Chapter 2

Plants in the fight against COVID-19: a predictive analysis

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Abstract: Present study explores the potential of medicinal plants in combating COVID-19, as compiled from a survey of all available literature and field from 2020-2025, highlighting their antiviral properties and bioactive compounds that may inhibit SARS-CoV-2 replication and modulate the immune response. Through a predictive analysis, we identify promising plant species and compounds, such as ginger (*Zingiber officinale*), turmeric (*Curcuma longa*), giloy (*Tinospora cordifolia*) and chireta (*Andrographis paniculata*), that may offer therapeutic benefits against COVID-19. The chapter focuses on the mechanisms of action, potential applications, and future research directions for plant-derived compounds in the fight against COVID-19, providing insights into their possible role in preventive and therapeutic strategies.

Keywords: Immunity, indigenous knowledge, medicinal plants, therapeutic

Introduction

In 2019, it is marked as the COVID-19 era, where it started and created chaos in the world. Coronavirus disease 2019 (COVID-19) is a contagious disease caused by the coronavirus SARS-CoV-2. In January 2020, the disease spread worldwide, resulting in the COVID-19 pandemic. COVID-19 creates havoc globally, causing

widespread illness, death, and disruption to economies, societies, and daily life. The pandemic triggered unprecedented lockdowns, disrupting mobility, economies, and livelihoods. Overwhelmed healthcare systems struggled under immense pressure, while social distancing reshaped human interaction. The global race for vaccine development showcased the power of scientific collaboration. Ultimately, the crisis underscored the vital need for global solidarity, strong public health systems, and preparedness for future pandemics (McCloskey and Heymann, 2020). The COVID-19 pandemic exposed the limits of conventional ethnomedicine in addressing global health emergencies, igniting renewed interest in alternative and indigenous traditional healing practices (Nyirenda, 2025). The World Health Organization (WHO) acknowledges traditional medicine's potential in symptom management, emphasizing the need for further research to validate its efficacy and integration into mainstream healthcare (Rao et al., 2024). The role of medicinal plants plays a vital role as an immune booster to protect our body against various ailments (Gasmi et al., 2023). During the COVID-19 pandemic, some major medicinal plants were prescribed as *Phyllanthus emblica* (Amla) has been recognized for its potential immune boosting properties, particularly in traditional formulations like Chyawanprash (Varnasseri et al., 2022). Amla supplementation may offer benefits as an adjunctive therapy to support immune function in COVID-19 patients, potentially enhancing their resilience and recovery (Varnasseri et al., 2022). Another preliminary research suggests that *Tinospora cordifolia* (Giloy) supplementation may enhance immune resilience in individuals with mild COVID-19, potentially supporting recovery and reducing symptom severity (Gupta et al., 2024). Further studies are needed to confirm these findings and establish optimal dosing and treatment protocols (Deepti et al., 2021; Rao et al., 2024). One of the oldest Turmeric-infused milks, a traditional remedy, is often recommended for its potential as an immunity booster (Chandra et al., 2023; Jige, 2022). Another milestone, the oldest medicinal plants, such as *Zingiber officinale* (Ginger), are used to relieve nausea and cough (Aher, 2021). Recognizing the significance of these medicinal plants in treating respiratory ailments, a checklist has been prepared to aid in managing COVID-19 and similar health challenges in the present and future.

Methodology

Through a literature survey, data was gathered from Scopus, Web of Science, Springer, PubMed, Chem Spider, Elsevier, BioMed Central Google Scholar, using the search terms like "Plants used for COVID-19", "Ethnomedicinal uses", "COVID-19", "mode of uses", MDPI, Science Direct, SciFinder, Scirus, and Scientific Electronic Library Online (SciELO) from 2020-2025 (Kumar, 2025). The collected data was presented in this chapter.

