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Efficacy of Herbal Drugs and Marketed Herbal Drugs used in treatment of COVID-19: A Comprehensive Review

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Abstract
The COVID-19 pandemic has fast-tracked the global search for effective and affordable therapeutic interventions, giving new impetus to herbal medicine systems like Ayurveda and TCM. These ancient systems prescribe natural remedies that confine antiviral, anti-inflammatory, and immunomodulatory effects upon the body. This review highlights the efficacy of individual herbal drugs and polyherbal formulations in the treatment and management of COVID-19. Several prospective medical and scientific literature published from 2020 to 2024 have been considered for the collated literature analysis: RCTs, observational studies, clinical reports, and patent literature. Several herbal formulations showed promising results, with Lianhua Qingwen (TCM) and NRICM101 (Taiwan) notably demonstrating reduced symptom severity, shortened recovery times, and slowed progression toward serious forms of COVID-19 by angling viral replication and immune modulation. In light of these hopeful results, in general, trial designs remain inconsistent between these studies, with small sample sizes and variability in regulatory approvals; this makes generalization of the results inappropriate. This review thus highlights the need for urgent large-scale, standardized clinical trials to establish safety and efficacy. Integrating scientifically validated herbal medicines into COVID-19 management protocols could offer cost-effective, complementary treatment options, especially in resource-constrained settings, but must be guided by rigorous scientific evaluation and regulatory oversight.

Keywords: COVID-19, Herbal drugs, Marketed Herbal drugs, antiviral, anti-inflammatory, immunomodulatory, antioxidant.

Introduction

The global epidemic of Coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome Coronavirus-2 (SARS-CoV-2), a member of the beta coronaviruses family, has affected the world's physical and mental health, social relations, and economy. The virus enters into type 2 alveolar epithelial cells of the lower respiratory track by binding virus S glycoprotein to the cell membrane receptor Angiotensin-converting enzyme 2 (ACE2). The entry is followed by replication of the virus in the cell and virus release. Symptoms of COVID-19, including dyspnea, fever, nonproductive cough, pneumonia, fatigue, and myalgia , emerge after an incubation stage of 2 to 14 days. Herbs can provide valuable sources of compounds that have immunomodulatory, anti-inflammatory, antioxidant, and antiviral properties, exerting beneficial effects on systems affected by viruses [1]. COVID-19 is a viral heterogeneous disease with hyper inflammation and excessive reactive oxygen species (ROS) production, which play a critical role in cytokine release in inflammation diseases[2].

The late 2019 advent of SARS-CoV-2 initiated a world health crisis that engendered considerable morbidity, mortality, and social disruption[3]. Unlike vaccine processes which have amassed much attention,

antiviral therapeutics for the treatment of COVID-19 remain scant for moderate to severe cases, or during provision of care in sub-standard conditions[4]. These antivirals alongside steroids for inflammation and monoclonal antibodies against the virus are amongst the current treatment modalities. Conversely, high costs, issues with supply, and even contraindications in certain patient groups due to adverse effects or co-morbidities may render such interventions useless[5-6]. Therefore, alternative and complementary options for treatment, especially those from traditional systems of medicine, have increasingly come into the limelight.

Herbal medicines that constitute the basis of ancient systems such as Ayurveda, Traditional Chinese Medicine (TCM), and Unani have been in use for centuries for the treatment of a plethora of ailments, especially respiratory ones. These treatments have an aura of holistic healing and are considered to have antiviral, anti-inflammatory, antioxidant, and immunomodulatory potentials.The onset of the COVID-19 pandemic intensified global interest in these traditional herbal therapies as potential supportive treatments to alleviate symptoms, enhance immunity, and possibly inhibit viral replication[7-9].

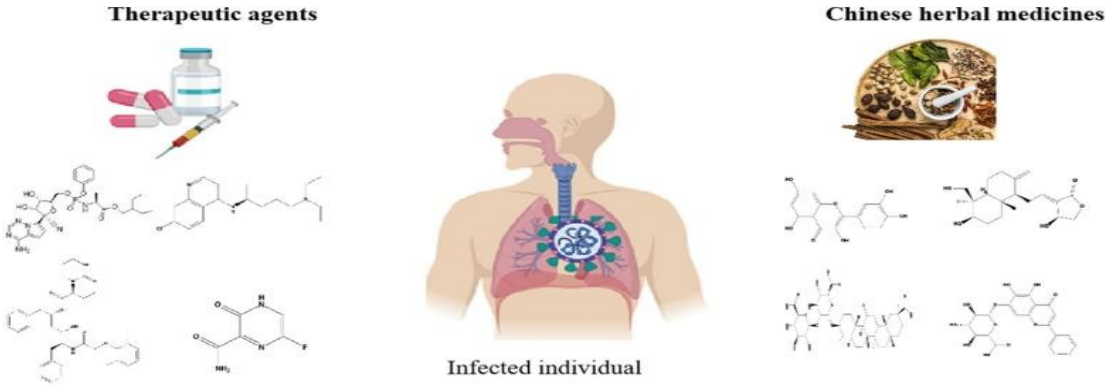

Fig.1: Graphical abstract showing comparative overview of therapeutic agents and herbal medicines for an infected individual of COVID-19 [10]

During the pandemic, some countries were actively promoting herbal formulations as coadjuvants in the treatment of COVID-19. National health agencies provided guidelines and approved herbal protocols based on their traditional use and recent clinical data. Examples of herbs widely considered include Andrographis paniculata (Indian Echinacea), Glycyrrhiza glabra (Licorice), and Curcuma longa (Turmeric). These botanicals have been proven to exhibit antiviral activity *in vitro* and were shown to affect immune responses, which are crucial in management of inflammatory complications linked to COVID-19 [11-14].

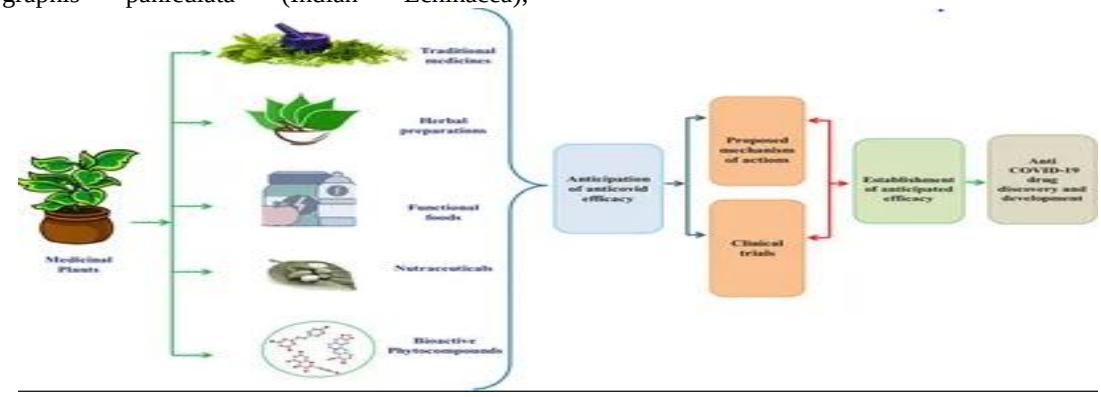

Fig.2: Graphical Abstract of Phytomedicines/Herbal Medicines/Bioactive compounds/Functional Foods/Nutraceuticals for the development of anti-COVID-19 therapies. [15]

This review intends to offer a thorough analysis concerning herbal medicines in the treatment of COVID-19, considering traditional medicine as well as contemporary herbal formulations marketed on the

trade. The review assesses recent research work, including randomized controlled trials, clinical observations, and pharmacological studies, to gauge the therapeutic potential and efficacy as well as safety of herbal interventions. The review also tackles some issues surrounding herbal products, such as their non-standardization in formulation and the general lack of solid scientific ground to support their use. However, the intent of the review is to clarify whether herbal medicine can be justified as a complementary therapy in the broader area of treatment of COVID-19.

