A Systematic Review of the Prophylactic Role On Seerana Kudineer, A Traditional Siddha Therapeutic drink in Corona Virus Disease-19(Covid-19)

Santhini N¹, Mahespriya S², Gomathi R³, T. Lakshmikantham T⁴, Meenakumari R⁵

¹-³ PG Scholar, Department of Maruthuvam, ⁴ Associate Professor, Department of Maruthuvam, ⁵ Director, National Institute of Siddha, Chennai, Tamil Nadu, India.

*Correspondence and offprint requests to: Santhini N
© 2020 BioSci Group, Reverse Publishing Ltd, India.

ABSTRACT

COVID 19 is a life threatening diseases. That causes a significant decline in the world’s population. As a result the global economy is in recession. Several companies are actively involved in the process of inverting a new vaccine. The traditional Siddha system of medicine is a gift to the mankind, which treasure innumerate prophylactic medicines & therapeutic drinks. To encounter this COVID 19 pandemic situation globally. One such therapeutic drink is Seerana Kudineer which made of green Chilly, Seeragam (cumin seed), turmeric powder and salt. The ingredients are easily available and easily to prepare, cost effective & efficacious. They are well known for their anti-oxidant, anti-viral, thermoregulatory properties.

AIM & OBJECTIVE:
To review the Siddha and scientific literatures about the individual ingredients of Seerana Kudineer for their anti-oxidant, anti-inflammatory, anti-viral activites.

MATERIALS & METHODS:
References from Various Siddha classical texts, Data bases such as Google scholar, Pub Med, Recent research articles about COVID 19 have been studied this review article.

CONCLUSION:
This review through a light on the scientific basis of the individual ingredients as their anti-oxidant, anti-inflammatory, anti-viral properties of Seerana kudineer. Thereby paves a platform and adds value to the traditional Siddha system of medicine in the war against the COVID 19 globally.

KEYWORDS
Siddha system, Seerana Kudineer, Prophylaxis, COVID 19.

Received: Aug 2020. Revised: Sep 2020. Accepted: Oct 2020
© The Author(s) 2020. Published by BioSci Group Publishing Ltd, India.

This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (http://creativecommons.org/licenses/by-nc/4.0/), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited.

For commercial re-use, please contact journals. editorjrbms@biosci.in

INTRODUCTION

The novel Corona virus disease or the COVID 19 originated from Wuhan, in China in December 2019. It causes severe respiratory and enteric infections both in human and animal. The clinical symptoms of COVID 19 are very similar to influenza viral infection. There are seven types of corona virus can naturally infect the human beings. WHO declared the COVID 19 as a pandemic on 30 January 2020. COVID 19 spreads via human to human transmission through droplets from or on direct contact with surfaces contaminated by the individuals suffering from this nosocomial source. [1]. As per the notification given in WHO guidelines 2019-20, now in a single day 12,750,275 numbers of confirmed cases were reported worldwide. 566,355 peoples were died and 216 countries got affected from this COVID 19 disease.[2]

In the ancient Siddha system of medicine, originated from south India.[6] 4448 types of diseases were described here by Siddhars.[3] In this system, the Medicines are broadly classified into 2 types - 32 types of internal medicine and 32 types of external medication and treatment procedure. [4] The Uniqueness of Siddha system of medicine is understood by its preventive and curative methods. [5]

“Prevention Is Better Than Cure “

Several prophylactic measures have been undertaken by government. The ancient Siddha literature have described various prophylactic measures in the form of guidelines to be followed and medicines to be taken during the outbreaks of epidemic diseases Seerana Kudineer is one such therapeutic drink said to be effective as a prophylactic and this paper explains how it acts as a prophylaxis in the management of COVID 19 in a scientific manner.

Some prophylactic measures from classical Siddha texts:

Theraiyar, in his Theraiyar Pini amuga vidhi states many preventive measures to maintain quality of life.

As per Thirukkural, “Marunthena vendavam yaakaikkku arunthiyathu Atrathu potri unin”

Here Thiruvalluvar says, “There is no need to take medicine to heal if one takes food after the prior meal is completely digested.” [1]

METHODOLOGY

Seerana Kudineer - Siddha therapeutic drink

Green chili - 1 number
Turmeric powder - 200mg
Cuminum seed - 200mg
Salt - 200mg

Above mentioned ingredients are added into 200 ml of water and subjected to boil 1 minute and filter it. This drink is taken in an empty stomach for 5 days. Milk and milk products should be avoided at this period of medication. Boiling the kudineer for more than one minute can degrade the Vitamin C present in most of these ingredients.

