Role of Medicinal plants in Covid-19 pandemic: An Ayurveda perspective

Review Article

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Abstract

The corona virus Covid-19 pandemic is the defining ongoing global health crisis situation. In Ayurveda communicable and epidemic diseases are described as Aupasargika Rogas - infectious or contagious and Janopadhvansa - pandemics respectively. The aim of this study is to review medicinal plants acting on Pranavaha Srotas and Rasavaha Srotas along with their action on signs and symptoms correlated with Covid 19. Extensive compilation and tabulation of medicinal plants is done by literary search of Brihat-trayee and their pharmacological actions from research databases. A total of 26 different medicinal plants have been enlisted. Analysis of these plants has been made as per Rasa, Amursasa, Vipaka, Veerya, Gunas and Karmas. Pharmacological actions are analyzed. Review reveals huge potential of many medicinal plants which can be used in this Covid-19 pandemic situation. This review evaluated the importance of medicinal plants described in Ayurveda literatures which can be used in the management and prevention of Covid-19.

Key Words: Corona virus, Covid-19 pandemic, Ayurveda, Aupasargika Rogas, Janopadhvansa, Medicinal plants, Pranavaha Srotas, Rasavaha Srotas.

Introduction

The corona virus Covid-19 pandemic is the defining ongoing global health crisis situation, caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Close contact person to person transmission is through respiratory droplets produced when an infected person coughs or sneezes.(1) Clinical manifestations of 2019-nCoV infection have similarities with SARS-CoV-2 where the most common symptoms include fever, dry cough, dyspnea, chest pain, fatigue and myalgia (2), (3), (4). Less common symptoms include headache, dizziness, abdominal pain, diarrhea, nausea, and vomiting (5). In Ayurveda communicable and epidemic diseases are described as Aupasargika Rogas - infectious or contagious and Janopadhvansa- pandemics respectively. (6), (7), (8), (9), (10).

Root cause of Janopadhvansa

The root cause of Janopadhvansa (pandemics) is vitiation of all the factors is Adharma (unrighteousness) and the source of this is Pragyapradha (intellectual error). People behave irresponsibly and do not take the right path and lead to sins, then people of that community deviate from their duties as well and propagate such sinful act further. Their sinful acts causes the goodness to disappear. Overall result of this is bad environmental changes which favors the infectious conditions leading to various diseases. As a result of infectious contact or ingestion of polluted food and water the whole community suffers lead to morbidity.

Factors for spread of Aupasargika Rogas (infectious or contagious diseases) (11)

- Prasangat (close interaction with the infected person), Gatrasmtparshat (physical contact with the infected person)
- Nishwas (through droplet inhalation), Sahabhajanat (sharing of food by means of contact transmission with the infected person)
- Sahashhayya (sleeping in close proximity with the infected person), Asana (use of sitting arrangement used by the infected person)
- Vastrā (use of clothes used by the infected person), Mdala Anulepnaat (use of cosmetics used by the infected persons)
- Ayurveda views Covid-19 disease as an attack on the Ojas (immune system) and Pranavaha Srotas (respiratory system) and Rasavaha Srotas (cardio vascular system). Covid -19 symptoms according to Ayurveda can be considered as Pranavaha and Rasavaha Srotu dushti lakshanas (signs and symptoms of vitiation of respiratory cardio vascular system). (12), (13), (14), (15), (16)

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**Pathophysiology of Covid-19 disease according to Ayurveda**