Results and discussion

Harnessing the therapeutic potential of herbal formulations and medicinal plants can be an effective approach, given their historical use and the significant contribution of plant-derived compounds to modern medicine, offering a valuable resource for addressing health challenges. According to table 1, it is concluded that some medicinal plants are used for COVID-19 across India (Table 1). In this table, a total of 50 plant species is documented through various literature reviews. The compilation of medicinal plants and their bioactive compounds reveal a vast array of potential therapeutic applications, particularly in the context of managing COVID-19 symptoms and boosting immunity. Plants like *Withania somnifera*, *Tinospora cordifolia*, and *Phyllanthus emblica* have been traditionally used for their immunomodulatory properties, while compounds such as curcumin from *Curcuma longa* and artemisinin from *Artemisia annua* have shown promise in addressing various health issues. The presence of flavonoids, terpenoids, and phenolic compounds in these plants contributes to their antioxidant, anti-inflammatory, and antimicrobial activities, which can be beneficial in mitigating the severity of COVID-19 symptoms. The analysis highlights the potential of these medicinal plants as adjunctive therapies for COVID-19 management, particularly in enhancing immune response and alleviating symptoms like cough, fever, and respiratory issues. For instance, *Piper betle* and *Zingiber officinale* have been noted for their antiviral and anti-inflammatory properties, which could be valuable in managing viral infections. Further research is warranted to validate the efficacy and optimal dosing of these plant-derived compounds, as well as their potential interactions with conventional medications. Integrating traditional knowledge with



modern scientific approaches enables these medicinal plants to play a vital role in supporting public health during the pandemic and beyond.

Table 1: Some medicinal plants used for COVID-19 in India

Botanical name	Part(s) used	Active compound(s)	Health problems	Source(s)
Abelmoschus esculentus (L.) Moench	Fruits	Carbohydrates, protein, fat, fiber, minerals, vitamins and flavonoid	Diabetes	Thangjam et al., (2024); Sreenivas, (2024)
Acorus calamus L.	Leaves, flowers and rhizome	Tatanan, b-asarone and a-asarone	Sore throat and fever	Mishra et al., (2023); Thangjam et al., (2024)
Aegle marmelos (L.) Corrêa	Fruits	Flavone, auraptene, cumin aldehyde, Fagarine, eugenol and rutin	Stomach disorders and blood pressure	Monika et al., (2023); Thangjam et al., (2024)
Ailanthus altissima (Mill.) Swingle	Leaves and bark	quassinoids, alkaloids, terpenoids, lignans and coumarins	Coughs, fever and respiratory infections	Sharma et al., (2025); Zhang et al., (2025)
Allium cepa L.	Bulbs	Flavonoids, sulfur compounds s-propyl crystcinesulfoide and cycloallin	Cold	Vhalgade et al., (2022)
Allium sativum L.	Bulbs	Allicin, alliin, ajoenes, and vinyl dithiins	Cold	Chandra et al., (2023)
Alpinia galanga (L.) Willd.	Rhizomes	Flavonoids, phenolic acids and terpenoids	Skin diseases	Cahyono et al., (2023); Thangjam et al., (2024)
Andrographis paniculata (Burm.f.) Wall. ex Nees	Leaves	Isoandrograpaholide, diterpenoids and flavonoids	Diabetes and blood pressure	Purohit, (2021); Chandra et al., (2023)
Artemisia annua L.	Leaves	Artemisinin	Diarrhea	Verma et al., (2021)

