

Kadukkai ooral kudineer (Chebulic Soaked Water): Prophylactic Siddha Herbal Drink for Covid-19

**Indhu PM¹ SherinNisha A^{1*}, Sivakkumar S¹, Mariappan A¹, Visweswaran S¹
Meenakaumari R²**

¹ Department of Gunapadam, National Institute of Siddha, Tambaram Sanatorium, Chennai - 47

²National Institute of Siddha, Tambaram Sanatorium, Chennai-47

Abstract:

In December 2019 from Wuhan, China the novel corona virus disease (COVID-19) makes a huge impact on human physical and mental health as well as world economy. Unfortunately there are no specific vaccines or treatments for this pandemic disease. WHO advised the general public to focus on enhancing of their immune system to prevent getting affected from this pandemic disease. In Siddha system of medicine, lot of immune boosting formulations, therapies like *Kaayakalpam* (rejuvenation), *Pranayamam* (breathing exercise), and health drinks are available. *Kadukkai ooral kudineer (Chebulic soaked water)* is one among them which is prepared from the outer skin of *Kadukkai (Terminalia chebula)* by soaked in water for 12 hours. *Terminalia chebula* possess more phytoconstituents liketannins, anthroquinones, chebulinic acid, chebulic acid, ellagic acid and gallic acid. The present study is aimed to review the immunomodulatory, anti-oxidant, anti-inflammatory and anti-viral property of *Kadukkai*. This review reveals, *Kadukkai* possess immunomodulatory, anti-oxidant, anti-inflammatory and anti-viral properties which may have major role in the management of COVID-19 infection. This study concluded that the consumption of Siddha health drink *Kadukkai ooral kudineer (Chebulic soaked water)* may boost our immunity and help to prevent the possibility of COVID-19 infection.

Key Words: *Kadukkai ooral kudineer* (Chebulic soaked water); Immunity booster; COVID-19.

Introduction:

The novel Corona virus disease 2019 (COVID-19) is caused by SARS-CoV-2, which is the causative agent of a potentially

fatal disease that is of great global public health concern. The COVID-19 pandemic has entered a dangerous new phase⁽¹⁾. Globally, more than 16 million cases of

***Corresponding author**

Sherin Nisha A, PG Scholars, Department of Gunapadam, National Institute of Siddha, Tambaram Sanatorium, Chennai-47,
E-mail: sherin9664@gmail.com

COVID-19 have been reported, more than 5, 30,000 death and number of new cases also increased more than 1,60,000 on every single day(WHO, 2020)⁽²⁾. SARS-CoV-2 has been detected in broncho-alveolar secretions, sputum, saliva, throat, and nasopharyngeal secretions of infected persons⁽³⁾. About 50-80% transmission occurs from asymptomatic carriers, hence transmission through speech droplets is considered as a significant mode of transmission of the disease. The virus can be transmitted through fomites also⁽⁴⁾. The initial symptoms are fever with chills, dry cough and malaise in 83-98% of cases. Other symptoms include shortness of breath, abdominal pain, diarrhea, head ache and vomiting in few cases⁽⁵⁾.

Holistic approach of traditional system of medicine gives focus on prevention through improving the immunity. Since ancient times, medicinal herbs have been used as a treatment and prevention for several diseases, including respiratory infections. According to Siddha literature *Kayakalpamis* the process of total body rejuvenation. It enables to transcend any degenerative condition and attain an optimal health status. One of the Kayakalpa herbs *Kadukkai (Terminalia chebula)* has been used to treat various health ailments like asthma, cough, phlegmatic diseases, jaundice, diabetes, cardiovascular diseases in traditional system of medicines.

Kadukkai ooral kudineer is one among them which is prepared from the outer skin of *Kadukkai (Terminalia chebula)* by soaking in water for 12 hours. *Terminalia chebula* possess more phytoconstituents like tannins, anthroquinones, chebulinic acid, chebulagic acid, chebulic acid, ellagic acid and gallic acid⁽⁶⁾. The present study is aimed to review the immunomodulatory, anti-oxidant, anti-inflammatory and anti-viral property of *Kadukkai*.

Kadukkai ooral kudineer (Chebulic soaked water):

Method of preparation:

Kadukkai	- 100 gm
Water	- 800 ml

Kadukkai (Terminalia chebula) is purified by removal of its seeds. Then the pericarp of *Kadukkai (Terminalia chebula)* is soaked in water for 12 hours.