Nidanas (etiological factors) mentioned previously will cause Jatharagni Mandya (derangement of strength of digestive processes) and Rasa Dhatu Agni and Rakta Dhatu Agni Mandya (derangement of strength of metabolic processes) which also leads to production of Ama (a product that is an undigested form derived from food that gets absorbed into the system without proper assimilation). Due to this there will be Kapha-Vata Pradhan Tridosha Prakopa (aggravation), Dushya (vitiates body tissue) is Rasa (circulatory fluid) and Rakta (blood) affecting Pranavaha and Rasavaha Srotas. This Tridosha incriminating Rasa and Rakta Dhatu, circulates all over the body gets localized in Uraasthan (chest region) and head and Indriya (sense organs) where preexisting Khavaignaya (a weak or defective part of the body) is there. This circulation of vitiated Dosha and Dushya occurs due to Sanga (acute/chronic obstructive mechanism) and Vimargagaman (abnormal passage) and Atipravritti (hyper functional activity) mechanism. In a nutshell Tridosha in association with Rasa and Rakta Dhatu affecting preexisting Khavaignaya in Pranavaha Srotas and Rasavaha Srotas Hridaya (Heart), Phuphusa (Lungs), head and Indriya present with all or some of these signs and symptoms like Shushka Kaas (Dry Cough), Pratishhaya (Sneeze), Jwar (Fever), Shrama (Fatigue), Shwas (Shortness of breath), Angamarda (Muscle and joint pain), Kantha Vedana (Sore throat), Shiraschoola (Headache), Chardi (Vomiting) and Atisara (Diarrhea)

Treatment should be emphasized on Kapha-Vata Shama (pacification of Kapha-Vata) by virtue of Deepan (appetite enhancing), Pachana (digestion), Jwaraghana (antipyretic), Kaphanissaraka (expectoration of Phlegum), Chedan (disunion of adhered Doxa expenxorant, mucolytic and bronchodilator), Pranavaha Moola Sthana Balya (strengthening), Kanthya (beneficial to Throat issues), Rasayan (rejuvenation), Hrudya (cardio tonic), and Krumighna (antimicrobial/anti-viral).

**Aim of the study**

- The aim of this study is to review medicinal plants acting on Pranavaha Srotas, Rasavaha Srotas and medicinal plants showing action on signs and symptoms correlated with Covid 19 with Ayurveda as a natural and safe remedy for the Covid-19 management.
- To provide scope for further study.

**Material and Methods**

An extensive Compilation and tabulation of medicinal plants acting on Pranavaha Srotas, Rasavaha Srotas and medicinal plants showing action on signs and symptoms correlated with Covid 19 with Ayurveda were done by literary search of Charaka Samhita, Sushruta Samhita and Ashtanga Samgraha/Ashtanga Hridaya along with commentaries. Pharmacological actions from databases like Science Direct, PubMed and Google Scholar are also reviewed for the related published works. A total of 26 different medicinal plants have been enlisted from Bhavaprakasha Nighantu. Analysis of these plants have been made. Rasa (Taste), Vipaka (Post digestive effect/metabolite), Veerya (potency) and Gunas (properties) Doshghnata (pacified Dosha) have been enlisted. Pharmacological actions are analyzed. The selection of plants by authors for enlisting is based on the criteria that the extensive review of scientific and Ayurveda literature provided the basis of selection of plants having their therapeutic efficacy as anti-oxidant, anti-inflammatory, anti-viral, immune stimulant properties and possess phytochemicals which has definite role in Pranavaha Srotas, Rasavaha Srotas related symptoms and Covid-19 infection related symptoms.

**Observations**

Following drugs has vital role in Pranavaha Srotas and Rasavaha Srotas related issues and in turn can be used in Covid-19 symptoms. The properties of the mentioned medicinal plants are taken in to account as per Charaka Samhita, Sushruta Samhita and Ashtanga Samgraha/Ashtanga Hridaya, Bhavaprakasha Nighantu.

