

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 *Janopadhdvansa* - 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*, *Anurasa*, *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*, *Janopadhdvansa*, 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 *Janopadhdvansa*- pandemics respectively. (6), (7), (8), (9), (10).

Root cause of *Janopadhdvansa*

The root cause of *Janopadhdvansa* (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), *Gatrasamsparshat* (physical contact with the infected person)
- *Nishwas* (through droplet inhalation), *Sahabhajanat* (sharing of food by means of contact transmission with the infected person)
- *Sahashayya* (sleeping in close proximity with the infected person), *Asana* (use of sitting arrangement used by the infected person)
- *Vastra* (use of clothes used by the infected person), *Maalya 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 Sroto 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

Nidan (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* (vitiated 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 *Urasthan* (chest region) and head and *Indriya* (sense organs) where preexisting *Khavaigunya* (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 nut shell *Tridosha* in association with *Rasa* and *Rakta Dhatu* afflicting preexisting *Khavaigunya* in *Pranavaha Srotas* and *Rasavaha Srotas Hridaya* (Heart), *Phuphusa* (Lungs), head and *Indriya* presents with all or some of these signs and symptoms like *Shushka Kaas* (Dry Cough), *Pratishyaya* (Sneezing), *Jwar* (Fever), *Shrama* (Fatigue), *Shwas* (Shortness of breath), *Angamarda* (Muscle and joint pain), *Kantha Vedana* (Sore throat), *Shirashoola* (Headache), *Chardi* (Vomiting) and *Atisara* (Diarrhea)

Treatment should be emphasized on *Kapha-Vata Shaman* (pacification of *Kapha-Vata*) by virtue of *Deepan* (appetite enhancing), *Pachana* (digestion), *Jwaraghana* (antipyretic), *Kaphanissaraka* (expectoration of Phlegum), *Chedan* (disunion of adhered *Dosha* expectorant, mucolytic and bronchodilator), *Pranavaha Moola Sthana Balya* (strengthening), *Kanthy* (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 *Gun* (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)

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

4	Pushkarmoola (<i>Inula racemosa</i> Hook.f.)	Tikta, Katu	Katu	Ushna	Laghu, Tikshna, Ruksha	Kapha Vata Shamak	Root
5	Shathi (<i>Hedychium spicatum</i> Buch Ham)	Katu, Tikta, Kashaya (Astringent)	Katu	Ushna	Ruksha, Tikshna	Kapha Vata Shamak	Rhizome
6	Sunthi (<i>Zinziber officinale</i> Rosc.)	Katu	Madhur	Ushna	Laghu, Snigdha	Kapha Vata Shamak	Rhizome
7	Kushtha (<i>Saussura lappa</i> (C.B Clarke)	Tikta, Katu Madhur (Sweet).	Katu	Ushna	Laghu, Tikshna, Ruksha	Kapha Vata shamaka	Root
8	Ashwagandha (<i>Withania Somnifera</i> (Linn.) Dunal.	Tikta, Katu, Madhur.	Madhur	Ushna	Laghu, Snigdha	Kapha Vata shamaka	Root
9	Kasmarda (<i>Cassia occidentalis</i> Linn)	Tikta, Madhur	Katu	Ushna	Laghu, Tikshna, Ruksha	Kapha Vata shamaka	Leaves, Seed, Root
10	Bharangi (<i>Clerodendrum Serratum</i> Linn)	Tikta, Katu	Katu	Ushna	Laghu, Ruksha	Kapha Vata shamaka	Root
11	Tulasi (<i>Ocimum Sanctum</i> Linn)	Katu, Tikta	Katu	Ushna	Laghu, Ruksha	Kapha Vata shamaka	Leaves
12	KarkatShrugi (<i>Pistacia integerrima</i> Stewart ex Brandis)	Kashaya, Tikta	Katu	Ushna	Laghu, Ruksha	Kapha Vata shamaka	Galls
13	Talispatra (<i>Abies webbiana</i> Lindle)	Tikta, Madhur	Katu	Ushna	Laghu, Tikshna	Kapha Vata shamaka	Leaves
14	Kaiphala (<i>Myrica esculenta</i> Buch-Ham)	Kashaya, Tikta, Katu	Katu	Ushna	Laghu, Tikshna	Kapha Vata shamaka	Bark

