



(REVIEW ARTICLE)



Impact of siddha kaya karpam: A preventive intervention for COVID-19: A review

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Abstract

The Siddha system of medicine is not only well known for its curative measures but also this system spreads its wings over preventive measures too. COVID-19 is the contagious disease caused by the recently identified and named as Novel corona virus (SARS CoV-2). Its spread is considered to be the current pandemic. In this situation prevention is considered to be wiser than treatment. In Siddha system of medicine, a wide range of immune boosting formulations are available. In which Siddha Kaya karpam is also one among the treatment modality to increase one's immunity. Inji, Chukku (*Zingiber officinale*) and Kadukkai (*Terminalia chebula*) are few Kaya karpam herbs (Rejuvenators). This article focuses on review about anti-oxidant, anti-viral, anti- pyretic, immuno modulatory and anti-inflammatory properties of Inji, Chukku and Kadukkai. The result of this review provides promising hope as it consists of rich anti- oxidant, immunomodulating and also has appreciable anti-viral property particularly against respiratory viruses. This study concluded that consuming the above said Siddha Kaya Karpam medicines will improve the immunity, which helps in prevention of COVID -19.

Keywords: COVID-19; Rejuvenators; *Zingiber officinale*; *Terminalia chebula*

1. Introduction

COVID -19 is a pandemic disease caused by novel corona virus. At the end of June month, the total numbers of COVID-19 cases are in condition of raising the bar. The worldwide status of positive cases crossed more than a crore and the death rate is above 5 lakhs. In India, the positive cases were beyond 6 lakhs and the death rate is more than 19 thousands [1]. In Tamil Nadu total numbers of positive cases are more than 1 lakh and the death rate is above 1500. As of now, in all countries people made use of their own Traditional systems of medicines and controlled the prevalence of COVID positive cases. In India, the government now started promoting AYUSH system because its success rate is appreciable, provides speedy recovery in positive cases and lowers the mortality rate too. Presently, no vaccines or drugs have been developed yet to prevent the incidence of Covid-19. Vaccines have limited use against individuals who are already infected with a virus[2]. They are also associated with problems of supply, cost of development, coverage and deployment and efficacy against newly emerging and rapidly mutating viruses [3].

Kaya Karpam (Rejuvenation therapy) increases the longevity by acting on the immune system of an individual. In this condition, making use of certain Siddha Kaya Karpam medicines may help in the effective management and prevention of COVID- 19 incidence. The Kaya karpam (Elixir science) is well optimized treatment of Siddha technique that completely detoxifies the body by replenishing the cellular physiology and altering the immune competence [4]. These benefits are gained by their anti-oxidant properties. The importance of Kaya karpam herbs which helps in immune boosting mechanism was clearly mentioned in an ancient Siddha text [5].

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By making use of this Kaya Karpam it increases self-immunity. Even though, it is well known by explaining its activities it can be further used as a preventive intervention and helps in lowering the incidence of COVID-19.

2. Ginger (*Zingiber officinale*)

Inji is the fresh rhizome of Ginger and Chukku is the dried rhizome of Ginger which is treated with lime and then dried. Dried Ginger is of two kinds, peeled and unpeeled, the latter is the cleaned rhizomes dried in the sun. In case of dry ginger, before using the outer skin should be scrapped off.



Figure 1 Fresh Ginger

In Siddha classical text, Agasthiyar Gunavagadam it was quoted that taking dried ginger decoction as Kaya Karpam preparation it always provides benefits to those who consumes it and helps in curing chronic fever [6]. By chewing a piece of Ginger helps in relieving throat congestion and hoarseness of voice and while consuming the fresh ginger as Kaya Karpam preparation it cures Kapham Disorders [6]. The major and minor phytoconstituents of *Z.officinale* is tabulated below,

Table 1 Phytoconstituents of *Zingiber officinale* [7, 8]