Mechanism of Action of Herbal Drugs against SARS-CoV-2

The main structural components of coronaviruses are the spike glycoprotein S, the transmembrane proteins M (membrane) and E (envelope), and the nucleoprotein N. The S, M and E proteins are embedded in the virus envelope while N protein forms a viral ribonucleoprotein (vRNP) complex with the viral. The SARS-CoV-2 genome is organized similarly to other coronaviruses and the positive-stranded RNA genome has a 5′-cap and a 3′-poly-A tail, allowing its translation from the host translation machinery [16]. A frameshift between two open reading frames (Orf), Orf1a and Orf1b at the 5′-end of the genome allows production of two polypeptides that are involved in various processes of the virus infection cycle [17]. The structural S, N, M and E proteins are encoded at the 3′-end. The life cycle of SARS-CoV-2 involves the initial infection of human cells through the host cell receptor angiotensin-converting enzyme 2 (ACE2), together with the cell surface serine protease TMPRSS2 that acts as a coreceptor mediated by the S glycoprotein via its receptor binding domain (RBD). Following entry via endocytosis, the positive-sense RNA genome is translated into a polyprotein with RNA polymerase function; this produces negative-sense sub-genomic mRNA before making positive-sense sub-genomic mRNA ready for translation [18]. Following translation, the components associate in the endoplasmic reticulum Golgi intermediate compartment (ERGIC) before being released by exocytosis. Most of the antiviral development efforts against SARS-CoV-2 have targeted the glycoprotein S which is the major receptor binding protein. This glycoprotein is also the focus of the vaccine development efforts as it is the main target of our immune response [19].

Herbal drugs have been investigated for their potential in treating COVID-19 due to their antiviral activity and anti-inflammatory activity as well as immunomodulatory effects and anti-oxidant effects showing potential in inhibiting the activity of SARS-CoV-2 and its replication by targeting several proteins like 3CLpro, ACE2, S protein, Rdrp, and PLpro [20]. Herbal medicines offer multiple mechanisms through which they can potentially mitigate the effects of COVID-19, targeting different stages of the virus's lifecycle or its associated symptoms[21].

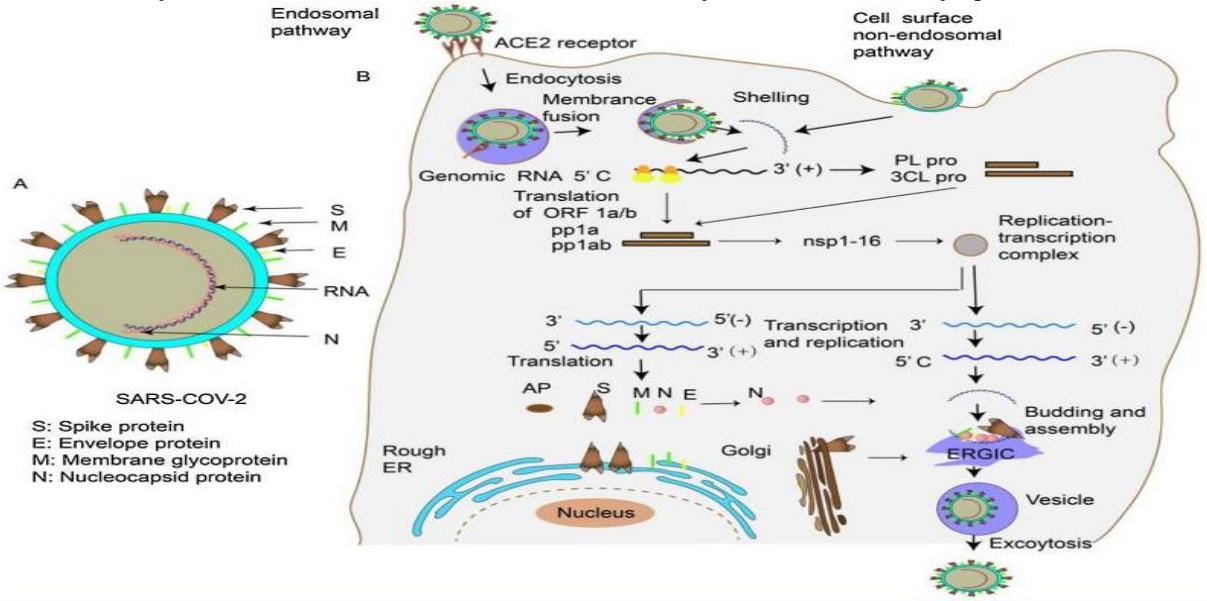

Fig.3: Life cycle of SARS-CoV-2 in host cells. (A) Structure of SARS-CoV-2 (B) Mechanism of SARS-CoV-2 infection. [10]

Several modes of bioactive phytoconstituents and traditional herbal medicines to exert anti-COVID-19 efficacy including: (as descripted in Fig.4)

(A) Inhibition of main protease and 3C-like protease,
(B) Disruption of microtubules, viral trafficking and formulation of double membrane vesicles,
(C) Binding affinity toward host macromolecular target protein to make it unavailable and **(D)** Downregulation of ACE2 receptor anchorage and TMPRSS2 expression which ultimately causes inhibition of viral replication.

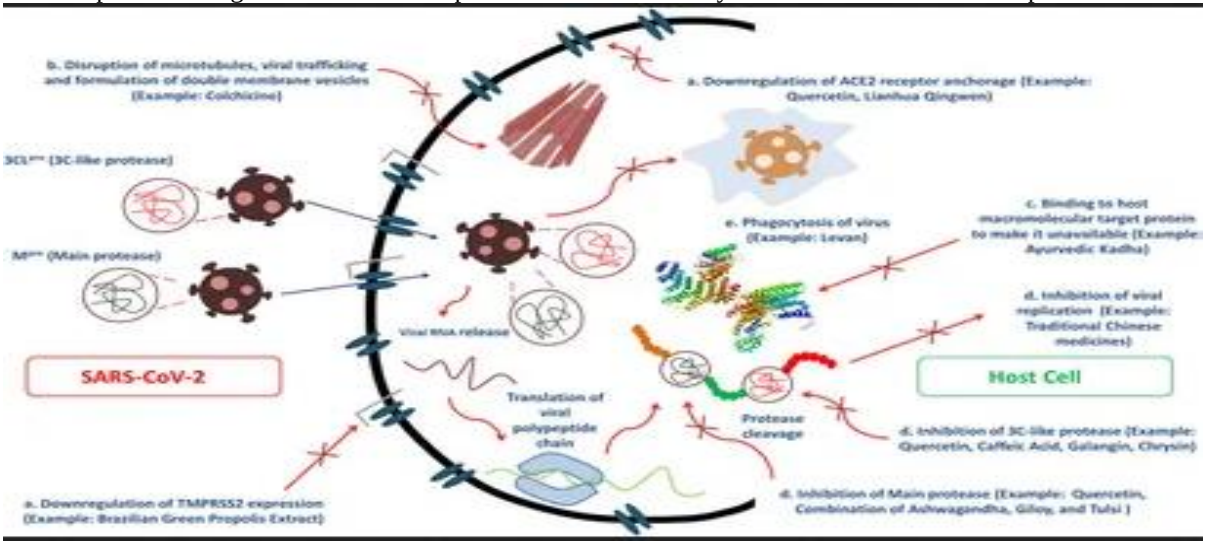

Fig.4: Mechanism of action of herbal drugs used against SARS-CoV-2 [15]

Various effects of herbals with their detailed mechanism are discussed as

Antiviral Activity

The herbal drugs fight against COVID-19 mainly by preventing viral entry or replication. Several herbal drugs show their effectiveness by inhibiting viral replication and blocking viral entry[22] Glycyrrhizin, an active constituent of licorice root, prevents the virus from attaching and thereby from replicating. Glycyrrhizin blocks viral protease activity, which is needed for replication[23]. Also, andrographolide compounds isolated from the Andrographis paniculata inhibit the binding of SARS-CoV-2 spike protein, which prevents the virus from entering the host cells by targeting ACE2[24].

Anti-inflammatory Activity

The herbal drugs fight against COVID-19 mainly by reducing cytokine storm and inhibit pro-inflammatory cytokines. Herbal medicines modulate cytokine secretion and reduce the risk of cytokine storms associated with COVID-19 and have shown great potential in inhibiting pro-inflammatory cytokines, which further contributes to COVID-19 severity[25].