***Terminalia chebula*⁽⁷⁾:**

Terminalia chebula belongs to Combretaceae family is widely distributed in India, Sri Lanka, and Burma upto an altitude of 1500 (-2000)m⁽⁸⁾. A Siddha text, Gunapadam mooligai vaguppu, quotes that *Terminalia chebula* "Cares the patients as if a mother cares a child", and superior to the nourishing mother for its extraordinary healing power. It's also known as "King of

medicine" in Tibet ⁽⁹⁾. In Siddha system of medicine seven different varieties are there which are listed in Table.No:1.

Table.No:1. Different varieties of *Terminalia chebula*⁽⁷⁾

S.No	Species name	Features	Therapeutic Indicaiton	Place of origin
1.	Visayan	Resembles Curcumistrigonus	Vatha diseases	Avanthi country
2.	Arogini	Circular Four lines on it	Cures sannibaatham	Kanyakumari
3.	Prithivi	Soft epicarp	Cures insanity and lengthens the lifespan	Sowrastra
4.	Amirtha	Fleshy	Plegmatic disorders	Kasi
5.	Sivanthi	Golden color	Piles due to vaayu	Growth in forest
6.	Thirivirithi	Five colors with three lines	All kind of sores	Grown in mountain region
7.	Abayan	Black in color	Certain kinds of disease in body	Pothigai hills

As per Siddha fundamental taste theory each and every taste has major role in neutralizing the vitiated three vital humour. *Terminalia chebula* possess Astringent, Pungent, Bitter, Sweet and Sour taste. These tastes help to reduce / balance the vitiated vatham, pitham and kabham and also it has hot potency.

The Phytoconstituents present in *Terminalia chebula* are tannins, anthroquinones, chebulinic acid, chebolic acid, ellagic acid and gallic acid and it has purgative (gentle laxative), astringent, alterative actions⁽⁶⁾. The characteristic features, phytoconstituents, actions, medicinal use are tabulated in Table 3.

Table 2. Kadukkai karpam with anupanam for various seasons⁽⁷⁾

Kaalangal (Seasons)	Anupanam(Adjuvent)
<i>Kaarkalam</i>	<i>Induppu</i> (Rock salt)
<i>Koothirkalam</i>	<i>Sarkarai</i> (Sugar)
<i>Munpani</i>	<i>Chukku</i> (dried ginger)
<i>Pinpani</i>	<i>Thippili</i> (Long pepper)
<i>Elavenil</i>	<i>Thean</i> (Honey)
<i>Muthuvenil</i>	<i>Vellam</i> (Jaggery)

Table 3. Phyto -chemicals and medicinal uses of Kadukkai

Taste ⁽⁷⁾	Astringent, Pungent, Bitter, Sweet and Sour taste
Parts used ⁽⁷⁾	Tender fruit and Ripe fruit
Phytoconstituents ⁽⁶⁾	<p><u>Major chemical constituents:</u></p> <p>Tannins, anthroquinones, chebulinic acid, chebulagic acid, chebulic acid, ellagic acid and gallic acid.</p> <p><u>Minor constituents:</u></p> <p>Fruit also possesses corilegin, β-D- glucogallin, glucose and sorbitol, polyphenolic compounds, triterpene glycosides, terchebulin, punicalagin, terflavin A, flavonoids, reducing sugars and starch.</p>
Actions ^(7,10)	Stomachic, effective purgative (gentle laxative), astringent, alterative.
Medicinal uses ^(7,10)	Jaundice, obesity, ageusia, hypertension, eye diseases, dropsy, peptic ulcer, anaemia, vomiting, fistula, stomatitis, hydrocele, fever, cough, asthma, urinary diseases, piles, worm infestations, rheumatism, scorpion sting

As rejuvenation therapy, Kadukkai may be administered with different vehicle (anupanam) based on seasonal variation for enhancing immunity which is mentioned in Table 2.

Phyto-constituents:

Kumar KJ (2006)., reported that *Terminalia chebula* contains several phytoconstituents like tannins, flavonoids, sterols, amino acids, fructose, resin, fixed oils etc., and it is rich in different tannins (approximately 32% tannin content). Further, he stated that, the tannin content of *T. chebula* largely depends on its geographic location⁽¹¹⁾.

