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A Review On Immunomodulatory Effect Of *Rasayana* Therapy As A Prophylactic Measure In COVID-19

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ABSTRACT: Coronavirus disease 2019 (COVID-19) is a newly emerged highly infectious disease that become the biggest health crisis for the world in this. The outbreak of the disease was initiated from the seafood market in Wuhan city of China in December 2019, and turned out to be a global health emergency. Due to its global quick spread and high fatality ratio, the World Health Organization declared the COVID-19 outbreak a pandemic in March 2020. Till date there is no vaccine or confirmed treatment has been discovered in the World, various research institutes all over the world are trying their best to invent vaccine for COVID-19. Thus far the management of this pandemic lies on its preventive aspect by reducing its infectivity through following some basic steps such as social, distancing, proper hand washing, sanitization, using masks etc, and by enhancing immunity. In *Ayurveda* the *Rasayan* therapy is highly recommended for immunomodulation and supposes to have effective role in the prophylaxis and management of COVID-19 infection. This review article is based on various classics of Ayurveda, contemporary medical science, researches etc, to enlighten the immunomodulatory effect of *Rasayan* therapy as a prophylactic strategy against COVID-19.

Keywords, Ayurveda *Rasayan* therapy Immunomodulation, COVID-19

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A Review On Immunomodulatory Effect Of Rasayana Therapy As A Prophylactic Measure In Covid-19

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INTRODUCTION:

The recent outbreak of COVID-19 was firstly identified in Wuhan city of China in December 2019, rapidly spread worldwide and declared as a pandemic in March 2020 by WHO.¹ The pandemic of COVID-19 is similar to the previous viral outbreaks of SARS and MERS that emerged in 2003 and 2012 respectively. It is found that SARS & COVID-19 both are because of Corona virus strains (SARS is caused by SARS-CoV, whereas SARS-CoV-2 causes COVID-19) which affects the respiratory system of the patients.² The clinical manifestations of COVID-19 include fever, breathing difficulty, cough, lethargy, headache, myalgia, sore throat, diarrhea and conjunctivitis variably. The symptoms of disease are mostly includes manifestations of respiratory system, hence, it is relentlessly challenging to

identify this disease from other respiratory infections.³ Presently, no successful antiviral treatment or vaccine is available for COVID-19, so it's all upon the prophylactic measures to reduce the infection of the virus. Currently according to the ICMR guidelines; doctors prescribe a combination of Lopinavir and Ritonavir for severe COVID-19 cases and hydroxyl-chloroquine for prophylaxis of SARS-CoV-2 infection,⁴ whereas avoidance of virus exposure and efforts to enhance the immunity of population are identified as the easy way to decrease SARS-CoV-2 infection rates. The Ministry of Health and Family Welfare of India has raised awareness about the recent outbreak and has taken necessary actions to control the spread of COVID-19. The second aspect of prophylaxis i.e. Immune-boosters; various

reports suggest that humans do not have immunity to this virus, allowing its easy and quick spread among human populations through contact with an infected person.⁵

India is known for its traditional medicine system in the form of AYUSH; playing an important role to control the health crisis. With the outbreak of COVID-19, the ministry of AYUSH has released a press note “Advisory for Coronavirus,” mentioning useful medications to improve the immunity of the individuals.⁶ In Ayurveda *Rasayana* is a unique branch which especially deals with the promotion of health and curative purposes by nourishing the tissues in the best manner. *Rasayana* therapy comprises lifestyle, diet and medicine that have properties to enhance growth, retard aging, induce tissue regeneration and stimulate immunity. Due to its effects on immunity, *Rasayana dravyas* have been found to be effective in immunomodulation and restoration of immune homeostasis hence can play an important role in prevention of the disease in present scenario. *Charak Samhita*, the classics of Ayurveda, describes the condition of epidemic in form of *Janpadodhwamsa*, and suggested its management through improving immune

system using *Panchakarama* procedures, proper use of *Rasayana* drugs and lifestyle strategies.⁷

AIMS AND OBJECTIVES:

1. To study the concept of Rasayana therapy and its various perspectives according to Ayurvedic Science.
2. To review the Immunomodulatory effect of Rasayana therapy, and its role as a prophylactic measure in covid-19.