Immunomodulatory Effects

Herbal medicines like Ashwagandha, Giloy and Tulsi helps to regulate the immune response by reducing inflammation and promoting the recovery and may be beneficial for the lung function in patients with COVID-19. Many of the herbal compounds act by modulating the immune system and regulating immune response, and thus allow the body to adequately respond against viral infections, preventing an over-response that would trigger cytokine storms by modulating cytokine levels[26]. Curcumin, for instance, extracted from Curcuma longa (turmeric), shows potent anti-inflammatory capacities, acting upon various pro-inflammatory cytokines such as TNF-α, IL-6, and IL-1β[27] Since downregulation of such cytokines occurs, the development of severe inflammatory reactions in COVID-19 patients is thereby hindered[28].

Antioxidant Effects:

The pathogenesis of COVID-19 is mainly attributed to oxidative stress, whereupon viral infection leads to the excess production of reactive oxygen species (ROS) that damage cells and tissues[29]. Herbal flavonoids act as antioxidants, with their active moiety helping to neutralize these free radical[30]. Herbs such as Scutellariabaicalensis, which is rich in baicalin, have been found to possess the ability to decrease oxidative stress, thus safeguarding the cells from the damage induced by viruses [31].

These combined mechanisms illustrate the potential of herbal medicines to provide a broad-spectrum treatment for COVID-19 by not just targeting the viral load but also preventing the injurious effects resulting from inflammation and oxidative stress.

Herbal Drugs Used Against COVID-19

Various herbal drugs have been investigated for their potential therapeutic effects against COVID-19[32]. Here are some of the most prominent herbs, their active constituents, and the reported activities based on recent studies:

Andrographis paniculata

Andrographolide, the active component of Andrographis paniculata, has been reported to have antiviral, immunomodulatory, and anti-inflammatory properties. Research has pointed towards its capability to prevent viral replication and to boost the immune response of the body, suggesting it as a potential therapeutic option for COVID-19 treatment. An RCT conducted in 2021 revealed that it could help in the alleviation of symptoms in cases of mild to moderate COVID-19[33-36].

Glycyrrhiza glabra

Glycyrrhizin, the primary active ingredient in *Glycyrrhiza glabra* (Licorice), has displayed strong antiviral activity against SARS-CoV-2 through inhibition of viral replication and binding of the SARS-CoV-2 spike protein. Glycyrrhizin has been demonstrated *in vitro* to decrease the viral load in infected cells and thus is a promising candidate for COVID-19 therapy[37-39].

Curcuma longa

Curcumin, which is isolated from *Curcuma longa* (Turmeric), exhibits potent anti-inflammatory and antioxidant activity. Its capacity for lowering oxidative stress and regulating inflammatory mechanisms may significantly alleviate symptoms of COVID-19. Research in clinical trials indicates that supplementation with curcumin may decrease inflammation by shortening recovery time among patients with COVID-19[40-42].

Tinospora cordifolia

Used as an immunostimulant and adaptogen traditionally, Tinospora cordifolia is recognized for its immunomodulatory activity. Investigations have indicated that tinosporide, the active ingredient in Tinospora cordifolia, has the potential to improve immune response in viral infections as well as assist with treating COVID-19 manifestations by modulating immune cell activity[43-44].

Scutellariabaicalensis

Baicalin, the primary flavonoid in Scutellariabaicalensis, has proved to exhibit antiviral, anti-inflammatory, and antioxidant effects. Research has suggested that it can inhibit SARS-CoV-2 replication and alleviate inflammation, which contributes immensely to COVID-19 complications [45-47].

Table 1: Summary of Herbal Drugs Investigated for COVID-19 Treatment

Herb Name	Active Constituents	Reported Activity	Study Type	Reference
Andrographis paniculata	Andrographolide	Antiviral, Immunomodulatory	RCT	[48]
Glycyrrhiza glabra	Glycyrrhizin	Antiviral, Anti-inflammatory	*In vitro*	[49]
Curcuma longa	Curcumin	Anti-inflammatory, Antioxidant	Clinical	[50]
Tinospora cordifolia	Tinosporide	Immunostimulant	RCT	[51]
Scutellariabaicalensis	Baicalin	Antiviral, Anti-inflammatory	*In vitro*	[52]

Ayush Kadha and its herbal constituents as an immunity booster in COVID-19

Ayush Kadha is a herbal decoction recommended by the Ministry of AYUSH, Government of India, to boost immunity against COVID-19. While Ayush Kadha may have potential benefits, often cure COVID-19 in three days. The Ministry of AYUSH recommends Ayush Kadha as an immunity booster, not a cure for COVID-19[53-55].

Benefits of Ayush Kadha: [56]

- **Immunity Booster:** Ayush Kadha is believed to enhance the body's immune system, helping to fight against infections like COVID-19.
- **Respiratory Health:** The herbs in Ayush Kadha may help support respiratory health, reducing the severity of symptoms.
- **Antiviral Properties:** Some studies suggest that the herbs in Ayush Kadha may have antiviral properties, which could help combat COVID-19.

How to Make Ayush Kadha:

To make Ayush Kadha, you can follow these steps:

1. Mix 30 grams of holy basil, 20 grams of black pepper, 30 grams of dry ginger, and 20 grams of cinnamon in 1 liter of water.

2. Boil the mixture until it reduces to half.

3. Strain and drink the Kadha hot, adding jaggery or honey for sweetness.

The formulation comprises four medicinal herbs widely used in Indian kitchens, including:

- ✓ **Holy Basil (Tulsi):** Well known for its antiviral and immunomodulatory properties. Tulsi is well known to augment immunity that may help fight viral, bacterial and fungal infections. Tulsi extracts are known to strengthen the immune system. The bioactive phytocompounds from Tulsi as an effective

alternative for the treatment of infections caused by coronaviruses and provides insights into the molecular interactions of its bioactive compounds with SARS-CoV-2 targets [57].

- ✓ **Black Pepper:** Black pepper enhances digestion and absorption of nutrients. Piperine stimulates the digestive capacity by activating the release of digestive enzymes from the pancreas. Piperine treatment has also been evidenced to decrease lipid peroxidation and beneficial in influencing antioxidant molecule and antioxidant enzymes. Piperine has binding interactions toward the spike glycoprotein and ACE2 cellular receptor for SARS-CoV-2[58].
- ✓ **Dry Ginger:** Ginger is a home remedy commonly used in food and drink mixes and exhibits anti-inflammatory properties. The potential effects of ginger against SARS-CoV-2 infection and highlights its antiviral, anti-inflammatory, antioxidant, and immunomodulatory impacts in an attempt to consider this plant as an alternative therapeutic agent for the treatment of COVID-19. Ginger may have beneficial impacts on many organs that are affected by coronaviruses and having the potential effects against SARS-CoV-2 infection considering this as an alternative therapeutic agent for the treatment of COVID-19[59].
- ✓ **Cinnamon:** Cinnamon (Darchini) is well-known to be effective in corona disease as it is considered effective in traditional medicine for lung diseases. Cinnamon is a valuable potent medicinal plant with several pharmacological activities especially antimicrobial and anti-inflammatory effects and also can be a great diuretic. Cinnamon can be effective in SARS-CoV-2 improvement and treatment through its anti-obstructive, diuretic, tonic and antidote effects. Cinnamon and its ingredients can be recommended in SARS-CoV-2 infection due to its multi-targeting properties[60].

Comparative Review: Marketed Herbal Formulations vs Traditional Use

Traditional Herbal Remedies for COVID-19 Management

Other traditional medicine systems, such as Ayurveda and Traditional Chinese Medicine (TCM), have for centuries depended on herbal treatments in the management of respiratory diseases. The COVID-19 pandemic has once again given these therapies focus because of their antiviral, immune-stimulating, and anti-inflammatory effects[61]. In Ayurveda, Ashwagandha (Withania somnifera) and Guduchi (Tinospora cordifolia) have emerged as examples where their therapeutic advantages have been pinpointed[62]. Ashwagandha has been reported to facilitate stress management and augment immune function, whereas Guduchi is used for its antiviral effects and ability to modulate immune responses[63]. Both herbs were recommended by India's Ministry of AYUSH in advisory guidelines as supportive therapies for COVID-19, especially for coping with mild symptoms and general immunity[64].