**Table 1: Group A: Kapha Vata Shamak (balancing)**

<table>
<thead>
<tr>
<th>Sr No.</th>
<th>Plant ( genus species)</th>
<th>Rasa</th>
<th>Vipaka</th>
<th>Veerya</th>
<th>Guna</th>
<th>Doshghnata</th>
<th>Part used</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Kantakari (Solanum xanthocarpum Schard. Wendle)</td>
<td>Katu (pungent), Tikta (bitter)</td>
<td>Katu (undergoes pungent taste conversion after digestion)</td>
<td>Ushna (hot potency)</td>
<td>Laghu (Light), Ruksha (dry), Tikshna (Piercing)</td>
<td>Kapha-Vata Shamak</td>
<td>Whole plant, root, fruit</td>
</tr>
<tr>
<td>2</td>
<td>Bruhati (Solanum indicum Linn.)</td>
<td>Katu, Tikta</td>
<td>Katu</td>
<td>Ushna</td>
<td>Laghu, Ruksha, Tikshna</td>
<td>Kapha-Vata Shamak</td>
<td>Whole plant, root, fruit</td>
</tr>
<tr>
<td>3</td>
<td>Pippali (Piper longum Linn)</td>
<td>Katu</td>
<td>Madhur (undergoes sweet taste conversion after digestion)</td>
<td>Anushna (not so hot so cold potency)</td>
<td>Laghu, Snigdha (unctuous), Tikshna</td>
<td>Kapha Vata Shamak</td>
<td>Fruit, Root</td>
</tr>
</tbody>
</table>
Table 2: Group B: Kapha Pitta Shamaka

<table>
<thead>
<tr>
<th>Sr No</th>
<th>Plant</th>
<th>Rasa</th>
<th>Vipaka</th>
<th>Veerya</th>
<th>Guna</th>
<th>Doshghnata</th>
<th>Part used</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Vasa (Adhatoda vasica Nees)</td>
<td>Tikta, Kashaya</td>
<td>Katu</td>
<td>Sheeta</td>
<td>Ruksa, Laghu</td>
<td>Kapha-Pitta shaman</td>
<td>Leaf flowers</td>
</tr>
<tr>
<td>2</td>
<td>Hansapadi (Adiantum tanulatum Burm.F.)</td>
<td>Kashay</td>
<td>Madhur (undergoes sweet taste conversion after digestion)</td>
<td>Sheeta</td>
<td>Snigdha</td>
<td>Kapha pitta shamaka</td>
<td>Whole plant</td>
</tr>
</tbody>
</table>

Table 3: Group C: Vata Pitta Shamaka

<table>
<thead>
<tr>
<th>Sr No</th>
<th>Plant</th>
<th>Rasa</th>
<th>Vipaka</th>
<th>Veerya</th>
<th>Guna</th>
<th>Doshghnata</th>
<th>Part used</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Banafsa (Viola odorata Linn.)</td>
<td>Katu, Tikta</td>
<td>Katu</td>
<td>Ushna</td>
<td>Laghu, Snigdha</td>
<td>Vata Pitta Shamaka</td>
<td>Whole plant</td>
</tr>
<tr>
<td>2</td>
<td>Yashtimadhu (Glycyrrhiza glabra Linn.)</td>
<td>Madhur</td>
<td>Madhur</td>
<td>Sheeta</td>
<td>Guru, Snigdha</td>
<td>Vata Pitta Shamak</td>
<td>Root</td>
</tr>
<tr>
<td>3</td>
<td>Guduchi (Tinospora cordifolia Willd)</td>
<td>Tikta, Kashaya</td>
<td>Madhur</td>
<td>Ushna</td>
<td>Laghu, Snigdha</td>
<td>Vata-Pitta-Kapha Shamak</td>
<td>Stem</td>
</tr>
<tr>
<td>4</td>
<td>Dalchini (Cinnamomum zeylanicum Blum)</td>
<td>Kashaya, Tikta, Madhur</td>
<td>Katu</td>
<td>Ushna</td>
<td>Laghu, Tiksha, Ruksa</td>
<td>Vata Pitta Shamaka</td>
<td>Bark</td>
</tr>
</tbody>
</table>
Table 4: Group D: Tridosha Shamaka