MATERIAL & METHOD:

This review is based on various classics of Ayurveda & modern medical science, research database.

Definition of *Rasayana*:

Rasayana (rejuvenation) is a unique branch of *Ayurveda* fulfilling both the objectives of *Ayurveda* i.e. maintenance of health of healthy person and to cure diseased, having great importance and designated in the eight specialties of *Ayurveda*. According to *Acharya Charaka* therapeutics is of two types i.e. invigorator of health of healthy (*swasthasya –urjaskara*) and eliminator of the diseases of diseased (*Artasya-roganuta*), and stated that *Vrishya* and *Rasayana* drugs stands for the first type. Further he elaborated that both categories of drugs serve both purposes as invigorating drugs alleviate diseases too,

and eliminator drugs also act as invigorating drugs.⁸

The word “*Rasayana*” means the way for attaining excellent *Rasadi Dhatus*. The word *Rasayana* is a combination of two words *Rasa* and *Ayana*, refers to proper nutrition and its proper transportation throughout the body. *Rasayana* therapy enhances the qualities of *rasa dhatu*, enriching it with nutrients so one can attain *Dirghamayu* (longevity), *Smriti* (recapitulating power), *Medha* (Intellect), *Arogyam* (healthy status), *Taruna Vaya* (youth-fullness), *Prabha* (lustre), *Varna* (complexion), *Swara* (voice) and *Dehendriya Bala* (strength of body and sense organs), *Vaksiddhi* (successful words), and *Pranati-Kanti* (reverence or virility).⁹ *Acharya Shusutra* defines *Rasayana* as a measure to promote a young age, longevity, develops health and mental functions, impart resistance and immunity against disease.¹⁰ According to *Acharya Sharangdhar*, various drugs, diet and regimens which promote longevity by delaying aging and preventing diseases are called *Rasayana*. Such as *Guduchi*, *Haritaki*, *Guggulu*, *Yasthimadhu* etc.¹¹

Mode of action of *Rasayana*:

The improved nutritional status and the better qualities of *Dhatus* lead to a series of secondary attributes of *Rasayana*, which bestow longevity, impart strength, *Ojabala*, etc.

Rasayana measures act by one of the following three ways-

1. Acting at the level of *Rasa*:
2. Acting at the level of *Agni*
3. Acting at the level of *strotas*

Ayurvedic aspect of immunomodulation: Ayurveda has proposed the concept of immunity as “*Vyadhikshamattwa*”. *Acharya Chakrapanidatta* has interpreted the term *Vyadhi-ksamattwa* as *Vyadhi bala Virodhitwa* i.e., antagonistic to the strength and virulence of the disease and *Vyadhyutpada Pratibandhakatwa* i.e., the capacity to inhibit and bind the causes and factors of the disease.¹² It can be correlated with the Immune-modulation as the Immunomodulatory drugs reduces the chance of being diseased either by modifying the response of the immune system by increasing (immunostimulators) or decreasing (immunosuppressives) the production of serum antibodies.

Mode of action of immunomodulators¹³:

The term immunomodulation is used rather than immune-stimulator for a substance that causes measurable alterations in immune function. Immuno-suppressants inhibit the immune response in case of organ transplantation and autoimmune diseases, whereas immune-stimulants increase the immune response in case of infections, immunodeficiency and cancers. Immunomodulatory drugs act at different levels of the immune system. Therefore different kinds of drugs have been developed that selectively either inhibit or intensify the specific populations and subpopulations of immune responsive cells, i.e. lymphocytes, macrophages, neutrophils, natural killer (NK) cells, and cytotoxic T lymphocytes (CTL). Immunomodulators affect the cells producing soluble mediators such as cytokines. Thus, in immunotherapy the immune system is modulated in such way that it reduces the chance of being diseased.

