



# Unexplored Potential of Ayurveda to Manage the Current Outbreak of COVID-19: A View Point

Author: Rekha Phull<sup>1</sup>

Co Authors: Gaurav Phull<sup>2</sup> and Dimple Agarwal<sup>3</sup>

<sup>1</sup>Kayachikitsa, SGT University, Gurugram, Haryana, India

<sup>2</sup>Shalya Tantra Department, Ch. Brahm Prakash Ayurveda Charak Sansthan, Najafgarh, New Delhi, India

<sup>3</sup>Department of Sharir kriya, Ch. Brahm Prakash Ayurveda Charak Sansthan, Najafgarh, New Delhi, India

## ABSTRACT

At present, the whole world is struggling in dealing with the sudden outbreak of pandemic of COVID-19. The healthcare system across the globe is found wanting and inadequate. Ayurveda has been the benchmark of healthcare system of India for ages. The rich heritage of our ancient science was certainly overlooked and ignored to some extent in last century, due to emergence of Allopathic system of medicine. The literature of Ayurveda has ample references of epidemics/ pandemics, different pathogens and anti-viral remedies, which clearly indicate towards the potential of Indian system of medicines to deal with viral infections in an efficient way and this is now being explored in form of various clinical trials. The herbal remedies are a boon for improving immunity. In present scenario, China has dealt with this viral outbreak using its traditional medical system along with western science quite efficiently. In India however, the Indian system was majorly kept aside initially, but gradually its importance was appreciated by the government and at present utility of AYUSH is being explored by encouraging the trials. This is a welcome step as the modern science is also not very sure about the definitive treatment and they also are trying to manage with different combinations. Therefore, in this paper we will try to highlight the importance of our ancient medical system in dealing with this menace. *Material and Methods:* The required data was collected from library of our institutes, online publications, Web-portals like Medscape, current news updates, AYUSH website and ancient texts of Ayurveda. *Conclusion:* There are still some unexplored areas in potential of Ayurveda to manage this pandemic more effectively. Vast potential of Indian system of medicine is a definite advantage in strengthening the available workforce of health system in our country to boost our fight against the present outbreak.

**Key Words:** *Ayurveda, Coronavirus, Janpadodhvansa, Krimi, Rasayana*

## INTRODUCTION

In last seven months, the world has been shocked by sudden outburst of severe viral attack which originated in Wuhan city of China in December, 2019<sup>1</sup>. According to WHO, there are 29,737,453 confirmed cases and 937,391 deaths with involvement of 206 countries, areas or territories

up to 17<sup>th</sup> September, 2020<sup>1</sup>. In India, 1017754 active cases and 84372 deaths have been reported till morning of 18/9/2020<sup>3</sup>. The number is increasing very fast globally. Even the countries having best of resources and health facilities like USA, Italy, Spain etc. are struggling to get over this coronavirus disease caused by SARS-CoV-2



virus, which is evident from the huge number of cases and lives lost<sup>4</sup>. This has raised many questions on the approach of modern system of medicine in dealing with this newly diagnosed disease. The viruses have tendency to mutate which is evident from the history of viral outbreaks time to time. Earlier corona viruses were responsible for SARS-Co-V in China (2002-03)<sup>5</sup> and MERS-Co-V in Middle East (2012)<sup>6</sup>. There is history of many other viral outbreaks causing epidemics/pandemics in the world which challenged the healthcare system viz. American Polio epidemic (1916), Spanish Flu(1918-1920), Asian Flu originated from China (1957-58), AIDS (1981 to present time), H1N1 Swine Flu pandemic originated from Mexico (2009-10), West African Ebola pandemic (2014-15) and Zika virus (2015 to present day)<sup>7</sup> etc. Every time newer vaccines are needed to be developed and different combination of remedies are tried, often without satisfactory outcomes. A study of 'global seasonal influenza-associated respiratory mortality' found that 389,000 deaths from respiratory causes are associated with influenza each year on average during 2011-12, which implicates Influenza in roughly 2% of all respiratory deaths. This study also showed more mortality rate in elder population (>65 years)<sup>8</sup>. This study is a wake-up call that the western system needs to think differently, otherwise what is the reason that despite of knowing the morphology and other features of influenza virus, we are not able to combat them? This strongly indicates the need to work on developing better immunity and making

our bodies capable of fighting against different infectious agents rather than looking for newer solutions every time. This aspect can be completely fulfilled by adapting Ayurvedic approach because it recommends treating an individual 'as a whole' rather than targeting the causative agent only. Ayurveda advocates strengthening the immune system capable of fighting any disease by using different rejuvenation methods broadly covered under the sphere of 'Rasayana'<sup>9</sup>. First principle of Ayurveda is to maintain the health of the individual, second is to treat the ailments<sup>10</sup>. Ayurveda speaks about maintaining a healthy life style by following particular regimes in different seasons (*Ritucharya*)<sup>11</sup>, ideal daily routines (*Dincharya*)<sup>12</sup>, and Moral-ethics (*Sadvritta*)<sup>13</sup>. *Acharya Charak* has beautifully explained the ethical guidelines (*Achar- Rasayana*) to attain a disease free life<sup>14</sup>. *Maharishi Patanjali* has explained 'Ashtanga-Yog' to achieve the eternal aim of getting freedom from ignorance and to gain self-realisation<sup>15</sup>. Ayurvedic literature contains elaborated knowledge about epidemics, their origin, implications and methods to deal with them under the headings of *Janpadodhvansa*<sup>16</sup>, *Janmar*<sup>17</sup>, *Marak*<sup>18</sup> etc. The concept of different microbial, viral infections is also mentioned in Ayurveda under description of *Krimi*<sup>19</sup>. There are ample descriptions of anti-viral remedies and other modalities to deal with them like *Nasya*<sup>20</sup>, *Dhoopan karma*<sup>21</sup>, *Rakshakarma*<sup>22</sup> etc. Therefore it is high time to seriously find the effective solutions by investing more on Ayurveda and