<table>
<thead>
<tr>
<th>Sr No</th>
<th>Plant</th>
<th>Rasa</th>
<th>Vipaka</th>
<th>Veerya</th>
<th>Guna</th>
<th>Dosoghna</th>
<th>Part used</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Haridra (Curcuma longa Linn.)</td>
<td>Tikta, Katu</td>
<td>Katu</td>
<td>Ushna</td>
<td>Laghu, Ruksha</td>
<td>Vata-Pitta-Kapha Shamaka</td>
<td>Rhizome</td>
</tr>
<tr>
<td>2</td>
<td>Haritaki (Terminalia chebula (Retz) Lyons)</td>
<td>Kashay, Madhur, Amla, Katu, Tikta</td>
<td>Madhur</td>
<td>Ushna</td>
<td>Laghu, Ruksha</td>
<td>Vata-Pitta-Kapha Shamaka</td>
<td>Fruit</td>
</tr>
<tr>
<td>3</td>
<td>Amalaki (Emblica officinalis Gaertn)</td>
<td>Amla, Kashay, Madhur, Katu, Tikta</td>
<td>Madhur</td>
<td>Sheeta</td>
<td>Guru, Ruksha, Sheeta</td>
<td>Vata-Pitta-Kapha Shamaka</td>
<td>Fruit</td>
</tr>
<tr>
<td>4</td>
<td>Ela (Elettaria cardimomum Maton)</td>
<td>Katu, Madhur</td>
<td>Madhur</td>
<td>Sheeta</td>
<td>Laghu, Ruksha</td>
<td>Vata-Pitta-Kapha Shamaka</td>
<td>Seeds</td>
</tr>
</tbody>
</table>

Table 5: Pharmacological actions of drugs

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Plant</th>
<th>Pharmacological actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Kantakari (Solonum xanthocarpum Schard. Wendle)</td>
<td>Antihistaminic (17), anti-allergic (18), cardio tonic (19), antioxidant (20), immunomodulatory (21)</td>
</tr>
<tr>
<td>2</td>
<td>Bruhati (Solonum indicum Linn.)</td>
<td>laxative and cardio tonic (22), hepatoprotective (23), antioxidant (24), anti-inflammatory and antipyretic (25), antihypertensive (26), cardio-protective (27)</td>
</tr>
<tr>
<td>3</td>
<td>Pippali (Piper longum Linn)</td>
<td>cardio protective (28), antioxidant (29), hepatoprotective (30), anti-inflammatory (31)</td>
</tr>
<tr>
<td>4</td>
<td>Pushkarmoola (Inula racemosa Hook.f.)</td>
<td>cardio protective (32), anti-allergic (33), anti-inflammatory &amp; analgesic (34), adrenergic beta blocking activity (35)</td>
</tr>
<tr>
<td>5</td>
<td>Shathi (Hedychium spicatum Buch Ham)</td>
<td>anti-inflammatory (36), anti-asthmatic (37), hepatoprotective (38), antioxidant (39), antibacterial (40) nootropic effects and memory restorative activity (41), tranquilizing (42)</td>
</tr>
<tr>
<td>6</td>
<td>Sunthi (Zinziber officinale Rosc.)</td>
<td>anti-emetic (43), anti-diabetic and hypolipidaemic(44), antibacterial (45), antioxidant (46), antiinflammatory (47), antiviral (48), analgesic and anti-inflamatory (49), cardio protective (50), antioxidant (51), gastro protective (52)</td>
</tr>
<tr>
<td>7</td>
<td>Kushthha (Saussara lappa (C.B Clarke)</td>
<td>anti-inflammatory (57), hepatoprotective (54), anti-ulcer and chologenic (55), immunomodulatory (56), gastro-protective (57), spasmylocytic (58), antidiarrheal (59), antiviral (60), cardio tonic (61)</td>
</tr>
<tr>
<td>8</td>
<td>Ashwagandha (Withania Somnifera (Linn.) Dunal.)</td>
<td>anti-inflammatory (62), anti-stress (63), immunomodulatory (64), antioxidant (65), cardio protective (66)</td>
</tr>
<tr>
<td>9</td>
<td>Kasmarda (Cassia occidentalis Linn)</td>
<td>antioxidiant (67), hepatoprotective (68), analgesic and antipyretic (69), antianxiety and antidepressant (70), antiasthatic (71)</td>
</tr>
<tr>
<td>10</td>
<td>Bharangi (Clerodendrum Serratum (Linn)</td>
<td>antioxidant (72), anti-inflammatory and antipyretic (73), bronchodilator (74), allergic asthma(75), antioxidant, antiangiogenic and vasorelaxant activities (76)</td>
</tr>
<tr>
<td>11</td>
<td>Tulasi ( Ocimum Sanctum Linn)</td>
<td>antioxidant (77), immunomodulatory (78), anti-inflammatory (79), antipyretic (80), antihypertensive and cardio protective (81), hepatoprotective (82), antistress (83)</td>
</tr>
<tr>
<td>12</td>
<td>KarkatShrugi (Pistacia integerrima Stewart ex Brandis)</td>
<td>antioxidant (84), analgesic, anti-inflammatory (85), antiasthatic (86)</td>
</tr>
<tr>
<td>13</td>
<td>Talispatra (Abies webbiana Lindle)</td>
<td>antitussive (87), anti-inflammatory and sedative (88), antispasmodic, bronchodilator and antiplatelet (89), antipyretic (90), antioxidant and antimicrobial properties (91)</td>
</tr>
<tr>
<td>14</td>
<td>Kaiphal (Myrica esculenta Buch-Ham)</td>
<td>antioxidant, anti-inflammatory and analgesic (92), anti-allergic (93), anxiolytic (94), antihypertensive (95), antidiarrheal (96)</td>
</tr>
<tr>
<td>15</td>
<td>Vasa (Adhatoda vasica Nees)</td>
<td>anti-asthmatic and bronchodilator activity (97), anti-allergic (98), antioxidant (99), cardio protective (100), antipyretic (101)</td>
</tr>
</tbody>
</table>
Discussion