Immunomodulatory effect of Rasayana:

Immuno-modulator may be defined as substance, which can stimulate, suppress or modulate any of the immune system including both innate and adaptive types of the immune response. The modulation of immune response by using Ayurvedic

herbal medicines as a possible therapeutic measure has now become a subject of scientific investigations.¹⁴ *Rasayana Dravyas* are being conversely explored for their effect on immune system. Available researches & evidences show that, these drugs can be used to modulate the immune function. At one hand they may work to enhance immune function or they might pacify an angry immunity cell to be in its limits on the other.¹⁵ These *Rasayana* drugs favor's the host in both ways.

Effective Rasayana for COVID-19:

In Ayurveda; Several medicinal plants have been described as *Rasayanas* having *Immunomodulatory effect* and produces a proper immune functioning to fight against the etiological factors of any disease. These Rasayana Botanicals are used in clinical practice for strengthening immunity, and can be advised as a preventive measure in recent covid-19 condition. Based on research data we find *Ashwagandha* (*Withania Somnifera*), *Guduchi* (*Tinospora Cordifolia*), *Yastimadhu* (*Glyceriza globra*), *Amalaki* (*Emblica officinalis*), *Haridra* (*Curucuma longa*), *Tulsi* (*Ocimum sanctum*) etc. possess all of the properties of *Rasayana* and can be used to strengthen the immune due to their Immunomodulatory action.¹⁶

Rasayana Drug	Description
<p><i>Aswagadha</i> (<i>Withania Somnifera</i>), fam. <i>Solanaceae</i> also known as “Indian Winter cherry” or “Indian Ginseng”</p>	<p>It is one of the most important herbs of Ayurveda described as rasayana and widely used in the treatment of many clinical conditions. The roots of the plant are categorized as <i>Rasayanas</i>.¹⁷ Studies indicate that it possesses anti-inflammatory, antistress, antioxidant, immunomodulatory, hemopoetic, rejuvenating properties and shows positive influence on the endocrine, cardiopulmonary, and central nervous systems.¹⁸ It improves the body's defense against disease by improving the cell-mediated immunity.¹⁹ It is commonly available in the form of <i>churna</i> and can be advised with water, milk, ghee (clarified butter) or honey.²⁰</p>
<p><i>Guduchi</i> (<i>Tinospora cordifolia</i> [Wild.] Miers.) fam: <i>Menispermaceae</i></p>	<p>It is a well-known Ayurvedic drug having excellent antioxidant and rejuvenating properties along with anti-inflammatory, anti-stress, antiallergic, anti-diabetic, antiarthritic, antioxidant, hepatoprotective, and immunomodulatory activities.²¹ Researches suggest that the alcoholic and aqueous extracts of <i>T. cordifolia</i> are reported to have beneficial effects on the immune system and have been tested successfully for their immunomodulatory activity.^{22,23} Due to presence of essential nutrients and minerals like Zink and Copper, it also promotes mental health and relieves one from stress and anxiety²⁴ hence it can be advised to use regularly.</p>
<p><i>Amalaki</i> (<i>Emblica officinalis</i>) Fam. <i>Euphorbiaceae</i> Indian Gooseberry</p>	<p>It is admired in <i>ayurveda</i> as the best among rejuvenative herbs. Research reports reveals its analgesic, anti-tussive, antiatherogenic, adaptogenic; cardio, gastro, nephro and neuroprotective, chemopreventive, radio and chemo modulatory and anticancer properties. It is also reported to possess potent free radical scavenging, antioxidant, anti-inflammatory, anti-mutagenic, immune-modulatory activities, which are efficacious in the prevention and treatment of various diseases.^{25,26}</p>