Artemisia capillaris Thunb.	Leaves	Capillarisin (flavone)	Immunity booster	Bajpayee and Ashaq, (2024)
Azadirachta indica A.Juss.	Leaves, root, bark, stem and bark	Deacetyl-3-cinnamoyiazadirachtin	Immunity booster	Vhalgade et al., (2022)
Capsicum annuum L.	Fruits	Capsaicin	Colds and cough	Sharma et al., (2025)
Carica papaya L.	Fruits	Catechin, kaempferol and apigenin	Blood pressure and stomach problems	Verma et al., (2021)
Carissa spinarum L.	Leaves, fruits and stem	Alkaloids, tannin, glycosides, saponins, terpenoids, flavonoids and steroids	Viral infection	Babu et al., (2021)
Celastrus paniculatus Willd.	Fruits, seeds and leaves	Alkaloids, glycosides, proteins & amino acids, phenolic compounds and tannins	Immunity booster	Gautam, (2024)
Centella asiatica (L.) Urb. (Figure 3)	Leaves	Triterpenoids, polyacetylenes and benzoic ester	Neurological problem and immunity booster	Purohit, (2021); Maya et al., (2021)
Cinnamomum verum J.Presl	Bark	eugenol, cinnamaldehyde, cinnamyl acetate, copane, cinnamic acid, cinnamate, cinnamaldehyde and camphor	Diabetes	Chandra et al., (2023)
Cissampelos pareira L. (Figure 1)	Leaves	Salutaridine, cissamine, pareirarine and magnoflorine.	Vital infection and immunity booster	Verma et al., (2021)
Clitoria ternatea L.	Flowers, leaves, and pods	Phenolic compounds, anthocyanins, and flavanols	Cold	Purohit, (2021); Chun et al., (2023)
Colocasia esculenta (L.) Schott	Stem and roots	Flavonoids, terpenoid, phenols, alkaloid, saponin and thiamine	Dysentery	Jain et al., (2023); Thangjam et al., (2024)

Curcuma caesia Roxb.	Rhizomes	Curcumin	Fever, cold and cough	Bormann et al., (2021); Thangjam et al., (2024)
Curcuma longa L.	Rhizomes	Alkaloids, steroids, saponins, glycosies, curcumene and curcone	Immunity booster	Vhalgade et al., (2022)
Cymbopogon citratus (DC.) Stapf	Leaves	Alkaloids, terpenoids, flavonoids, phenols, saponins and tannins	Hair care	Watuguly et al., (2022); Thangjam et al., (2024)
Eryngium foetidum L.	Leaves and roots	Carotenoids, flavonoids, and phenols	High blood pressure and stomach disorders	Rodrigues et al., (2022); Thangjam et al., (2024)
Foeniculum vulgare Mill.	Seeds, leaves and bulbs	Pyridoxine, niacin, thiamine and riboflavin	Viral infection	Purohit, (2021); Ardakan et al., (2024)
Glycyrrhiza glabra L.	Stolon	Glycyrrhizic acid	Immunity booster	Purohit, (2021); Babu et al., (2021)
Hedychium coronarium J.Koenig	Rhizome and leaves	Eucalyptol, β-pinene, linalool and coronarin-e rich	Cough and fever	Ray et al., (2018); Thangjam et al., (2024)
Hibiscus sabdariffa L.	Leaves and fruits	Anthocyanins	Immunity booster	Bajpayee and Ashaq, (2024)
Houttuynia cordata Thunb.	Leaves and rhizome	Alkaloids, polyphenols and flavonoids	Dysentery and stomach disorders	Thangjam et al., (2024); Gurung et al., (2021)
Lippia javanica (Burm.f.) Spreng.	Leaves	Flavonoids, alkaloids, polyphenols, and terpenoids	Cough and influenza	Maroyi, (2017); Rankoana, (2021)
Mentha spicata L.	Leaves	Flavonoids, limonene, cineole, methone and carvone	Gastric and mouth ulcers	Chakraborty et al., (2022); Thangjam et al., (2024)
Mimosa pudica L.	Leaves and roots	Alkaloids, sterols, glycosides, mucilages, flavonoids, tannins,	Piles and urinary tract infection	Thangjam et al., (2024); Rawat et al., (2024)

