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Use of Giloy (*Tinospora cordifolia*) as an Herbal Medicine in Targeting Novel Corona Virus (Sars-Cov -2)

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ABSTRACT

The world is facing a new public health catastrophe with the emergence and spread of 2019 novel corona virus which causes severe acute respiratory syndrome COVID-19. COVID-19 (Coronavirus disease 2019) is a transmissible disease initiated and spread through a new virus strain SARS-CoV-2 (Severe Acute Respiratory Syndrome Coronavirus-2) since 31st December 2019 in Wuhan city of China. Infection of this virus spread globally to millions of people. The current consequences of novel corona virus have created a global crisis due to lacking of any vaccine or drug that can effectively work against this deadly virus. A wide variety of drugs (including natural herbal medicines with well-known therapeutic importance) have been explored by the scientists. As the structural components (spike proteins) and gene sequence of Corona virus have already been characterized therefore the systematic trial of drugs and especially herbal medicines and phytochemical agents has become possible. The main key CoV protease enzyme of COVID-19 virus is M^{pro} or 3CL^{pro}. It is an excellent drug target as it plays a major role in mediating viral replication and transcription. Molecular docking is a significant tool to control this virus as most of the studies showed the beneficial roles of phytochemical agents present in the herbs in India. Ayurvedic herbs such as *Withania somnifera* (Ashwagandha), *Tinospora cordifolia* (Giloy), *Curcuma zadoaria* (Haldi), *Zingiber officinale* (Ginger), *Syzygium aromaticum* (Clove), *Elettaria cardamomum* (Cardamom), *Citrus x limon* (lemon) and *Ocimum sanctum* (Tulsi) *Piper nigrum* (Black pepper) etc. are broadly used for the preparation of Ayurvedic medicine. Recent studies suggested that active phytochemicals from these medicinal plants could potentially inhibit M^{pro} of SARS-CoV-2. These herbs are really advantageous to effectively cure the respiratory problems such as cough, cold and flu in Covid-19. Molecular docking also specifies that the phytochemicals present in these herbs possess anti-inflammatory properties and preparations made from these herbs can also boost individual's immunity. This article aims to review the vast progress in this emerging field with special emphases on the use of medicinal herbs to fight against Corona virus.

Key words: COVID-19, Corona virus, Phytochemicals, SARS-CoV-2, M^{pro} Protein

As we are writing this sentence, cases of COVID-19 (Coronavirus disease 19) are continuously increasing across the globe. As we know about the world wide epidemic. Last year and this year also Schools/Colleges were closed, roads closed, cities closed, hospitals over crowded with covid patients, people were and still in a panic as we are expecting third wave of COVID-19. Maintaining social distance, sanitizing and mask wearing practices are much needed today. This time is very critical for our health and as well as

for financial problems of peoples for surviving. As long as we keep our digestive fire (called 'agni' in Ayurveda) strong and alive we can survive in corona. Ayurveda has a great way of prevention.

COVID-19 has now become a pandemic worldwide affecting mostly all countries globally. It is an infectious disease with a high potential for transmission for human-to-human close contacts through the respiratory droplets (such as coughing) and by fomites that can propagate through air at a minimum distance of 1 m [7]. It is a single stranded RNA virus (positive sense) having diameter of 80–120 nm, among which recently SARS-CoV-2 (Severe Acute Respiratory Syndrome Coronavirus-2) has arose as a universal contagion infecting humans with 3–4% mortality rate [14]. Owing to zoonotic origins and genetic similarity, bats are pondered as the natural hosts of SARS-CoV-2 [13]. It consists of four structural proteins namely Spike (S), Envelope (E), Membrane (M) and Nucleocapsid (N) which

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helps coronavirus in recognizing the receptor on the target cell, fusion with membrane receptor causing infection and further transmission within the host [12].

The surface glycoprotein of this virus creates a crown-like appearance which can be visible under electron microscope. Crown like spike proteins are the important part of SARS-CoV-2 [3]. It recognizes some specific human proteins. The human proteins which coats inside of the nose and the cells of lungs are mainly can interact with the spike protein of the SARS-CoV-2 virus. After interaction the two proteins bind together. In the product form, the spike protein of CoV-2 changes its shape and causes the human receptor cell to engulf the virus. After entering human body, it then replicates itself and can infect neighbouring cells and tissues by damaging mainly lung, heart, brain cells and many other organs [4].