<p><i>Yastimadhu</i> <i>(Glyceriza globra)</i> Fam. Fabaceae Liquorice</p>	<p>Ayurvedic literature describes liquorice as a <i>Rasayana</i> for <i>Pranavaha srotas</i>. It is excellent emollient and hence used in cough, asthma and hoarseness of voice. It is used to treat coughs, laryngitis, sore throat, bronchitis and chronic bronchitis. Researches reveals its antioxidant, anti-inflammatory, immunostimulent, immunomodulator, antiviral, antidepressant, hepatoprotective, and antitussive activity etc.²⁷ Review suggests that liquorice possess immunomodulatory effect²⁸ hence can be used to strengthen the immune system and the respiratory system.</p>
<p><i>Haridra</i> <i>(Curcuma longa</i> Linn) Fam.Zingiberaceae</p>	<p><i>Haridra</i> is a vital herb described in the ancient Ayurvedic text as a <i>Rasayana</i>. <i>Curcuma longa</i>, reportedly possess several pharmacological properties including anti-inflammatory, anti-cancer, immune-modulatory activities.²⁹ It can be prescribed with milk in the form of golden milk.</p>
<p><i>Tulsi</i> <i>(Ocimum sanctum)</i> Fam. Labiaceae Holy basil</p>	<p>Studies reveal that it has a unique combination of therapeutic actions that include: Antimicrobial (including antibacterial, antiviral, antifungal, antiprotozoal, antimalarial), anti-diarrheal, anti-oxidant, anti-cataract, anti-inflammatory, hepato-protective, neuro-protective, cardio-protective, anti-diabetic, anti-hypercholesterolemia, anti-hypertensive, analgesic, anti-pyretic, anti-allergic, immunomodulatory, memory enhancement, anti-asthmatic, anti-tussive, anti-spasmodic, adaptogenic, anti-stress activities.³⁰ Due to its easy availability, medicinal properties and proved Immunomodulatory activity³¹ it can be advised as an immune-booster.</p>
<p><i>Pippali</i> <i>(Piper Longum</i> Linn.) Fam.Piperaceae long pepper</p>	<p><i>Pippali</i> is one of the traditional plants described as <i>Rasayana</i> especially for <i>Pranavaha srotas</i> and also used for the treatment and prophylaxis of various diseases. studies reveals that it has several beneficial pharmacological activities such as anticancer, antioxidant, anti-inflammatory, antimicrobial, immunomodulatory, bioavailability-enhancing, analgesic hepatoprotective, radioprotective, cardioprotective, antidepressant etc.³²Clinical Studies reported that “Pippali Rasayana” is very much effective in the management of respiratory diseases as an adjuvant.³³</p>

<p>Marich (<i>Piper nigrum</i>) Fam. <i>Piperaceae</i></p>	<p>It has been also found to increase bioavailability, thus enhance the therapeutic efficacy of many drugs, vaccines and nutrients and have immunomodulatory, anti-oxidant, antihypertensive, anti-asthmatic, antipyretic, analgesic, anti-carcinogenic, anti-inflammatory, anti-diarrheal, antispasmodic, anxiolytic, antidepressants, hepatoprotective, antibacterial, antifungal and anti-amoebic properties. The extract and its constituents like piperine, regulate the balance of the cytokines production of Th1, Th2, Th17, and Treg cells, reduce the accumulation of inflammatory cells, inhibit the expressions of GATA3, IL-4, IL-6, IL-1β, RORγt, IL-17A and TNF-α, increase INF-γ and IL-10 secretions in BALF (Broncho-alveolar lavage fluid) and increase macrophage activation and T and B cell proliferation.³⁴</p>
<p>Shunthi (<i>Zingiber officinale</i> <i>Rosc.</i>) Fam. <i>Zingiberaceae</i></p>	<p>is quite a recognized Ayurvedic herb, having many medicinal properties. The main pharmacological actions of ginger and compounds include immuno-modulatory, anti-tumorigenic, anti-inflammatory, anti-apoptotic, anti-hyperglycemic, anti-lipidemic and anti-emetic actions. Ginger is a strong anti-oxidant substance and may either mitigate or prevent generation of free radicals.³⁵ It improves the immune system by increasing humoral and cell-mediated immune responses³⁶</p>
<p>Rasona/ Garlic (<i>Allium sativum</i> L.)</p>	<p>Garlic has been observed to possess antiviral, antibacterial and antifungal activities^{37,38} It has been reported to possess several biological properties including anticarcinogenic, antioxidant, antidiabetic, renoprotective, anti-atherosclerotic, antimicrobial, and antihypertensive activities in traditional medicines.³⁹ It appears to enhance the functioning of the immune system by stimulating certain cell types, such as macrophages, lymphocytes, natural killer (NK) cells, dendritic cells, and eosinophils, by mechanisms including modulation of cytokine secretion, immunoglobulin production, phagocytosis, and macrophage activation.⁴⁰ Hence it can be suggested as a beneficial preventive measure before being infected with SARS-CoV-2 virus.⁴¹</p>