In the TCM setting, multi-herbal extracts have been utilized to treat the multifaceted symptomology of COVID-19. One obvious example is QingfeiPaidu Decoction, whose ingredients, like Houttuynia cordata and Forsythia suspensa, have been traditionally utilized for resolving lung heat and toxins. The formulation has been included officially in Chinese treatment guidelines for COVID-19 and has demonstrated potency in the clinic for the relief of symptoms such as fever, cough, and asthenia [65-66].

Marketed Herbal Products Targeting COVID-19

Apart from classical formulas, various herbal products have also been marketed to aid in COVID-19 treatment, where classical experience is coupled with contemporary scientific methods. LianhuaQingwen is one such established product in China, where Forsythia, Honeysuckle, and Rhubarb are mixed. It has been proven through clinical trials to alleviate symptoms like cough, fever, and nasal congestion in mild COVID-19 patients.

NRICM101, which was created in Taiwan, contains Scutellariabaicalensis, Houttuynia cordata, and Glycyrrhiza glabra (Licorice). It has shown promising results in preventing the development of COVID-19 in its early stages, as per initial studies [67-69].

In India, Patanjali Ayurved launched Coronil containing Ashwagandha, Giloy, and Tulsi as an immune-modulatory and symptom-reducing medicine for mild COVID-19 infection[70]. KabasuraKudineer, which is a Siddha polyherbal drug, also emerged to prominence during the pandemic for traditional use against respiratory infections and fevers. Such commercialized products are attempts at mainstreaming evidence-based herbal products into pandemic control strategies [71].

Table 2: Marketed Herbal Formulations for COVID-19

Product Name	Key Ingredients	Country of Origin	Claimed Benefits	Reference
LianhuaQingwen	Forsythia, Honeysuckle, Rhubarb	China	Antiviral, Symptom Relief	[72]
NRICM101	Scutellaria, Houttuynia, Licorice	Taiwan	Antiviral, Immunomodulatory	[73]
Coronil	Ashwagandha, Giloy, Tulsi	India	Immunity Boosting	[74]
KabasuraKudineer (KSK)	15 Herbal Ingredients	India	Respiratory Support	[75]

Recent Research Studies and Clinical Trials

Over the last few years, more and more clinical studies have investigated the use of herbal medicines in the management and treatment of COVID-19. These clinical studies have found that herbal medicines do have potential therapeutic benefits when combined with conventional medical care [76]. A significant meta-analysis of 32 randomized controlled trials (RCTs) involving an estimated 3,177 patients discovered that adding herbal interventions to standard treatments improved significantly the general symptoms of COVID-19, such as fever, cough, and fatigue. In addition, the interventions were for the most part well tolerated without any severe side effects reported, which indicates that they are possibly safe for clinical application [77].

Among the most researched herbal preparations is LianhuaQingwen, which is a Traditional Chinese Medicine (TCM) drug. This preparation was proven effective in lessening the time and severity of symptoms in individuals with mild COVID-19 [78]. The patients who received LianhuaQingwen presented with higher rates of recovery and lower rates of symptom worsening than control groups [79].

Likewise, NRICM101, a traditional Taiwanese herbal formula with Scutellariabaicalensis, Houttuynia cordata, and Glycyrrhiza glabra, has been found to be promising. Clinical findings suggested that NRICM101 prevented the development of early-stage COVID-19 into more severe disease forms, possibly because of its antiviral and immunomodulatory effects [80].

A number of clinical trials have been initiated in various countries to further evaluate the efficacy and safety of these and other herbal preparations. These include double-blind, placebo-controlled trials to develop high-grade evidence for regulatory and clinical decision-making [81,82]. The promising initial findings indicate that herbal medicines may be useful complementary therapies in managing COVID-19. Their advantages are particularly pertinent to settings with limited resources, in which access to cutting-edge drugs is limited. But to fully corroborate these early findings and open the door for integration of these herbal treatments into conventional treatment standards requires standardized study protocols and big-trial evaluation [83-84].

Table 3: Selected Clinical Trials on Herbal Formulations

Study Title	Herbal Intervention	Sample Size	Outcome	Reference
Efficacy of LianhuaQingwen in COVID-19	LianhuaQingwen	284	Symptom Improvement	[72]
NRICM101 for Early COVID-19 Treatment	NRICM101	120	Reduced Disease Progression	[73]
Herbal Adjunct Therapy in COVID-19	Various Herbs	3,177	Symptom Relief, No Adverse Events	[85]

Regulatory and Safety Aspects

With the worldwide interest in herbal drugs growing during the COVID-19 pandemic, greater demands were made for effective regulatory systems and safety assessments. Therapeutic potential has been exhibited by herbal preparations in treating mild to moderate symptoms of COVID-19; yet, their integration into mainstream healthcare requires close monitoring [86]

The World Health Organization (WHO) has emphasized that while traditional medicine plays a valuable role in healthcare systems worldwide, herbal remedies must undergo rigorous scientific validation to confirm their safety, efficacy, and quality [87]. Without such validation, widespread use could potentially lead to misuse or unintended adverse effects.

At the national level, governments have adopted differing strategies to regulate herbal remedies. In India, the Ministry of AYUSH (Ayurveda, Yoga & Naturopathy, Unani, Siddha, and Homeopathy) released guidelines encouraging the use of certain herbal preparations like Ashwagandha, Giloy, and Tulsi for immune enhancement and symptom relief in mild cases of COVID-19. The ministry also suggested their use under medical supervision, emphasizing the need for responsible and informed consumption[88-89].

While herbal medicines are usually safe, particularly when taken traditionally, there are a number of concerns. One of the most significant concerns is the possibility of herb-drug interactions, especially in patients who are taking antiviral drugs, corticosteroids, or anticoagulants. Some herbal constituents have the ability to modify the metabolism of drug molecules, either enhancing or inhibiting their action or inducing toxic side effects. Additionally, the absence of standardization among herbal products is another concern. Differences in plant source, cultivation practices, processing methods, and dosages can result in differences in therapeutic effects and safety profiles [90-92].

For safe incorporation of herbal medicines into public health interventions, it is imperative that such products be subjected to the same extent of scrutiny as mainstream drugs. This involves preclinical evaluation, clinical trials, quality control procedures, and Pharmacovigilance. Regulatory policies need to be fortified to ensure manufacturing standards, labeling correctness, and post-marketing safety data so that herbal remedies are both effective and dependable [93-94].

Clinical Significance

Herbal treatments have shown significant clinical utility, particularly in the case of a global pandemic such as COVID-19, where conventional medicines and sophisticated healthcare facilities are not always accessible. In most low- and middle-income nations, herbal medicine is still part of primary healthcare, and the COVID-19 pandemic underlined the significance of using these resources. Herbal treatments may be useful in controlling mild to moderate COVID-19 symptoms like fever, cough, fatigue, and respiratory distress. By boosting immunity and possibly curbing viral replication, these drugs may reduce severity and duration of illness [95-98].

Where healthcare networks have been burdened or in areas where the resources of hospital beds, oxygen, and antiviral medicines are limited, herbal interventions are a viable, low-cost complementary measure. Through their use, medical facilities' burden can be relieved by providing early, outpatient treatment for cases that are non-critical in nature. Additionally, for groups experiencing difficulties in getting vaccinated or continue to be suspicious of traditional regimens, herbal remedies offer the alternative that meets cultural practices and beliefs[99].

Nonetheless, here it should be stressed that traditional herbal treatments need not be used as alternatives for evidence-based clinical treatments, particularly in the serious or critical case of COVID-19. Instead, they are to be employed as complementary agents under proper clinical supervision in order to enhance patients' treatment benefits and public health interventions[100].

Summary and Conclusion

The COVID-19 pandemic has sparked global interest in herbal medicines, leading to a great deal of research into their potential therapeutic roles. Traditional remedies and commercially available herbal formulations have been investigated for their action on immune modulation, symptom relief, and antiviral properties. Products such as LianhuaQingwen, NRICM101, Coronil, and KabasuraKudineer have reported promising findings in clinical trials and observational studies, especially in mild to moderate illness.

