



INTERNATIONAL JOURNAL OF RESEARCH IN PHARMACEUTICAL SCIENCES

Published by JK Welfare & Pharmascope Foundation

Journal Home Page: www.ijrps.com

Tinospora Cordifolia-An immunomodulatory drug in Ayurveda for prevention and treatment of Covid-19

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Article History:

Received on: 08 Nov 2020
Revised on: 08 Dec 2020
Accepted on: 10 Dec 2020

Keywords:

Tinospora cordifolia,
Immunomodulator,
Covid-19,
Antioxidant,
Ayurveda

ABSTRACT

'COVID-19' is a highly infectious disease caused by the virus SARS-CoV-2 and it becomes a global pandemic in a very short period. Currently, there is a lack of precise management or vaccine available to counteract this disease which mainly attacks the immune system of a body. To manage COVID-19 existing disease-modifying and anti-virals agents and are being repurposed. Many research types are conducted in the development of particular immunomodulators, anti-virals agent or vaccines for SARS-CoV-2. In Ayurveda concept of epidemic condition (*Janapadodhwanasa*) is explained and various measures mentioned for prevention and treatment against such conditions including *Rasayan dravyas* (immunomodulator drugs). *Tinospora cordifolia* (Willd.) Miers is one of an immune-modulator drug in Ayurveda which known to possess properties like antioxidant, immunomodulatory, anti-inflammatory, anti-allergic, antiviral hyperglycaemic etc. This herb chiefly contains compounds like glycosides, alkaloids, steroids, diterpenoid lactones, sesquiterpenoid, aliphatic compound. Scientific researches on this drug may provide a new approach as well as insight for prevention, management and development of new therapeutic entity to treat COVID-19. The current review focus on researches conducted on properties of *Tinospora cordifolia* in the view of possible application in the prevention and treatment of COVID-19.



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ISSN: 0975-7538

DOI: <https://doi.org/10.26452/ijrps.v11iSPL1.4194>

Production and Hosted by

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INTRODUCTION

Coronavirus disease or COVID-19 is caused by the recently discovered coronavirus SARS — COV-2 that can spread between animals and humans. The outbreak of the coronavirus was begun in Wuhan, China,

in December 2019. It then extended across the world and its coronavirus was designated as a global Pandemic by WHO in 2020 (Shah and Farrow, 2020). The immune system of a body is primarily affected by infection from this virus. The symptoms of this disease are fever, tiredness, dry cough, diarrhea, aching throat, nasal congestion, aches and pains. Serious illness, respiratory distress may develop in old age persons and those with underlying medical problems like hypertension, heart diseases or diabetes (Huang et al., 2020). This pandemic has distinctively challenged medical fraternity worldwide due to lack of any proven therapy or vaccine. Hence, it is even necessary to look over it through alternative sciences. Ayurveda is the oldest system of medicine that can manage any ailment without side effects. It has varieties of treatment modalities to handle any type of tedious diseases, but there is a

lack of sufficient scientific basis. There are of herbal and herbo-mineral formulations are mentioned in the ancient classics (Chavan *et al.*, 2016).

As per the need of modern science, each drug needs to be scientific, pre-clinically and clinically evaluated for the global acceptance. In Ayurveda, the concept of an epidemic condition is explained by *Acharya Charak* in *Janapadodhwans Adhayay*. There are many preclinical studies; multiple clinical trials are conducted around the world. Various herbs and medicines have come out as a probable treatment for the COVID-19 virus and one of them includes *Tinospora cordifolia*. This herb is considered as *Rasayan Dravya* (immunomodulator drug) in Ayurveda. Immunity is the body's natural defence system against a vast collection of diseases and disorders. The advanced Immune system is competent to produce a boundless range of molecules and cells to arrest a vast variety of undesirable substances and infections.

Substances which are proficient of amplifying, inducing, and inhibiting any constituent or stage of the immune system is known as Immunomodulator (Patil *et al.*, 2012). *Tinospora cordifolia* (*T. cordifolia*) is Indian native herbaceous creeping plant usually recognized as *Giloy*, *Guduchi*, *Amruta*, or Heart-leaved moonseed and belong to family Menispermaceae. This plant has numerous properties like antioxidant, immunomodulatory, anti-inflammatory, antiallergic, anti-hyperglycaemic and it largely contains compounds like glycosides, steroids, alkaloids, diterpenoid lactones, sesquiterpenoid, aliphatic compound etc (Choudhary *et al.*, 2013).