As compared to SARS-CoV, novel SARS-CoV-2 binds ACE2 (Angiotensin Converting Enzyme-2) host surface protein with affinity far greater than threshold requisite for virus infectivity [12]. This binding factor is the major reason for swift transmission potentiality of the novel SARS-CoV-2 as compared to SARS-CoV [11].

What is Giloy?

Giloy or Guduchi is an ancient herb that is filled with a wide array of benefits. Scientifically known as '*Tinospora cordifolia* L'. Giloy has an immunity boosting properties which can fight against various pathogens. It is a significant part of Indian medicine for a very long time. Giloy means 'Amrita' which means the root of immortality. Its magnificent medicinal properties proved that giloy is an extensively effective natural medicine. It is also written in Charak Samhita that Giloy is one of the bitter medicine that can cure various disorders and helps in vata and cough dosh.

Applications / benefits of Giloy

Giloy is anti-toxin, anti-inflammatory, anti-pyretic and also best immuno booster. It can cure Chronic fever, Hay fever, Dengue fever, Improve digestion, reduce anxiety and stress, Maintain blood sugar level, Improves eye-sight, Treat arthritis and gout, and can also effective against corona virus infection. Giloy contains protein, fat and rich fibre content. The leaves, root stems, and sattu of Giloy are used for medicinal purpose. It also improves complexion and lustre of the skin. It also treats gout and rheumatic disorders. The daily consumption of Giloy gives horse-like strength and vitality. The best way of consumption of giloy to take it in the form of powder mixed with honey or milk before bed time. It can also be taken in the form of Kadha or Giloy juice.

To get a valid answer to act against COVID-19, various complementary and alternative vaccines, medicines and treatment methods are also needed for the managements of patients with SARS-CoV-2 infection. So, research works with different phytoconstituents from various traditional medicinal herbs is certainly worth of investigation [6] in this present emergency situation. *Tinospora cordifolia* is the member of the family of Menispermaceae. It is usually found in mostly Asian counties like India, Myanmar, Sri Lanka, and China. The plant is commonly used as a main component in many traditional Ayurvedic medicines. It is used as a parent medicine for the therapies against several common diseases like jaundice, rheumatism, urinary disorder, skin diseases, diabetes, anemia, inflammation, allergic condition, etc. [9]. For the treatment of helminthiasis, heart diseases, leprosy, rheumatoid arthritis, etc the stem of the plant is very useful. It also supports the immune system by increasing the body's resistance to various infections, supports standard white blood cell structure, function, and levels [8].