other streams of AYUSH to deal with this monstrous situation. In China, their traditional medical system has played a pivotal role in managing this disaster, working in tandem with modern medicine<sup>23</sup>. The outcome is in front of world, they have managed such a huge crisis in an efficient way and now China is on the verge of recovery. Hence this precedence should be followed in India and the government has now shown more faith and confidence in its traditional system of medicine which is also the oldest system of medicine<sup>24</sup>. As evident from description of epidemics/ pandemics, their prophylactic measures and elaborated management in the ancient texts of Indian medicine, the ancient treatise can provide better and effective measures to combat this viral outbreak. The CEO of world's leading network marketing company Milind Pant believes India could also consider building long-term immunity and a healthy society as the Chinese have done in the wake of this outbreak. He quoted- '*Crisis like outbreak of coronavirus provides an opportunity to revisit the ancient wisdom of Ayurveda for prevention of disease through improved immunity and combine it with western science for a holistic healthy living*'<sup>25</sup>. A large network of Ayurvedic scholars and clinicians is available across the length and breadth of country. There were 339 Ayurvedic colleges in 2016<sup>26</sup> and approximately 6.5 lakhs Ayurvedic doctors are available in India<sup>27</sup>. AYUSH department can work in harmony with allopathic system. Integrated treatment may be started, in which allopathic system should provide

life-support measures along with emergency management, while routine management of mild to moderate cases should be managed by Ayurvedic remedies. The health minister of India in collaboration with AYUSH ministry has recently released Ayurveda and Yoga protocol for management of COVID-19. Unfortunately, this welcome step was not taken in good spirits by the western medicine people and their organisation IMA raised questions on this.

### Overview of Disease

There was a sudden outbreak of influenza like illness in Wuhan city of China in December 2019. The progress of number of affected people was very fast and it caused many casualties<sup>28</sup>. Later WHO named Wuhan pneumonia as Coronavirus disease- 2019 (COVID-19), on February 11, 2020<sup>29</sup>. COVID-19 is an infectious disease caused by a newly discovered Corona virus. This new virus was named as "Severe Acute Respiratory Syndrome Coronavirus 2(SARS-CoV-2)" by International Committee on Taxonomy of Viruses (ICTV) on 11<sup>th</sup> Feb., 2020<sup>30</sup>. Most people infected with COVID-19 experience mild to moderate respiratory illness and recover without need of any special treatment. Older people and those with underlying co-morbidities like cardio-vascular disease, diabetes, cancer and chronic respiratory diseases are prone to have serious manifestations of this disease. The effects of COVID-19 are different for different people. Common symptoms include fever, dry cough, tiredness and other features may range from shortness of breath to



body aches, pains, sore throat and rarely diarrhoea, nausea or running nose<sup>31</sup>.

**Route of Transmission:** The transmission of this virus is believed to occur via respiratory droplets from coughing and sneezing<sup>32</sup>. Respiratory secretions containing the virus can infect other individuals via direct contact of virus with mucous membranes. This virus usually can't travel more than six feet<sup>33</sup>. A study reported that virus can persist upon different surfaces for different duration, sometimes even up to 72 hours. For instance this virus doesn't remain viable on copper surface after 4 hours<sup>34</sup>.

**Clinical Manifestations:** In initial report of 41 patients in Wuhan, China- ARDS developed in 29% patients. The common features according to predominance were fever, cough, myalgia/fatigue, headache, sputum production and diarrhoea respectively<sup>35</sup>. Clinical features of disease can be divided into 3 categories according to severity: A. Mild Illness- Symptoms of upper respiratory tract viral infections including mild fever, cough (dry), sore throat, nasal congestion, malaise, headache, muscle pain or malaise. B. Moderate Pneumonia- cough and shortness of breath (tachypnoea in children) are present without signs of severe pneumonia. C. Severe Disease- it includes severe pneumonia, ARDS, sepsis and septic shock. Severe pneumonia includes fever associated with severe dyspnoea, respiratory distress, tachypnoea (> 30 breaths/min) and hypoxia. Although fever may be moderate or even absent<sup>36</sup>. The authors of Chinese CDS reports described the severity of clinical

manifestations of disease as follows- mild disease in 81% cases, severe disease including pneumonia features, dyspnoea, tachypnoea, hypoxia etc. in 14% of cases and critical illness in only 5% of cases who had respiratory failures, septic shock and/or multiple organ dysfunction/ failure<sup>37</sup>. The most common symptoms of COVID-19 are fever, dry cough, and tiredness. Other symptoms that are less common and may affect some patients include aches and pains, nasal congestion, headache, conjunctivitis, sore throat, diarrhoea, loss of taste or smell or a rash on skin or discoloration of fingers or toes. These symptoms are usually mild and begin gradually. Some people become infected but only have very mild symptoms (WHO). The symptomatology is complex as many patients are asymptomatic, some present with only 1 or 2 complaints like anorexia, loss of taste or smell etc. and some others may present with more complaints together.

**Diagnostic testing:** The CDC has developed a diagnostic test which is known as Real time Reverse Transcription- Polymerase Chain Reaction (rRT- PCR) assay that can be used to diagnose virus in respiratory and serum samples from clinical specimens<sup>38</sup>. Recently CSIR- Institute of Genomics and Integrative Biology has developed paper strip test named as FELUDA to detect COVID-19. It has shown 96% sensitivity and 98% specificity in results. Saliva or blood sample is tested for this test.<sup>39</sup>

**Treatment:** No specific anti-viral treatment is yet recommended for this condition. Infected patients should get supportive care to help alleviate



symptoms<sup>40</sup>. No vaccine is currently available for COVID-19. Avoidance is the principle method of deterrence<sup>33</sup>.

As specific antiviral remedies & vaccination is not available, main treatment strategy is supportive care supplemented by combination of broad spectrum antibiotics, antivirals, vitamin supplements, corticosteroids and convalescent plasma<sup>41</sup>. Chloroquine being a potential broad spectrum antiviral drug has been shown to have anti-SARS CoV-2 activity<sup>42</sup>. Hydroxychloroquine might actually do more harm than good, according to an infectious disease physician at the University of California- David Smith<sup>43</sup>. Recent studies have shown that four major drugs tried for treatment of COVID cases in India by western medicine people like hydroxychloroquine, remdesivir, ivermectin, methyl prednisolone etc., have shown no positive outcomes in improving the condition of affected cases<sup>44</sup>.