**Among group A - Kapha Vata Shamak**


**Among these maximum plants possess**

Laghu Ruksha properties, only Pippali and Sunthi possesses Snigdha Guna while Kantakari, Bruhati, Pippali, Pushkarmoola, Kushtha, Kasmanda, Talispatra, Kaiphal possesses Tikshna Guna and all possess Ushna Potency.

So by Katu Tikta Rasa and Laghu Ruksha Guna and Ushna Veerya Deepan of Jatharagni (appetite enhancing and Dhatvagni (tissue metabolism) is achieved Pachana (digestion) of Ama.

Tikta Rasa and Laghu Ruksha Guna combination acts as Rasadhavatni Vardhan and Ama Pachana resulting in Jwaraghana action. Tikta Rasa of the drug due to their Viskhagha (neutralizes toxins) and Krumighna property reduces the incidence and manifestation of allergy and infection of microorganism like virus and bacteria.

Laghu Ruksha Guna and Ushna Veerya does Kaphanissaraka Karma while Tikshna along with Laghu Ruksha and Ushna Guna does Chedan. Thus obstruction made by Kapha in the Pranavaha Srotas is relieved by Srotostrodhana (purification of channels) and Vata Anulomana (normal direction or downward movement) is achieved. Among these Pippali, Sunthi and Ashwagandha possess Madhur Vipaka Snigdha Guna which gives Bala (strength) Pranavaha Srotas Moolasthan (anatomical seat of channel) and do Rasayan Karma.

**Group B - Kapha Pitta Shamaka**

Vasa is Tikta, Kashaya, Katu Vipaka and Sheetta has Ruksa, Laghu Guna.