From the stem of a plant, the chief phytoconstituent which are reported includes tinosporide, clerodane furano diterpene cordifolide, palmatine, tinosporin, Berberine, tinosporine, diterpenoid furano lactone, tinosporaside, magniflorine, β -sitosterol, cordifol, heptacosanol, choline, tembertarine, (Singh *et al.*, 2003). This ancient herb is packed with lots of benefits. It is popular with its immunity-boosting properties and assists actively in fighting against various types of pathogens. In the current review, an effort has been made to illustrate the role of *Tinospora cordifolia* in the prevention and treatment of COVID-19.

Importance of *Tinospora Cordifolia* in Traditional Indian System

Plant origin drugs have been used since the beginning of civilization to sustain health and treat disease (Khan *et al.*, 2019). *Tinospora cordifolia* is native to lower elevation in tropical areas of the Indian subcontinent and it is broadly spreading

glabrous, a perennial deciduous climbing shrub which climbs numerous types of trees. It is a part of the traditional Indian medicine system from a very long time. Tribal population is using this as its every part have some vital health benefits. In dialect, it is called as *Giloy*, *Guduchi Amrita*, *Shindilkodi*. The literally meaning of *Giloy* is 'Amrita', which means the root of immortality. It is considered a drug which can improve body resistance power.

Its chemical constituents help to fight against the virus through preventing fusion or adsorption. It is designated as "*Rasayana*" in Ayurveda due to its vital therapeutic potential. In the classical texts of Ayurveda *Guduchi* mentioned as an ingredient of different composite formulations and indicated for general debility, fever, dyspepsia and urinary diseases. Its stem is mainly used to alleviate thirst, fever; prevents vomiting; useful in skin diseases; cures jaundice and its juice are useful to treat enlarged spleen, diabetes, vaginal discharges (Sharma *et al.*, 2014).

Immunomodulator Activity of *Tinospora Cordifolia*

Since many years *Tinospora Cordifolia* is investigated in the view of its immunomodulatory properties. For this various compound are separated from it and studies for probable activities related to immunomodulation. Aqueous extract from the stem of this plant has shown to produce immunological activity as it contains arabinogalactan. The potential immunomodulatory compounds like N-formylannonain, magnoflorine, hydroxymustakone, cordifolioside A, N-methyl-2-pyrrolidone, tinocordiside are reported from this plant. Its aqueous extracts also reported for immune effect or cells stimulation; influence cytokine production, and mitogenicity, In one preclinical *in vivo*, studies its extracts result in up-regulation of IL-6 cytokine which results in B cell differentiation.

In experimental rat model active compounds from aqueous extracts of *T. Cordifolia* like alkaloids, steroids, phenolics, polysaccharides di-terpenoid lactones, glycosides, sesquiterpenoid, have been reported for their cytotoxic action (Tiwari *et al.*, 2018). *Tinospora cordifolia* extract has also shown an immunomodulatory effect in patients of HIV disease. An *in vivo* study was conducted in CCl 4 induced rats evaluated for immunomodulatory and Hepatoprotective properties of *Tinospora cordifolia* (Bishayi *et al.*, 2002).

Antioxidant Potential of *Tinospora Cordifolia*

Several studies on *Tinospora cordifolia* shows that it also has antioxidant potential. *Tinospora cordi-*

folia stem methanol extracts have the anti-oxidant capacity, which when administered orally in rats increased the catalase activity and erythrocytes membrane lipid peroxide (Krishna *et al.*, 2009). A study reveals that *Tinospora cordifolia* contains alkaloids such as a magnoflorine, isocolumbin, palmatine, choline, tinosporin, tetrahydropalmatine; due to which it shows that this herb has a defence against aflatoxin-induced nephrotoxicity and has the capability to scavenge free radicals. Its aqueous extract shows metal chelation and free radical scavenging which indicate its radioprotective property (Gupta and Sharma, 2011).