**Ayurvedic Perspective:** Ayurveda has a unique approach in dealing with a newly diagnosed disease like the present challenge imposed by COVID-19. *Acharya Charak* has indicated that it is not necessary to know the name of every disorder<sup>45</sup>, although any newly diagnosed disease can be managed according to dosh involvement and presenting symptoms. Three factors needs to be considered to deal with any disease at hand- the natural history (*vikara prakriti*), site of pathology (*adhishtana*) and aetiology (*samutthan vishesh*)<sup>46</sup>. a. *Vikara prakriti*- In case of COVID-19, it can be considered as *Agantuja gada*<sup>47</sup> and

can be specifically taken as a *Bhootabhishangaj vyadhi*<sup>48</sup>. The pandemic evolution of this viral disease can be categorised under *Janpadodhvansa /Janmar/ Marak*, according to Ayurveda. *Acharya Vagbhata* has beautifully explained the epidemics by quoting that people having different food habits, different tolerance power, different body types get infected at the same time due to exposure to impure air, water etc.<sup>49</sup> There are ample number of references mentioned in Ayurveda regarding existence as well as disease causing potential of viruses, micro-organisms etc. under a common term- "*Bhoot*". Exogenous diseases mentioned in text are caused by these *bhootas* (microorganisms), toxins, and polluted air etc.<sup>50</sup>. There is description of different '*Krimi*', including visible and invisible ones. Many diseases are caused by them ranging from various skin disorders to GIT disorders and respiratory diseases<sup>51</sup>. *Acharya Sushruta* and *Vagbhata* described *daiva-bala pravritta* (supernatural agencies) diseases and *Prabhavaja rog*, which occurs due to infections<sup>52,53</sup>. *Ayurvedic* scientists were aware about communicable disease also<sup>54</sup>. b. *Samutthan Vishesh- Pragyapradh* leading to *Adharma* (wrongdoing), is believed to be the cause of *janpadodhvansa*<sup>55</sup> and *agantuja vyadhis*. It is believed that the wrong deeds of human beings lead to different epidemics time and again. When we disturb the nature, it retaliates in form of mass casualties. Dry, rotten meat or meats of diseased/aged animals are causes of influenza, cough, dyspnoea, anorexia, vitiation of all three *doshas* and sometimes death<sup>56</sup>. Similar features



are found in present corona virus infection. Many people think that the rotten, putrefied meat was the cause of this infection in China, as the Chinese people consume different kind of meats. According to Ayurveda such foods increase *Tama guna* and leads to diseases. Interestingly China has been the origin country of 3 major epidemics in past few years<sup>57</sup> which can be attributed to their excessive meat consumption. It has been quoted that this disease COVID-19 likely began in a wet market in Wuhan city. Early research suggests that this virus originated in bats and was transferred by unknown intermediary animal (pangolin?) to people. Previously SARS originated from bats to civet cats and then humans<sup>58</sup>. c. *Adhishthana*-Respiratory system (*Uras*) is the site majorly involved in this disease. The major clinical features are also pertaining to respiratory system involvement viz. cough, dyspnoea, fever, running nose etc.<sup>33</sup> Thus we can plan to manage COVID-19 according to this background. In the latest guidelines issued by ministry of AYUSH, the whole symptomatology of COVID-19 has been divided into 3 stages<sup>59</sup>.

1. First Stage- Comprising of mild features like Shwasa- Kasa (mild breathlessness and cough) symptoms with Jwara (fever).
2. Second stage- Patients having moderate level symptoms. It can be considered Vata- Kapha pradhan Jwara.
3. Third stage- Severe symptoms with respiratory distress. It can be correlated to Vata-Kaphaj Sannipatika Jwara.

**Management plan:** It encompasses two major steps- Preventive and Curative. Post treatment restorative health care can also be provided by preventing recurrence and health restoration by adopting various rejuvenation methods advocated in Ayurveda as Promotive health<sup>60</sup>. To prevent the disease, Ayurvedic scholars suggested to-avoid the countries or regions where epidemics are spread<sup>61</sup>. Moving away from affected places is the foremost measure<sup>62</sup>. This is very relevant to stay safe from infection and this strategy is being followed today in form of social distancing and vulnerable people are kept in quarantine. Other measures advised in Ayurveda are atonement, auspicious rites, repeated recitation of sacred incantations, hawan (lighting of sacrificial fire) etc. should be followed<sup>63</sup>. Researches show this practice of fumigation with medicinal smoke, as a potent method to disinfect the environment and can be adopted in present situation also<sup>64, 65</sup>. *Achara rasayana* (ethical guidelines)<sup>66</sup>, *Sadvritta*<sup>13</sup> (high moral values) and *Dincharya*<sup>12</sup> (ideal daily routine) should be followed prophylactically. Presently *Sharada Ritucharya*<sup>67</sup> (guidelines for spring season) should be followed. Ayurveda stresses upon improving immunity to fight against diseases and our literature is studded with immune modulator remedies. *Rasayana chikitsa* is a separate full-fledged branch of Ayurveda<sup>68</sup> which is meant to enrich the body tissues and metabolism. Commonly used remedies like *Amalaki*, *Haritaki*, *Brahma rasayan*, *Bhallatak*, *Pippali*, *Triphala*, *Shilajit* etc. are few examples<sup>69</sup>. AYUSH ministry has also advocated



consumption of *Chyawanprash* daily to enhance immunity<sup>70</sup>. *Nasya*, a technique of pouring medicated oils through nostrils, is an effective practice to protect from infections and keeping the nasal mucosa lubricated<sup>20</sup>. Okeechobee county commissioner Bryant Culpepper cited a suggestion that the nasal membranes are the coolest part of the body which attracts the virus. Thus increases in temperature up to 136 degree Fahrenheit leads to disintegration of the virus and this temperature can be maintained by a blow drier or steam inhalation, although this claim was later discarded by WHO, they said it might irritate the skin rather than killing the virus<sup>71</sup>. This indicates that *Nasya karma* and medicated *Dhoom-pana*<sup>72</sup> can both be effective measure to prevent infection, if they are done by using medicines which have anti-viral properties. For therapeutic purpose, there are three possible approaches- first against causative agent (*Hetu vipreet*), second against the disease (*Vyadhi vipreet*) and third against both of them<sup>73</sup>. This disease is caused by a virus SARS-CoV-2, there are many medicines in Ayurveda with proven anti-viral properties viz. *Nimba*, *Lashuna*, *Guggulu*, *Aragvadha*, *Yashtimadhu*, *Amalaki*, *Mahanimba*, *Shigru*, *Bhumyamalaki*, *Katuki*, *Karanja* etc.<sup>74</sup>

**A.1. Table of herbs having Anti-viral effects**<sup>74</sup>

Ayurvedic Name	Botanical Name	Effective against Virus
1. <b>Nimba</b>	Azadirachta Indica	Vaccinia virus
2. <b>Lashuna</b>	Allium sativum	Influenza virus herpes simplex 1
3. <b>Guggulu</b>	Commiphora mukul	Vaccinia virus
4. <b>Aragvadha</b>	Cassia fistula	Vaccinia virus