SIDDHA TASTE THEORY:

Increase or reduction of the tastes in foodstuffs, the three humours namely Vatham, Pitham and Kabam will be affected, this affection will manifest some symptoms in the body which is called diseases.

If vatham increases, sweetness, sourness and saltishness will balance, bitterness, astringency and pungency smoothen Kabam, astringency, sweetness and bitterness smoothen Pitham. [6]

SIDDHA ASPECTS:

Green chilly (Milakai) (Capsicum annum.Linn, Solanacea)

Characteristic - Suvai (Taste) – Kaarppu
Veeriyum (potency) – Veppam

Actions - Cardiac stimulant
Stomachic
Tonic
Stimulant

Pungent is a taste stimulates the taste buds spontaneously & enhance the digestion of food quickly. It facilitates digestion of food in correct time thus preventing the formation of gases (vayu) and eliminates kabam [7]

As per Siddhar Agasthiyar, It is mentioned that

“Thaalamathil thaathu thazhaiyum enbar – aalamenum
Mantham arosigumnam vayvum porulam pom”

-Agasthiyar gunavagadam.

Thaathu thazhaiyum : improves 7 udal thathukkal, 3 uyir thathukal.
Aamam : Indigestion, Mucous of the intestine, Unassimilated chyle.
Mantham : Indigestion
Arusi : Tastelessness, loss of appetite.

Hence it acts as an immunomodulator. As per Siddha system, fever is induced by accumulation of aamam in digestive tract. [8]

“Kudalthan i seethamalathu suram vaaraathu”

There by capsicum corrects indigestion through increasing digestive secretions thus it prevents the fever by correcting indigestion in COVID patients. It improves 7 udal thathukkal, 3 uyir thathukal thereby enhances the immune system in COVID patients.

**SCIENTIFIC REVIEW:**

The fruit of *Capsicum annum* Linn is a commonly used spices in India, it contains capsaicin (8-methyl-N-vanillyl-6-nonenamide) and capsaicinoids as their Chief chemical entity. The major capsaicinoids are capsaicin (48.6%) is quantitatively followed by 6,7-dihydrocapsaicin, minorcapsaicinoidsare, Nordihydrocapsaicin(7.4%), homodihydrocapsaicin(2%), and homocapsaicin (2%).[9]The nutrient values of *c.annum* are

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zinc</td>
<td>0.045mg</td>
</tr>
<tr>
<td>Magnesium</td>
<td>2.736mg</td>
</tr>
<tr>
<td>Calcium</td>
<td>2.664 mg</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>1.375mg</td>
</tr>
</tbody>
</table>

Vitamin C is a potent antioxidant & also it contributes to immune mechanism of both innate & acquired immunity.[10] Zinc is an important microelements, which influence on innate immunity also acts immune stimulant.[11], capsaicin rich in zinc and vitamin c, thus acts as a immunomodulator and prevents infection in covid patients.

*Capsicum annum* possess the Pharmacological activities such as anti- oxidant, anti –inflammatory, anti - viral, etc., [12].

**ANTI-INFLAMMATORY ACTIVITY**

Monika Muller et.al., evaluated the anti-inflammatory effect of capsaicin on gastric epithelial cells, the highest effect was detected with chili pepper, which has moderately enhanced the IL-10 secretion 190%, slightly reduced TNF-α secretion to 62% and iNOS expression to 35% and highly reduced IL-6 secretion to less than 20%.

The capsaicin also positively influenced the level of the secreted cytokines and reduced iNOS expression. [13]

Lee et.al., study conclude that capsaicin acts a potential anti-inflammatory action by modulated NF-kappa β- and IL-8 pathways, and thus inhibited IL-8 production of Helicobacter pylori induced gastric epithelial cells. [14]

Therefore by reducing IL 6 and TNFα capsaicin possess good anti-inflammatory activity. Bourne et.al., studied that treatment of Primary or Recurrent Experimental Genital Herpes with civamide (cis-capsaicin). The prophylactic treatment with capsaicin, alters the function in sensory neurons, can protect guinea pigs against cutaneous herpes simplex virus disease, although the compound has no direct antiviral activity. The civamide, the cis-isomer of capsaicin, interfere with herpes simplex virus disease and reduces recurrent disease during latent infection. [15].

