



INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Review Article On Immunomodulatory Effects Of A *Tinospora Cordifolia*

“A Comprehensive Review On Botanical, Phytochemical And Pharmacological Properties Of *Tinospora Cardifolia* ”

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ABSTRACT : The ancient Ayurvedic writings, *Tinospora cordifolia* has been considered as the highly valuable and crucial medicinal plant. For hundreds of years, its leaves have been used to treat numerous health problems in humans. The main focus of this analysis is the chemical makeup of Giloy leaves, as well as the mechanisms underlying their immune-Modulating action Act as Functional food, specifically the NF-KB pathways & interleukin adjustment. Giloy leaf include antioxidants properties & cause immunity cells to undergo programmed cell death.

KEYWORDS: *Tinospora cordifolia*; Immunity-Modulating; Act Functional foods; Phytochemical composition; NF-kB pathway; Interleukin modulation; Antioxidant activity;

INTRODUCTION: Giloy plants has been playing a wide role in traditional clinical care systems globally, particularly in Ayurveda.^[1] These natural sources offer a wide range of bioactives constituents with significant therapeutical benefits. *Tinospora cordifolia* plant, named as Guduchi, Amrita, Guduchi has more important in Ayurveda due to its rich content of 2^o metabolite.^[2]

Historically, Giloy leaf has been used in treat various conditions including diabetes mellitus, gout, jaundice, & skin disorders.^[3] Due to its long-standing usage and the rising interest in natural remedies, researchers are investigating the therapeutic effects of Giloy leaf & mechanism of action on medicinal properties.^[4] The extracted from Giloy leaf can help GIT digestive issues such as gastric acidosis, parasite infection, lacks in appetites, stomach discomfortness, more thirsty, nausea, & liver problems like hepatitis.^[5]

METHODOLOGY: 1.TAXONOMICAL POSITION OF AN TINOSPORA CORDIFOLIA.

Tinospora cordifolia as a ancient time medicinal plant that belongs in Menispermaceae family's, as moonseeds.^[6] The family's Menispermaceae has prevalent in topical region lowland regions, comprising approximately 71 generas and around 450 species. Among these, *Tinospora* an one of the wide prominent genera, featuring about 15 distinct species.^[7] *Tinospora cordifolia* is widely distributed across Tropical Indian & it's can be at elevation up to 1001 feet in various regions such as South asiana, the Philippines, Thailand, bangladesh, pakistan, and Sri Lanka.^[8] it's important frequently used in ancient Ayurvedic &

folk medicine method. This plant can thrive in a varieties of soil type, ranging from acidic to alkaline, and it requires only a modest amount of soil moisture to grow successfully.^[9]



fig.1. Tinospora cordifolia leaves.

2. PLANT DESCRIPTION.

Tinospora cordifolia is a large, smooth, perennial, vine characterized by its papery barks & juice branches they spreading over a wide area. It is commonly found in Sri Lanka & India.^[10] Guduchi has native to India tropical regions, where it can grow up in temperatures ranging from 26 to 46 degrees Celsius and can grow up to elevations of 550-552 meters. The leaf are heart shaped, simple, & possess a deep, green color. This measure between 10 to 12 centimeters in length and 8 to 15 centimeters in width. These leaves are alternate, stipulate, and have smooth edges.^[11]

3. PHYTOCHEMICAL AND NUTRITIONAL CONTRIBUTION.

Giloy leaf are a rich source in essential nutrient & other vital components. Dehydrated giloy leaves have been found to contain high concentrations of calcium, potassium, protein, fat, fiber, an ashes, as detailed in bellow table.^[12] All offering parts of *Tinospora cordifolia* leaf, stems, fruits & roots are employed as an functional nutrients. *Tinospora cordifolia* leaf particularly noted for their high nutritional value, providing a wide range of important macronutrient & micronutrient, as shown in following table.

Nutrients	Fresh	Dehydrated	Reference
Moisture contain %	31.30	9.54	
Ash value%	2.2	5.82	
Carbohydrates(g)	3.32	6.53	[13,14]
Proteins (g)	2.28	5.13	
Fats (g)	0.37	1.02	
Fibers (g)	11.22	51.2	
Irons (gm)	6.57	12.5	
Calcium con. (gm)	82.2	200	[14,15]
Vitamin C (mg)	55	18	

Beta carotenate in (µg)	302	418	
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Table.1. A wide range of important macronutrient & micronutrient, table.

4. IMMUNOMODULATOR EFFECTS OF GILOY LEAF.

The impressive ability an *Tinospora cordifolia* leaf to influence the immune system is largely due to a wide variety of active compounds that are naturally present in them.^[16] These bioactive substances consist of several important chemical groups, such as alkaloids, which are especially found in the stems, & steroidal like 6-sitosterol, delta-sitosterol & gala-sitosterol. There are also glycoside that include 16-norclerodane glycosidase, furanoids diterpenes glycoside,& tinocordiside, along with specific alkaloids such as palmatinic acid D, choline D, tinosporinase, magnofloridine, tetrahydruspalmatine, & isocolumbinat.^[17]

Furthermore, parts of the plant known as aerial sections contain other compounds like Diterpenoids lactone, specifically furanolactonase, tinosporine, & columbin, along with diverse substances like cordifoliosidase-A, 10-hydroxymuskatonate, N-methyl-2-pyrrolidonate, 8-sanols, 5-cosanolate & nonacosan-11-one.^[18] The immune-boosting effects of giloy leaves are attributed to specific bioactive compound obtain in the plant, as 10-hydroxymuskatonate, N-methylene pyrrolidone, cordifoliosidase, magnoflorine, tinocordiosidase, & synringinase. These compounds interact with various immunity cells in body, including B lymphocyte & macrophage, which are essential for immune regulation and response.^[19]