It has Swarya (soothing to the Throat /good for voice) property- Vasa by its Tikta, Kashaya, Katu Vipaka and Ruksa, Laghu Guna eliminates Kapha which is Adhered to Kantha (Throat) by its Scrapping action ultimately Shotha (inflammation) is relieved Srotostrodhana and Srotostrodhana is achieved and action of Swarayantra (Larynx and Pharynx) is reestablished. Also by its properties mainly by Kashay Rasa and Laghu Ruksa and Sheeta Gunas it helps Wound healing at Respiratory system caused by excessive Pitta. By its Kashay Rasa and Sheeta Veerya and Sheeta Guna it acts on Hemoptysis and also Sadhak Pitta Shaman is achieved thus does Hrudya (Cardio tonic) Karma. Chemical component vasicine which is present in the leaves, roots and flowers found to have the pharmacological properties like – bronchodilator activity, expectorant, respiratory stimulant activity.

Hansapadi – Kashay Rasa, Madhur Vipaka, Sheeta and Snigdha Gunas increases the Bala does Dhatu Vardhan (tissue promotion), Rakta Prasadan (blood purification) and Oja Vardhan (promotion of health). Gives Strength to the Heart (Hrudya) by Mansa Dhatu Bala Vardhan (muscle strengthening).
Rasayan property of drug also revitalizes and establishes good quality of Sharira Dhatu (body tissues).

**Group C- Vata Pitta Shamak**

Among these maximum plants possess Laghu property only Yashthimadhu and Khatmi possesses Guru Guna while Yashtimadhu, Khatmi, Banafsa has Snigdha property and Tejapatra, Dalchini possesses Raksha Guna while Tejapatra and Dalchini possess Tikshna Potency.

So by Katu Tikta Rasa and Laghu Ruksha Guna and Ushna Veerya Deepan of Jatharagni and Dhatvagni is achieved Pachana of Ama is done. Tikta rasa and Laghu Ruksha Guna combination acts as Rasadhavagni Vardhan and Ama Pachana resulting in Jwaraghana action. Tikta Rasa of the drug due to their Vishaghna and Krushnighna property reduces the incidence and manifestation of allergy and infection of microorganism like virus and bacteria.

Laghu Ruksha Guna and Tikshna Guna and Ushna Veerya does Kaphanissaraka Karma while Tikshna along with Laghu Ruksha and Ushna Guna does Chedan. Thus obstruction made by Kapha in the Pranavaha Srotas is relieved by Srotosthapan karma and Mala with and Vata Anulomana is achieved. Among these Yasthimadhu, Khatmi possess Madhur Vipaka Snigdha Guna which gives Bala Pranavaha Srotas Moolasthan and do Rasayan Karma. Yasthimadhu shows Jeevaniya Karma (Longevity promoter) by its action on Rakta Dhatu and Rasayan Karma ultimately improvises Oja Dhatu. Yasthimadhu is good drug in bleeding disorders to stop bleeding (Shonitsthapan Karma).

**Group D - Tridosha Shamak**

In this group Guduchi, Haridra and Haritaki has Ushna Vireya while Amalaki and Ela possess Sheetha Veerya. All show Madhur Vipaka except Haridra shows Katu Vipaka. These Tridosha Shamak drugs by their Rasayan property increase quality and Quantity of all Dhatus. In Pranavaha Srotas related signs and symptoms they increase the Bala of organs associated with Pranavaha Srotas. Amalaki is known for its Vivranoti karma that means it acts on Aging process by slowing down accelerated aging process by its free radical scavenging process (172). Haritaki, Amalaki and Ela by its Anulomana Karma (normal direction or downward movement act) on Mala. Regular evacuation of Mala after Deepan and Pachana helps in restoration of Dosh and Dhatu. More specifically Anulomana of Apan Vayu helps in restoration of Prakriti Gati and functions of Prana, Udhan, Saman and Vyan Vayu. Heart and Lungs and other parts of Pranavaha Srotas are mainly made up of Rakta Dhatu. Phuphusa is made up of Rakta and Phena. Phena means bubbles or froth of Rakta Dhatu. Heart is made up of essence of Rakta and Kapha. Guduchi and Haridra Tikta, Katu Rasa and Ushna Veerya does Ama Pachana, Kleda Shoshana thus minimizes Fibrotic changes occurring in Lungs. Guduchi and Haridra has action on Rakta Dhatu. It increases Rakta Dhatvagni and pacifies Kapha related issues there by helps in production of quality Rakta Dhatu and maintains functioning of organs which are made of Rakta Dhatu and Kapha.