5. <b>Yashtimadhu</b>	Glycyrrhiza glabra	Herpes simplex
6. <b>Amalaki</b>	Embllica officinalis	Vaccinia virus
7. <b>Mahanimba</b>	Melia azadirach	Virostatic
8. <b>Katuki</b>	Picrorrhiza kurroa	Vaccinia virus
9. <b>Karanja</b>	Pongamia pinnata	Herpes simplex 1 & 2
10. <b>Bhumyamalaki</b>	Phyllanthus amarus	Hepatitis B

Recently Patanjali research institute has found potent anti-viral activity in *Ashwagandha*, i.e. *Withania somnifera*, which showed distinct effects on viral RBD (receptor binding domain) and host ACE 2 receptor complex. The electrostatic interaction between RBD & ACE2 would block or weaken COVID-19 entry and its subsequent infectivity. *Tulsi* phytochemicals were also found to dock well into the enzyme cavity of RDRP enzyme, which is needed for growth and multiplication of corona virus, which shows its potential to inhibit coronavirus<sup>75</sup>. This research paper has been submitted to ministry of AYUSH and also for peer review to a medical journal- 'Virology'<sup>76</sup>. Some notable herbal medicines with ant-viral properties are as follows- *Hypericum perforatum* has activity against HIV & HCV<sup>77</sup>, Garlic (*lashuna*) extract has activity against influenza virus<sup>78</sup>, all parts of *Eclipta alba* (*bhringraj*)<sup>79</sup> and *Ocimum sanctum* have anti-viral properties<sup>80</sup>, *Phyllanthus urinaria* (*bhumyamalaki*) has shown anti-HIV-1 capability and activity against Epstein-Barr virus<sup>81</sup> and *Cissus quadrangularis* (*Asthishrinkhla*) is effective against HSP type 1 & 2 virus<sup>82</sup>. *Andrographis paniculata* (*Kalmegh*) has shown anti-viral (against Simian Retro virus) and immune-



stimulant activities<sup>83</sup>. *Giloy* (*Tinospora cardifolia*) has immunomodulatory and anti-viral activities against some of the very virulent disorders<sup>84</sup>.

For *Vyadhi vipreet chikitsa*, we need to counter the clinical features of this disease which are pertaining to respiratory system mainly. The *Kasahara and Shwasahara mahakashaya dravya*<sup>85</sup> (drugs acting on cough and other respiratory problems) mentioned in Charak Samhita can be efficiently used. The Herbo-mineral drugs (*rasa-aushadhis*) mentioned in *Rasa-shashtra* can also be used by assessing the severity of disease in emergency conditions.

A. 2. Table of medicines mentioned in *Kasahara Mahakashaya*<sup>85</sup>

Name of medicine	Botanical Name	Reference (API vol./part/page)*
1. <b>Draksha</b>	<i>Vitis vinifera</i> Linn.	3/1/45-46
2. <b>Abhya</b>	<i>Terminalia chebula</i> . **	
3. <b>Amalaki</b>	<i>Emblica officinalis</i> Gaertn.	1/1/5
4. <b>Pippali</b>	<i>Piper longum</i> Linn.	4/1/91-92
5. <b>Duralabha</b>	-.***	
6. <b>Shringi</b>	<i>Pistacia chinensis</i> Burgo	1/1/66
7. <b>Kantkari</b>	<i>Solanum surattense</i> Burm	1/1/59
8. <b>Vrishchir (shwet punarnava)</b>	<i>Boerhaavia verticillata</i> Poir	5/1/168
9. <b>Punarnava</b>	<i>Boerhaavia diffusa</i> Linn	3/1/157-158
10. <b>Tamalaki</b>	<i>Phyllanthus fraternus</i> Webst	1/1/111

\* The botanical names have been taken from Ayurvedic Pharmacopoeia of India.

\*\* This name has been taken from text book of *Dravyaguna* (by P.V.Sharma).

\*\*\* Its scientific name is not mentioned in API. Many people mention it as a variety of *Tulsi*.

A.3. Table of medicines mentioned in *Shwasahara Mahakashaya*<sup>85</sup>

Name of medicine	Botanical name	Reference (API vol./part/page)*
1. <b>Shati</b>	<i>Hydichium spicatum</i>	1/1/99

		Ham.ex. smith	
2.	<b>Pushkarmool</b>	<i>Inula racemosa</i>	4/1/102-103
3.	<b>Amlavetus</b>	<i>Cassia fistula</i> Linn	5/1/8
4.	<b>Ela</b>	<i>Elettaria cardamomum</i>	
5.	<b>Hingu</b>	<i>Ferula foetida</i> Regel	1/1/49
6.	<b>Agru</b>	<i>Aqualaria agallocha</i> Roxb.	4/1/4-5
7.	<b>Sursa</b>	<i>Ocimum sanctum</i>	4/1/128-129
8.	<b>Tamalaki</b>	<i>Phyllanthus fraternus</i> Webst.	1/1/111
9.	<b>Jivanti</b>	<i>Leptadenia reticulata</i> W&A	6/1/73
10.	<b>Chanda</b>	<i>Angelica archangelica</i> Linn.	5/1/16

\* The botanical names have been taken from Ayurvedic Pharmacopoeia of India

Other potent formulations like *Gojiwhadi kwath (Sidhhyog sangrah)*, *Abhrak bhasm and Tribhuvan kirti ras (Yogratnakar)*<sup>86</sup>, *Sitopladi churan*, *Talisadi churan*<sup>87</sup>, *Pushkarmooladi churan*<sup>88</sup> etc. can treat the symptoms of respiratory involvement. *Shatyadi kshaya* and *Brihatyadi kwath* mentioned in *sannipata jwara* effectively treats cough, thoracic pain, dyspnoea and fever<sup>89</sup>. *Shwasari ras* reduce mucous accumulation, helps in airway remodelling, decreased pro-inflammatory cytokines in the inflamed lungs and kept them in healthy oxidation state<sup>90</sup>. *Anu tail* instillation through nasal route (*Nasya*) has shown anti-inflammatory potential through amelioration of pro-inflammatory cytokines like IL-1 $\beta$ , TNF- $\alpha$ , TNF- $\gamma$ , MCP-1, IL-4 AND IL-8<sup>91</sup>. Similarly, other drugs can be tried for their lungs-friendly potential.





The herbo-mineral drugs are given in small doses and have quick action due to better bio-availability. Some important formulations are mentioned in the table A.4.

