

A Review on Pharmacological Activity of Single Herbs Used for Fumigation - A Preventive Measure for COVID-19 Pandemic

Vishnu Priya. K^{1*}, Ponmozhi. V², Mahalakshmi. V³, Muthu Kumar. N. J³, Meenakumari. R⁴

¹Dept.of Varma Maruthuvam, National Institute of Siddha, Tambaram Sanatorium, Chennai.

²Dept.of Pura Maruthuvam, National Institute of Siddha, Tambaram Sanatorium, Chennai.

³Dept.of Sirappu Maruthuvam, National Institute of Siddha, Tambaram Sanatorium, Chennai.

⁴National Institute of Siddha, Tambaram Sanatorium, Chennai.

Abstract

Corona virus disease caused by SARS like RNA virus has become a global public health problem presenting with mild respiratory symptoms to pneumonia like fatal condition. This pandemic disease ruined thousands of people life and created global economic crisis. As many nations are in process of finding a vaccine, only precautionary measures paves way to come across the virus. The infection is spread through the aerosols from the cough and secretions of the infected person. This virus remains in the air and surface for hours. Preventive measures like hand sanitizing, disinfecting the surface and environment with alcohol-based chemicals and fumigation techniques are carried out. Many fumigation procedures are mentioned in Siddha system of medicine to sterilize the environment in periods of *Kollai noi* (endemic diseases). *Pugai* (Fumigation) is one among the 32 types of external medicine in Siddha. *Pugai* is indicated for both therapeutic and sterilization purpose. Traditionally, fumigation is used in home as a holy spiritual habit.

To review the phytochemical properties and medicinal uses of commonly used fumigating herbals like Neem leaf & bark, *Nochi* leaves, Turmeric powder, *Adathodai* leaves, *Agil kattai*, *Devadaru*, *Oomathai* leaves, *Kungilium*, *Sambirani* and Camphor. Various Siddha literatures, data bases such as google scholar, PubMed. Articles related to COVID-19 and herbal fumigation. This paper states about the sterilizing nature of the herbal fumigation, medicinal benefits behind it and how it can be used in the current situation.

Key words: COVID-19, Corona virus, Fumigation, Siddha, Disinfection

*Corresponding author

Dr. A. Vishnu Priya, P G Scholar, Dept. of Varma Maruthuvam, National Institute of Siddha, Tambaram Sanatorium, Chennai. E-mail: vishnubsms1995@gmail.com

Introduction

Corona virus disease is a pandemic infectious disease causing upper respiratory and gastrointestinal tract infections. This SARS-CoV2 infection was first identified as an outbreak in Wuhan city, China on December 31st, 2019 and hence named as COVID-19. COVID-19 outbreak was declared as a global medical emergency on January 30, 2020. WHO announced corona virus outbreak as pandemic on March 11, 2020. The infection being air-borne is mainly transmitted by the respiratory droplets generated during coughing, sneezing, saliva etc and by direct contact with infected persons. The indirect spread is by the contaminated fomites ^[1]. At present by the end of July, 2020 the total Corona virus cases crossed around 17 million globally with 667,000 deaths and India is in the third position worldwide with 1.6 million confirmed cases ^[2]. As the number of cases increasing day by day, the world nations are in an urge to develop the vaccine for the virulent virus. But it would take months to years for the vaccine to reach all the people. So, the only weapon to come across this pandemic is prevention. WHO declared control measures like use of PPE, restriction of transport, physical distancing, environmental cleaning and disinfection ^[3].

Siddha system is a comprehensive system of medicine and healthy life style giving equal emphasis on body, mind and spirit. It helps to restore the innate harmony in an individual by balancing the three physiological factors or humours namely *Vatham*, *Pitham* and *Kabam* and thus maintaining the mind – body system. Siddha system consists of 32 internal and 32 external medicines. Apart from internal medicine, there is a wide repository of external therapies in which drug is administered through other routes than oral. *Pugai* (Fumigation) is one among the 32 external therapies. *Pugai* (Fumigation) is a process of gaseous sterilisation used for killing the micro-organisms and prevention of microbial growth in the air and surface. Fumigation denotes the artificial impregnation of the atmosphere. The fumigation process was done with medicinal herbs under specific ritual influences. The aroma therapy can be an evolution of this therapy. Fumigation is a method by which medicines can be taken to the deeper organs by the process of respiration ^[4]. This study reveals the phytochemical and pharmacological importance of herbal fumigation in disinfecting the surface and promoting the immune system in upcoming the pandemic situation.

Air borne transmission of COVID-19

WHO states that infected persons who spend long time in indoor locations crowded and inadequately ventilated even though not shaken hands or stood to each other are highly infected than others. Many studies revealed that SARS-CoV-2 can exist as an aerosol in health care setup. A research showed the presence of virus genetic material and RNA in aerosol surrounding the hospital isolated wards, ventilated patient's room and in higher level in the patient's toilet areas. Thus, virologist in the Wuhan University states that aerosol transmission might be a not negligible route of transmission from the infected carriers to others. SARS-CoV-2 virus can last in the aerosol for at least three hours and up to several days in different surfaces [5]. Even though the virus is present in the aerosol, there comes the hypothetical question whether the amount of virus in the aerosol is sufficient to cause the infection which is yet to be resolved by the scientist.