Taste	Pungent and spicy
Parts Used	Rhizome
Phytoconstituents	Major Phytoconstituents: Phellandrene, Gingerol, Gingerin, Alpha zingiberene, arcurcumene, hexa hydro curcumin, Beta sesquiphellandrene, Beta bisabolene camphene, phellandrene, citral, citronellol, geranial, linalool, bisabolene, limonene, desmethhexahydrocurcumin, borneolzingiberole, and cineole. Minor Phytoconstituents: Monoterpene, sesquiterpene hydrocarbons, paradols, gingerdols, ginger di acetates, gingerdiones, 6-ginger sulfonicacid, gingerenones, diaryl heptanioids, diterpenes, ginger glycolipids A, B &C
Actions	Stomachic, Carminative, Sialagogue, Digestive, Stimulant, Rubefacient.
Medicinal Uses	Rheumatic diseases, respiratory disorders, nausea, cardio vascular health and gastrointestinal disorders. It is used in sprains, sore throats, cramps, muscular aches, pains, constipation, hypertension, dementia, helminthiasis, infectious ailments, bronchitis, stomach disorders, and useful for insect bites.

2.1. Inji Karpam

2.1.1. Fresh Ginger (Inji)

The outer layer of fresh ginger is peeled off and cut into smaller pieces. Those pieces are soaked in honey and kept in sunlight. This formulation can be consumed daily in the early morning [5].

2.1.2. Dried Ginger (*Chukku*)

The outer layer of dried ginger is peeled off and the remaining portion of rhizome can be used in preparing decoction. Now, this decoction should be taken daily in the afternoon [6].



Figure 2 Dried Ginger

2.2. Toxicity study

The ginger has been listed in “Generally Recognized as Safe” (GRAS) document of the US FDA. A dose of 0.5-1.0 g of ginger powder ingested 2-3 times for period ranging from 3 months to 2.5 years did not cause any adverse effects. The British Herbal Compendium states that there were no adverse effects of Ginger. The acute oral LD50 in rats which were fed with ginger is 170 g/kg body weight. Dry ginger is more than 250g/kg body weight [9].

2.3. Anti-oxidant activity

Stoilova et al., studied the anti-oxidant of *Z.officinale* and reported that it possess anti-oxidant activity against a variety of free radicals. The anti-oxidant effect of *Z.officinale* was reported by DPPH radical scavenging activity. The phenolic content of alcoholic extract of *Z.officinale* was 870.1mg/g of dry extract. This extract exhibited 90.1% of DPPH radical scavenging activity with the IC 50 concentration of 0.64µg/ml [10].

Dugasini.S et al., analysed the anti-oxidant property of Gingerol, a active component of *Z.officinale* analogues such as 6-,8-,10- GN as well as 6-SG, displayed anti-oxidant activity with IC 50 value ranges from 8.05 to 26.3 IM for the DPPH radical, 0.85 to 4.05 IM for the superoxide and 0.72 to 4.62 IM for the hydroxyl radical [11].

2.4. Anti -pyretic activity

Awatify M.Al. Saeedi studied the anti-pyretic effect of aqueous extract *Zingiber officinale* at the dose of 100mg /kg and 200mg /kg in female rats by Brewer’s yeast induced pyrexia method .At initial stage rectal temperature was again noted at interval of 0,1,2 and 3 hours after drug administration .when compared with the control group, the test groups and standard group decreased body temperature of rats ($P < 0.05$) [12].

2.5. Anti - Viral activity

Jung San Chang,et al., studied the anti-viral activity of Ginger, against human respiratory syncytial virus (HRSV) at dose level of 300 µg/ml which was done by plaque reduction assay in human upper (HEp-2) and low (A549) respiratory cell lines. Ability of ginger to induce anti-viral cytokines was evaluated by enzyme-linked immuno-sorbent assay (ELISA).

Fresh ginger dose-dependently inhibited HRSV infection which was induced by plaque formation in both HEp-2 and A549 cell lines ($p < 0.0001$). It decreases the plaque counts to 19.7% (A549) and 27.0% (HEp-2) of that of the control group. It was more effective when given before viral inoculation ($p < 0.0001$), particularly on A549 cells. Fresh ginger dose-dependently inhibited viral attachment ($p < 0.0001$) and internalization ($p < 0.0001$). Fresh ginger of high concentration could stimulate mucosal cells to secrete IFN-β that possibly contributed to counteracting viral infection [13].