The antioxidant saponarin present in *T. cordifolia* which characterized as an α -glucosidase inhibitor and it shows that leaf extract had considerable hydroxyl radical scavenging and antioxidant activities. A *in vivo* study conducted on herbomineral formulation 'Pepticare' prepared by using herbal drugs, including *Tinospora cordifolia*, had to reveal anti-ulcer and antioxidant activities (Bafna and Balaraman, 2005). Another study was carried out in *in vitro* models in which leaf extracts of *T. cordifolia* shows antioxidant activity through non-enzymatic method (Praveen *et al.*, 2012).

Anti Inflammatory Activity of *Tinospora Cordifolia*

Alcoholic extract of *T. cordifolia* has been shown anti-inflammatory activity in the in acute and sub-acute inflammation models (Wesley *et al.*, 2008). A study was conducted on water extract prepared from stem of *T. cordifolia* which grow on *Azadirachta indica* plant. In this study, the extract significantly inhibited acute inflammatory response induced by carrageenin given intra-peritoneally and orally and. Significant inhibition was seen in an arthritis model induced by adjuvant (Pendse *et al.*, 1977). The water extract of this plant revealed significant anti-inflammatory activity in the formalin-induced arthritis model and cotton pellet granuloma (Upadhyay *et al.*, 2010).

Antipyretic Activity *Tinospora Cordifolia*

The formulation of *Tinospora cordifolia* 'Guduchi ghrita' shows significant antipyretic activity in albino rats (Ashok *et al.*, 2010). In another study, *T. cordifolia* extract exhibited considerable antipyretic activity in the Pyrexes test induced by brewer's yeast (Hussain *et al.*, 2015). Some clinical studies also conducted on *Tinospora cordifolia*, which shows its *Jwaraghna* (Anti-pyretic) property (Kumar and Ojha, 2018).

DISCUSSION

Herbs generate a different array of natural compounds which make them a prosperous basis of various types of drugs, as per WHO around 4 billion natives (80%) of the globe currently depends on medication of herbal origin for some aspect of primary health care. There is a need for research & scientific documentation on newly derived and traditionally used herbal compounds and due to limitation of modern medicine & therapies, ayurvedic medicine is a ray of hope (Khan *et al.*, 2020). Medicines prepared from botanical source modulate cytokines which may provide the mechanism of action for many of their therapeutic effects. Cytokines which are one of the important mediators of the immune system arbitrate the cross-talk between the specialized cells of the immune system, thereby completely integrating the behaviour and action responses of the cells. Immunomodulators are of two types, i.e. immune stimulators and immunosuppressant and their administration as per the response of an immune system is appreciating to reconstitute the normal immune system and increase the longevity of life. The Pandemic diseases SARS-CoV-2 has a high rate of mutagenesis (Shannon *et al.*, 2020).

Covid 19 disease damage immune homeostasis and mainly alters immune regulatory mechanism. This Viral infections cause damage to airway epithelial cells and induce oxidative stress and 'Cytokine storm' damages tissues of the heart, lungs and kidney that in future lead to severe complication like respiratory failure, ARDS, shock and potentially death (Wang *et al.*, 2020). Covid-19 is rapidly spreading throughout the world and vaccine availability could be years away. In Ayurveda to fight against epidemic conditions along with other treatment, 'Rasayan dravyas' are described which primarily concerned with boosting immunity, modulators of the immune system, nourishing the body. *Tinospora cordifolia* and its various formulations are mentioned in Ayurvedic literature for the treatment of various ailments. It is mentioned as an Immunomodulator (*Rasayana*) drug, which is utilized to develop the body resistance against infectious diseases. The entire herb is utilized for the medicinal purpose, but the stem is mainly used for the preparation of different types of formulation because of more alkaloid contents than leaves.

It is supposed that *T. cordifolia* growing on *Azadirachta indica* is more effective because of incorporation the therapeutic properties of that plant. In Ayurveda, there is a suggestion of prophylaxis measure for respiratory diseases that may be

helpful in Corona Virus disease avoidance and *T. cordifolia* is a better preference for this condition. *T. cordifolia* traditionally uses against pain, fever and inflammation and previous researches on this also show that plant has significant anti-inflammatory, anti-oxidant, and antipyretic activities which may be beneficial in symptomatic treatment against Covid-19. This plant is enriched with lots of antioxidants that neutralize free radicals and prevent inflammation. A study verified that this plant contains various groups of phytochemicals which are responsible for its substantial anticancer, antibacterial, and antioxidant properties (Mishra *et al.*, 2013). In a molecular docking study on this plant shows potentially inhibition of M^{pro} of SARS-CoV-2 due to its active phytochemicals which further provide the management approach against Coronavirus disease and this may show the anti-viral activity of this plant (Shree *et al.*, 2020).