A.4. Table of Herbo-mineral Drugs

Drugs	Roga-Adhikara
1. Chandramrita rasa	Kasa
2. Tribhuvankirti rasa	Jwara
3. Laghumalini vasant rasa	Jwara
4. Shringabhra rasa	Swasa-Kasa
5. Swasakuthar rasa	Swasa-Kasa
6. Naradiya Laxmivilas Rasa	Swasa-Kasa
7. Mrityunjaya Rasa	Jwara
8. Chandramrita Rasa	Shwasapradhan Kasa
9. Swarnamalini Vasant Rasa	Vyadhi-kshamatva
10. Abhrak Bhasma	Prameha

\*The above mentioned drugs are taken from Rasa

Sara-Sangrah and Guidelines for Ayurveda Practitioners for COVID 19.

Thus it can be clearly understood that beyond doubt Ayurveda has a vast potential to help in overcoming this menace. AYUSH ministry has actively dealt with this situation and provided necessary guidelines for awareness of general public as well as for the doctors to proceed further. A large number of clinical trials are presently undergoing in our country and majority of them are incorporating AYUSH drugs. This speaks volumes about the therapeutic potential of Ayurveda and other traditional systems in AYUSH. Although, there is a lot of scope in this area, but still the clinicians and researchers are by enlarge avoiding the trial on one important area of clinical use of Rasaushadi (herbo-mineral) preparations, as evident from the registered trials in CTRI. They can be more widely used to gain maximum benefits. There are some other areas which should be worked upon for better outcomes. Some general guidelines have been issued by the

ministry which needs to be specified as per individual needs. Ayurveda cannot be considered as a “one pill for all ill”, it is highly specific to every individual. The concept of Prakriti which forms the base of Ayurvedic treatment, co-morbid conditions of different individuals need to be considered for every individual and therefore this must be clarified to general population to avoid the complications and have better results. For instance, the dose of Kwath advised by the ministry needs to be tapered in Pitta Prakriti individuals and in summer season. Sometimes the ingredients may also be needed to be replaced by other suitable herbs. Thus all the medicines should be taken under medical supervision and customised to individual needs. Also dosage of the drugs also needs to be decided as per the need, otherwise it may also have negative impact on the body. It is stated everywhere in our literatures that “A poison can be a nectar if used with *Yukti* and in proper dose”<sup>92</sup>.

## DISCUSSION

It is clearly evident that whole world is presently struggling to combat the challenge imposed by COVID-19. Even countries with the best of healthcare systems have not been very successful in overcoming this emergent condition, even they are seen short of solutions. After an initial havoc, China has now managed to slowly overcome this situation and their traditional system of medicine has played a key role in this venture, in coordination with western medical system. India can take a leaf out of China’s successful journey



by making better use of its own traditional system of medicine. India has a huge network of stakeholders of Ayurveda and other traditional systems covered under umbrella of AYUSH. Ayurveda doctors are available across length and breadth of this country and many post-graduates/specialist are also available. We have discussed that ancient Ayurvedic literature contains knowledge of exogenous diseases, detailed description of epidemics along with their management, many drugs having anti-viral properties, competent drugs to manage respiratory disorders, *Rasayana dravya* and other different treatment modalities like *dhoopan karma* to disinfect the environment, *Nasya*, *dhoompana* and so on. Therefore it seems a wise option to include Ayurveda clinicians in this present work force of health care system to make it into a more competent team. It can prove to be a boon to our fight against this menace, not only in prevention from disease but also in management of mild to moderate cases which covers around 90% of patients. Up to present day, modern system is not very confident about an absolute solution or medicine to work against COVID-19. Although different combinations have been tried but they have high safety concerns and this is a 'Hit and Trial' method. Recent studies have clarified their ineffectiveness of modern medicines being tried, in improving the outcome of patient. Thus it becomes more meaningful to utilize safer options available in Ayurveda more liberally. Ayurveda is expected to work, not only because it can inhibit the virus, but it helps to overcome the infection,

regulate immune response of host, cut-off the inflammatory storm and promote the repair of body. The population receiving AYUSH prophylaxis in containment zones, high risk areas have been shown to get benefited. Some state authorities like those of Gujarat, Goa, Kerala have shared the positive outcomes of AYUSH interventions in prevention of disease. Many states governments have issued the advisory to use preventive measures recommended by the ministry of AYUSH. Therapeutic usage of Ayurveda has also been started but as Add-on treatment to the conventional remedies at maximum places. Ayurveda can better be utilised as a Stand-alone treatment in majority of cases although. This is being justified by the trials being conducted at institutions like CBPACS, AIIA and A& U Tibbia collage, in New Delhi. The mortality rate is reported to be lesser in Delhi than the national average and recovery has also been faster. Other state governments need to follow the suite by giving more freedom to Ayurveda intervention as Stand-alone therapy. Controlled experimentation can be done, as at least the herbal remedies have meagre chances to adverse the condition of patients and better outcomes can be expected.

## CONCLUSION

The approach of our medical system can be strengthened many folds by leveraging AYUSH system especially Ayurveda, and including their relevant treatment modalities in our present management protocol. Innovative ideas can

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emerge by this integrated approach of our traditional wisdom and modern western science. India can lead this fight against a global emergency and this can pave the path to new heights in health care system, which will then be having more variety and weapons in its armoury. This will prepare us to combat any new health challenge in future and to deal with other existing diseases which are increasing day by day. It is the high time to explore this vast potential of Ayurveda to strengthen our mission and make best use of the rich resources of this traditional science. The age-old and time tested science can bring newer and better solutions, and it definitely deserves the attention and faith shown by the government of India. PM of India addressed the population through video conference on 25<sup>th</sup> April, 2020 that “This Pandemic has thrown at us new challenges and problems which we have never imagined, but it also taught us a very good lesson with a strong message” i.e. the importance of self-reliance and self-sufficiency. It taught us that we have to find out the solution within our country not outside and there is a need to leverage India’s inner potential. So, it is highly needed to be self-dependent in the field of medical science too. It’s high time to give our holistic science, a boom towards self-reliant Bharat and to utilize it as stand-alone therapy. Ayurveda has enough potential and efficacy to prove its best in serving the nation against this fight. It shouldn’t be kept limited to certain boundary rather given a free hand to emerge as a full-fledged system. It is the right opportunity for our Indian system of

medicine to lead the global health care system from the front.