Rasayana Yoga: In Ayurveda there are several compositions described in the context of rasayana which can be used as immune-modulator for example *Trikatu*, *Brahma Rasayana*, *Chyavanprasha* etc.⁴² These compositions can be suggested as prophylactic measure in present scenario of Covid-19. *Trikatu* is a very well known 'Rasayana' in Ayurveda and widely used as a polyherbal Ayurvedic formulation in India. It consists of three well known plants, viz., *Piper longum* Linn., *Piper nigrum* Linn. and *Zingiber officinale* Rosc. in equal parts. Pharmacological activities of *Trikatu* reported hepato-protective, antioxidant, analgesic, anti-anorectic, anti-inflammatory, antimicrobial, antifungal, anthelmintic, anti-arthritis, adaptogenic and immune-modulatory effect.⁴³ So it can be advised in the form of *kwatha*, or in the form of powder with honey. *Chyavanprasha* is also a well-known rasayana yoga practiced since long time. A regular intake of *Chyavanprasha* strengthens the trachea-bronchial tree and improves the immunity and functioning of the respiratory system. It helps to treat respiratory infections, allergic cough, asthma, bronchospasm, rhinitis, seasonal or non-seasonal respiratory disorders, common cold, and tuberculosis

etc. *Chyavanprasha* is also known for its wide range of health benefits such as antioxidative, chemopreventive, antimutagenic, anti-inflammatory, immune-modulatory effects on cells and several beneficial effects on the gastrointestinal, cardiovascular, respiratory, metabolic, reproductive, neural, and other systems.⁴⁴

DISCUSSION:

Ayurveda pays particular attention to the person and recommends measures for a healthy life style rather than the mere prescription of medicine. The condition of pandemic is described in the form of *Janapadodhwamsa* in *Ayurveda* and found much relevant to existing theories of pandemic/epidemic such as etiological factors, modes of transmission, preventive measures of outbreaks etc. *Acharya Charaka* has explained the regular detox procedures in the form of *panchakarma*, consumption of *rasayana* herbs and dietary & lifestyle strategy as the preventive measure to control the condition. All these measures improve the immunity in the form of *Bala* (strength), *Oja* (supreme resilience) & *Vyadhikshamattva* (resistance to illness development). The *Bala* (strength) of a

person explains the ability of disease prevention by repairing and nourishing itself, whereas *Oja & Vyadhikshamattva* is the ability of the immune system to fight against the disease causing pathogens.

Rasayana Chikitsa (rejuvenation) promotes the health via attaining excellent *Rasadi Dhatus*. The improved digestion, nutritional status and properly functioning metabolic pathways results in the formation of better qualities of *Dhatus* lead to a series of secondary attributes of *Rasayana* such as improved *oja*, *bala* and *arogya*. In present study, we have studied about drugs like *Ashwagandha*, *Guduchi*, *Amalaki*, *Haridra*, *Pippali*, *Marich*, *Yashtimadhu* and some yoga such as *Trikatu*, *Chyavanaprash* etc. having *rasayana* effect and acting on the respiratory system. these drugs act as immunobooster and can be used in the form *Rasayana* therapy to increase the immunity power. It may be helpful in fighting against corona virus.

Ministry of AYUSH, Government of India has recommended '*Ayush Kwath*' to improve the immunity and combat the infection. Ingredients are mostly from the above described *Rasayana* drugs having reporting Immunomodulatory effects.