Enlisted plants showed antihistaminic, ant allergic, cardio tonic, antioxidant, immunomodulatory, hepatoprotective, anti-inflammatory, antipyretic, anti-asthmatic, antiutissive, anidiarrheal, antiviral, anti stress, antianxiety, antidepressant, nephroprotective, antihypertensive in preclinical and clinical studies.

Medicinal plants, which were reviewed, possess properties like Jatharagni Vardhan and Dhatvagni Vardhan, Pachana of Ama, Krumighna, Kaphanissaraka, Chedan, Balya, Rasayan Karma, Hrudy, Oja Vardhan, Jeevaniya Karma, Shonitsthapan Karma, Vrana Ropak (wound healing and anti-ulcer genic), Shothahara (anti-inflammatory), Jwaraghana (anti-pyretic).

In the treatment of Jwar, which is major symptom seen in Covid 19, it is clearly mentioned that when Agni is stabilized, Bala and Ojas are increased (173). It has been pointed out that Bala by itself can bring back the balance of the Doshas (174). Strengthening the host immunity would be an important therapeutic strategy from the Ayurveda viewpoint. Medicinal plants possessing Jatharagni Vardhan and Dhatvagni Vardhan and Ama Pachana properties can play vital role in this situation. It has been observed that a robust immune response across different cell types was associated with clinical recovery, similar to what we see in influenza, in COVID-19 cases also (175). As the disease progresses, the efficiency of Ojas is compromised and a crisis can develop. Such a presentation is seen in critical COVID 19 cases, characterized by disruption of immune system (176). The word ‘Rasayan (Rasa + ayana)’ refers to nutrition and its transportation in the body for attaining excellent Dhatu; which leads to gain longevity, freedom from disorders, optimum strength of physique and sense organs (177). Rasayan promotes nutrition by explicitly enriching the nutritional value of Rasa by enhancing Agni, i.e digestion, metabolism, and absorption. Medicinal plants showing Balya, Rasayan Karma and Oja Vardhan properties can improve immune response in Covid-19 cases. Signs and symptoms related with Respiratory system can be relieved by use of medicinal plants showing properties like Kaphanissaraka, Hrudy, Shonitsthapan, Vrana Ropak, Shothahara and Jwaraghana properties. As Covid-19 is a viral disease medicinal plants showing Krushnighna properties can minimize or nullify viral load and associated other infective foci effectively. Considering digestion related issues plants showing Jatharagni Vardhan and Dhatvagni Vardhan and Ama Pachana properties can relieve symptoms like headache, abdominal pain, diarrhea, nausea and vomiting. Psychological wellbeing is also important aspect in disease progression or recovery. Plants showing anti-stress, antianxiety, antidepressant activities can address these issues. There are research findings showing multi organ failures due to Covid-19 (178) Medicinal plants showing cardio tonic,
hepatoprotective, nephroprotective action can prevent organ damage.

Ayurveda takes a holistic approach toward treatment that integrates mind, body, and soul, and also taking into account of individual constitution as well as seasons. Medicines should be planned as per individuals Dosh, Dhatu, Mala vitiation status, locality of individual and disease on body, strength of individual and infection, season of infection and whether it is chronic or acute, digestive power, Prakruti (individual constitution), age, strength of mind or tolerance of an individual, food and activities to which individual is accustomed to, food habits and stages of disease (179).

Conclusion

In the present review, we have discussed the possible potential uses of medicinal plants to prevent or even treat COVID-19 symptoms. Decision regarding to whom and which medicinal plant can be used as a single herb or in combination with other herbs considering signs and symptoms of individual infected person can be taken with the holistic approach of Ayurveda. We can conclude that enlisted plants can play crucial role in the management of Covid-19 pandemic.

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