Table 2: Group B: Kapha Pitta Shamaka

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

Table 3: Group C: Vata Pitta Shamaka

Sr No	Plant	Rasa	Vipaka	Veerya	Guna	Doshghnata	Part used
1	Banafsa (<i>Viola odorata</i> Linn.)	Katu, Tikta	Katu	Ushna	Laghu, Snigdha	Vata Pitta Shamaka	Whole plant
2	Yashtimadhu (<i>Glycyrrhiza glabra</i> Linn.)	Madhur	Madhur	Sheeta	Guru, Snigdha	Vata Pitta Shamak	Root
3	Guduchi (<i>Tinospora cordifolia</i> Willd)	Tikta, Kashaya	Madhur	Ushna	Laghu, Snigdha	Vata-Pitta-Kapha Shamak	Stem
4	Dalchini (<i>Cinnamomum zeylanicum</i> Blum)	Kashaya, Tikta, Madhur	Katu	Ushna	Laghu, Tikshna, Ruksha	Vata Pitta Shamaka	Bark

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5	Tejapatra (<i>Cinnamomum tamala</i> Nees & Eberm)	<i>Katu, Tikta</i>	<i>Katu</i>	<i>Ushna</i>	<i>Laghu, Tikshna, Ruksha</i>	<i>Vata Pitta Shamaka</i>	Leaves
6	Khatmi (<i>Althaea officinalis</i> Linn)	<i>Madhur</i>	<i>Madhur</i>	<i>Sheeta</i>	<i>Snigdha, Pichhil, Guru</i>	<i>Vata Pitta Shamaka</i>	Roots

Table 4: Group D: Tridosha Shamaka

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

Table 5: Pharmacological actions of drugs

Sr. No.	Plant	Pharmacological actions
1	Kantakari (<i>Solanum xanthocarpum</i> Schard. Wendle)	Antihistaminic (17), anti-allergic (18), cardio tonic (19), antioxidant (20), immunomodulatory (21)
2	Bruhati (<i>Solanum indicum</i> Linn.)	laxative and cardio tonic (22), hepatoprotective (23), antioxidant (24), anti-inflammatory and antipyretic (25), antihypertensive (26), cardio-protective (27)
3	Pippali (<i>Piper longum</i> Linn)	cardio protective (28), antioxidant (29), hepatoprotective (30), anti-inflammatory (31)
4	Pushkarmoola (<i>Inula racemosa</i> Hook.f.)	cardio protective (32), anti- allergic (33), anti-inflammatory & analgesic (34), adrenergic beta blocking activity (35)
5	Shathi (<i>Hedychium spicatum</i> Buch Ham)	anti-inflammatory (36), anti-asthmatic (37), hepatoprotective (38), antioxidant (39), antibacterial (40) nootropic effects and memory restorative activity (41), tranquilizing (42)
6	Sunthi (<i>Zinziber officinale</i> Rosc.)	anti-emetic (43), anti-diabetic and hypolipidaemic(44), antibacterial (45), antioxidant (46), antitussive (47), antiviral (48), analgesic and anti-inflammatory (49), cardio protective (50), antioxidant (51), gastro protective (52)
7	Kushtha (<i>Saussura lappa</i> (C.B Clarke)	anti-inflammatory (53), hepatoprotective (54), anti-ulcer and cholagogic (55), immunomodulatory (56), gastro-protective (57), spasmolytic (58), antidiarrheal (59), antiviral (60), cardio tonic (61)
8	Ashwagandha (<i>Withania Somnifera</i> (Linn.) Dunal.)	anti-inflammatory (62), anti-stress (63), immunomodulatory (64), antioxidant (65), cardio protective (66)
9	Kasmarda (<i>Cassia occidentalis</i> Linn)	antioxidant (67), hepatoprotective (68), analgesic and antipyretic (69), antianxiety and antidepressant (70), antiasthmatic (71)
10	Bharangi (<i>Clerodendrum Serratum</i> (Linn)	antioxidant (72), anti-inflammatory and antipyretic (73), bronchodilator (74), allergic asthma(75), antioxidant, antiangiogenic and vasorelaxant activities (76)
11	Tulasi (<i>Ocimum Sanctum</i> Linn)	antioxidant (77), immunomodulatory (78), anti-inflammatory (79) , antipyretic (80), antihypertensive and cardio protective (81) , hepatoprotective (82), antistress (83)
12	KarkatShrugi (<i>Pistacia integerrima</i> Stewart ex Brandis)	antioxidant (84), analgesic, anti-inflammatory (85), antiasthmatic (86)
13	Talispatra (<i>Abies webbiana</i> Lindle)	antitussive (87), anti-inflammatory and sedative (88), antispasmodic, bronchodilator and antiplatelet (89), antipyretic (90), antioxidant and antimicrobial properties (91)
14	Kaiphala (<i>Myrica esculenta</i> Buch-Ham)	antioxidant, anti-inflammatory and analgesic (92), anti-allergic (93), anxiolytic (94), antihypertensive (95), antidiarrheal (96)
15	Vasa (<i>Adhatoda vasica</i> Nees)	anti-asthmatic and bronchodilator activity (97), anti-allergic (98), antioxidant (99), cardio protective (100), antipyretic (101)