These are *Tulsi/Holy Basil/Ocimum sanctum*, *Dalchini/Cinnamon/Cinnamomum zeylanicum*, *Sunthi/Zingiber officinale* and *Marich/Black Pepper/Piper nigrum*. *Ayush Kwath* due to its immunomodulatory, antiviral, anti-oxidant, anti-inflammatory, anti-platelet, anti-atherosclerotic, hepato-protective, reno-protective properties; seems to be effective in immuno-regulation for controlling viral infections like COVID-19.⁴⁵

Some other herbs such *Ashwatha*, *Brahmi*, *Dhanyak*, *Kutaki*, *Kantakari*, *Nimba*, *Pudina*, *Shallaki*, *Twak*, *Vasa*, *Agastya*, are also recommended by *Ayurveda* for ailments like COVID -19. All these drugs are antioxidants, anti-inflammatory, immunomodulator, antiviral & antimicrobial in nature.⁴⁶

CONCLUSION:

In recent time the entire world is suffering severely from Covid-19 pandemic, and till date there is no confirmatory treatment is available to combat the situation. In the order to prevent the infection only prophylactic measures such as avoidance of exposure of infection, proper sensitizations, use of immune-modulator drugs etc. are playing the key role. To fight against the condition; Ministry of AYUSH made

recommendations based on Ayurvedic literature and scientific publications for preventive measures and immunity boosters with special references to respiratory health. There are various rasayana drugs as described above, which are easily available and can be advised to promote immunity against any type of infection, strengthen and protect the

respiratory system. Practice of these rasayana drugs enhances the immunity, whereas *Achar Rasayana* helps to establish the mental health to face the conditions like anxiety, stress and depression and thereby *Rasayana* the specialty of Ayurveda can play an effective role against COVID-19 infection.

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REFERENCES .

1. <https://www.pharmaceutical-technology.com/news/who-declares-covid-19-pandemic/>
2. Yuki, Koichi et al. "COVID-19 pathophysiology: A review." *Clinical immunology (Orlando, Fla.)* vol. 215 (2020): 108427. doi:10.1016/j.clim.2020.108427
3. Rothan H.A., Byrareddy S.N., The epidemiology and pathogenesis of coronavirus disease (COVID-19) outbreak; *Journal of Autoimmunity*, Volume 109, May 2020, 102433
4. Bhatnagar T, Murhekar MV, Soneja M, Gupta N, Giri S, Wig N, et al. . Lopinavir/ritonavir combination therapy amongst symptomatic coronavirus disease 2019 patients in India: protocol for restricted public health emergency use. *Indian J Med Res.* (2020) 151:184–9. 10.4103/ijmr.IJMR_502_20.
5. Kumar, S Udhaya et al. "The Rise and Impact of COVID-19 in India." *Frontiers in medicine* vol. 7 250. 22 May. 2020, doi:10.3389/fmed.2020.00250
6. Advisory for Corona virus, Homoeopathy for Prevention of Corona virus Infections, Unani Medicines useful in symptomatic management of Corona Virus infection Press Information Bureau. Available online at: pib.gov.in/Pressreleaseshare.aspx?PRID=1600895 (accessed February 03, 2020).
7. Pt. Kashinath Shastri, Pt. Gorakhnath Chaturvedi Agnivesh, Charaka, Dridhabala. Caraka Samhita, vidyotini hindi commentary, Chaukhamba Bharti Academy; Reprint Year:2013 Vimansthan-3/13-14,
8. Pt. Kashinath Shastri, Pt. Gorakhnath Chaturvedi, Agnivesh, Charaka, Dridhabala. Caraka Samhita, vidyotini hindi commentary Chaukhamba Bharti Academy; Reprint Year:2013, Chikitsasthan-1/1/,
9. Pt. Kashinath Shastri, Pt. Gorakhnath Chaturvedi, Agnivesh, Charaka, Dridhabala. Caraka Samhita, vidyotini hindi commentary Chaukhamba Bharti Academy; Reprint Year:2013, Chikitsasthan-1/1/,
10. Sushruta Samhita, Choukhamba Sanskrit Sansthan, Varanasi, Reprint 2007, Part -1 Sarbopghat shamni Rasayana Adhayay P-120 Sutrasthan.
11. Dr. Shailaja Shrivastava Sharangdhar A. Sar Sam. Poorva Khanda, Hindi commentary; Choukhamba publication, Varanasi, 1998 Pp-4-14/48.