		non- protein amino acids, flavonoid C-glycosides and terpenoids and fatty acids		
Moringa oleifera Lam.	Leaves and fruit	Quercetin and chlorogenic acid	Immunity booster	Rao et al., (2024)
Morus alba L.	Fruits	Kuwanon S, mulberroside C, cyclomorusin and hydroperoxide	Diarrhoea	Vhalgade et al., (2022)
Nigella sativa L.	Seeds	Terpenes like thymol, carvacrol, dithymoquinone and thymohydroquinone	Stomach disorder	Chandra et al., (2023)
Nyctanthes arbor-tristis L.	Flowers and leaves	Arborside-C, beta amyrin and beta-sitosterol	Respiratory infections and promoting better sleep	Albiheyri et al., (2024); Sharma et al., (2025)
Ocimum tenuiflorum L.	Leaves and seeds	Caffeic acid, luteolin, apigenin, eugenol and limonen	Fever, cough and cold	Vhalgade et al., (2022)
Phyllanthus emblica L.	Fruits	Tannins, flavonoids, saponins and terpenoids	Immunity booster	Purohit, (2021)
Piper betle L.	Leaves	Phenolic compounds, flavonoids, terpenoids, eugenol, hydroxychavicol, chavibetol and tannins	Viral infections	Purohit, (2021); Fatimawali et al., (2022)
Piper nigrum L.	Fruits	Flavonoids, terpenes, phenolics and sterols	Cold and cough	Syed, (2020); Purohit, (2021)
Punica granatum L.	Leaves	Ellagic acid	Diarrhoea and dysentery	Alexova et al., (2023); Thangjam et al., (2024)
Solanum nigrum L.	Fruits	Glycoalkaloids like solanine, solamargine and solasodine	Stomach disorders	Deepti et al., (2021); Sharma et al., (2023)

Solanum virginianum L.	Fruits	Arabinogalactan, chlorogenic and caffeic acid, khasianine, solasonine, solamargine, beta-solamargine, solanocarpine, and solanocarpidine	Fever, sore throat and ulcer	Chidambaram et al., (2022); Thangjam et al., (2024)
Syzygium aromaticum (L.) Merr. & L.M.Perry	Flowers	Eugenol and β-caryophyllene	Toothache	Thangjam et al., (2024); Muhmood et al., (2025)
Terminalia arjuna (Roxb. ex DC.) Wight & Arn.	Bark	Flavonoids, tannins and minerals	Diabetes and immunity booster	Purohit, (2021); Wanarase et al., (2022)
Terminalia bellirica (Gaertn.) Roxb.	Bark, fruits and gum	Glucoside, tannins, gallic acid, corilagin and ellagic acid	Immunity booster	Gupta et al., (2020); Purohit, (2021)
Tinospora cordifolia (Willd.) Hook.f. & Thomson (Figure 2)	Stem and leaves	Berberine, tinosporin, palmatine, tembetarine, choline and isocolumbin	Immunity booster	Purohit, (2021); Chandra et al., (2023)
Withania somnifera (L.) Dunal (Figure 4)	Roots and leaves	Flavonoids, alkaloids, fatty acid and phenolic compound	immunity booster and helps manage stress	Vhalgade et al., (2022); Omer, (2022)
Zanthoxylum armatum DC.	Leaves and seeds	phenolic compounds viz., chlorogenic acid, trans-ferulic acid and gallic acid	Indigestion and cough	Chelleng et al., (2023); Thangjam et al., (2024)
Zingiber officinale Roscoe	Rhizomes	Gingerols, quercetin, zingerone and alphcurcumene	Cough, Arthritis and colds	Purohit, (2021); Vhalgade et al., (2022)