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## REFERENCES

1. <https://www.medicalnewstoday.com>> coronavirus cause: origin and how it spreads.
2. <https://www.who.int/emergencies/diseases/novel-coronavirus-2019>.
3. <https://www.mohfw.gov.in>
4. <https://www.cnbc.com> >charts show the coronavirus spike in US,Italy and Spain.
5. <https://www.who.int>ith>diseases>.
6. <https://www.who.int>home/newsroom/factsheets/detail/> Middle East respiratory syndrome coronavirus(MERS-CoV)
7. <https://www.livescience.com>
8. Paget et al. Global mortality associated with seasonal influenza epidemics. December 2019.vol 9 no.2.020421. [www.jogh.org.doi:10.7189/jogh.09.020421](http://www.jogh.org.doi:10.7189/jogh.09.020421)
9. Vidyadhar shukla, Ravi tripathi, editor. Charak samhita of Agnivesa, chikitsa sthana; Rasayanadhyaya-1-4 pada, chapter 1, Varanasi: chaukhambha surbharti prakashan, 2002; 3-46.
10. Pt. Kashinath pandey, dr. gorakhnath chaturvedi, editor, reprint edition. Charak samhita of agnivesa, sutra sthana; Arthedashmahamuliyadhyaya, chapter 30, verse26, Varanasi: chaukhamba bharti academy, 2001; 587.
11. Pt. kashinath pandey, Gorakhnath Chaturvedi, editor (reprint edition). Charak samhita- vidyotini, sutrasthanam, Tasyashitiya adhyaya, chapter 6, verse 9-48.Varansi: chaukhambha bharti academy, 2001; 139-148.
12. Kaviraja Ambikadutta shastri, editor (edition 13). Sushruta samhita of maharishi sushruta, chikitsa sthana, Anagatabadha pratishedhama, chapter 24, verse 4-58, Varansi: chaukhambha Sanskrit sansthan, 2002; 105-110.
13. Vaidya yadavji trikamji acharya, edition 2017. Charak samhita of Agnivesa, sutra sthana, Indriyaupkramniyadhyayam, chapter 8, verse 17-33. Varanasi: chaukhamba surbharti prakashan, 2017; 58-61.
14. Vidyadhar shukla, Ravi Dutta tripathi, editor. Charak samhita of Agnivesa, chikitsa sthana; Rasayanadhyaya-1-4 pada, chapter 1, Varanasi: chaukhambha surbharti prakashan, 2002; 3-46.
15. Nandalal dashora, editor(edition 3<sup>rd</sup>). Patanjali Yogsutra , Saadhan pada, verse 29. Haridwar: Randhir prakashana, 1997;102-103.
16. P.V.Tewari, editor (1<sup>st</sup> edition). Caraka samhita, purvardha, Vimanasthana, Jnapadodhwansaneeyam adhyaya , chapter 3, Varanasi: chaukhambha vishwabharati, 2018; 149-169.
17. Govind Pareek, editor(edition 3<sup>rd</sup>). Ayurved sangraha, Bhel samhita vaishishtya, chapter 5. Jaipur: Ayurved Sanskrit hindi pustak bhandar, 2007; 108.
18. Kaviraja Ambikadutta shastri, editor (edition 13). Sushruta samhita of maharishi sushruta, sutra sthana, Ritucharyamadhyayama, chapter 6, verse 19, Varansi: chaukhambha Sanskrit bhawan, 2002; 22.
19. Pt. kashinath pandey, Gorakhnath Chaturvedi, editor (reprint edition). Charak samhita- vidyotini, vimansthanam, Vyadhitroopiya vimana, chapter 7, verse 3-



32. Varansi: chaukhambha bharti academy, 2001; 724-735.
20. P.V.Tewari, editor (1<sup>st</sup> edition). Caraka samhita, purvardha, sutrasthana, Matrasheetiyam adhyaya, chapter 5, verse 59-60, Varanasi: chaukhambha vishwabharati, 2018; 107.
21. G. D. Singhal, editor (1<sup>st</sup> edition). Sushruta samhita of susruta- ancient indian surgery, part-1, Aturopkramaneeyam adhyayam chapter 5, verse 18. Delhi: chaukhamba Sanskrit pratishthan, 2018; 48.
22. Kaviraja Ambikadutta shastri, editor (edition 13). Sushruta samhita of maharishi sushruta, chikitsa sthana, Dvivraniya chikitsitam, chapter 1, verse 133, Varansi: chaukhambha Sanskrit sansthan, 2002; 13.
23. Yang Yang, Md Sahidul Islam, Jin Wang, Yuan Li and Xin Chen, 2020. Traditional Chinese Medicine in the Treatment of Patients Infected with 2019- New Coronavirus (SARS-CoV-2): A Review and Perspective. International Journal of Biological Sciences; 16(10): 1708-1717. <https://doi:10.7150/ijbs.45538>
24. <https://www.ncbi.nlm.nih.gov>pmc>. Rachel Hajr, M.D. The Medicine of old India. Heart views. 2013 Apr-Jun; 14(2):92. doi:10.4103/1995-705x.115497
25. <https://m.economictimes.com/industry/healthcare/coronavirus-outbreak-a> right time to revisit Ayurveda wisdom on prevention.
26. <https://www.ccimindia.org>.
27. <https://medicaldialogues.in>news>
28. Burki TK, 2020. Coronavirus in China. The Lancet respiratory medicine; 8(3): 238. [https://doi.org/10.1016/S2213-2600\(20\)30056-4](https://doi.org/10.1016/S2213-2600(20)30056-4)
29. <https://www.who.int/dg/speeches/detail/who-director-general-s-remarks-at-the-media-briefing-on-2019-ncov-on-11-february-2020>.
30. <https://www.who.int>diseases>naming> the coronavirus/ disease and the virus that causes it.
31. <https://www.who.int>health-topics>coronavirus>
32. <https://www.cdc.gov/coronavirus/2019-ncov/faq.html>.
33. <https://www.emedicine.medscape.com>article>2500114-overview>coronavirus> disease 2019(COVID-19): Practice essentials
34. Van Doremalen N, Bushmaker T, Morris DH, Holbrook MG, Gamble A, Williamson BN et al. Aerosol and Surface Stability of SARS-CoV-2 as compared with SARS-CoV-1. N Engl J Med. 2020 Mar 17. [Medline].
35. Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, et al. Clinical Features of patients infected with 2019 novel coronavirus in Wuhan, China. Lancet. 2020 Jan 24. [Medline].
36. <https://www.ncbi.nlm.nih.gov/books/NBK554776/> Features, Evaluation and Treatment of Coronavirus (COVID-19).
37. Wu Z, McGoogan JM. Characteristics of and Important Lessons from the Coronavirus Disease 2019 (COVID-19) Outbreak in China: Summary of a Report of 72 314 Cases from the Chinese Centre for Disease Control and Prevention. JAMA. 2020 Feb 24; [PubMed] [Reference List].