Kankanam Gamage Chithramala Dissanayake et al., studied the anti-viral activity of fresh rhizome of *Z.officinale* against Human Respiratory Syncytial Viruses (HRSV) via decreasing HRSV induced plaque formation in respiratory mucosal cell lines. Therefore, high concentration of *Z.officinale* could stimulate mucosal cells to secrete IFN-β which responsible

is counteracting viral infections by reducing viral attachment and internalization. Allicin compound is active against anti-influenza cytokines. It is found to be effective against influenza A (H1N1) macrophage mediated inhibitory effect of *Z.officinale* on the growth of influenza A virus was already studied [14].

2.6. Protective Effects against Respiratory Disorders

Qian-Qian Mao et al., studied the protective effects of Ginger in managing respiratory disorders. Ginger induces significant and rapid relaxation in the isolated human airway smooth muscle. In results from guinea pig and human trachea models, 6-gingerol, 8-gingerol, and 6-shogaol could lead to the rapid relaxation of pre contracted airway smooth muscle. The nebulization of 8-gingerol attenuated airway resistance via a reduction in Ca^{2+} influx in mice. In another study, 6-gingerol, 8-gingerol, and 6-shogaol promoted β -agonist-induced relaxation in human airway smooth muscle via the suppression of phosphodiesterase 4D. In addition, ginger ameliorated allergic asthma by reducing allergic airway inflammation and suppressed Th2-mediated immune responses in mice with ovalbumin-induced allergic asthma. Moreover, the water-extracted polysaccharides of ginger could decrease times of coughing, which were induced through citric acid in guinea pigs. Besides, ginger oil and its bioactive compounds, including citral and eucalyptol, inhibited rat tracheal contraction induced by carbachol.

The above results indicate that ginger and its bioactive constituents, including 6-gingerol, 8-gingerol, 6-shogaol, citral, and eucalyptol, have protective effects against respiratory disorders, at least mediating them through the induction of relaxation in airway smooth muscle and the attenuation of airway resistance and inflammation [15].

2.7. Immunomodulatory Activity

Carrasco FR et al., reported the immuno-modulatory effect of *Z.officinale* essential oils was reported in mice. In the study, essential oil of *Z.officinale* was administered to mice (once a day, orally, for a week) previously immunized with sheep red blood cells. *Z.officinale* essential oil showed the improvement in humoral response in immune suppressed mice [16].

2.8. Anti – Inflammatory activity

Raji Y et al., studied the anti-inflammatory activity of the *Z.officinale* at a dose of 50 and 100mg/kg body weight by carrageenan induced rat paw edema in Wistar albino rats. The rhizome extract significantly reduced the inflammation in rats [17].

Roohi Azam et al., analyzed the anti-inflammatory activity of the Ginger Essential Oil (GEO). Pleurisy was induced in anesthetized mice by intra peritoneal injection of carrageenan (200 μ g/cavity). Four hours later, the rats were sacrificed and the exudates were collected to determine the total volume and leukocyte number. In the pleurisy test, indomethacin and GEO 200 and 500 mg/kg reduced significantly the exudates volume ($P<0.05$ and $P<0.001$) without promoting alteration of total leukocyte migration. The anti-inflammatory activity was obtained due to inhibition of prostaglandin release [18].

3. Kadukkai (*Terminalia chebula*)

Terminalia chebula is one of the chebulinic myrobalan. *Kadukkai* can be compared with ones mother who take care of her child nourishes the body by providing perfect balanced diet with six tastes.