**ANTIOXIDANT ACTIVITY:**

Narmin Yazdizadeh Shotorbani et.al., evaluated that Antioxidant activities of phenolic extract of *Capsicum annum* are a rich source of vitamins A,C and phenolic compounds, thus acts as an antioxidant and reduce risk of the diseases.[16][17]

Sambo et al., study was deals with a *Capsicum annum* induced gastric acid secretion in rats. The aqueous extract of *c.annum* prepared by maceration were administered to urethane anaesthetized rats, & gastric acid secretion assessed using the continuous perfusion method. [18]

Setareh sanati et.al., study revealed that alkaloid capsaicin is reduced the ACE 2 receptors also act as a ACE 2 inhibitor. [19]

In COVID infection, spike proteins of virus attach to the ACE 2 receptors, produce protease & cause viral replication. So ACE 2 inhibitor action containing capsaicin may act as an inhibitor of viral replication .This Capsaicin also acts in thermoregulatory center (Hypothalamus). It maintains the body temperature.

Janos Szoles anyi studied that Effect of capsai- cin on thermoregulation. Capsaicin is a selective activa- tor of the chemo- and heat-sensitive transient receptor potential (TRP) V1 action channel. [20]

Its thermoregulatory action may help to main body temperature in normal range.
SIDDIHA ASPECT:
MANJAL -Curcuma longa. Linn, Zingiberaceae
1. Characteristic - Suavi (Taste) – Kaarppu, Kaippu
   Veeriyam (potency) – Vepam
2. Actions - Carminative
   Hepatic tonic
   Stimulant
   Bitter taste reduces the ill effects of kabam and Pitham. It kills the intestinal worms. It stimulates the digestion of food quickly. [7]

“VanthiPithathodam iyam vatham pom thipanamam”
Kurntha manjalin kizhangu.

-Agasthiya gunavagadam

“Onriya vatha pithakapa mivai uyaravannam
Nanruru kariga lellam naalume samaippa raaynthor
Thinrudu milagu manjal seeraga muyartha kaayam”

-Parthartha guna chinthamani

“Iyam ozhivu madarviyarvung kaanathu”

-Agasthiya gunavagadam. [8]

Iyam ozhivu – decreases kabam kuttram

As per Siddha system of medicine, the human body composed by three vital humours (Vatham, Pitham, Kabam). The humors maintain the upkeep of the human body through their combined functioning, when deranged they bring about diseases. Increased level of kabam (kaba kutram) causes aamam in the body and results in fever.

The above mentioned Manjal is one of the thirthoda samaporul. Tumeric plays an important role in maintaining the 3 uyirthathukkal (Vatham, Pitham, Kabam), Hence it has anti-pyretic effects & also enhances the digestive system. [21]

SCIENTIFIC REVIEW OF CURCUMA LONGA. Linn

PHYTOCHEMICALS:

Curcuma longa has a main alkaloid called curcumin and other nutritive substances like Iron, Zinc, Copper etc., Vitamins A, C &E. [22]

Three major constituent such as curcumin, demethoxycurcumin, & bis demethoxy curcumin were separated from curcuma longa by using HPTLC. The Curcuma longa has total phenolic content is 11.24 as mg GAE%, ethanol extract of curcumin is 10.23% and color value is 172. [23]

Pharmacological activities of curcuma longa constitutes anti-viral, anti-fungal, anti-oxidant, anti-inflammatory, etc., [24]

ANTI VIRAL ACTIVITY:

Hye jin et. al., studied the anti-viral activity against hepatitis B virus replication in the aqueous extract of Curcuma longa. Linn by using a northern blot, southern blot & ELISA analysis. [25].

Yuvan chen et al., evaluated anti influenza activity of curcumin ,which results demonstrated that the treatment with 30 μM curcumin reduced the yield of virus by over 90% in cell culture.[26] Thus curcumin has effective anti-viral activity

IMMUNOMODULATORY ACTIVITY:

In the last couple of decades has been shown curcumin as a potent immuno modulatory agent which can enhance and modulate the activation of T cells, B cells, macrophages, Neutrophils, NK cells & Dendritic cells.[27] Thus it provides the immunomodulatory activity.