38. <https://www.cdc.gov/coronavirus/2019-ncov/summary.html>.
39. <https://www.thehindu.com/sci-tech/science/explained-feluda-paper-strip-test-for-coronavirus/article32835460.ece>
40. Luo H, Tang QL, Shang YX, Liang SB, Yang M, Robinson N, et al. Can Chinese Medicine be used for Prevention of Coronavirus disease 2019 (COVID-19)? A Review of Historical classics, Research Evidence and current prevention program. Chin J Integr Med.2020.
41. Jin YH, Cai L, Cheng ZS, Cheng H, Deng T, Fan YP, et al. A rapid advice guideline for the diagnosis and treatment of 2019 novel coronavirus (2019-nCoV) infected pneumonia (standard version). Mil Med Res. 2020;7 :4.
42. Savarino A, Di Trani L, Donatelli I, Cauda R, Cassone A. New insights into the antiviral effects of chloroquine. Lancet Infect Dis. 2006; 6:67/9.
43. Kai Kupferschmidt, John Cohen, Race to find COVID-19 treatments accelerates. Science 27Mar 2020; 367(6485): 1412-1413. <https://doi:10.1126/science.367.6485.1412>.
44. <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/global-research-on-novel-coronavirus-2019-ncov/solidarity-clinical-trial-for-covid-19-treatments>
45. Brahmanand Tripathi, Gangasahay pandey, editor (edition 7). Charak Samhita of Agnivesa, sutra sthana, Trishothiyadhyaya, chapter 18, verse 44. Varansi: chaukhamba Surbharti Prakashan, 2000; 378.
46. Deepak Yadav Premchand, editor (1<sup>st</sup> edition).Vagbhata's Astanga Hrdaya, Sutrasthana, Dincharya adhyaya, chapter 2, verse 66. Varanasi: chaukhabha surbharti prakshan, 2018; 409.
47. Pt. kashinath pandey, Gorakhnath Chaturvedi, editor (reprint edition). Charak samhita- vidyotini, Sutrasthanam, Na Vegandharniyadhyaya, chapter 7, verse 51-52.Varansi: chaukhambha bharti academy, 2001; 170.
48. P.V.Tewari, editor (1<sup>st</sup> edition). Caraka samhita, Uttrardha, chikitsasthana, jwarachikitsa adhyaya, chapter 3, verse 14, Varanasi: chaukhambha vishwabharati, 2020; 102.
49. Kaviraj Atridev Gupta,editor. Vagbhata's Astang Samgrah,volume 1, sutra sthana, chapter 9, verse 94. Varanasi: Chaukhamba Krishnadas academy, 2011; 104.
50. Deepak Yadav Premchand, editor (1<sup>st</sup> edition).Vagbhata's Astanga Hrdaya, Sutrasthana, Rogantupadaniya adhyaya, chapter 4, verse 31. Varanasi: chaukhabha surbharti prakshan, 2018; 98.
51. Brahmanand Tripathi, Gangasahay pandey, editor(edition 7). Charak Samhita of Agnivesa, Vimana sthana, Vyadhitrupiya vimanadhyaya, chapter 7, verse 12. Varansi: chaukhamba Surbharti Prakashan, 2000; 713.
52. Dr. Parmeswarappa. S. Byadgi, editor. Text book of Ayurvediya Vikrti-Vijnana & Rog-Vijnana, volume-1, chapter- Vyadhivigyana. New Delhi: Chaukhamba publication, 2109; 121.
53. G.D.Singhal and co-authors, editor. Sushruta Samhita of Susruta,part-1,



- vyadhisamuddeshiya adhyaya, chapter 24, verse 7. Delhi: chaukhamba Sanskrit pratishthan, 2018; 215.
54. G.D.Singhal and co-authors, editor. Sushruta Samhita of Susruta, part-1, Kushtha nidanamadhyaya, chapter 5, verse 33-34. Delhi: chaukhamba Sanskrit pratishthan, 2018; 543.
55. Vaidya yadavji trikamji acharya, edition 2017. Charak samhita of Agnivesa, vimana sthana, Janpadodwansaniyamadhyayam, chapter 3, verse 20. Varanasi: chaukhamba surbharti prakashan, 2017; 242.
56. Kaviraja Ambikadutta shastri, editor (edition 13). Sushruta samhita of maharishi sushruta, chikitsa sthana, Annapanavidhimadhyayam, chapter 46, verse 126-128, Varansi: chaukhamba Sanskrit sansthan, 2002; 167.
57. <https://www.nytimes.com/2020/02/10/world/asia/china-epidemics-coronavirus.html>
58. <https://www.usatoday.com/story/news/factcheck/2020/03/18coronavirus-fact-check-covid-19-caused-eating-animals/5073094002/>
59. <https://www.ayush.gov.in/docs/ayurved-guidlines.pdf>
60. Vaidya yadavji trikamji acharya, edition 2017. Charak samhita of Agnivesa, sutra sthana, Arthedasha-mahamuliya adhyaya, chapter 30, verse 26. Varanasi: chaukhamba surbharti prakashan, 2017.
61. P.V. Tewari, editor(1<sup>st</sup> edition). Ayurvedadipika Commentary of Cakrapanidatta on Caraka samhita, Purvardha, Na Vegandharniyadhyaya, chapter 7, verse 53-54. Varanasi: chaukhamba vishwabharati, 2020; 148 .
62. G.D.Singhal and co-authors, editor. Sushruta Samhita of Susruta, part-1, Ritucharyam adhyaya, chapter 6, verse 20. Delhi: chaukhamba Sanskrit pratishthan, 2018; 61.
63. Kaviraja Ambikadutta shastri, editor (edition 13). Sushruta samhita of maharishi sushruta, chikitsa sthana, Ritucharyam adhyaya, chapter 6, verse 22-23 Varansi: chaukhamba Sanskrit sansthan, 2002; 22.
64. Shekhar Nautiyal et al. Medicinal Smoke Reduces Airborne Bacteria. J Ethnopharmacol.2007. <https://www.ncbi.nlm.nih.gov/m/pubmed/17913417/>.
65. Bhatwalkar SB, et al. Validation of Environmental Disinfection Efficiency of Traditional Ayurvedic Fumigation Practices. J Ayurveda Integr Med.2019. PMID: 31427141.
66. Vidyadhar shukla, Ravi Dutta tripathi, editor. Charak samhita of Agnivesa, chikitsa sthana; Rasayanadhyaya-4th pada, Ayurvedsamutthaniyam rasayana padam, chapter 1(4), verse30-35. Varanasi: chaukhamba surbharti prakashan, 2002; 42.
67. P.V.Tewari, editor (1<sup>st</sup> edition). Caraka samhita, purvardha, sutrasthana, Tasyashiteeyam adhyaya, chapter 6, verse 22-26, Varanasi: chaukhamba vishwabharati, 2018; 125.
68. Vaidya yadavji trikamji acharya, edition 2017. Charak samhita of Agnivesa, Sutra sthana, Arthedashmahamuliyamadhyayam, chapter 30,