Although these results are encouraging, the evidence base is still heterogeneous. Differences in study design, herbal formulation, dose, and patient populations complicate drawing firm conclusions. Thus, large-scale, standardized clinical trials are essential to validate the efficacy and safety of herbal medicines for COVID-19 treatment. In addition, regulatory systems need to guarantee product quality, consistency, and appropriate use to prevent risks like herb-drug interactions or poor-quality preparations.

In summary, herbal medicines are very promising adjunct therapies for COVID-19. When underpinned by scientific proof and regulatory support, they have the potential to add value to the therapeutic regimen, particularly in disadvantaged areas. In anticipation of future pandemics, incorporating proven herbal therapies into health systems may offer more equitable, accessible, and culturally acceptable care.

References

1. Hossain MM, Tasnim S, Sultana A, Faizah F, Mazumder H, Zou L, McKyer EL, Ahmed HU, Ma P. Epidemiology of mental health problems in COVID-19: a review. F1000Research. 2020 Jun 23;9:636.
2. Soy M, Keser G, Atagündüz P, Tabak F, Atagündüz I, Kayhan S. Cytokine storm in COVID-19: pathogenesis and overview of

anti-inflammatory agents used in treatment. Clinical rheumatology. 2020 Jul;39(7):2085-94.
3. Pollard CA, Morran MP, Nestor-Kalinoski AL. The COVID-19 pandemic: a global health crisis. Physiol Genomics. 2020;52(11):549–57.
4. Cascella M, Rajnik M, Aleem A, Dulebohn SC, Di Napoli R. Features, evaluation, and treatment of coronavirus (COVID-19) [Internet]. StatPearls - NCBI Bookshelf. 2023. Available from: https://www.ncbi.nlm.nih.gov/books/NBK554776/
5. Miguez-Rey E, Choi D, Kim S, Yoon S, Săndulescu O. Monoclonal antibody therapies in the management of SARS-CoV-2 infection. Expert Opinion on Investigational Drugs [Internet]. 2022 Jan 2;31(1):41–58. Available from: https://doi.org/10.1080/13543784.2022.2030310
6. ong Y, Shamsuddin A, Campbell H, Theodoratou E. Current COVID-19 treatments: Rapid review of the literature. Journal of Global Health. 2021 Apr 24;11.
7. Muralidas D, Yaamika H, Elumalai K, Cheriyan BV, Ramanujam SK, Shanmugam A. Traditional Chinese medicine (TCM) and nutraceuticals for the prophylaxis and treatment of COVID-19 variants: A review. Phytomed Res Med. 2023;100:100330.
8. Parham S, Kharazi AZ, Bakhsheshi-Rad HR, Nur H, Ismail AF, Sharif S, et al. Antioxidant, antimicrobial and antiviral properties of herbal materials. Antioxidants. 2020 Dec 21;9(12): 1309.
9. Al-Jamal H, Idriss S, Roufayel R, Khattar ZA, Fajloun Z, Sabatier JM. Treating COVID-19 with Medicinal Plants: Is It Even Conceivable? A Comprehensive Review. Viruses [Internet]. 2024 Feb 20;16(3):320. Available from: https://doi.org/10.3390/v16030320
10. Huang F, Li Y, Leung EL, Liu X, Liu K, Wang Q, Lan Y, Li X, Yu H, Cui L, Luo H. A review of therapeutic agents and Chinese herbal medicines against SARS-COV-2 (COVID-19). Pharmacological research. 2020 May 20;158:104929.
11. Liana D, Phanumartwiwath A. Leveraging knowledge of Asian herbal medicine and its active compounds as COVID-19 treatment and prevention. Journal of Natural Medicines [Internet]. 2021 Oct 8;76(1):20–37. Available from: https://doi.org/10.1007/s11418-021-01575-1
12. International Agency for Research on Cancer. Introduction [Internet]. Some Traditional Herbal Medicines, Some Mycotoxins, Naphthalene and Styrene - NCBI Bookshelf. 2002. Available from: https://www.ncbi.nlm.nih.gov/books/NBK326625/
13. Kadiyska T, Tourtourikov I, Dabchev K, Zlatarova A, Stoynev N, Hadjiolova R, et al. Herbs and plants in immunomodulation (Review). International Journal of Functional Nutrition [Internet]. 2023 Apr 27;4(1). Available from: https://doi.org/10.3892/ijfn.2023.31
14. Gangal N, Nagle V, Pawar Y, Dasgupta S. Reconsidering Traditional Medicinal Plants to Combat COVID-19. Molecular Biology [Internet]. 2020 Apr 15; Available from: https://doi.org/10.21467/preprints.34
15. Alam S, Sarker MMR, Afrin S, Richi FT, Zhao C, Zhou J-R and Mohamed IN (2021) Traditional Herbal Medicines, Bioactive Metabolites, and Plant Products Against COVID-19: Update on Clinical Trials and Mechanism of Actions. Front. Pharmacol. 12:671498. doi: 10.3389/fphar.2021.671498
16. Thiel V, Ivanov KA, Putics A, Hertzig T, Schelle B, Bayer S, Weißbrich B, Snijder EJ, Rabenau H, Doerr HW, Gorbalenya AE. Mechanisms and enzymes involved in SARS coronavirus genome expression. Journal of General Virology. 2003 Sep;84(9):2305-15.
17. Hui, K. P. Y. et al. Tropism, replication competence, and innate immune responses of the coronavirus SARS-CoV-2 in human respiratory tract and conjunctiva: an analysis in ex-vivo and in-vitro cultures. *Lancet Respir. Med.* https://doi.org/10.1016/S2213-2600(20)30193-4 (2020).
18. V'kovski, P., Kratzel, A., Steiner, S. *et al.* Coronavirus biology and replication: implications for SARS-CoV-2. *Nat Rev Microbiol* 19, 155–170 (2021). https://doi.org/10.1038/s41579-020-00468-6
19. Liu YX, Zhou YH, Jiang CH, Liu J, Chen DQ. Prevention, treatment and potential mechanism of herbal medicine for Corona viruses: A review. Bioengineered [Internet]. 2022 Feb 19;13(3):5480–508. Available from: https://doi.org/10.1080/21655979.2022.2036521