Likewise, *Kadukkai* prevents occurrence of diseases, as an alternative it preserve the body, improves ones appetite and taste. So, it is considered to be superior than mother [6]. The major and minor phytoconstituents of *T.chebula* was tabulated below,



Figure 3 Chebulinic myrobalan

Table 2 Phytoconstituents of *Terminalia chebula*[7,8]

Taste	Astringent and slightly bitter
Parts Used	Dried fruits, immature fruits, mature fruits, galls, mostly the epicarp of fruits.
Phytoconstituents	Major Phytoconstituents: Tannic acid, Gallic acid, chebulagic acid, ellagic acid, chebulinic acid, D-galloyl glucose. Minor Phytoconstituents: Corilegin, beta D-Glucogallin, glucose, sorbitol, Polyphenolic compounds, triterpene glycosides, terchebulin (ellagic tannin), terchebin, syringic acid, punicalagin, terflavin A, Flavanoids, Terpene glycosides, arjungenin and arjunglucoside -1.
Actions	Stomachic, effective purgative, Astringent and Alterative.
Medicinal Uses	Asthma, diseases of the heart, ascites, biliousness, spleen diseases, tumours, bleeding piles, leucoderma, itching, anaemia, skin diseases, fevers, cough, asthma, urinary diseases, piles, worms and rheumatism and scorpion sting. A decoction of chebulinic myrobalan is a good astringent wash useful in bleeding piles and some vaginal discharges.

3.1. Kadukkai Karpam

Kadukkai (*Terminalia chebula*) - The seeds of *T.chebula* should be removed and only the epicarp of fruit can be used. This epicarp is powdered and should be taken with water in bed time [6]. The following table indicates the usage of *Kadukkai Karpam* for *Mukkutram*.



Figure 4 Powder of Chebulinic myrobalan

Table 2 Kadukkai Karpam for Mukkuttra [6]

Mukkuttram	Adjuvant
Vaatham	Ghee
Pitham	Sugar
Kapham	Rock Salt
Mukkuttram	Jaggery

3.1.1. Toxicity profile

Ethanol extract of *Terminalia chebula* at the dose of 2000mg/kg b.wt did not produce any mortality in experimental animals. No adverse effects were observed in rats in 28 days repeated oral toxicity also [19]. There were no toxic signs reported with the aqueous extract of *Terminalia chebula* at a single oral dose of 5000 mg/kg b.wt. In chronic toxicity study for 270 days, the test substance (300, 600 and 1200 mg/kg b.wt.) did not show any toxic signs in rats [20]. 50% alcoholic extract of *Terminalia chebula* showed no toxic changes in acute toxicity study [21].

3.1.2. Anti-oxidant activity

Chang and Lin et al., (2011) evaluated the anti-oxidant activity of three extracts of *Terminalia chebula* namely methanol extract, water extract and ethanol extract. In which methanol extract has greatest total triterpenoid content and exhibited good antioxidant activity in the HRP-luminol- H₂O₂ assay. The water extract has greatest total phenolic and tannin content and showed good antioxidant activities in both CuSO₄ 4-Phen-Vc-H₂O₂ and luminol-H₂O₂ assays. The 95% ethanol extract exhibited good antioxidant activity in the pyrogallol-luminol assay [22].

Na et al.,2004 evaluated the anti-oxidant activity of Aqueous extract of *Terminalia chebula* which inhibits xanthine/xanthine oxidase activity and is also an excellent scavenger of DPPH radicals [23].

Lee et al.,2005,2007 evaluated the anti-oxidant effect of an aqueous extract of *Terminalia chebula* fruit on the tert-butyl hydroperoxide (t-BHP)- induced oxidative injury was observed in cultured rat primary hepatocytes and rat liver. The extract showed good anti-oxidant activity against oxidative injury [24].

Thomas et al., (2012) evaluated the anti-oxidant effects of an aqueous extract of *Terminalia chebula* by microwave treatment followed by ultrasonication. 20.6% of antioxidant activity of the aqueous extract was obtained [25].