- verse 28. Varanasi: chaukhamba surbharti prakashan, 2017; 189.
69. Vidyadhar shukla, Ravi Dutta tripathi, editor. Charak samhita of Agnivesa, chikitsa sthana; Rasayanadhyaya-1-4 pada, chapter 1, verse: 29-37, 41-47(1<sup>st</sup> pada), 13-19(2<sup>nd</sup> pada), 32-35, 41-65(3<sup>rd</sup> pada). Varanasi: chaukhambha surbharti prakashan, 2002; 3-46.
70. <http://ayush.gov.in/event/ayurveda-immunity-boosting-measures-self-care-during-covid-19-crisis>.
71. <https://globalnews.ca/news/6725349/hair-dryer-coronavirus-cure/>
72. Deepak Yadav Premchand, editor (1<sup>st</sup> edition). Vagbhata's Astanga Hrdaya, Sutrasthana, Dhumapana vidhi, chapter 21. Varanasi: chaukhamba surbharti prakashan, 2018; 616-626.
73. Brahmanand Tripathi, Gangasahay pandey, editor (edition 7). Charak Samhita of Agnivesa, Nidana sthana, Jwara nidanadhyaya, chapter 1, verse 10. Varansi: chaukhamba Surbharti Prakashan, 2000; 582-583.
74. Dr. J. J. Vijeayapall. Evidence Based Infection Management. AYURVEDLINE, cover story. Bangalore: dr. Sreetharam Prasad, 2009(10<sup>th</sup> edition); 21-47.
75. Acharya Balkrishna. Indian Traditional Ayurvedic Treatment Regime for Novel Coronavirus, COVID-19. Patanjali Research Institute. 2020; 3-29.
76. <https://theprint.in/health/ramdevs-patanjali-submits-a-herbshydroxychloroquine-plan-to-treat-covid-19/394797/>
77. P. Vijayan, C. Raghu, G. Ashok, S.A, Dhanraj & B. Suresh. Antiviral activity of medicinal plants of Nilgiris. Indian J Med Res 120, July 2004; 24-29.
78. Mehrbod P, Amini E, Tavassoti-Kheiri M. Antiviral Activity of Garlic Extract on Influenza Virus. Iranian Journal of Virology 2009;3(1): 19-23.
79. Goutam Mukhopadhyay, Shymodip Kundu, Argha Sarkar, Pintu Sarkar, Riyanka Sengupta and Chandan Kumar. A Review on Physicochemical and Pharmacological Activity of Eclipta Alba. The Pharma Innovation Journal 2018; 7(9): 78-83.
80. Usha Patil, Sri Jayendra Saraswathi. Studies on Antiviral Activity of Tulsi(Ocimum Sanctum) Crude Extracts on Selected Viruses of Veterinary Importance. Int.J.Ayur. Pharma Research, 2018; 6(4): 17-21.
81. Guankui Du, Man Xiano, Siman Yu, Mengyi Wang, Yiqiang Xie, Shenggang Sang. Phyllanthus urinaria: a potential phytopharmacological source of natural medicine. Int J Clin Exp Med 2018; 11(7): 6509-6520.
82. P. Balasubramanian, K Jayalakshmi, N Vidhya, R.Prasad, A Khaleefathullah Sheriff, G. Kathiravan, et al. Antiviral Activity of Ancient System of Ayurvedic medicinal plant Cissus quadrangularis L. (Vitaceae). Journal of Basic and Clinical Pharmacy 2010; 001(001): 37-40.
83. Churiyah, Olivia Bunga Pongtuluran, Elrade Roofani, Tarwadi. Antiviral and Immunostimulant Activities of Andrographis paniculata. HAYATI Journal of Biosciences April 2015; 22(2): 67-72. doi: 10.4308/hjb.22.2.67





84. Swati Sachan, Kuldeep Dhama, et al. immunomodulatory potential of *Tinospora Cardifolia* and CpGODN(JLR21 agonist) against the very virulent, infectious bursal Disease virus in SPF chicks. *Vaccines* 2109; 7(106). doi:10.3390/vaccines7030106.
85. Vaidya yadavji trikamji acharya, edition 2017. *Charak samhita of Agnivesa, Sutra sthana, shadvirechan Shatashriteeya adhyayam*, chapter 4, verse 36,37. Varanasi: chaukhamba surbharti prakashan, 2017; 34.
86. Ramnarayan Sharma Vaidya, editor. *Ayurveda Sar-Sangraha*. Allahbad: Shri Baidyanath Ayurveda Bhawan Limited, 2005. 88,309 and 706.
87. Vidyadhar shukla, Ravi Dutta tripathi, editor. *Charak samhita of Agnivesa, chikitsa sthana*;, *Rajyakshma chikitsadhyaya*, chapter 8, verse103-104, 145-147. Varanasi: chaukhambha surbharti prakashan, 2002; 219, 223.
88. Brahmanand Tripathi, Gangasahay pandey, editor (edition 7). *Charak Samhita of Agnivesa, Sutra sthana, yajyapurushiyadhyaya*, chapter 25, verse 40. Varansi: chaukhamba Surbharti Prakashan, 2000; 454-455.
89. Vaidya yadavji trikamji acharya, edition 2017. *Charak samhita of Agnivesa*., *Jwara chikitsadhyaya*, chapter 3, verse211-214. Varanasi: chaukhambha surbharti prakashan, 2002; 418.
90. Acharya Balkrishna,Siva Kumar Solleti, Hoshiyar Singh, Meenu tomar,Niti Sharma, Anurag Varshney. Calico-herbal formulation, Divya-Swasari-Ras, alleviates chronic inflammation and suppress airway remodelling in mouse model of allergic asthma by modulating pro-inflammatory cytokine response. *Biomedicine and Pharmacotherapy* 2020; 126. <https://doi.org/10.1016/j.biopha.2020.110063>
91. Acharya Balkrishna. Indian Traditional Ayurvedic Treatment Regime for Novel Coronavirus, COVID-19. Patanjali Research Institute. 2020; 13.
92. Sharma S. Rasatarangani. Reprint. Varanasi: Chaukhamba publication, 1979, p648.