Juanget al.,(2004), isolated 14 hydrolysable tannins names gallic acid, chebulic acid, punicalagin, chebulanin, corilagin, neochebulinic acid, ellagic acid, chebulegic acid, chebulinic acid, 1,2,3,4,6-penta-O-galloyl-b-D-glucose, casuarinin, 3,4,6-tri-O-galloyl-D-glucose and terchebulin from fruits of *T. chebula*.⁽¹²⁾

Suchalathaet al.,(2005), reported that total phyto-constituents of *Terminalia chebula* are hydrolysable tannins (which may vary from 20-50%) and they are responsible for pharmacological activities. The tannin content varies with the geological variation. Flavonol glycosides, tri-terpenoids, and

coumarin conjugated compounds with gallic acid called as chebulin, and also phenolic compounds are isolated. Total eight compounds viz. Gallic acid, methyl gallate, ethyl gallate, chebulagic acid, tetra-O-galloyl- β -D-glucose, and ellagic acid, chebulinic acid and penta-O galloyl- β -D-glucose from *Terminalia chebula* were isolated and checked out the reverse phase chromatography. There are seven varieties of *Terminalia chebula*. All of them are more or less used in similar fashion but vary in specific usages and quality⁽¹³⁾. Trease and Evans pharmacognosy states that *Terminalia chebula* contains about 20-40% of tannin⁽¹⁴⁾.

Anti-oxidant activity:

Sarmisthasaha *et al.*, (2016) studied the anti-oxidant activity of polyphenolic extract of *Terminalia chebula* Retzius fruits. In this study the total phenolic content of the polyphenolic extract of *T. chebulais* significantly correlated with its total antioxidant capacity ($R = 0.992, p < 0.05$), DPPH radical scavenging activity ($R = 0.971, p < 0.05$), nitric oxide radical quenching activity ($R = 0.995, p < 0.05$) and hydrogen peroxide scavenging activity ($R = 0.990, p < 0.05$). This result indicates that the phenolic contents of *T. chebula* are responsible for its antioxidant activity⁽¹⁵⁾.

Chen *et al.*, (2011) reported anti-oxidant study on *Terminalia chebula*. In this study, 6 extracts and 4 pure compounds of

Terminalia chebula exhibited *in-vitro* antioxidant properties through anti-lipid peroxidation, anti-superoxide radical formation, and DPPH activities at different concentration. The results demonstrated that tri-ethyl-chebulate was a strong antioxidant and free-radical scavenger, which might contribute to the anti-oxidative ability of *Terminalia chebula*⁽¹⁶⁾.

Saleem *et al.*, (2001) studied that the *Terminalia chebula* has a stronger antioxidant activity than alpha-tocopherol and HPLC analysis with diode array detection indicated the presence of hydroxybenzoic acid derivatives, hydroxycinnamic acid derivatives, flavonolaglycones and their glycosides, as main phenolic compounds in *Terminalia chebula*⁽¹⁷⁾.

Hyun-Sun *et al.*, (2005) evaluate the protective effects of an aqueous extract of fruit of *T. chebula* on the *tert*-butyl hydroperoxide (*t*-BHP)-induced oxidative injury observed in cultured rat primary hepatocytes and rat liver. *T. chebula* fruits have potent anti-oxidative and protective effects against *in vitro* free radical generation and *t*-BHP-induced oxidative hepatotoxicity in rat primary cultured hepatocytes and rat liver⁽¹⁸⁾.

Anti-viral activity:

Lin *et al.*, (2011) stated that the extract of *Terminalia chebula* fruit shows inhibitory

effects on human immunodeficiency virus-1 reverse transcriptase. Hot water extract of *Terminalia chebula* has anti-herpes simplex virus (HSV) activity *in-vivo* and anti-cytomegalovirus (CMV) activity both *in-vitro* and *in vivo* study. Thus *Terminalia chebula* inhibited the HSV-1 entry at non-cytotoxic doses in A549 human lung cells by preventing binding, penetration, and cell to cell spread, as well as secondary infection⁽¹⁹⁾.

