial asthma, intestinal worm, Skin sickness, looseness of the bowels, dysentry and tuberclosis. [15] The plant has anti- viral, hypoglycaemic, Abortifacient, Anti-inflammatory, antibacterial and cytoxic exercises. [16]

Major Siddha arrangements utilizing J. adhatoda as an ingredient incorporates in Adathodai kudineer, Adathodai manapagu, Adathodai nei, and Kabasura kudineer. [25]

Taste: Bitter

Therapeutic uses: Asthma, bleeding dysentery, cough, fever, throat infection

Table 8: *Justicia adathoda*

S. No	Chemical constituents	Bio-activity
1.	Vasicine	Antimicrobial,antioxidant, cytotoxic
2.	Vasicinone	Neuroprotective
3.	Adhavasinone	Antibacterial
4.	Kaempferol	Anticancerous
5.	Quercetin	Antioxidant
6.	p-coumaric acids	Anti melanogenic

9. Anisochilus carnosus

P. ambonicus (syn. Anisochilus carnosus) (Lamiaceae) and is known as Karpooravalli in Siddha [17]. It is an errect, Succulent, lasting spice emerging from flat Rhizome, found in tropical and sub-tropical locales of India. The significant phytochemicals present are carvacrol, thymol, Cyperene, γ-terpinene, caryophyllene, terpinolene, Alpha-terpinene, β-terpineol, ethyl salicylate, quercetin and Luteolin [18, 19]. The medication shows antibacterial, antiviral, antifungal, antileptic exercises. It is utilized in respiratory problems, digestive related issues, insect sting, fever, oral protection and restoring of skin illnesses.

Major Siddha arrangements utilizing P. ambonicus as an Ingredient incorporates Gana thailam and Kabasura kudineer. [25]

Taste: Pungent

Therapeutic uses: Cough pox, phlegm, sinusitis, rhinitis

Table 9: *Anisochilus carnosus*

S. No	Chemical constituents	Bio-activity
1.	Carvacrol	Antimicrobial
2.	Thymol	Antimicrobial
3.	Cyperene	Antimicrobial
4.	γ-Terpinene	Antimicrobial
5.	p-Cymene	Antimicrobial
6.	Caryophyllene	Antimicrobial
7.	β-Selinene	Antimicrobial
8.	1,8-Cineole	Anti-inflammatory
9.	Spathulenol	Antioxidant, anti-inflammatory, anti-proliferative, anti-mycobacterial
10.	Terpinen-4-ol	Insecticidal
11.	Salvigenin	Antimicrobial
12.	Cirsimaritin	Antimicrobial
13.	Chrysoeriol	Antimicrobial
14.	Terpinolene	Antinociceptive, anti-inflammatory
15.	α-terpinene	Antifungal
16.	B-Terpineol	Antifungal
17.	Ethyl salicylate	Antifungal
18.	6-Methoxygenkwanin	Antimicrobial
19.	Quercetin	Antimicrobial
20.	Luteolin	Anticancerous
21.	Apigenin	Anticancerous

10. Costus specious

Costus speciosus (Syn. Saussurea costus) (Asteraceae) is known as Kostam in Siddha. This Perennial herb is distributed in Himalayas, Kashmir, Himachal Pradesh, Uttaranchal and Sikkim. The major chemical components present are Costunolide and dehydrocostus lactone [20, 21]. Antifungal, anthelmintic, anti-asthamatic, anti-diabetic, antiviral, antimicrobial and larvicidal activities are present for this herb.

Major Siddha preparations using S. costus as an ingredient includes Amirthathi kuligai, Seendhil nei, Idivallathi, Kaesari ilagam, Nochi thailam, Thuthuvalai nei, Vadhasura kudineer, Venpoosani Ilakam.

Taste: Slightly bitter

Therapeutic uses: Abscess, asthma, fever, piles, wounds

Table 10: *Costus specious*

S. No	Chemical constituents	Bio-activity
1.	Costunolide	Anti-inflammatory, anti-viral, anti-tumor
2.	Hexadecaterinal	Anti-ulcer, hepatoprotective
3.	Dehydrocostus lactone	Anti-microbial, anti –neoplastic
4.	Elemol	Immunosupressive

11. Tinopsora cordifolia

T. cordifolia (Menispermaceae) is known as Seendhil kodi in Siddha. This climber is found all through tropical region of India upto 1,200 m elevations. The significant constituents present in this medication are Sesquiterpene, tinocordifolin, tinosponone, cordioside, Columbin, glycosides, alkaloids and so forth The medication helps in decrease of liver harmfulness and has antiulcer, cardioprotective, immunomodulatory, antimalarial and antileprotic exercises. It is immunosuppresent, anti-provocative, pain relieving, antipyretic, cell reinforcement and hepatoprotective exercises. [22, 23, 24]

Major Siddha arrangements utilizing T. cordifolia as a fixing incorporates Seendhil chooranam, Seendhil nei, kabasura kudineer. [25]

Taste: Bitter
Therapeutic uses: Diabetes, diarrhoea, fever, hypertension, skin disease

Table 11: *Tinosopra cardifolia*

S. No	Chemical constituents	Bio-activity
1.	Tinocordifolin	Antioxidant
2.	Tinosponone	Anti-inflammatory
3.	Cordioside	Anti-inflammatory
4.	Columbin	Anti-inflammatory

Discussion and Conclusion

The periodic spread of serious immuno-suppressing infections like ARS-CoV, MERS-CoV and the latest novel covid-19 has become a serious threat to the human crowd. As they were serious threat to the human population. There has been an increase in the intensive studies of antivirals from plants which can be successful in 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. So its clear that we require a medication which will be helpful to boost the immune responses without putting the host defense under strain. 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.

Siddha medication has been proven to be very effective in boosting the immune system of the body against various ailments. These herbs in the form of decoction are loaded with curative and preventive biological activities. Many of the chemicals in the form of alkaloids, flavonoids, terpenoids, polysaccharides, lactones, and glycoside products are responsible to cause alterations in the immunomodulatory properties. The herbal extract of these herbs has proved its biochemical activities with various clinical and preclinical studies. The detailed review of the phytochemical constituents and the pharmacological activities of these herbal drugs, Tabulated data makes it evident that they possess Antibacterial, Anti-viral, Anti-inflammatory, Antioxidant, Antimicrobial, Anti-parasitic, Anti-asthmatic, Anti-malarial, Anthelminthic, Anti-diabetic, Antifungal, Antispasmodic, Antipyretic, Analgesic, Anti-cancer, Antidepressant, Anticonvulsant, Anti-hyperglycemic, Cytoprotective, Hepatoprotective, Immunomodulatory, Larvicidal, Neuroprotective, Hypoglycaemic and Wound healing activities.

This Siddha formulation which is safe and efficient with multiple benefits can be proposed to be an ideal choice of preventive measure for immune related infections. This paper will serve as platform for further research in lines of docking to find more evidences supporting siddha herbal therapeutic efficacy.

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