20. Luo L, Jiang J, Wang C, Fitzgerald M, Hu W, Zhou Y, Zhang H, Chen S. Analysis on herbal medicines utilized for treatment of COVID-19. Acta Pharmaceutica Sinica B. 2020 Jul 1;10(7):1192-204.
21. Brendler T, Al-Harrasi A, Bauer R, Gafner S, Hardy ML, Heinrich M, Hosseinzadeh H, Izzo AA, Michaelis M, Nassiri-Asl M, Panossian A. Botanical drugs and supplements affecting the immune response in the time of COVID-19: Implications for research and clinical practice. Phytotherapy Research. 2021 Jun;35(6):3013-31.
22. Panyod S, Ho CT, Sheen LY. Dietary therapy and herbal medicine for COVID-19 prevention: A review and perspective. Journal of Traditional and Complementary Medicine [Internet]. 2020 May 30;10(4):420–7. Available from: https://doi.org/10.1016/j.jtcme.2020.05.004
23. Wang L, Yang R, Yuan B, Liu Y, Liu C. The antiviral and antimicrobial activities of licorice, a widely-used Chinese herb. Acta Pharmaceutica Sinica B [Internet]. 2015 Jun 17;5(4):310–5. Available from: https://doi.org/10.1016/j.apsb.2015.05.005
24. Van De Sand L, Bormann M, Alt M, Schipper L, Heilingloh CS, Steinmann E, et al. Glycyrrhizin effectively inhibits SARS-COV-2 replication by inhibiting the viral main protease. Viruses [Internet]. 2021 Apr 2;13(4):609. Available from: https://doi.org/10.3390/v13040609
25. De Oliveira JR, Antunes BS, Nascimento GOD, De Souza Kawall JC, Oliveira JVB, Silva KGDS, et al. Antiviral activity of medicinal plant-derived products against SARS-CoV-2. Experimental Biology and Medicine [Internet]. 2022 Jul 27;247(20):1797–809. Available from: https://doi.org/10.1177/15353702221108915
26. Alhazmi HA, Najmi A, Javed SA, Sultana S, Bratty MA, Makeen HA, et al. Medicinal plants and isolated molecules demonstrating immunomodulation activity as potential alternative therapies for viral diseases including COVID-19. Frontiers in Immunology [Internet]. 2021 May 13;12. Available from: https://doi.org/10.3389/fimmu.2021.637553
27. Iweala EJ, Uche ME, Dike ED, Etumnu LR, Dokunmu TM, Oluwapelumi AE, et al. Curcuma longa (Turmeric): Ethnomedicinal uses, phytochemistry, pharmacological activities and toxicity profiles—A review. Pharmacological Research - Modern Chinese Medicine [Internet]. 2023 Jan 22;6:100222. Available from: https://doi.org/10.1016/j.prmcm.2023.100222
28. Sharifi-Rad J, Rayess YE, Rizk AA, Sadaka C, Zgheib R, Zam W, et al. Turmeric and its major compound curcumin on Health: Bioactive effects and safety profiles for food, pharmaceutical, biotechnological and medicinal applications. Frontiers in Pharmacology [Internet]. 2020 Sep 15;11. Available from: https://doi.org/10.3389/fphar.2020.01021
29. Delgado-Roche L, Mesta F. Oxidative stress as key player in severe Acute respiratory syndrome coronavirus (SARS-COV) infection. Archives of Medical Research [Internet]. 2020 Apr 30;51(5):384–7. Available from: https://doi.org/10.1016/j.arcmed.2020.04.019
30. Ullah A, Munir S, Badshah SL, Khan N, Ghani L, Poulson BG, et al. Important flavonoids and their role as a therapeutic agent. Molecules [Internet]. 2020 Nov 11;25(22):5243. Available from: https://doi.org/10.3390/molecules25225243
31. Wu J, Qiu Y, Tian M, Wang L, Gao K, Yang X, et al. Flavonoids from Scutellariabaicalensis: Promising Alternatives for Enhancing Swine Production and Health. International Journal of Molecular Sciences [Internet]. 2025 Apr 14;26(8):3703. Available from: https://doi.org/10.3390/ijms26083703
32. Hu L, Wang C, Zhang Y. Hotspots and Trends in Global Antiviral Herbal Basic Research: A Visualization analysis. European Journal of Integrative Medicine [Internet]. 2024 Nov 5;72:102419. Available from: https://doi.org/10.1016/j.eujim.2024.102419
33. Intharuksa A, Arunotayanun W, Yooin W, Sirisa-Ard P. A Comprehensive Review of Andrographis paniculata (Burm. f.) Nees and Its Constituents as Potential Lead Compounds for COVID-19 Drug Discovery. Molecules [Internet]. 2022 Jul 13;27(14):4479. Available from: https://doi.org/10.3390/molecules27144479
34. Chidambaram K. Antiviral efficacy of Andrographis paniculata and andrographolides: A narrative review. Asian Pacific Journal of Tropical Biomedicine [Internet]. 2024 Nov 1;14(11):461–76.

Available from: https://doi.org/10.4103/apjtb.apjtb_751_23
35. Kongsomros S, Boonyarattanasoonthorn T, Phongphaew W, Kasorndorkbua C, Sunyakumthorn P, Im-Erbsin R, et al. In vivo evaluation of Andrographis paniculata and Boesenbergia rotunda extract activity against SARS-CoV-2 Delta variant in Golden Syrian hamsters: Potential herbal alternative for COVID-19 treatment. Journal of Traditional and Complementary Medicine [Internet]. 2024 May 16;14(6):598–610. Available from: https://doi.org/10.1016/j.jtcme.2024.05.004
36. Wanaratna K, Leethong P, Inchai N, Chueawiang W, Sriraksa P, Tabmee A, et al. Efficacy and safety of Andrographis paniculata extract in patients with mild COVID-19: A randomized controlled trial. medRxiv (Cold Spring Harbor Laboratory) [Internet]. 2021 Jul 11; Available from: https://doi.org/10.1101/2021.07.08.21259912
37. Li J, Xu D, Wang L, Zhang M, Zhang G, Li E, et al. Glycyrrhizic acid inhibits SARS-COV-2 infection by blocking spike Protein-Mediated cell attachment. Molecules [Internet]. 2021 Oct 9;26(20):6090. Available from: https://doi.org/10.3390/molecules26206090
38. Diomede L, Beeg M, Gamba A, Fumagalli O, Gobbi M, Salmona M. Can antiviral activity of licorice help fight COVID-19 infection? Biomolecules [Internet]. 2021 Jun 8;11(6):855. Available from: https://doi.org/10.3390/biom11060855
39. Rizvi ZA, Babele P, Sadhu S, Madan U, Tripathy MR, Goswami S, et al. Prophylactic treatment of Glycyrrhiza glabra mitigates COVID-19 pathology through inhibition of pro-inflammatory cytokines in the hamster model and NETosis. Frontiers in Immunology [Internet]. 2022 Sep 27;13. Available from: https://doi.org/10.3389/fimmu.2022.945583
40. Rapti E, Adamantidi T, Efthymiopoulos P, Kyzas GZ, Tsoupras A. Potential Applications of the Anti-Inflammatory, Antithrombotic and Antioxidant Health-Promoting Properties of curcumin: A Critical review. Nutraceuticals [Internet]. 2024 Oct 11;4(4):562–95. Available from: https://doi.org/10.3390/nutraceuticals4040031
41. Vollbracht C, Kraft K. Oxidative Stress and Hyper-Inflammation as major drivers of Severe COVID-19 and Long COVID: Implications for the benefit of High-Dose Intravenous Vitamin C. Frontiers in Pharmacology [Internet]. 2022 Apr 29;13. Available from: https://doi.org/10.3389/fphar.2022.899198
42. Fessler SN, Chang Y, Liu L, Johnston CS. Curcumin Confers Anti-Inflammatory Effects in Adults Who Recovered from COVID-19 and Were Subsequently Vaccinated: A Randomized Controlled Trial. Nutrients [Internet]. 2023 Mar 23;15(7):1548. Available from: https://doi.org/10.3390/nu15071548
43. Chaudhary A, Das R, Mehta K, Mehta DK. Indian herb Tinospora cordifolia and Tinospora species: Phytochemical and therapeutic application. Heliyon [Internet]. 2024 May 1;10(10):e31229. Available from: https://doi.org/10.1016/j.heliyon.2024.e31229
44. Gupta A, Gupta P, Bajpai G. Tinospora cordifolia (Giloy): An insight on the multifarious pharmacological paradigms of a most promising medicinal ayurvedic herb. Heliyon [Internet]. 2024 Feb 1;10(4):e26125. Available from: https://doi.org/10.1016/j.heliyon.2024.e26125
45. Liao H, Ye J, Gao L, Liu Y. The main bioactive compounds of Scutellariabaicalensis Georgi. for alleviation of inflammatory cytokines: A comprehensive review. Biomedicine & Pharmacotherapy [Internet]. 2020 Nov 18;133:110917. Available from: https://doi.org/10.1016/j.biopha.2020.110917
46. Silva MJA, Ribeiro LR, Gouveia MIM, Marcelino BDR, Santos CSD, Lima KVB, et al. Hyperinflammatory response in COVID-19: A Systematic review. Viruses [Internet]. 2023 Feb 16;15(2):553. Available from: https://doi.org/10.3390/v15020553
47. Batool S, Chokkakula S, Jeong JH, Baek YH, Song MS. SARS-COV-2 drug resistance and therapeutic approaches. Heliyon [Internet]. 2025 Jan 1;11(2):e41980. Available from: https://doi.org/10.1016/j.heliyon.2025.e41980
48. Siripongboonsitti T, Ungtrakul T, Tawinprai K, Auewarakul C, Chartisathian W, Jansala T, et al. Efficacy of Andrographis paniculata extract treatment in mild to moderate COVID-19 patients being treated with favipiravir: A double-blind, randomized, placebo-controlled study (APFaVi trial). Phytomedicine. 2023;101:155018. doi: 10.1016/j.phymed.2023.155018.
49. van de Sand L, Bormann M, Alt M, Schipper L, Heilingloh CS, Steinmann E, et al. Glycyrrhizin effectively inhibits SARS-CoV-2 replication by inhibiting the viral main