Hongbo *et al.*,(2010)studied the extracts from *Terminalia chebula* Retz., for a new alternative treatment of swine influenza A virus infection. The Acetone extracts of *Terminalia chebula* Retz, combined with pandemic influenza-A virus were inoculated into non immune chick embryo, and then the chick embryo and allantoic fluid were observed to evaluate the antiviral effect. The result of the study shows the acetone extract (tannic acids, TA) of *Terminalia chebula* Retz, may be considered as an effective method for human being to fight against pandemic swine influenza-A virus⁽²⁰⁾.

Ajay Kesharwani *et al.*, studied the Anti-HSV-2 activity of *Terminalia Chebula* Retz extract and its constituents, chebulagic and chebulinic acids. The extract as well as purified compounds were used to determine their *in vitro* cytotoxicity on Vero cells by MTT assay. The study results, that the extract from *T. chebula* ($IC_{50} = 0.01 \pm 0.0002 \mu\text{g/ml}$), chebulagic ($IC_{50} = 1.41 \pm$

$0.51 \mu\text{g/ml}$) and chebulinic acid ($IC_{50} = 0.06 \pm 0.002 \mu\text{g/ml}$) showed the dose dependent potent *in vitro* direct anti-viral activity against HSV-2. These also effectively prevented the attachment as well as penetration of the HSV-2 to Vero cells⁽²¹⁾.

Jeong *et al.*,(2002)evaluated that the gallic acid from *T.chebula* showed strong inhibitory effect on Human immunodeficiency virus type 1 (HIV-1) integrase and the three galloy glucose from *T.chebula* showed moderate inhibition against the HIV-1 integrase⁽²²⁾.

Badmaev *et al.*, (2000) reported that out of the 23 components tested, only one, *Terminalia chebula*, showed a significant protective effect when applied to the epithelial cells. It protects epithelial cells against influenza-A virus, supporting its traditional use for aiding in recovery from acute respiratory infections⁽²³⁾.

In recent study conducted by IIT Delhi, reveals that the experimental findings showed that aqueous extracts from Tea(*Camellia sinensis*) and *Kadukkai* (*Terminalia chebula*) have potential anti-viral activity via *in-vitro* inhibition of the proteolytic activity of the main protease of the corona virus 3CL pro and showing potential therapeutic candidates for the SARS-CoV-2 infection, which should be further validated in *in-vivo* models. This study concluded that Gallotannin (or tannic acid) from Tea and *Kadukkai* is majorly

involved in the inhibition of 3CL Pro viral protease⁽²⁴⁾.

Anti-microbial activity:

Golammostafa *et al.*, evaluated the Antimicrobial activity of *Terminalia chebula* by disc-diffusion method on Mueller-Hintonagar media. The results demonstrated that both the methanol and aqueous extracts of the leaves of *T. chebula* are well effective in producing antibacterial activities against gram-negative bacteria, particularly the agents causing gastroenteritis. Furthermore, in a few cases, these plant extracts were active against antibiotic resistant bacteria under very low concentration, thus minimizing the possible toxic effects. Such a potential of this medicinal plant, therefore demands further research to unfold its therapeutic values⁽²⁵⁾.

Immunomodulatory activity:

Shiva prasad *et al.*, (2006) has evaluated the aqueous extract of *Terminalia chebula* has effect on cell-mediated and humoral components of the immune system in mice. Administration of *Terminalia chebula* extract produced an increase in humoral antibody (HA) titer and delayed-type hypersensitivity (DTH) in mice. The result of the study was aqueous extract of *Terminalia chebula* produce a dose-dependent immune stimulatory effect in relation to antigenic stimulation. Thus the

study is concluded that aqueous extract of *Terminalia chebula* has the immune stimulatory activity⁽²⁶⁾. Trinh *et al.*, (2020) studied about a herbal formulation named KM1608 prepared from three medicinal plants such as *Saussurea lappa*, *Terminalia chebula*, and *Zingiber officinale*. The cytotoxicity and immuno-stimulating effect of KM1608 were determined using cell viability and nitric oxide assays. The results of this study showed that major compounds of KM1608 exhibit anticancer potential via immune signaling pathways. Both innate and adaptive immune responses are controlled by multiple signaling pathways using numerous complement proteins, cytokines, inflammatory mediators, and antibodies⁽²⁷⁾.