3.1.3. Anti-pyretic activity

Joonmoni Lahon et al., conducted anti-pyretic activity of ethanolic extract of *Terminalia chebula* at doses of 400 mg/kg and 600mg/kg on rats by brewer's yeast induced method. Initial rectal temperature was recorded. After 18h, animals that showed an increase of 0.3-0.5 °C in rectal temperature were selected. Then temperature was noted at 0, 30, 60, 120 and 180 minutes following drug administration. The Paracetamol and extract started showing significant antipyretic activity after 1h (60 min.) of post dosing. It was observed up to 3 h (180 min.) after paracetamol and test extracts administration. The extract markedly decreased the rectal temperature of pyretic rats [26].

3.1.4. Anti-Viral Activity

Badmaev and Nowakowski, (2000) evaluated the anti-viral activity of *Terminalia chebula* against Influenza A virus. It was concluded that it protects epithelial cells against Influenza A virus, supporting its traditional use for aiding in recovery from acute respiratory infections [27].

Anwesa Bag et al., studied the anti-viral property of *T.chebula* against Respiratory Syncytial Virus (RSV). The viruses were propagated in HEP-2 cells. Viral titres and anti-viral assays of RSV was determined by immune histochemical staining plaque assay using anti-RSV fusion protein antibody (1:5000, millipore) and goat anti-mouse IgG (H+L) alkaline phosphatase (AP) conjugate in ratio RSV 1:10,000 followed by development with vector Black AP Substrate Kit.

Broad Spectrum Anti-Viral: CHLA and PUG are the tannin extracts of *T.chebula*. It shown broad spectrum anti-viral effect against HCMV, HCV,

DENV-2, MV and RSV with their EC 50, <35µm and SI>10. Both tannins are especially effective against RSV with their EC50 values being <1µm. The tannins were able to interact with RSV virions hence a block of 60 -80% was observed against RSV. CHLA and PUG inhibits the virus attachment ranging from 90-100% and inhibits host cell binding and penetration of RSV during cell entry process [28].

3.1.5. Immunomodulatory activity

H.N. Shivaprasad et al., studied the aqueous extract of *T.chebula* has a effect on cell mediated and humoral component of the immune system in mice. The administration of *T.chebula* extract produced a increase in humoral antibody titre and delayed type hypersensitivity in mice. The result of the study was aqueous extract of *T.chebula* produced a dose dependent immune stimulatory effect in relation to antigenic stimulation [29].

Vaibhav Aher et al., reported the immuno-modulatory activity of *T.chebula* by the inhibition of lipid peroxidation and increased level of anti- oxidant enzyme catalase and superoxide dismutase. This study explains melatonin secreted by pineal gland plays a role as direct or indirect stimulatory effect on both cellular and humoral immunity and increased level of cytokinin IL-2, IL-10 and TNF-α which play important role in immune modulatory action such as T and B lymphocyte proliferation, natural killer cell activation[30].

3.1.6. Anti-inflammatory activity

Safkath Ibne Jami et al studied that anti-inflammatory activities of ethanolic extract of *Terminalia chebula* fruits in long Evans rats by carrageenan induced paw edema method with the administration dose of 300 mg/kg .Comparing with control, largest inhibition was found in inhibiting inflammation 5 hours after treatment. The present study suggests that ethanolic extract of *Terminalia chebula* fruits has significant anti-inflammatory activities [31].

4. Conclusion

From this review, it is concluded that above discussed *Kaya Karpam* herbs *T.chebula* possess a highly potent anti-oxidant because of its rich phenolic content and it exhibit immuno-modulatory action owing to the presence of active constituents such as chebulinic acid, rich phenolic content, gallic acid, ellagic acid, tannic acid etc. and *Z.officinale* also possess anti-oxidant, anti-viral potency against certain respiratory viruses which is owed to the presence of rich phenolic content, phellandrene, gingerol, gingerin etc. Making use of this *Kaya karpam* is cost effective and not only provides immunity but also prevents a wide range of diseases and also delays ageing process. In this predominant infectious state, this review article on *T.chebula* and *Z.officinale* gives a promising role against COVID-19 which helps in stepping forward against the battle.

Compliance with ethical standards

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Disclosure of conflict of interest

There are no conflicts of interest.

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