Curcumin is an active chemical component which is present in curcuma longa.

S.Antony et.al., study revealed , Curcumin was analysed for immune modulatory activity in Balbo/c mice. This study showed curcumin have immune stimulatory activity. [28]

ANTI INFLAMMATORY ACTIVITY:

Curcumin down regulate the expression of variety of pro inflammatory cytokines which includes TNF, IL-1, IL-2, IL-6, IL-8, IL-12 & Chemokine’s through the inactivation of NF- kappa β transcription factor. [27]

Chan et.al., study described, curcuma longa had performed molecular cloning & characterization of the novel phytocystatin gene. It is a type of protease inhibitor, so it involves anti-pathogenic reaction. [29] In COVID 19 infection, protease, IL-6 and TNF alpha levels are high in lung tissues. Here curcumin acts as a protease inhibitor.

A potent anti-inflammatory action of curcumin could prevent the release of TNF alpha & IL-6 against the pulmonary system. Curcumin also have anti cytokine & anti fibrotic activity. . [30]

Liang chen et.al., study revealed that Curcumin act as anti-inflammatory and inhibits the APN (Aminopeptidase N),it is identified as cellular receptor in Covid virus.[31] It may reduce the COVID 19 infection.
SIDDHA ASPECT:
SEERAGAM (Cuminum cyminum. Linn – Apiaceae)
Characteristic - Suvai (Taste) – Kaarppu,
Veeriyyam (potency) - Thatppam
Actions - Carminative, 
Stomachic
Stimulant.

“Pithamenum manthiriyai pinnap paduthiyavan
Chathruvai thuranthu saathithu”
- Theran venba.

Pithamenum manthiriyai pinnap paduthiyavan: Pitham humour has an important role in maintaining the body temperature. Here cuminum seeds act as a neutralizing the Kabam kutram, through maintain the Pitham in our body. Hence it acts maintaining body temperature and enhancing the digestive action. [8]

“Vanthi yarusigunmam vaainoipee ligamiraip Porriirummal.....

- Theran gunavagadam.

Vanthi - vomiting
Arusi - Ageusia
Gunnam - Peptic ulcer
Iraipu - Bronchial asthma
Irumal - Cough
Porumal - Abdominal flatulence [8]

SEERAGAM – KAYA KARPAM - REJUVINATOR:

Kayakarpam means (kayam - Body) (karpam - able competent) rejuvenation of mind and body thereby it helps to make our body and mind disease free, competent and maintains the youth fullness. It is classified into pothu and sirapu karpam. As per Therayar karpam Seeragan comes under the sirapu karpam. [32]

Seeragam as a kayakarpam, Rejuvenation means that prolonging life.

“Pochana kudari yaip pusikkilnoi yellamarum
\ Kaasami raatha kararthhi lundida”
- Theran venba.

Pochana kudari - Seeragam
Seeragam cures all the disease from our body, it also cures cough. [8]

SCIENTIFIC REVIEW:

Cumin seeds possess a phytochemical constituents such as phenol compound, flavones, saponins, tannin, cumin aldehyde, cymene and terpenoids.

Nutrient contents in cumin (in 2 g of seeds) were included: [33] [34].

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitamin A (IU)</td>
<td>25.40</td>
</tr>
<tr>
<td>Vitamin A (RE)</td>
<td>2.54</td>
</tr>
<tr>
<td>α-carotenoid (RE)</td>
<td>2.54</td>
</tr>
<tr>
<td>Thiamin B1 (mg)</td>
<td>0.02</td>
</tr>
<tr>
<td>Niacin – B3 (mg)</td>
<td>0.10</td>
</tr>
<tr>
<td>Niacin equip</td>
<td>0.10</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>0.16</td>
</tr>
<tr>
<td>Vitamin E alpha equip</td>
<td>0.02</td>
</tr>
<tr>
<td>Vitamin E (IU)</td>
<td>0.04</td>
</tr>
<tr>
<td>Vitamin E (mg)</td>
<td>0.02</td>
</tr>
<tr>
<td>Folate (µg)</td>
<td>0.20</td>
</tr>
<tr>
<td>Vitamin K (µg)</td>
<td>0.11</td>
</tr>
<tr>
<td>Omega 6 fatty acids (g)</td>
<td>0.06</td>
</tr>
<tr>
<td>Beta carotene (µg)</td>
<td>15.24</td>
</tr>
<tr>
<td>Calcium (mg)</td>
<td>18.62</td>
</tr>
<tr>
<td>Copper (mg)</td>
<td>0.02</td>
</tr>
<tr>
<td>Iron (mg)</td>
<td>1.32</td>
</tr>
<tr>
<td>Magnesium (mg)</td>
<td>7.32</td>
</tr>
<tr>
<td>Phosphorus (mg)</td>
<td>9.98</td>
</tr>
<tr>
<td>Potassium (mg)</td>
<td>35.76</td>
</tr>
<tr>
<td>Sodium (mg)</td>
<td>3.36</td>
</tr>
<tr>
<td>Zinc (mg)</td>
<td>0.10</td>
</tr>
</tbody>
</table>