Vaibhav Aher *et al.*, (2011) has reported the immunomodulatory activity of *T. chebula* by the inhibition of lipid peroxidation and increased levels of antioxidant enzymes catalase and superoxide dismutase. This study explains melatonin secreted by pineal gland plays a role as direct and / or indirect stimulatory effect on both cellular and humoral immunity and increased levels of cytokines IL-2, IL-10 and TNF- α which play important role in immunomodulatory actions such as T and B lymphocyte proliferation, natural killer cell activations⁽²⁸⁾. Ramasundaramsrikumar *et al.*, conducted a study of Immunomodulatory activity in Triphala on Neutrophil Functions in eight groups of animals, by the method of testing

the various neutrophil functions like adherence, phagocytosis (phagocytic index (P.I) and avidity index (A.I)) and nitro blue tetrazolium (NBT) reduction in albino rats. Oral administration of Triphala stimulate the neutrophil functions in the immunized rats and stress induced suppression in the neutrophil functions were significantly prevented by Triphala⁽²⁹⁾.

VaibhavAher *et al.*,(2010), carried out the *in-vivo* study of oral administration of *Terminalia chebula* alcoholic extract (100 mg/kg, p.o) was found to increase the neutrophils and lymphocytes as compared to vehicle and cyclophosphamide treated groups. *T. chebula* alcoholic extract showed linear time dependent significant phagocytic activity as compared to SRBC sensitized and cyclophosphamide treated group. In zinc sulphate turbidity test, *T. chebula* treated rats serum showed more turbidity (cloudy) which shows the increased level of immunoglobulin as compared to vehicle, SRBC sensitized and cyclophosphamide treated group. By conclusion of this study, *Terminalia chebula* ripe fruits show potent immunomodulatory action⁽³⁰⁾.

Sohni *et al.*,(1996) conducted the experimental hepatic amoebiasis and immune modulatory study on rat using a crude drug formulation of *Terminalia chebula*. In immune-modulation, humoral immunity was enhanced where T-cells counts remained unaffected in the animals,

but cell mediated immune response was stimulated⁽³¹⁾.

Anti inflammatory:

SafkathIbne Jami *et al.*,(2004) evaluated the analgesic and anti-inflammatory activities of ethanolic extract of *T.chebula* fruits in experimental animal models. Anti-inflammatory effect of *T.chebula* extract was analyzed by carrageenan induced paw edema method with the administration dose of 300 mg/kg of animals. This study concluded that the considerable value of % inhibition of inflammation was found by determining the percentage of change in paw volume in extract in 1 hour (21%), 2 hour (27%) and 3 hour (25%) after treatment⁽³²⁾.

Min hey yang *et al.*,(2014) studied the Anti-inflammatory activity of twelve constituents isolated from the methanolic extract of fruits of *Terminalia chebula*, the activity was determined by their ability to inhibit inducible nitric oxide synthase (iNOS) and cyclooxygenase-2 (COX-2) in LPS-stimulated macrophages. This study result shows that the chebulinic acid, 2,3,6-tri-O-galloyl-beta-D-glucose, arjunic acid and arjunolic acid efficiently reduce the nitric oxide (NO) production and COX-2 activities at the cellular level⁽³³⁾.

Goutam *et al.*, (2013), evaluated the curative effects in extract of *Terminalia chebula* (TCE) on acetic acid (AA)-induced

colitis in experimental animals. TCE indicated the presence of active principles with proven antioxidants, anti-inflammatory, immunomodulatory and free radical scavenging and healing properties. The result of the study, TCE seemed to be safe and effective in healing experimental colitis⁽³⁴⁾.

Conclusion:

Kayakalpa medicinal plant *Terminalia chebula* has the ability to balance three doshas through its taste and potency. From this review *Kadukkai (T.chebula)* is proved as highly potent anti-oxidant because

of its rich phenolic content and it exhibit immunomodulatory action due to its biological active compounds such as chebulagic acid, gallic acid, ellagic acid and tannic acid. Thus *T.chebula* shows that it can act as a tremendous immune boosting agent as well as inhibit the pathogens. In this prevailing circumstances, the ongoing research on extract of *T.chebula* for Covid-19⁽²⁴⁾ gives a new hope to propagate this easily prepared *Kadukkai ooral kudineer (Chebulic soaked water)* from Siddha as a healthy herbal drink for prevention of covid-19 on daily basis.

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