16	Hansapadi (<i>Adiantum lanulatum</i> Burm.F.)	antibacterial (102), hepatoprotective and antioxidant (103)
17	Banafsā (<i>Viola odorata</i> Linn.)	anti-asthmatic (104), antipyretic (105), antihypertensive and anti dyslipidemic (106), anti-inflammatory (107)
18	Yashtimadhu (<i>Glycyrrhiza glabra</i> Linn.)	antitussive and expectorant (108), anti-bacterial anti-oxidant (109), antithrombotic (110), memory enhancing activity (111), antiviral (112), anti-inflammatory and anti-ulcer (113), immunomodulatory (114), antistress (115)
19	Guduchi (<i>Tinospora cordifolia</i> (Willd))	neuroprotective (116), anti-diarrheal and antiulcer (117), analgesic (118), anti-inflammatory (119), cardio protective (120), antidepressant (121), antiasthmatic (122), antipyretic (123), anti-allergic (124), antioxidant (125)
20	Dalchini (<i>Cinnamomum zeylanicum</i> Blum)	antioxidant and antimicrobial (126), antihypertensive and vasorelaxant (127), antiviral (128), antidepressant and anti-anxiety (129), antipyretic (130)
21	Tejapatra (<i>Cinnamomum tamala</i> Nees & Eberm)	anti-diarrheal (131), antioxidant (132), anti-inflammatory, analgesic and antipyretic (133), nephroprotective (134), immunomodulatory (135), anxiolytic, antidepressant, and anti-stress activities (136), antiviral (137), cardio protective (138)
22	Khatmi (<i>Althaea officinalis</i> Linn)	antitussive (139), antioxidant (140), analgesic and anti-inflammatory (141), cardio protective (142), antiviral (143)
23	Haridra (<i>Curcuma longa</i> Linn)	anti-inflammatory (144), hepatoprotective (145), antioxidant (146), cardio protective (147), antiviral (148), antidepressant (149), antipyretic (150)
24	Haritaki (<i>Terminalia chebula</i> (Retz) Lyons)	antimicrobial (151), antiviral (152), antioxidant (153), cardio protective (154), immunomodulatory (155), antitussive (156), antipyretic (157), anti-allergic (158)
25	Amalaki (<i>Embelica officinalis</i> Gaertn)	antipyretic (159), antidepressant (160), antioxidant (161), anti-inflammatory (162), antiviral (163), hepatoprotective (164), cardio protective (165), antitussive (166)
26	Ela (<i>Elettaria cardimomum</i> Maton)	antibacterial (167), gastro protective (168), antihypertensive (169), antioxidant (170), antispasmodic (171)