Pharmacological activities are Cumin seed such as anti-inflammatory, anti-oxidant, digestive stimulant. [35]

ANTIOXIDANT ACTIVITY:

Atooz M studied., Anti-oxidant activity of cuminum seed by DPPH free radical scavenging assay and the β-carotene bleaching assay, which shows acetonic extracts of cuminum seed had a high ability to neutralize the free radicals over a period of 60 min in the DPPH assay with most of the neutralization occurring quickly with in the first 30 seconds & act as an anti-oxidant. [36]

ANTI DIARRHEAL ACTIVITY:

Sahoo HB et.al., studied anti diarrheal activity of aqueous extract of cuminum cyminum seeds in albino rats.
through castor oil induced diarrheal model and prostaglandin E2 induced enter pooling model. The study result showed cuminum extract markedly reduced the frequency of diarrheal stool, also reduced the weight and volume of intestinal content & intestinal transit. This effect was due to gastro motility reduction, prostaglandin synthesis & intestinal muscle contraction inhibition reaction. [37]

A recent analysis of COVID 19 disease, 1 in 5 patients had gastro intestinal symptoms like diarrhea, vomiting & stomach pain. Here the cuminum seeds has significant anti-diarrheal activity.

ANTI INFLAMMATORY ACTIVITY:

Sangeetha et al., studied that the Cumin seeds suppressed inflammatory markers like TNF α and IL-6. The aqueous and ethanol extracts showed significant anti-inflammatory activity in Carrageenan-induced paw edema and Cotton-pellet granuloma models, which revealed the aqueous extracts of C. Cyminum seeds had higher anti-inflammatory activity.[38]

Kalpana platel et.al, studied that Cumin, Cucum, Capsaicin have influenced intestinal mucosa thereby maintained the digestive enzyme secretion in Wister albino Rat model. [39]

SIDDHA ASPECT:

KARIYUPPU( SALT ) – Sodium chloride
1. Action - Stomachic, Antiperiodic

“Mantham porumal arum vaayuvum pom theebeanamam
Thonthitha aiyam thodarumo”

Mantham – Indigestion
Porumal – Abdominal flatulence
Thonthitha aiyam - increased kham hamour
Theebanamam - Appetite

Indigestion (aamam), abdominal flatulence are induced by excessive Kabam(kabam kutram), which causes fever. kariuppu (common salt) corrects the excessive Kabam humour, thereby restores normal body temperature (i.e) relieves fever and enhances the digestive secretion (acts as an appetizer).[4]

MUPPU (TRIPLE SALT)

The uniqueness of muppu (kayakarpam) - rejuvenator, is well explained in Siddha literature KARPA MUPPU KURUNOOL. Besides rejuvenator action, muppu also acts as a catalyst, thereby promotes the bioavailability of the active principle of the Siddha medicine in the body systems.

Hence muppu has been used widely as one of the key ingredients in all the siddha medicine preparation. Hence by adding salt in this preparation increases the both Bio –availability and efficacy of Seerana kudineer. [40]

SCIENTIFIC REVIEW:
NORMAL SALINE PREVENTS PNEUMONIA IN COVID PATIENTS

Preclinical study:
The study was conducted at Jinzhou hospital of Hubei pro-Vince from Jan 30th to March 21, 2020. The animal test demonstrated that sodium chloride injection has a significant therapeutic effect on human corona virus pneumonia for the mice model.