Fumigation

In Siddha medicine, fumigation is done for both therapeutic and sterilising purpose. Therapeutically, this method is used to treat ailments such as respiratory diseases like *Peenisam* (Sinusitis), *Iraippu noi* (Bronchial asthma, Bronchitis), *Moolam* (Haemorrhoids), *Sevi noi* (Ear diseases),

Powthiram (Fistula), *Natpatta viranam* (Chronic non-healing wounds), *Pal noigal* (Dental caries), *Valippu* (Epilepsy), *Yoni putru* (Cervical carcinoma) and to treat *kirigai* (Psychiatric diseases) [6]. *Pugai* (Fumigation) was also done to kill the microbial load present in the environment. In infectious condition, *Pugai* controls the growth of pathogenic organisms and have bacteriostatic activity [7]. In traditional practise, fumigation is done with dried leaves and barks of Neem (*Azadiracta indica*), dried Basil (*Ossimum sanctum*) leaves, Garlic (*Allium sativum*) peels, Turmeric (*Curcuma longa*) powder, *Nochi* (*Vitex negundo*) leaves, Eucalyptus leaves. For incense making gum resin (*Styrax benzoin*) is the ideal choice apart from *Palingu sambrani* (*Boswellia serrata*) and *Kundhirikam* (*Vateria indica*) [4]. The leaves, bark, wood, flower or seed of the herbs are dried in the sun and powdered. The coarse powder is allowed to burn in the vessel with the gum resin of *Styrax benzoin*, *Boswellia serrata* or camphor.

Scientific exploration on fumigation

The polyherbal fumigation with neem leaves, peppermint leaves, basil leaves, eucalyptus leaves, dried ginger and garlic powder, Chinese chaste tree leaves, clove powder and few drops of lavender oil reduce the aerobic bacterial load and acts as an effective weapon against the air borne

infections such as *Mycobacterium tuberculosis*, *Varicella zoster*, H1N1, H3N2, SARS [8] and they possess health benefits like antirepellent, antimicrobial, anticancer and anti-inflammatory activity [9].

The aroma of the eucalyptus leaves solves the respiratory ailments and flu like symptoms [10]. Fumigation with ginger, garlic and clove powder have a protective action against the Tamiflu and bird flu H5N1 [11]. These herbals also have antimicrobial, anticancer, antioxidant property. A study reported that SEM analysis revealed the reduction in the total count of bacteria on fumigation with garlic peels [12].

A study of poly herbal fumigation containing *Commifera mukul* (*Gukkul*), *Vetiveria zizanoids* (*Vetiver*), *Acorus calamus* (*Vasambu*), *Shorea robusta* (*Sambirani*), *Azhadiracta indica* (*Vembu*), *Calotropis procera* (*Vellai erukkan*), *Cedrus deodara* (*Devadharu*) and *Boswellia carterii* (*Parangi sambrani*) possess lethal effects in *Staphylococcus aureus* bacterial cells when exposed to 60 minutes than that of 20, 30 and 45 minutes by the qualitative DNA damage assay. Exposure of bacterial cells in the fumigation for one hour showed more DNA damage by formation of tail and head in the cells, and on hand no such changes observed in non-fumigated bacterial cells [8].

During the pandemic of swine flu in 2009, a paper was published in the International journal of Ayurveda and Pharma Research stating that the essential oils in herbal extracts can be used in the form of air freshener to control against the spread of flu and associated diseases [13].

Vembu

Botanical Name: *Azhadiracta indica*,
Family: Meliaceae, Taste (*SUVAI*): Pungent (*Karppu*),

Potency (*Veeriam*): Hot (*Veppam*).

“*Kirumikutta mantha keduvidasu rangal
poorumiyavai soorigaiyin pungal-*

- Agasthiyar guna sinthamani

The leaves of neem are known to kill the germs and to cure diseases like leprosy, digestive problems, infectious fever, skin disease and chicken pox wound [14]. The leaf, seed, oil possesses insecticidal activity [14]. The Neem leaves can be used as a fumigant in the outbreak of infectious diseases [16]. The fumigation of Neem leaves and bark is used as a pesticide for crops and makes surface and house hold substances free of microbes by its antimicrobial, antiseptic, vermifuge, febrifuge, anticancer, anti-inflammatory and anti-helminthic activity [17]. The Neem leaf exhibits pharmacological activities like anti-inflammatory, antioxidant, antiviral and antimicrobial activities. The active

compounds in the leaves include nimbin, nimbidine, β -sitosterol, isomeldenin and quercetin^[18].