protease. Viruses. 2021;13(4):609. doi: 10.3390/v13040609.
50. Akaberi M, Sahebkar A, Emami SA. Turmeric and Curcumin: From Traditional to Modern Medicine. In: Sahebkar A, editor. Therapeutic Applications of Curcumin. 1st ed. Cham: Springer; 2021. p. 11-28. doi: 10.1007/978-3-030-56153-6_2.
51. Khan MB, Rathi B. Tinospora Cordifolia - An immunomodulatory drug in Ayurveda for prevention and treatment of COVID-19. Int J Res Pharm Sci. 2020;11(SPL1):1695-1699. doi: 10.26452/ijrps.v11iSPL1.4194.
52. Zandi K, Musall K, Oo A, Cao D, Liang B, Hassandarvish P, et al. Baicalein and Baicalin inhibit SARS-CoV-2 RNA-dependent-RNA polymerase. Microorganisms. 2021;9(5):893. doi: 10.3390/microorganisms9050893.
53. Panda AK, Kar S, Rai AK, Rao BC, Srikanth N. AYUSH-64: A potential therapeutic agent in COVID-19. Journal of Ayurveda and Integrative Medicine. 2022 Apr 1;13(2):100538.
54. Acharyya A. Prospect of Ayurveda System of Medicine in recent COVID-19 Pandemic in India. International Journal of Ayurveda and Traditional Medicine. 2020 Jun 8;2(2):26-9.
55. Gupta PK, Sonewane K, Rajan M, Patil NJ, Agrawal T, Banerjee ER, Chauhan NS, Kumar A. Scientific rationale of Indian AYUSH Ministry advisory for COVID-19 prevention, prophylaxis, and immunomodulation. Advances in Traditional Medicine. 2023 Jun;23(2):321-45.
56. Vachher M, Yadav S, Rastogi A, Tihara S, Kumar B, Arora T, Burman A. Consumption of natural products and Ayurvedic decoctions "Kadha" as immunity-boosting measures during the spread of covid-19 in Delhi. Journal of Drug Research in Ayurvedic Sciences. 2022 Jul 1;7(3):192-9.
57. Bhattacharya R, Bose D, Maqsood Q, Gulia K, Khan A. Recent advances on the therapeutic potential with Ocimum species against COVID-19: A review. South African Journal of Botany. 2024 Jan 1;164:188-99.
58. Tripathi, A.K., Ray, A.K. & Mishra, S.K. Molecular and pharmacological aspects of piperine as a potential molecule for disease prevention and management: evidence from clinical trials. *Beni-Suef Univ J Basic Appl Sci* **11**, 16 (2022). https://doi.org/10.1186/s43088-022-00196-1
59. Utami AT, Qarrah AG. Benefi ts of Ginger as Medicine for COVID-19: Literature Study. Journal ISSN. 2022;2766:2276.
60. Aswani BS, Sajeev A, Hegde M, Kunnumakkara AB. Cinnamon: health benefits and its potential role in prevention and treatment of COVID-19. In Cinnamon 2025 Jan 1 (pp. 263-288). Academic Press.
61. Chen JT, Ostermann M. Review of Anti-inflammatory and Antiviral Therapeutics for Hospitalized Patients Infected with Severe Acute Respiratory Syndrome Coronavirus 2. Critical Care Clinics [Internet]. 2022 Feb 14;38(3):587–600. Available from: https://doi.org/10.1016/j.ccc.2022.02.002
62. Mikulska P, Malinowska M, Ignacyk M, Szustowski P, Nowak J, Pesta K, et al. Ashwagandha (Withaniasomnifera)—Current Research on the Health-Promoting Activities: A Narrative Review. Pharmaceutics [Internet]. 2023 Mar 24;15(4):1057. Available from: https://doi.org/10.3390/pharmaceutics15041057
63. Munot NM, Jadhav NY, Phuge AN, Dawange SD, Jain KS. Enhancing immune responses to combat viral infections: A Phytoconstituents approach. Biosciences Biotechnology Research Asia [Internet]. 2025 Mar 25;22(1):73–94. Available from: https://doi.org/10.13005/bbra/3342
64. Prajapati SK, Malaiya A, Mishra G, Jain D, Kesharwani P, Mody N, et al. An exhaustive comprehension of the role of herbal medicines in Pre- and Post-COVID manifestations. Journal of Ethnopharmacology [Internet]. 2022 May 31;296:115420. Available from: https://doi.org/10.1016/j.jep.2022.115420
65. Zhang L, Ma Y, Shi N, Tong L, Liu S, Ji X, et al. Effect of QingfeiPaidu decoction combined with Western medicine treatments for COVID-19: A systematic review and meta-analysis. Phytomedicine [Internet]. 2022 May 15;102:154166. Available from: https://doi.org/10.1016/j.phymed.2022.154166
66. Ren W, Ma Y, Wang R, Liang P, Sun Q, Pu Q, et al. Research Advance on QingfeiPaidu Decoction in prescription principle, mechanism analysis and clinical application. Frontiers in Pharmacology [Internet]. 2021 Jan 27;11. Available from: https://doi.org/10.3389/fphar.2020.589714
67. Zhan YQ, Chen RF, Zheng QS, Li XW, Liu YN, Mootsikapun P, et al. Efficacy and safety of LianhuaQingwen capsules combined with

standard of care in the treatment of adult patients with mild to moderate COVID-19 (FLOSAN): protocol for a randomized, double-blind, international multicenter clinical trial. Journal of Thoracic Disease [Internet]. 2023 Apr 24;15(5):2859–72. Available from: https://doi.org/10.21037/jtd-23-281

68. Hu K, Guan WJ, Bi Y, Zhang W, Li L, Zhang B, et al. Efficacy and safety of Lianhuaqingwen capsules, a repurposed Chinese herb, in patients with coronavirus disease 2019: A multicenter, prospective, randomized controlled trial. Phytomedicine [Internet]. 2020 May 16;85:153242. Available from: https://doi.org/10.1016/j.phymed.2020.153242
69. Cheng YD, Lu C, Hsu YM, Tsai FJ, Bau DT, Tsai SC, et al. In silico and in vitro studies of Taiwan ChingguanYihau (NRICM101) on TNF-α/IL-1β-induced Human Lung Cells. Biomedicine [Internet]. 2022 Aug 28;12(3):56–71. Available from: https://doi.org/10.37796/2211-8039.1378
70. Balkrishna A, Haldar S, Singh H, Roy P, Varshney A. Coronil, a Tri-Herbal Formulation, Attenuates Spike-Protein-Mediated SARS-CoV-2 Viral Entry into Human Alveolar Epithelial Cells and Pro-Inflammatory Cytokines Production by Inhibiting Spike Protein-ACE-2 Interaction. Journal of Inflammation Research [Internet]. 2021 Mar 1;Volume 14:869–84. Available from: https://doi.org/10.2147/jir.s298242
71. Natarajan S, Anbarasi C, Sathiyarajeswaran P, Manickam P, Geetha S, Kathiravan R, Prathiba P, Pitchiahkumar M, Parthiban P, Kanakavalli K, Balaji P. KabasuraKudineer (KSK), a poly-herbal Siddha medicine, reduced SARS-CoV-2 viral load in asymptomatic COVID-19 individuals as compared to vitamin C and zinc supplementation: findings from a prospective, exploratory, open-labeled, comparative, randomized controlled trial, Tamil Nadu, India. Trials. 2021 Sep 15;22:623. doi: 10.1186/s13063-021-05583-0.
72. Liang C, Hui N, Liu Y, Qiao G, Li J, Tian L, et al. Insights into forsythia honeysuckle (Lianhuaqingwen) capsules: A Chinese herbal medicine repurposed for COVID-19 pandemic. Phytomedicine. 2021;81:100027. doi: 10.1016/j.phyplu.2021.100027.
73. Tsai K-C, Huang Y-C, Liaw C-C, Tsai C-I, Chiou C-T, Lin C-J, et al. A traditional Chinese medicine formula NRICM101 to target COVID-19 through multiple pathways: A bedside-to-bench study. Biomed Pharmacother. 2020;130:111037. doi: 10.1016/j.biopha.2020.111037.
74. Mukherjee J. Patanjali Ayurveda's Coronil: Marketing Controversy on COVID-19 Cure. J Ayub Med Coll Abbottabad. 2021;28(1):115-6. doi: 10.1177/09722629211004003.
75. Natarajan S, Anbarasi C, Sathiyarajeswaran P, Manickam P, Geetha S, Kathiravan R, Prathiba P, Pitchiahkumar M, Parthiban P, Kanakavalli K, Balaji P. Kabasura Kudineer (KSK), a poly-herbal Siddha medicine, reduced SARS-CoV-2 viral load in asymptomatic COVID-19 individuals as compared to vitamin C and zinc supplementation: findings from a prospective, exploratory, open-labeled, comparative, randomized controlled trial, Tamil Nadu, India. Trials. 2021 Dec;22:1-1.
76. Ang L, Song E, Hu XY, Lee HW, Chen Y, Lee MS. Herbal Medicine Intervention for the Treatment of COVID-19: A Living Systematic Review and Cumulative Meta-Analysis. Frontiers in Pharmacology [Internet]. 2022 Jun 20;13. Available from: https://doi.org/10.3389/fphar.2022.906764
77. Kumar A, Rai A, Khan MS, Kumar A, Haque ZU, Fazil M, et al. Role of herbal medicines in the management of patients with COVID-19: A systematic review and meta-analysis of randomized controlled trials. Journal of Traditional and Complementary Medicine [Internet]. 2022 Jan 1;12(1):100–13. Available from: https://doi.org/10.1016/j.jtcme.2022.01.002
78. Hu K, Guan WJ, Bi Y, Zhang W, Li L, Zhang B, et al. Efficacy and safety of Lianhuaqingwen capsules, a repurposed Chinese herb, in patients with coronavirus disease 2019: A multicenter, prospective, randomized controlled trial. Phytomedicine [Internet]. 2020 May 16;85:153242. Available from: https://doi.org/10.1016/j.phymed.2020.153242
79. Fan SJ, Liao JK, Wei L, Wang BY, Kai L, Tan DX. Treatment efficacy of LianhuaQingwen capsules for eraly-stage COVID-19. PubMed [Internet]. 2022 Jan 1;14(2):1332–8. Available from: https://pubmed.ncbi.nlm.nih.gov/35273735
80. Su YC, Huang GJ, Lin JG. Chinese herbal prescriptions for COVID-19 management:

Special reference to Taiwan ChingguanYihau (NRICM101). Frontiers in Pharmacology [Internet]. 2022 Oct 5;13. Available from: https://doi.org/10.3389/fphar.2022.928106

81. Koonrungsesomboon N, Sakuludomkan C, Takuathung MN, Klinjan P, Sawong S, Perera PK. Study design of herbal medicine clinical trials: a descriptive analysis of published studies investigating the effects of herbal medicinal products on human participants. BMC Complementary Medicine and Therapies [Internet]. 2024 Nov 8;24(1). Available from: https://doi.org/10.1186/s12906-024-04697-7
82. Rossignol JF, Bardin MC, Fulgencio J, Mogelnicki D, Bréchot C. A randomized double-blind placebo-controlled clinical trial of nitazoxanide for treatment of mild or moderate COVID-19. EClinicalMedicine [Internet]. 2022 Feb 28;45:101310. Available from: https://doi.org/10.1016/j.eclinm.2022.101310
83. Demeke CA, Woldeyohanins AE, Kifle ZD. Herbal medicine use for the management of COVID-19: A review article. Metabolism Open [Internet]. 2021 Oct 19;12:100141. Available from: https://doi.org/10.1016/j.metop.2021.100141
84. Zhang AL, Xue CC, Fong HHS. Integration of Herbal Medicine into Evidence-Based Clinical Practice [Internet]. Herbal Medicine - NCBI Bookshelf. 2011. Available from: https://www.ncbi.nlm.nih.gov/books/NBK92760/
85. **Kumar A, Rai A, Khan MS, Kumar A, Haque ZU, Fazil M, Rabbani G.** Role of herbal medicines in the management of patients with COVID-19: A systematic review and meta-analysis of randomized controlled trials. **J Tradit Complement Med.** 2022;12(4):562–574. doi:10.1016/j.jtcme.2022.01.002.
86. Onyeaghala AA, Anyiam AF, Husaini DC, Onyeaghala EO, Obi E. Herbal supplements as treatment options for COVID-19: A call for clinical development of herbal supplements for emerging and re-emerging viral threats in Sub-Saharan Africa. Scientific African [Internet]. 2023 Mar 5;20:e01627. Available from: https://doi.org/10.1016/j.sciaf.2023.e01627
87. World Health Organization. WHO guidelines on safety monitoring of herbal medicines in pharmacovigilance systems [Internet]. 2004. Available from: https://iris.who.int/bitstream/handle/10665/43034/9241592214_eng.pdf?sequence=1
88. Ministry of Ayush [Internet]. Available from: https://ayush.gov.in/#!/
89. Ministry of Ayush [Internet]. Available from: https://ayush.gov.in/#!/aboutus
90. Ye L, Fan S, Zhao P, Wu C, Liu M, Hu S, et al. Potential herb–drug interactions between anti-COVID-19 drugs and traditional Chinese medicine. Acta Pharmaceutica Sinica B [Internet]. 2023 Jun 5;13(9):3598–637. Available from: https://doi.org/10.1016/j.apsb.2023.06.001
91. Wang H, Chen Y, Wang L, Liu Q, Yang S, Wang C. Advancing herbal medicine: enhancing product quality and safety through robust quality control practices. Frontiers in Pharmacology [Internet]. 2023 Sep 25;14. Available from: https://doi.org/10.3389/fphar.2023.1265178
92. Wang H, Chen Y, Wang L, Liu Q, Yang S, Wang C. Advancing herbal medicine: enhancing product quality and safety through robust quality control practices. Frontiers in Pharmacology [Internet]. 2023 Sep 25;14. Available from: https://doi.org/10.3389/fphar.2023.1265178
93. Mssusa AK, Holst L, Kagashe G, Maregesi S. Safety profile of herbal medicines submitted for marketing authorization in Tanzania: a cross-sectional retrospective study. Journal of Pharmaceutical Policy and Practice [Internet]. 2023 Nov 20;16(1). Available from: https://doi.org/10.1186/s40545-023-00661-x
94. Thakkar S, Anklam E, Xu A, Ulberth F, Li J, Li B, et al. Regulatory landscape of dietary supplements and herbal medicines from a global perspective. Regulatory Toxicology and Pharmacology [Internet]. 2020 Apr 16;114:104647. Available from: https://doi.org/10.1016/j.yrtph.2020.104647
95. Silveira D, Prieto-Garcia JM, Boylan F, Estrada O, Fonseca-Bazzo YM, Jamal CM, et al. COVID-19: Is there evidence for the use of herbal medicines as adjuvant symptomatic therapy? Frontiers in Pharmacology [Internet]. 2020 Sep 23;11. Available from: https://doi.org/10.3389/fphar.2020.581840
96. Mahmoud K, Jaramillo C, Barteit S. Telemedicine in Low- and Middle-Income Countries During the COVID-19 Pandemic: A scoping review. Frontiers in Public Health

[Internet]. 2022 Jun 22;10. Available from: https://doi.org/10.3389/fpubh.2022.914423
97. Barber MS, Barrett R, Bradley RD, Walker E. A naturopathic treatment approach for mild and moderate COVID-19: A retrospective chart review. Complementary Therapies in Medicine [Internet]. 2021 Nov 6;63:102788.
98. National Academies Press (US). Factors that affect Health-Care utilization [Internet]. Health-Care Utilization as a Proxy in Disability Determination - NCBI Bookshelf. 2018. Available from: https://www.ncbi.nlm.nih.gov/books/NBK500097/
99. Arce JSS, Warren SS, Meriggi NF, Scacco A, McMurry N, Voors M, et al. COVID-19 vaccine acceptance and hesitancy in low- and middle-income countries. Nature Medicine [Internet]. 2021 Jul 16;27(8):1385–94.
100. Ng JY, Liu S, Maini I, Pereira W, Cramer H, Moher D. Complementary, alternative, and integrative medicine-specific COVID-19 misinformation on social media: A scoping review. Integrative Medicine Research [Internet]. 2023 Jul 13;12(3):100975.

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