Clinical study:
Clinical study was conducted in 40 COVID 19 positive cases, it observed that the Laboratory data, biochemical analysis, CT imaging well improved and symptoms such as cough, fatigue was reduced. Appetite and gastrointestinal symptoms get normal after the injection of sodium chloride. Hence sodium chloride have a good clinical effect in treatment of COVID 19. [41]

Wu-chang zhang et. al., in vitro study with vesicle stomatitis virus infection revealed that high salt (high concentration of NaCl) plays an important role in innate immunity by type 1 TNF production and signaling in the macrophages. The type 1 TNF production and signaling was proved by pharmacological inhibitors and RNA inference. [42]

DISCUSSION
COVID -19, A Novel corona virus disease which is caused by SARS COV2 virus and it is comparable to the condition Kabasuram explained in siddha text. [43]

Santhaba manailethuma surathai ,....
Maarnothal irumal ilaippi
Varuguthalvai thuv armanthame urusi illai
Thanthaba moochuvitu poga matran”

-Yugi chinthamani

Maarnothal – Chest discomfort
Irual - Cough
Ilaipu - Bronchial asthma
Urusi illa - Tastelessness

“Kabathinai andri kasaswasam kanna-\nuthu”

- Theraiyar
Kabam is the predominant factor for pneumonia which is one of the severe condition in COVID 19 patients.

Siddhar Theraiyar mentions that fever is mainly due to seethal tam accumulate in the gastrointestinal tract, Seetham which is known as aamam(indigestion) is the major cause for fever. [38]

“Kudal thannil seethamalaathu suram vaarathu”
- Theraiyar

In our Seerana Kudineer the active ingredients constitute Kaarppu suvai (pungent), & veppa veeryum (heat potency). Hence it increases pitham which enhance immunity & preventing the infection. The alkaloid curcumin in turmeric, Cumin seeds, Capsaicin in capsicum influence the gastro intestinal mucosa and digestive system.

The ACE 2 receptor which is responsible for replication of mRNA in the presence of protease enzyme. The alkaloids in Seerana Kudineer enhance the reduction of ACE 2 receptor. Thus they inhibits the protease and reduce viral replication. Thus it prevents COVID 19 infection.

It also contains vitamin C and Zinc. In current scenario which plays a vital role in Immune system preventing COVID-19 infection.

Sodium chloride in Seerana Kudineer can reduce the symptoms of pneumonia. Hence as a whole Seerana Kudineer which is a traditional Siddha health drink act as a prophylactic measure for pandemic COVID 19 infection.

CONCLUSION

In our perspective view among the various prophylactic measures mentioned by Siddhars, Seerana Kudineer will be enhancing normal immune power and effective in preventing COVID 19 infection.

CONFLICT OF INTEREST

None declared.

ACKNOWLEDGEMENT

I wish to acknowledge my thanks to Associated professor’s, Lecturer (Department of Maruthuvam), my colleague’s Dr.Indhu P.M, Dr.Vishupriya, PG scholar, National Institute of Siddha, Chennai-106.

REFERENCES

10. Lothar Rink, Zinc and the Immune system, Nutrients 2000,541-552.


17. Malgorzata materska, Maria Konopacka, Jacek Rogolinski, Krzysztof Slosarek, Antioxidant Activity and protective effect against oxidative damage of human cells induced by X radiation of Phenolic Glycosides Isolated From Pepper Fruits Capsicum Annuum L, Food chemistry, 2015.

18. Samo N, Odeh SO, Ibu JO, Onyikwola O. The Effects of Capsicum Annuum And Capsicum Frutescens Induced Gastric Acid Secretion In The Rat Is By H2 Receptor Stimulation. Highland Medical Research Journal. 2007;


31. Liang chen et,al.,A Novel combination of Vitamin C,Curcumin and Glycyrrhizic Acid potentially regulates Immune and Inflammatory response associated with Corona virus Infection: A Perspective from system Biology Analysis,Nutrients2020,12,1193.


33. KrishnapuraSrinivasan, Cumin (Cuminumcyminum) and black cumin (Nigella sativa) seeds: traditional uses, chemical constituents and nutraceutical effects, Food Quality and safety , volume2,Issue 1, March 2018.[Google scholar].


35. PeriyathambiKalaivaniet.al, Cuminum cyminum a dietary spice,Attenuates Hypertension via Endothelial Nitric Oxide synthenses and NO pathway in Renovascular Hypertensive Rats, Clinical and Experimental Hypertension ,2013,Early online 1-9.