The anti-inflammatory property is mainly due to quercetin, β -sitosterol and nimbidine. The anti-inflammatory effect is due to the inhibition of infiltration of pro-inflammatory molecules like TNF- α , NOS and NF.NLE also reduced the secretion of inflammatory mediators like ROS, IL-6 and NE. Neem leaf extract controlled the infiltration of inflammatory cells like neutrophils and macrophages in the lungs of mice exposed to cigarette smoke and LPS induced pulmonary inflammation. Nimbidin suppresses the activity of macrophages and neutrophils corresponding to inflammation^[19]. Neem has an important role in the regulation of pro-inflammatory enzyme activities such as cyclooxygenase (COX), and lipoxygenase (LOX) enzyme^[18]. Neem has a rich source of antioxidant and plays an important role in free radical scavenging. This activity is mainly due to alkaloids like azhadirachtin and nimbolide. The extracts of Neem leaves and bark have exhibited higher free radical scavenging effect.^[18] The leaves have highest antimicrobial action when compared with the seed and bark. Azadiractin, quercetin and β -sitosterol present in the leaf have anti-microbial activity against *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Proteus*

mirabilis, *Enterococcus faecalis*, *candida albicans* and *Aspergillus fumigatus*. Tricyclic diterpenoids like Margolone, Margolonone, isomargolone in the stem bark Nimbidine and Nimbolide in the seed are known to have anti-bacterial and anti-fungal activity^[20]. The extract of neem bark considerably blocked HSV-1 entry into the cells at specific concentrations ranging from 50 – 100 μ g/mL [21]. The leaves of Neem exhibit significant virucidal activity against coxsackievirus^[22].

Agil kattai

Botanical Name: *Aquilaria agallocha*,
Family: Thymellaceae, Taste (*Suvai*):
Pungent, Bitter and little Sweet (*Karppu*,
Kaippu, *Siru Inippu*), Potency (*Veeriam*):
Hot (*Veppam*)

“*Thalartha virutharukantha thaka manathaal*
ulaitha suramanaithum oodum–
valarthuthigazhum manae!
Agigpugaiku vanthiya rosaganpom
thanae thalarchiuru satru”
- Agasthiyar guna sinthamani

The fragrance of the fumigation of the wood is used to reduce the temperature in some types of fever. The exposure of the fumigation of the wood helps to treat vomiting, ageusia (loss of taste), and general tiredness. This can also be used as fumigation for wounds^[14]. Tarun kanti ghosh et al., had done a comparative study on antimicrobial activity of heartwood oil of

Aquilaria agallocha and seed oil of *Citrullus lanatus*. The result revealed that both oils possess anti-bacterial activity against *Escherichia coli*, *Staphylococcus aureus*, *Pseudomonas aeruginosa* and *Enterococcus faecalis*. But *Citrullus lanatus* seed oil exhibit more anti-bacterial activity than *Aquilaria agallocha*^[23] Habibur Rahman et al., conducted a study on in-vivo and in-vitro anti-inflammatory study of *Aquilaria agallocha* in carrageenan induced paw oedema in rats with diclofenac as standard. The study revealed that *Aquilaria agallocha* oil causes stabilization of the erythrocyte and lysosomal enzymes and thus inhibiting the release of anti-inflammatory agents like protease, histamine and serotonin⁽²⁴⁾.

Nochi

Botanical Name: *Vitex negundo*, Family: Verbenaceae, Taste (*Suvai*): Bitter, Astringent, Pungent (*Kaippu*, *Thuvarppu*, *Karppu*), Potency (*Veeriam*): Hot (*Veppam*)

“*Naasath tharvatha naasi piniazhalsu
vaasath thasanavuru vanthoda- kaasamara
luchu adaiyai urainooyu menpadumo
nochi adaiyai nuval*”

- Pathartha guna vilagam

The leaves of Nochi are used in the treatment of *Vatha* diseases, sinusitis, fever, asthma, cough, tooth ache and it balances the derangement of three humours^[25]. The

leaf extract of *Vitex negundo* have astringent, anti-parasitical, anti-bacterial, vermifuge, aromatic, analgesic and anti-tumour properties. A study on carrageenan and formaldehyde induced rat paw oedema showed that *Vitex negundo* exhibited anti-inflammatory, anti-histamine and analgesic property. In vitro study revealed that *V. negundo* extract inhibited the synthesis of prostaglandin. It also possesses anti-oxidant property^[26]. Essential oils, ethanol extract and successive ethyl acetate of *V. negundo* have anti-bacterial activity against *Staphylococcus aureus*, *Escherichia coli*, *Bacillus subtilis* and *Pseudomonas aeruginosa*. The anti-bacterial activity is due to the d-guaiene, caryophyllene epoxide present in the leaves and ethyl hexadecenoate in the flower oil^[27]

The methanolic extract of *V. negundo* leaves had excellent anti-pyretic activity against the yeast induced hyperpyrexia than the petroleum ether extract of the same plant by having paracetamol as a control group in male rabbit^[28]. The ethanolic extract contains anti-HIV property in the in vitro non-radioactive HIV-RT calorimetric ELISA kit with the recombinant HIV 1 enzyme. The flavonoids present in the leaves acts as an anti-viral agent^[29]