12. Pt. Kashinath Shastri, Pt. Gorakhnath Chaturvedi, Agnivesh, Charaka, Dridhabala. Caraka Samhita, vidyotini hindi commentary Chaukhamba Bharti Academy; Reprint Year:2013 Nidanstan-4,
13. Raj GRA, Shailaja U, Rao PN and Ajayan S: Review on the concept of Immunomodulation in Ayurveda with special emphasis on Prakara yoga. *Int J Pharm Sci Res* 2014; 5(4): 1116-23.doi: 10.13040/IJPSR.0975-8232.5(4).1116-23
14. Mukherjee D, Brago FC, Pulok KM. Neelesh K N, Immunomodulatory leads from medicinal Plants. *Indian J. tradit. knowladge* 2012; 13: 235-56
15. Six decodes of Ayurveda (1941-2000) by sharma P.V. Edited by Dubey S.D. and Singh A.N. Chaukhamba Sanskrit Sansthan First Edition 2006, Dehlhi P-814.
16. Balasubramani SP, Venkatasubramani P, et al. Plant based Rasayan drugs from Ayurveda. *ChinJ integr. Med* 2011; 17, 88-94.
17. Weiner MA, Weiner J. Mill Valley, CA: Quantum Books; 1994. Herbs that Heal. *Ashwagandha* (Indian ginseng) pp. 70–2.
18. <http://anaturalhealingcenter.com/documents/Thorne/articles/Ashwagandha.pdf>
19. Singh N, Bhalla M, de Jager P, Gilca M. An overview on ashwagandha: a Rasayana (rejuvenator) of Ayurveda. *Afr J Tradit Complement Altern Med.* 2011;8(5 Suppl):208-213. doi:10.4314/ajtcam.v8i5S.9
20. Singh N, Bhalla M, de Jager P, Gilca M. An overview on ashwagandha: a Rasayana (rejuvenator) of Ayurveda. *Afr J Tradit Complement Altern Med.* 2011;8(5 Suppl):208-213. doi:10.4314/ajtcam.v8i5S.9
21. https://www.researchgate.net/publication/331087814_GUDUCHI_A_POTENTIAL_DRUG_IN_AYURVEDA.
22. Nagarkatti DS, Rege NN, Desai NK, Dahanukar SA. Modulation of Kupffer cell activity by *Tinospora cordifolia* in liver damage. *J Postgrad Med.* 1994;40:65–7.
23. Lekshmi.R et al. “Guduchi as A Rasayana in Infectious Diseases: A Review” ISSN: 2322 -0902 (P)ISSN: 2322 -0910 (O)IJAPR | April 2016 | Vol 4 | Issue 4
24. <https://www.netmeds.com/health-library/post/medhya-rasayana-benefits-of-these-incredible-ayurvedic-herbs-to-improve-cognitive-abilities>.

25. Dasaroju S., Gottumukkala K.M. “Current Trends in the Research of *Embolica officinalis* (Amla): A Pharmacological Perspective” *Int. J. Pharm. Sci. Rev. Res.*, 24(2), Jan – Feb 2014; n° 25, 150-159.
26. Rajani, Jignesh et al. “Immunomodulatory activity of Āmalaki Rasāyana: An experimental evaluation.” *Ancient science of life* vol. 32,2 (2012): 93-8. doi:10.4103/0257-7941.118546
27. Korhalkar A., Deshpande M., Lele P., Modak M.; “Pharmacological studies of Yashtimadhu (*Glycyrrhiza glabra* l.) in various animal models” *Global J Res. Med. Plants & Indigen. Med.* | Volume 2, Issue 3 | March 2013 | 152–164.
28. Kumar, Krishan et al. “PA02.14. A review on immunomodulator activity of Yashtimadhu (*Glycyrriza Glabra*.)” *Ancient Science of Life* vol. 32,Suppl 2 (2013): S59. doi:10.4103/0257-7941.123878.
29. https://www.researchgate.net/publication/287994363_Immunomodulatory_potential_of_Curcuma_longa_A_review
30. Cohen, Marc Maurice. “Tulsi - *Ocimum sanctum*: A herb for all reasons.” *Journal of Ayurveda and integrative medicine* vol. 5,4 (2014): 251-9. doi:10.4103/0975-9476.146554
31. Venkatachalam V.V., Rajinikanth B. (2013) Immunomodulatory Activity of Aqueous Leaf Extract of *Ocimum sanctum*. In: Malathi R., Krishnan J. (eds) *Recent Advancements in System Modelling Applications. Lecture Notes in Electrical Engineering*, vol 188. Springer, India. https://doi.org/10.1007/978-81-322-1035-1_37
32. Kumar S., Kamboj J., Sharma S.S., “Overview for Various Aspects of the Health Benefits of *Piper Longum* Linn. Fruit” *Journal of Acupuncture and Meridian Studies* Volume 4, Issue 2, June 2011, Pages 134-140 [https://doi.org/10.1016/S2005-2901\(11\)60020-4](https://doi.org/10.1016/S2005-2901(11)60020-4)
33. Bisht D., Sharma Y K, Mehra B L “A clinical study to evaluate the efficacy of Pippali Rasayana in certain respiratory disorders” *AYU-VOL. 30, NO. 3 (JULY-SEPTEMBER) 2009*, pp. 337-341.