Along with boosting immunity, *T. cordifolia* also purifies blood, flushes out toxins from the body and effectively fights against bacteria and viruses. *Tinospora cordifolia* juice consumption can help to get rid of fever, which is one of the signs of COVID-19. Anti-inflammatory properties of this herb help in dealing with major signs of the Covid-19 infection like respiratory problems like difficulty in breathing cough and cold. A formulation prepared by using *T. Cordifolia* called *Sanshamani vati*, which can be used as symptomatic measures for conditions like fever and coryza. The formulations or extracts of this plant work as a potential antiviral remedy. This plant also has essential phytochemicals and other metabolites that propose a plethora of immunity-boosting properties which result in the improved defence system of the human body to deal against communicable diseases like COVID-19. This traditional herb also offers an effective solution or may help in the discovery of new drug molecules. Hence appropriate researches on herbal drugs like *Tinospora cordifolia* is urgently needed for prophylactic and treatment solutions to COVID-19.

CONCLUSION

Ayurvedic herbal products could be useful to select as an alternative and integrated approach to decrease the morbidity and mortality associated with novel coronavirus infection and enhance host immunity against viral attack. *Tinospora cordifolia* is one of the immunomodulators and strong antioxidant herb which has an expected range of efficacy in relation to pathological manifestations of the novel coronavirus. The Immunomodulator (Rasayana) drug in Ayurveda, i.e. *Tinospora Cordi-*

folia have enough therapeutic attributes such as immunomodulator, antiviral, anti-inflammatory, antioxidant and antipyretic which are to be utilized both for the prevention and treatment of COVID-19.

ACKNOWLEDGEMENT

The author is thankful to DMIMS(DU), Wardha for providing necessary help.

Conflict of Interest

The authors declare that they have no conflict of interest for this study.

Funding Support

The authors declare that they have no funding support for this study.

REFERENCES

- Ashok, B. K., Ravishankar, B., Prajapati, P. K., Bhat, S. D. 2010. Antipyretic activity of Guduchi Ghrita formulations in albino rats. *AYU (An International Quarterly Journal of Research in Ayurveda)*, 31(3):367–370.
- Bafna, P. A., Balaraman, R. 2005. Anti-ulcer and antioxidant activity of Pepticare, a herbomineral formulation. *Phytomedicine*, 12(4):264–270.
- Bishayi, B., Roychowdhury, S., Ghosh, S., Sengupta, M. 2002. Hepatoprotective and immunomodulatory properties of *Tinospora cordifolia* in CCl₄ intoxicated mature albino rats. *The Journal of Toxicological Sciences*, 27(3):139–146.
- Chavan, R., Khan, M., Sathe, N., Mankar, N. A. 2016. A Review: SRB Assay for Screening Anticancer Activity of Herbal drugs (in-Vitro). *International Ayurvedic Medical Journal*, 4(2):66–70.
- Choudhary, N., Siddiqui, M. B., Azmat, S., Khatoon, S. 2013. *Tinospora cordifolia*: ethnobotany, phytopharmacology and phytochemistry aspects. *International Journal of Pharmaceutical Sciences and Research*, 4(3):891–899.
- Gupta, R., Sharma, V. 2011. Ameliorative effects of *Tinospora Cordifolia* root extract on histopathological and biochemical changes induced by Aflatoxin-B 1 in mice kidney. *Toxicology International*, 18(2):94–98.
- Huang, C., Wang, Y., Ren, L., Zhao, J. 2020. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *The Lancet*, 395(10223):497–506.
- Hussain, L., Akash, S. H., Ain, N.-U., Rehman, K. 2015. The Analgesic, Anti-Inflammatory and Anti-Pyretic Activities of *Tinospora cordifolia*. *Advances in Clinical and Experimental Medicine*, 24(6):957–