Adathodai

Botanical Name: *Adhatoda vasica*, Family: Acanthaceae, Taste (*Suvai*): Bitter (*Kaippu*),

Potency (*Veeriam*): Hot (*Veppam*)

“*Adatho daipanna maiyarukum vathamuthar kodanuko disurathin koothozhikum-....*”

- *Agasthiyar guna sinthamani*

The leaf of *Adathoda vasica* is used to treat the *Vatha*, *Pitha* and *Kaba* disease and various types of fever^[25]. The dried leaves are rolled as a pipe and burnt. The inhaled smoke is used to treat *iraippu noi* (Asthma)^[14]. Vasicine and vasicone are the major alkaloids that are responsible for the respiratory functions^[30]. The leaf extract of *Adathoda vasica* is known to have a good anti-tussive activity against chemically induced cough in anesthetized guinea pigs and rabbits and in unanaesthetised guinea pigs^[31]. Recent study reveal that Vasicine acts as a bronchodilator in both in-vivo and in-vitro studies^[32]. The leaf extract has antibacterial activity against gram positive bacteria like *Staphylococcus aureus*, *Streptococcus faecalis*, *Staphylococcus epidermidis* and gram-negative bacteria like *Pseudomonas aeruginosa* and *Escherichia coli*^[33].

Devadaru

Botanical Name: *Cedrus deodara*, Family: Pinaceae, Taste (*Suvai*): little bitter (*Siru Kaippu*), Potency (*Veeriam*): Hot (*Veppam*)

“*Devada ragunathan serthuvalar peenisathai kavakathi lootuing karapalavae – mavalavar solluppu raana suramoodunee raetrathai vellum manatraniku mai*”

-*Agasthiyar guna sinthamani*

The wood of *Cedrus deodarais* used in the treatment of sinusitis and various types of fever^[25]. The exposure of the wood fumigant is used to treat *Kaba* diseases, tooth ache and 5 types of seizures^[14]. The volatile oil extract of *Cedras deodara* possess anti-inflammatory action against the carrageenan-induced rat paw oedema^[34]. *Cedrus deodara* oil have anti-bacterial activity against *E. coli*, *S. typhimurium*, *P. aeruginosa*, *E. faecalis* and *B. subtilis*^[35].

Kungilium

Botanical Name: *Shorea robusta*, Family: Dipterocarpaceae, Taste (*Suvai*): Bitter (*Kaippu*), Potency (*Veeriam*): Hot (*Veppam*)

This can be use as a fumigant in hospitals to destroy the unpleasant odour and it to bring down the level of toxic gases^[14]. The resin of *Shorea robusta* have stimulant, anti-cancerous, anti-oxidant, anti-bacterial, anti-inflammatory, anti-diarrheal, diuretic, anti-gonorrhoeal properties^[36]. The aqueous extract of *Shorea robusta* have a remarkable anti-bacterial activity against *Escherichia coli*, *Bacillus coagulans*,

Bacillus cereus, moderate inhibitory activity against the *Bacillus subtilis* and *Salmonella typhi* and less activity against *Pseudomonas fluorescens* and *Proteus vulgaris*. The ethanolic extract of the resin have anti-microbial activity against *Staphylococcus aureus*, *Staphylococcus epidermis*, *Escherichia coli* and *Candida albicans*. The anti-bacterial property is mainly due to the presence of tannin in the resins. The oleoresins of *Shorea robusta* have a strong and broad spectrum anti-microbial action against certain pathogens equal to the standard antibiotics. The methanolic extract is responsible for the antioxidant property [37].

Sambirani

Botanical Name: *Styrax benzoin*, Family: Styracaceae, Taste (*Suvai*): Pungent (*Karppu*), Potency (*Veeriam*): Hot (*Veppam*)

“*Vathasi thalakannoi maara thalaivaliyum oothamuru peeniamum oodunkan*”

- Agasthiyar guna sinthamani

The resin is used to treat *Vatha* and *Kaba* diseases, eye disease, long standing head ache and sinusitis [25]. The fumigation of the resin destroys the micro-organisms (*nunpuzhu*) and reduces the unpleasant odour [14]. The fumigation of the resin is used to reduce the heaviness of the head [16]. The essential oil present in sambirani (*Styrax benzoin*) has anti-bacterial property

against gram positive *Staphylococcus aureus* and gram-negative *Escherichia coli*. The phenolic compound plays a main role in inhibiting the free radicals by transporting the hydroxy group towards the phenols in the primary oil. The antioxidant activity depends upon the number of hydroxyl group in the aromatic ring and flavonoids [38, 39].