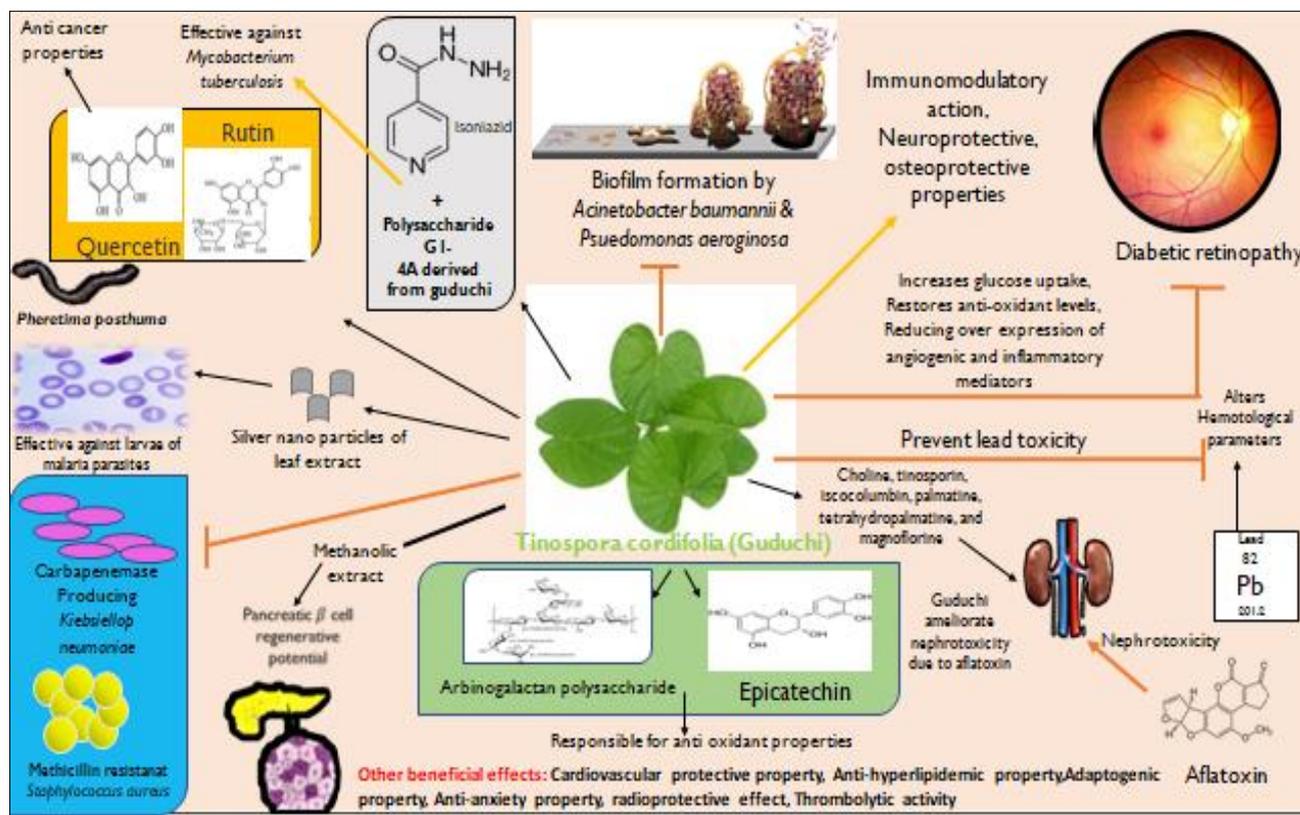


Fig 1 Several beneficial roles of Giloy

All of the above-mentioned pharmacological actions of *Tinospora cordifolia* originates from roots, stem, leaves, bark, flowers, fruits, seeds and its chemical constituents. All chemical constituents from different parts of the plant like root, stem, flowers and seeds are responsible for their pharmacological activities [Fig 1].

The various categories of chemical constituents of different classes such as alkaloids, glycosides, steroids, phenolics, aliphatic compounds, polysaccharides essential oils, a mixture of fatty acids, and polysaccharides are present in different part of the plant body, including root and stem [8]. Currently in modern medicine, both individual and combination of anti-malarial, anti-viral and corticosteroid therapy are being used for treating COVID-19. Repurposing of drug for treating COVID-19 is being extensively used for

managing the current cases of COVID-19. But all these drugs have many long-term side effects. Natural product with medicinal property can be used, as toxicity profile is less in comparison to synthetic compounds. Consulting Ayurveda for treating COVID-19 provides reliable evidence-based medicinal plants for managing the ailment of respiratory disorders. SARS-CoV-2 M^{pro} is important in stimulating proteolytic maturation of viral RNA into functional proteins namely RNA polymerase, endoribonuclease and exoribonuclease which also hampers the intrinsic immune system of the host. Therefore, SARS-CoV-2 M^{pro} can be deliberated as significant target as it helps in translation of polyproteins into individual functional component that subsequently forms 16 NSPs which helps in viral transcription and replication [5].