Figure 1: Leaves, fruits, and flower of *C. pariera*



Figure 2: Fruits of *T. cordifolia*



Figure 3: Leaves of *C. asiatica*



Figure 4: Leaves and flowers of *W. somnifera*

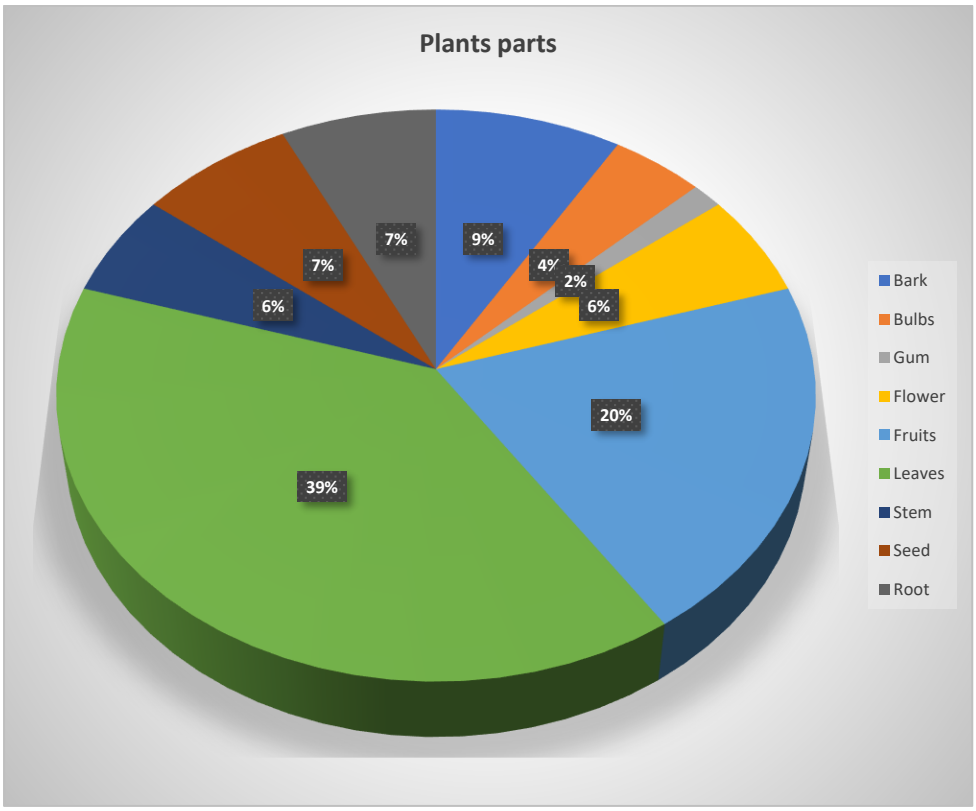


Figure 5: Illustrated pie chart of plants parts used to treat COVID-19

According to the illustrated pie chart, it revealed that most plant parts were used such as leaves, fruit, rhizome, bark, seed, root, flower, bulbs, and gum (Figure 5). The dominant parts are used as leaves in the form of decoction, infusion, juice, raw and paste. After COVID-19 common people give more importance to medicinal plants to boost immunity and to fight against common ailments (Figure 6). After COVID-19, many people have turned to Ayurveda as a complementary approach to support their recovery and overall well-being. This shift can be attributed to Ayurveda's holistic focus on enhancing immunity, managing symptoms, and promoting long-term health through natural remedies and lifestyle modifications. Ayurvedic herbs like *Withania somnifera*, Tulsi, and Turmeric are known for their immune-boosting, anti-inflammatory, and antioxidant properties, which can help alleviate lingering symptoms such as fatigue, respiratory issues, and stress. While Ayurveda offers potential benefits, it's essential to use these remedies under proper guidance to ensure they complement conventional medical treatments effectively.

Integrating Ayurveda with standard care may provide a more comprehensive approach to recovery and health maintenance. Due to the present lifestyle, people need more attention towards health beacause some common diseases can also lead to death nowadays.



Figure 6: Illustration of mostly consumed Ayurvedic Powders, Tablets, and Oils for COVID-19 Health Issues

Conclusion

The diverse array of bioactive compounds identified in these plants, such as flavonoids, alkaloids, and terpenoids, contributes to their therapeutic properties, ranging from anti-inflammatory and antioxidant activities to antimicrobial and immunomodulatory effects. Plants like *Withania somnifera*, *Tinospora cordifolia*, and *Phyllanthus emblica* stand out for their immune-boosting capabilities, while others, such as *Zingiber officinale* and *Piper betle*, show promise in managing respiratory infections. By leveraging traditional knowledge and modern scientific research, these medicinal plants could play a crucial role in developing complementary approaches to health management, particularly in the context of

infectious diseases and immune-related disorders. Further studies are essential to fully harness their potential and ensure safe and effective use.

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