Camphor (Sudan)

Botanical Name: *Cinnamomum camphora*, Family: Lauraceae, Taste (*Suvai*): Bitter and Pungent (*kaippu, karppu*), Potency (*Veeriam*): Hot (*Veppam*)

“*Kirumisala thodam kilaivalippu....*

Karpuram monru satru”

- Pathartha guna vilakam

Camphor is used to treat infectious diseases and sinusitis. [40]

“*Ithiri kudori iriku sirparam*”

- Therayar karisal

The inhalation of camphor and cumin seeds (*Cuminum cyminum*) will relieve the symptoms of sinusitis. The essential oils in camphor have biological activities like antifungal, antibacterial, anti-tussive, anti-mutagenic and insecticide properties. The entire benefits of camphor can be obtained by using it with other herbals than fumigating it separately. Camphor is a main component in many aromatic plants. [41]

During the outbreak of plague, the Black Death in Europe in the 14th century, camphor is used as the fumigant. This

fumigation was also used during the hard times of cholera and small pox [42]. Santoyo *et al.* investigated that rosemary essential oil obtained by the supercritical fluid extraction including camphor have antimicrobial activity against *S. aureus*, *E. coli*, *P. aeruginosa*, *B. subtilis*, *C. albicans* and *Aspergillus niger* observed in the disc diffusion and broth dilution methods [43]. A study on camphor as one of the components in the Greek sage (*salvia fruticose*) possess a high virucidal activity against herpes simplex virus and this activity was accompanied by the cytotoxic activity against the African green monkey kidney cells. Another study revealed that in plague reduction assay (in vitro) herpes simplex virus type 1 and type 2 are deactivated by lavender cotton (*Santolina insularis*) rich in camphor [44]. A study conducted in the burrow and co-workers for the anti-tussive activity, the vapour of camphor had cold sensation in the nose with improved airflow and no nasal resistance. The camphor vapour activates the cold receptors, TRPM8 that inhibits the cough but the mechanism is still not understood. A study revealed that citric acid induced cough in the guinea pigs have increased cough latency and reduced cough frequency on treating it with camphor and camphor lactam. [45,4]. An increased inhalation of camphor vapour above 2 ppm may cause irritation to the mucous membrane of the respiratory tract and cause

respiratory depression and may lead to apnoea. [41]

Turmeric (*manjal*)

Botanical Name: *Curcuma longa*, Family: Zingiberaceae, Taste (*Suvai*): Pungent, bitter (*Karppu, kaippu*), Potency (*Veeriam*): Hot (*Veppam*)

The smoke of the turmeric is used to treat sinusitis [16]. The phytochemicals in the rhizome of *curcuma longa* have antioxidant, anti-microbial, anti-inflammatory, anti-venom, Hepato-protective, Nephro-protective and anti-HIV activity. The alkaloid curcumin has a wide range of biological and pharmacological properties with no toxicity. Curcumin have action against viruses like hepatitis c virus, influenza virus, emerging Arbo viruses like Zika viruses or chikungunya virus, HIV and bacteria like staphylococcus, streptococcus and pseudomonas [47]. Turmeric exhibits hot potency and anti-inflammatory activity by inhibiting the lipoxygenase and COX-2 factors. The anti-microbial activity is mainly due to the essential oils and turmeric extract in *Curcuma longa* [48]

Oomathai

Botanical Name: *Datura metal*, Family: Solanaceae, Taste (*Suvai*): Bitter (*Kaippu*), Potency (*Veeriam*): Hot (*Veppam*)

“Oomathaikaippoo verilaiyu thando

Vudanpidungi vanthathai kayapottu
Aamathaiidithu pugailaiyum kutti
Agniyudanae kudika kabalaputhu
Samathaiyum pugaluirumalelai
Thalaivali mookalthanneervizhthal theerum
Naamithai ulagukaa unmaisonnom
Nambisei sura peenisangal poomae”

- Sarabenthiya vaithiya muraigal

The fruit, flower, root, leaves and stem of datura metal are dried and fumigated along with tobacco leaves. Inhalation of this smoke is used to treat tumour in the brain, cough, asthma, head ache, rhinitis, fever and sinusitis. The fumigation of the leaves expels the phlegm and relieves nasal block [49]. The ethanolic extract of datura metal leaves possess a good anti-inflammatory activity proved by the study in the carrageenan induced rat paw oedema with diclofenac sodium as a control [50]. The leaves exhibit little antimicrobial activity against the *Escherichia coli* and *Pseudomonas aeruginosa*[51]. The Atropine present in the leaf extract inhibit the growth of enveloped viruses like *Herpes simplex*, *Influenza virus*, *Adeno virus*, *Sindbis*, *New Castle disease virus* and *Japanese Encephalitis virus* [52].