Discussion

Among group A - Kapha Vata Shamak

Katu Tikta Rasa and *Katu Vipaka* plants are *Kantakari*, *Bruhati*, *Pushkarmoola*, *Kushtha*, *Kasmarda*, *Bharangi*, *Tulasi*, *Karkatshrugi* and *Kaiphal* is *Kashay Pradhan Tikta Katu Rasa* and *Katu Vipaka*, *Talispatra* is *Tikta Pradhan Madhur Rasa Katu Vipaka*, *Karkatshrugi Kashay Pradhan Tikta Rasa* and *Katu Vipaka*, *Kasmarda Tikta Pradhan Madhur Rasa* and *Katu Vipaka*, *Kushtha Tikta Pradhan Katu Rasa* and *Katu Vipaka* and *Ashwagandha* is *Tikta Pradhan Katu* and *Madhur Rasa* and *Madhur Vipaka* while *Sunthi* and *Pippali* has *Katu Rasa* and *Madhur Vipaka*.

Among these maximum plants possess *Laghu Ruksha* properties, only *Pippali* and *Sunthi* possesses *Snigdha Guna* while *Kantakari*, *Bruhati*, *Pippali*, *Pushkarmoola*, *Kushtha*, *Kasmarda*, *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 *Rasadhatvagni Vardhan* and *Ama Pachana* resulting in *Jwaraghana* action. *Tikta Rasa* of the drug due to their *Vishaghna* (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 *Sroto- Marga Vivrunoti* (bronchodilation)

and *Srotoshodhana* (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 *Sheeta* has *Ruksha*, *Laghu Guna*.

It has *Swarya* (soothing to the Throat /good for voice) property- *Vasa* by its *Tikta*, *Kashaya*, *Katu Vipaka* and *Ruksha*, *Laghu Guna* eliminates *Kapha* which is Adhered to *Kantha* (Throat) by its Scrapping action ultimately *Shotha* (inflammation) is relieved and action of *Swarayantra* (Larynx and Pharynx) is reestablished. Also by its properties mainly by *Kashay Rasa* and *Laghu Ruksha* 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 *Yashtimadhu* and *Khatmi* possesses *Guru Guna* while *Yashtimadhu*, *Khatmi*, *Banafsa* has *Snigdha* property and *Tejapatra*, *Dalchini* possesses *Ruksha 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 *Rasadhatvagni Vardhan* and *Ama Pachana* resulting in *Jwaraghana* action. *Tikta Rasa* of the drug due to their *Vishaghna* and *Krumighna* 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 *Sroto- Marga Vivrunoti* and *Srotoshodhana* and *Vata Anulomana* is achieved. Among these *Yashtimadhu*, *Khatmi* possess *Madhur Vipaka Snigdha Guna* which gives *Bala Pranavaha Srotas Moolasthan* and do *Rasayan Karma*. *Yashtimadhu* shows *Jeevaniya Karma* (Longevity promoter) by its action on *Rakta Dhatu* and *Rasayan Karma* ultimately improvises *Oja Dhatu*. *Yashtimadhu* is good drug in bleeding disorders to stop bleeding (*Shonitsthapan Karma*).

Group D - Tridosha Shamak

In this group *Guduchi*, *Haridra* and *Haritaki* has *Ushna Veerya* while *Amalaki* and *Ela* possess *Sheeta Veerya*. All show *Madhur Vipaka* except *Haridra* shows *Katu Vipaka*. These *Tridosha Shamak* drugs by their *Rasayan* property increase quality and Quantity of all *Dhatu*s. In *Pranavaha Srotas* related signs and symptoms they increase the *Bala* of organs associated with *Pranavaha Srotas*. *Amalaki* is known for its *Vayasthapan 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 *Prakrut Gati* and functions of *Prana*, *Udan*, *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, antiallergic, cardio tonic, antioxidant, immunomodulatory, hepatoprotective, anti-inflammatory, antipyretic, anti-asthmatic, antitussive, antidiarrheal, 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*, *Hrudya*, *Oja Vardhan*, *Jeevaniya Karma*, *Shonitsthapan Karma*, *Vrana Ropak* (wound healing and anti-ulcerogenic), *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*, *Hrudya*, *Shonitsthapan*, *Vrana Ropak*, *Shothahara* and *Jwaraghana properties*. As Covid-19 is a viral disease medicinal plants showing *Krumighna 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 in to account of individual constitution as well as seasons. Medicines should be planned as per individuals *Dosh, Dhātu, 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, *Prakṛuti* (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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