34. <https://www.sciencedirect.com/science/article/pii/S0975947620300668#bbib27>; “Immunity against COVID-19: Potential role of *Ayush Kwath*”
35. Badreldin H.Ali, Gerald Blunden, Musbah O.Tanira, Abderrahim Nemmar, “Some phytochemical, pharmacological and toxicological properties of ginger (*Zingiber officinale* Roscoe): A review of recent research” Food and Chemical Toxicology Volume 46, Issue 2, February 2008, Pages 409-420.
36. J. Bhat, A. Damle, P.P. Vaishnav, R. Albers, M. Joshi, G. Banerjee “**In vivo enhancement of natural killer cell activity through tea fortified with Ayurvedic herbs**” *Phytother Res*, 24 (2010), pp. 129-135, [10.1002/ptr.2889](https://doi.org/10.1002/ptr.2889)
37. Singh VK, Singh DK. Pharmacological Effects of Garlic (*Allium sativum* L.). *ARBS Annu Rev Biomed Sci* 2008;10:6-26.
38. Harris, J.C., Cottrell, .S., Plummer, .S. *et al.* Antimicrobial properties of *Allium sativum* (garlic). *Appl Microbiol Biotechnol* **57**, 282–286 (2001). <https://doi.org/10.1007/s002530100722>.
39. El-Saber Batiha, G.; Magdy Beshbishy, A.; G. Wasef, L.; Elewa, Y.H.A.; A. Al-Sagan, A.; Abd El-Hack, M.E.; Taha, A.E.; M. Abd-Elhakim, Y.; Prasad Devkota, H. Chemical Constituents and Pharmacological Activities of Garlic (*Allium sativum* L.): A Review. *Nutrients* **2020**, *12*, 872
40. https://www.researchgate.net/publication/275725771_Immunomodulation_and_Anti-Inflammatory_Effects_of_Garlic_Compounds
41. <https://www.sciencedirect.com/science/article/pii/S0306987720313487?via%3Dihub>.
42. Rastogi, Sanjeev et al. “COVID-19 pandemic: A pragmatic plan for ayurveda intervention.” *Journal of Ayurveda and integrative medicine*, S0975-9476(20)30019-X. 23 Apr. 2020, doi:10.1016/j.jaim.2020.04.002
43. Sharma V., Hem K., Singh N.K., Gautam D.S.; “PHYTOCHEMISTRY AND PHARMACOLOGY OF TRIKATU” *Indian Journal of Agriculture and Allied Sciences*; ISSN 2395-1109; Volume: 1, No.: 4, Year: 2015.
44. Sharma, Rohit et al. “Chyawanprash: A Traditional Indian Bioactive Health Supplement.” *Biomolecules* vol. 9,5 161. 26 Apr. 2019, doi:10.3390/biom9050161
45. <https://www.sciencedirect.com/science/article/pii/S0975947620300668#bbib27>; “Immunity against COVID-19: Potential role of *Ayush Kwath*”
46. <https://ijpsr.com/bft-article/review-on-the-concept-of-immunomodulation-in-ayurveda-with-special-emphasis-on-prakara-yoga/?view=fulltext>