Discussion

To overcome the COVID-19 pandemic situation, world nations and individual people taking anti-corona virus measures like wearing mask, social

distancing, hand sanitizing and sterilizing the surface. Though WHO have not authentically announced COVID-19 as airborne infection, it still remains as an unsolved hypothesis. Studies proved that virus can persist in the surface for about 2 – 9 hours depending upon the humidity and temperature. The virus in the surface is destroyed by use of chemical sanitizers and chemical fumigation. In fumigation, chemical components like isopropyl alcohol, formaldehyde, glutaraldehyde, hydrogen peroxide, Chlorohexidine, Digluconate, Phosphine ethanol, Methyl bromide and benzalkonium chloride are used. Major drawbacks of chemical disinfectants are development of drug resistance, toxicity and hypersensitivity [8]. As the viral crisis being exiting for more than 8 months, the exposure of these chemicals is increased among all individuals, especially in health care workers. The developed countries can able to spend a high cost to maintain a disinfectant environment. But in case of underdeveloped and developing countries, they don't have expensive technologies and hence use common conventional chemical disinfectant in sterilizing the environment, which are associated with toxic side effects. Being eco-friendly and cost effective, herbal incense can be preferred. Besides creating unfavourable condition for microbial growth, fumigation also helps to reduce the mild respiratory symptoms caused by the

virus. Most of the herbs used in the herbal fumigation have anti-inflammatory, anti-microbial and antioxidant property and potency to act in the respiratory cells. The gaseous and lipophilic nature of the fumigant aids in the rapid and potential absorption through the nasal mucosa. Thus, fumigation has both topical and systemic action.

Siddha perception

Most of the herbs used for fumigation have bitter (*kaippu*) and pungent (*karppu*) *suvai*. *Kaippu suvai* have ability to reduce the ill effects of *kabam* and kills the intestinal worms. It helps to reduce the high toxicity and reduce the excess secretions of the body. *Karppu suvai* balances the deranged humour and prevents throat infection. It removes the ill effects of *kabam* and improves circulation [53]. Hence fumigation of herbals with *kaippu* and *karppu* reduces the virulence of the virus, sterilizes the surface and reduces the symptoms of *kabam* like cough, throat pain and cold. The *Karppu*, *Kaippu suvai* and the hot potency helps to reduce the *kabam* in minor respiratory infections.

Scientific perception

The herbs used in the fumigation possess anti-microbial, anti-inflammatory, antioxidant, vermifuge, antitussive and antiviral property. Essential oil is one of the

major components in all fumigating herbs. The essential oil spreads in the environment while fumigating it. The beneficial properties of essential oils are fungicidal, antibacterial, relaxant, stimulant and anti-depressant. Apart from the antibacterial and antifungal activity, it have an effective antiviral activity which can be used as alternative for synthetic antiviral drugs with lesser toxicity (abaqui et al) the essential oils from specific plants is known to suppress the replication of Herpes simplex virus (HSV) and Epstein-barr virus (EBV) [54]. The essential oils have the nature to increase the immunity.

The quarantine life has put people into stress and affected their mental health. The essential oils observed through the olfactory and respiratory system is associated with the improvement of mood. The studies done with the fumigation of herbs containing essential oils proved to increase mood ratings, reduced anxiety and regulated the sleep patterns [55].

Conclusion:

This study reveals that fumigation with any one of the dried herbals mentioned above that are easily available in the locality helps to sterilize the surrounding area and surface without harm effects. At the same time inhalation of the aroma improves the immunity by the presence of essential oils

and manages the minor respiratory symptoms present in Covid-19. Further research works showed be focussed on the

evaluating the pharmacological activities and changes that happen in the surrounding on fumigation.

References:

1. David J Cennimo, MD, Corona virus disease 2019 (COVID-19) reported in Medscape on July 30, 2020.
2. World Health Organization coronavirus disease (COVID-19) Dashboard reported on 30/7/2020, 6:03pm CEST.
3. Infection prevention and control guidance for long -Term care facilities in the context of COVID-19, interim guidance, World health organization, 21 march 2020.
4. Thirunarayanan T, Sudha. R, External therapies of Siddha medicine, centre for traditional medicine and research, first edition, Chennai, 2010. Pg: 106-108
5. Transmission of SARS COV 2: implications for infection prevention precautions, Scientific brief, WHO, 9 JULY 2020.
6. Lalitha et al., Pugai (fumigation) as a puramaruthuvam (external therapy) in the Siddha system of medicine, International journal of Ayurveda and pharma research, Vol 6, issue 7, July 2018.
7. Seema R et al., Validation of the effect of an ayurvedic therapeutic procedure, Dasmool kwath & Dhoopan fumigation with medicinal herbs during first week of puerperium: an open clinical trial, International Ayurvedic medical journal, September 2017.
8. Babu M et al., Experimental analysis of polyherbal formulated fumigation practices over the growth of Staphylococcus aureus, Mukta shabd journal, VOL 9, Issue 5, May 2020.
9. Zhang H, Chen Q, Zhou W, Gao S, Lin H, Ye S et al., Chinese medicine injection shuanghuanglian for treatment of acute upper respiratory tract infection: a systematic review of randomized controlled trials. Evid Based Complement Alternat Med. 2013; 2013: 987326.
10. Akolade JO, Olajide OO, Afolayan MO, Akande SA, Idowu DI, Orishadipe AT. Chemical composition, antioxidant and cytotoxic effects of Eucalyptus globulus grown in north-central Nigeria. J Nat Prod Plant Res 2012; 2(1): 1-8.
11. Goodman, P.S. (2005) Star Rises in Fight Against Bird Flu. Demand for a Chinese Fruit Skyrockets. Washington Post Foreign Service, 18 November, p. D01.