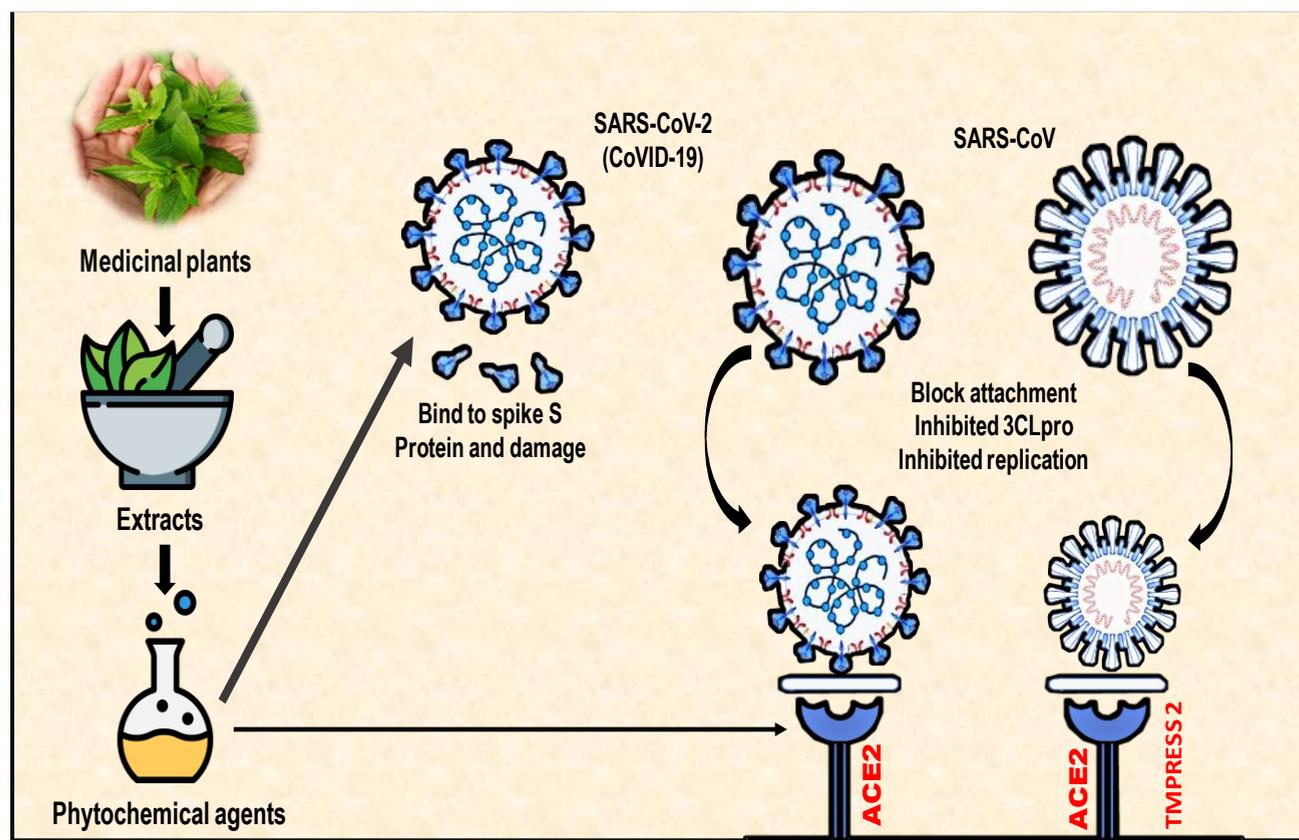


Fig 2 Mode of action of Giloy on SARS- CoV -2

As stated earlier in this article, from various studies some of the phytoconstituents from these medicinal plants have shown promising effect against COVID-19 targets. Phytochemicals obtained from medicinal plants have significant binding affinity. The binding of these identified active phytochemicals with M^{pro} decreases the process of viral transcription and replication by down turning the cleavage of poly proteins. Ayurvedic medicinal plants *W. somnifera* (Ashwagandha), *T. cordifolia* (Giloy) and *O. sanctum* (Tulsi) could be predicted to serve as potential inhibitors of SARS-CoV-2 M^{pro} or 3CL^{pro} which is a key CoV enzyme and an attractive drug target as it plays a pivotal role in mediating viral replication and transcription. Among all considered phytochemicals in *Tinospora cordifolia*, berberine can regulate 3CL^{pro} protein's function due to its easy inhibition and thus can control viral replication [Fig 2]. The selection of *Tinospora cordifolia* was motivated by the fact that the main constituents of it are

known to be responsible for various antiviral activities and the treatment of jaundice, rheumatism, diabetes, etc. These phytoconstituents not only impede the interaction of viral protein to the host cell to transmit and propagate inside the human body but they are also safe to repurpose against COVID-19 without any toxicity [1-2, 10].

CONCLUSION

Covid-19 is an overgrowing disease day by day to whole world. The lives of people are very much affected and drastically changed due to this pandemic. SARS-CoV-2-M^{pro} is found to be a highly potent target for the inhibition of Covid-19. Ayurveda is an alternative medicine system with historical roots in the Indian subcontinent. Giloy has many immune boosting and disease curing properties which can be helpful in prevention of Novel Corona virus disease.

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