- 964.
- Khan, M. B., Rathi, B. J., Rajput, D., Wanjari, A. 2019. A review on classical Vajikarana formulations of Shweta Musali. *Journal of Indian System of Medicine*, 7(4):205–211.
- Khan, M. B., Sathe, N., Rathi, B. 2020. Evaluation of In Vitro Anti-Cancer Activity of Kukkutanakhi Guggula on Liver, Prostrate, Ovary and Renal Cancer. *International Journal of Ayurvedic Medicine*, 11(3):491–496.
- Krishna, K., Jigar, B., Jagruti, P. G. 2009. Guduchi (*Tinospora cordifolia*): Biological and Medicinal properties, a review. *The Internet Journal of Alternative Medicine*, 6(2):1–10.
- Kumar, D., Ojha, N. K. 2018. Study of morbidity status in children and the effect of Guduchi Syrup as an Immunomodulator for lowering down the morbidity rate. *Journal of Ayurveda and Integrated Medical Sciences*, 3(2):7–14.
- Mishra, A., Kumar, S., Pandey, A. K. 2013. Scientific Validation of the Medicinal Efficacy of *Tinospora cordifolia*. *The Scientific World Journal*, 2013(11-12):1–8.
- Patil, U. S., Jaydeokar, A. V., Bandawane, D. D. 2012. Immunomodulators: A pharmacological review. *Int J Pharm Pharm Sci*, 4(1):30–36.
- Pendse, V. K., Dadhich, A. P., Mathur, P. N., Madan, B. R. 1977. Antiinflammatory, immunosuppressive and some related pharmacological actions of the water extract of Neem Giloe (*Tinospora cordifolia*): A preliminary report. *Indian journal of pharmacology*, 9(3):221–224.
- Praveen, N., Thiruvengadam, M., Kim, H. J., Kumar, J. K. 2012. Antioxidant activity of *Tinospora cordifolia* leaf extracts through the non-enzymatic method. *Journal of Medicinal Plants Research*, 6(33):4790–479.
- Shah, S. G. S., Farrow, A. 2020. A commentary on “World Health Organization declares global emergency: A review of the 2019 novel Coronavirus (COVID-19)”. *International Journal of Surgery*, 76:128–129.
- Shannon, A., Selisko, B., Huchting, J., Touret, F. 2020. The rapid incorporation of Favipiravir by the fast and permissive viral RNA polymerase complex results in SARS-CoV-2 lethal mutagenesis. *Nature Communications*, 11(1):4682.
- Sharma, R., Amin, H., Prajapati, P., Ruknuddin, G. 2014. Therapeutic Vistas of Guduchi (*Tinospora cordifolia*): A medico-historical memoir. *J. Res. Educ. Ind. Med*, 20:113–128.
- Shree, P., Mishra, P., Selvaraj, C., Singh, S. K. 2020. Targeting COVID-19 (SARS-CoV-2) main protease through active phytochemicals of ayurvedic medicinal plants – *Withania somnifera* (Ashwagandha), *Tinospora cordifolia* (Giloy) and *Ocimum sanctum* (Tulsi) – a molecular docking study. *Journal of Biomolecular Structure and Dynamics*, pages 1–14.
- Singh, S. S., Pandey, S. C., Srivastava, S., Gupta, V. S. 2003. Chemistry and medicinal properties of *Tinospora cordifolia* (Guduchi). *Indian journal of pharmacology*, 35(2):83–91.
- Tiwari, P., Nayak, P., Prusty, S. K., Sahu, P. K. 2018. Phytochemistry and Pharmacology of *Tinospora cordifolia*: A Review. *Systematic Reviews in Pharmacy*, 9(1):70–78.
- Upadhyay, A., Kumar, K., Kumar, A. 2010. *Tinospora cordifolia* (Willd.) Hook. f. and Thoms. (Guduchi) - validation of the Ayurvedic pharmacology through experimental and clinical studies. *International Journal of Ayurveda Research*, 1(2):112–121.
- Wang, C., Xie, J., Zhao, L., Fei, X. 2020. Alveolar macrophage dysfunction and cytokine storm in the pathogenesis of two severe COVID-19 patients. *EBioMedicine*, 57:102833.
- Wesley, J. J., Christina, A. J., Chidambaranathan, N., Raja, N. R. L. 2008. Effect of alcoholic extract of *Tinospora Cordifolia* on acute and subacute inflammation. *Pharmacologyonline*, 3:683–687.