12. Susma bagde bhatwalkar et al., Validation of environmental disinfection efficiency of traditional Ayurvedic fumigation practices, Journal of Ayurveda and integrative medicine, 2019 Aug 16. doi: [10.1016/j.jaim.2019.05.002](https://doi.org/10.1016/j.jaim.2019.05.002)
13. Ayush kumar Garg et al., swine flu the changing scenario and preparedness with formulation of win flu air freshener gel, International journal of Ayurveda and pharma research, Vol 5, Issue 11, November 2017.
14. Murugesu mudaliar K. S, Gunapadam muligai vaguppu, Chennai, Department of Indian medicine & Homeopathy, Chennai, 9th edition, 2013. Pg: 854, 6, 627, 63, 546, 225, 279, 446, 143
15. Patthartha Guna Sinthamani, Department of Indian medicine and Homeopathy, 2007 Pg: 159
16. Uthamarayan K.S., Siddhar Aruvai Maruthuvam, department of Indian medicine and Homeopathy, Chennai, 6th edition, 2013, page 62.
17. Vethanayagam, S. M. and Rajendran, S. M. Bio efficacy of neem insecticidal soap (NIS) on the disease incidence of bhendi, *Abelmoschus esculentus* (L.) Moench under field conditions. Journal of Biopesticides, 2010; 3(1): 246-249.
18. Alzohairy MA, Therapeutic role of *Azadirachta indica* (neem) and their active constituents in diseases prevention and treatment, National library of medicine, 2016.
19. Lee JW et al., Protective effects of neem (*Azadirachta indica*) leaf extract against cigarette smoke and lipo polysaccharide induced pulmonary inflammation, National library of medicine, 2017 Dec; 40(6): 1932-1940. doi: [10.3892/ijmm.2017.3178](https://doi.org/10.3892/ijmm.2017.3178). Epub 2017 Oct 10.
20. Raja Ratna Reddy et al., Antimicrobial activity of *Azadirachta Indica* (neem) leaf, bark and seed extracts, International Journal of Research in Phytochemistry and Pharmacology, Vol 3(1), 1-4, 2013.
21. Tiwari et al., Invitro antiviral activity of neem (*Azadirachta indica* L) bark extract against herpes simplex virus type 1 infection, Phyto therapy research, Vol 24, no 8, pp. 1132 – 1140, 2010.
22. L. Badam et al., Invitro antiviral activity of neem (*Azadirachta indica*. A. Juss) leaf extract against group B coxsackieviruses, Journal of communicable diseases, Vol 31, no 2, pp. 79-90, 1999.
23. Tarun kanti ghosh et al., Invitro antibacterial study of *Aquilaria agallocha* heart wood oil and *Citrullus lanatus* seed oil, Scholars Journal of Applied Medical sciences (SJAMS), 2013; 1(1): 13-15.

24. Habibur Rahman et al., In-vivo and invitro anti-inflammatory activity of Aquilaria agallocha oil, International journal of basic medical sciences and Pharmacy, Vol 2, no 1, June 2012.
25. Kannusamiyam pillai, Pathartha guna vilakam, Sri Sembaga pathipagam 2014 Pg: 486, 676
26. Kulkarni et al., Antioxidant and anti-inflammatory activity of Vitex negundo, Indian Journal of Pharmaceutical sciences, 2008 Nov-Dec; 70(6): 838–840. doi: [10.4103/0250-474X.49140](https://doi.org/10.4103/0250-474X.49140)
27. Khokra et al., Essential oil composition and antibacterial studies of Vitex negundo Linn. Extracts, Indian journal of pharmaceutical sciences 2008, 70(4): 522-526.
28. Narayanan miskin et al., Antipyretic activity of Vitex negundo Linn leaves extracts, Rajiv Gandhi University of health sciences journal of pharmaceutical sciences, June 2012, DOI: 10.5530/rjps.2012.2.11.
29. Kannan. M et al., HIV -1 reverse transcriptase inhibition by vitex negundo Linn. Leaf extract and quantification of flavonoids in relation to anti- HIV activity, Journal of cell and molecular biology 10(2): 53-59, January 2012.
30. Dorsch W, Wagner H., New antiasthmatic drugs from traditional medicine, Int Arch Allergy Appl Immunol 1991; 94(1-4):262-5.
31. Dhuley JN. Antitussive effect of Adhatoda vasica extract on mechanical or chemical stimulation-induced coughing in animals. Journal of Ethnopharmacology 1999; 30; 67(3):361-5.
32. Lahiri PK, Pradhan SN. Pharmacological investigation of vasicinol, an alkaloid from Adhatoda vasica Nees. Indian Journal of Experimental Biology 1964; 2:219
33. Patel VK, Venkata Krishna BH. In vitro study of antimicrobial activity of Adhatoda vasica Linn. (leaf extract) on gingival inflammation a preliminary report. Indian J Med Sci 1984; 38(4):70-2.
34. Shinde et al., Studies on the anti-inflammatory and analgesic activity of Cedrus deodara (Roxb) Loud. Wood oil, Journal of Ethnopharmacology, 1999; 65(1):21-27. Doi:10.1016/s0378-8741(98)00150-0.
35. Abdul Majid et al., Antibacterial effects of Cedrus deodara oil against pathogenic bacterial strains in vitro approaches, International journal of biosciences, Vol 6, No. 1, p. 185-191, 2015.

36. Wani et al., Anti-inflammatory and antipyretic activities of the ethanolic extract of Shorea Robusta Gaertn.f. resin, Indian journal of biochemistry and biophysics, Vol 49, December 2012, pp. 463-467.
37. Susma vashisht et al., In vitro antioxidant and antibacterial activity of methanolic extract of Shorea Robusta Gaertn.F. Resin, International Journal of Pharmaceutical and phytopharmacological research, August 2016, Vol 6, Issue 4, Page 68-71.
38. Atia sharif et al., A review on bioactive potential of benzoin resin, International Journal of chemical biochemical sciences, 10(2016): 106-110.
39. Zineb Hacini et al., Evaluation of antibacterial and antioxidant activities of three types of benzoin resin, European journal of chemistry ,9(4) (2018) 408-411.
40. Thiagarajan, R, Gunapadam Thathu Jeeva vaguppu, Department of Indian medicine and homeopathy, Chennai, 8th edition,2013, pg. 402,403.
41. Weiyang chen et al., Camphor – A Fumigant during the Black Death and a converted Fragrant wood in ancient Egypt and Babylon- A Review, Multidisciplinary Digital Publishing Institute, May 10 2013, doi: 10.3390/molecules18055434
42. Donkin R.A. Dragon's brain Perfume: An Historical Geography of Camphor. Koninklijke Brill; Leiden, The Netherlands: 1999. p. 141. (Google scholar)
43. Santoyo S., Cavero S., Jaime L., Ibañez E., Señoráns F.J., Reglero G. Chemical composition and antimicrobial activity of Rosmarinus officinalis L. essential oil obtained via supercritical fluid extraction. J. Food Prot. 2005; 68:790–795. [PubMed] [Google Scholar]
44. De Logu A., Loy G., Pellerano M.L., Bonsignore L., Schivo M.L. Inactivation of HSV-1 and HSV-2 and prevention of cell-to-cell virus spread by Santolina insularis essential oil. Antiviral Res. 2000; 48:177–185. doi: 10.1016/S0166-3542(00)00127-3. [PubMed] [CrossRef] [Google Scholar]
45. Burrow A., Eccles R., Jones A.S. The effects of camphor, eucalyptus and menthol vapour on nasal resistance to airflow and nasal sensation. Acta Otolaryngol. 1983; 96:157–161. doi: 10.3109/00016488309132886. [PubMed] [CrossRef] [Google Scholar]
46. Laude E.A., Morice A.H., Grattan T.J. The antitussive effects of menthol, camphor and cineole in conscious guinea-pigs. Pulm. Pharmacol. 1994; 7:179–184. doi: 10.1006/pulp.1994.1021. [PubMed] [CrossRef] [Google Scholar]
47. Dimas Praditya et al., Anti-infective properties of the golden spice curcumin, Frontiers in microbiology, Vol 10, 03 may 2019, doi: 10.3389/fmicb.2019.00912.

48. Sayantani chanda et al., Phytochemical and Pharmacological importance of Turmeric (*Curcuma longa*): A Review, Research and reviews: A Journal of Pharmacology, Vol 9, Issue 1, 2019.
49. Vengadarajan S, Sarabendra vaithiya muraigal (Siraroga segichaigal) Saraswathi Mahal library, Thanjavur Third edition, July 2003.
50. Gupta sonika et al., Comparative studies on Anti-inflammatory activity of *Coriandrum sativum*, *Datura stramonium* and *Azadirachta Indica*, Asian Journal of Experimental biological sciences, Vol 1(1), 2010.
51. Takhi Djalila et al., Study of anti-microbial activity of secondary metabolites extracted from spontaneous plants from the area of Laghouat, Algeria, Advances in environmental biology 5(2):469-476, January 2011.
52. Z Yamazaki et al., Antiviral effects of atropine and caffeine, Journal of General virology 1980;50(2):429-431. Doi:10.1099/0022-1317-50-2-429.
53. Uthamarayan, K.S., Siddha maruthuvaanga surukkam, Department of Indian Medicine and Homeopathy, Chennai, 3rd edition, 2016, pg. 36-39.
54. Hamid, A.A et al., Essential oils: Its medicinal and Pharmacological uses, International Journal of current research, Vol 3, Issue 2, pp.086-098, February 2011.
55. Dalinda Isabel et al., The effectiveness of aromatherapy for depressive symptoms: A Systematic review, Evidence based complementary and alternative medicine, 04 January 2017.