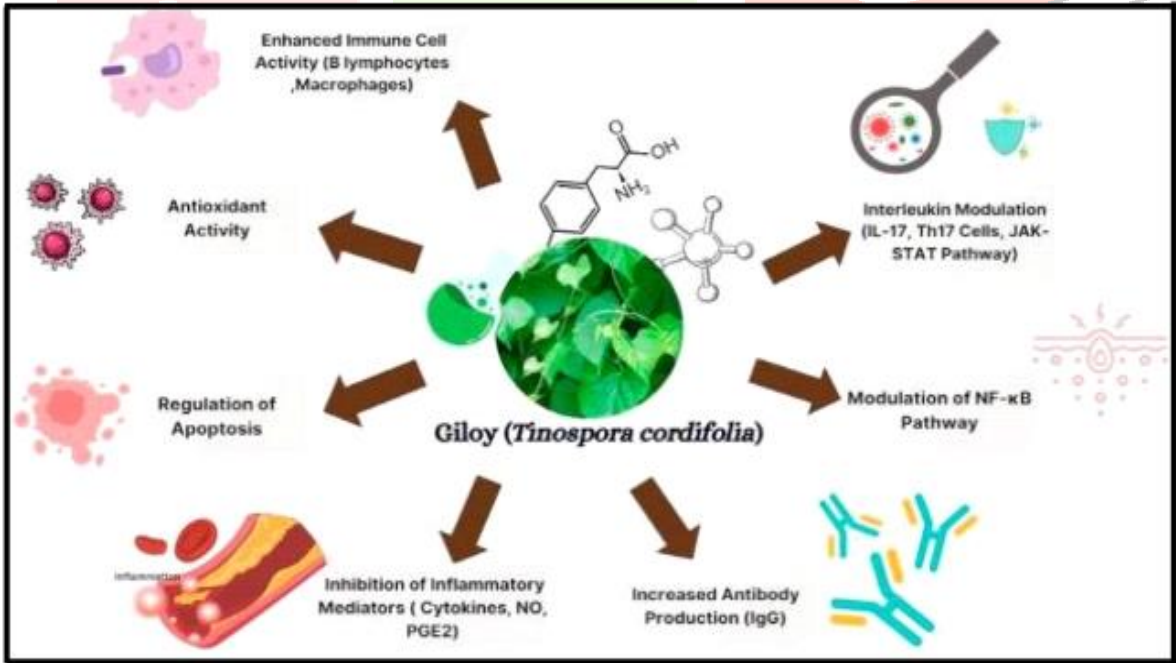


fig.2. Immunomodulation effects of Giloy leaf.

5. INFLAMMATION AND IMMUNITY BOOSTING.

Inflammation is a natural process carried out by the immune system to help the body heal from injuries or infections. However, when inflammation becomes too intense or lasts for a long time, it can actually cause more harm than good. For a long time, people have used herbal medicines like giloy leaves (*Tinospora cordifolia*) to treat inflammation, especially in traditional Ayurvedic medicine. But there are also concerns about possible side effects, which have been mentioned in several studies. It is essential to remember the although giloy have been uses for a longer time in Ayurveda, it should be uses carefully, especially in large amounts, because it might have negative effects.^[20]

Research shows that taking too much of it can lead to stomach problems like nausea, stomach discomfort, and constipation. Also, some studies have found that giloy might affect the liver in harmful ways, possibly by changing how liver enzymes and metabolism work.^[21] On the other hand, the ability of giloy to decrease blood sugars be helpful in people with diabetic mellitus but using too much or combining it with other blood-sugar-lowering medications could lead to dangerously low blood sugar levels, called hypoglycemia.^[22]

Additionally, some people might have allergic reactions to giloy, especially those who are sensitive to plants in the Menispermaceae family. Symptoms could include skin rashes and swelling When applied to the skin, giloy leaf extract can help with wound healing by activating certain immune cells that help in tissue repair and speeding up skin recovery from wounds or bruises. The immune-modulating effects of giloy are due to its active chemical components, given as alkaloidal, glycosidal, terpenoidal, & polysaccharidal, they help in regulating the immune response and reducing inflammation.^[23] The leaf extract of *Tinospora cordifolia* contains various bioactive compounds that help reduce inflammation and lower immune reactions. Some of these compounds have both anti-inflammatory and antioxidant properties.^[24] Studies show that this compound has strong binding abilities against both COX-1 and COX-2, making it a promising candidate for use in drug treatments for inflammation.^[25]

Furthermore, *Tinospora cordifolia* leaves extracted has being studied in laboratory settings for its anti-inflammation effects and has been found to overcome proteins denaturation, as key step in the inflammatory process. Those finding suggest that an chemical compounds in *Tinospora cordifolia* leaves extract help reduce inflammation by inhibiting COX-1 enzymes & decreasing Proteins denaturation. The compounds in giloy leaf help lower inflammation mediator, block enzymatic activities like COX-2, & change the functions of immune cells. Giloy leaf have the potentially to fight inflammation throughly several pathways described at Figure 4 about inflammatory & it's mechanism of action. Wide research is needed to fully understand the clinical benefits of giloy leaves in managing inflammation diseases.^[26]

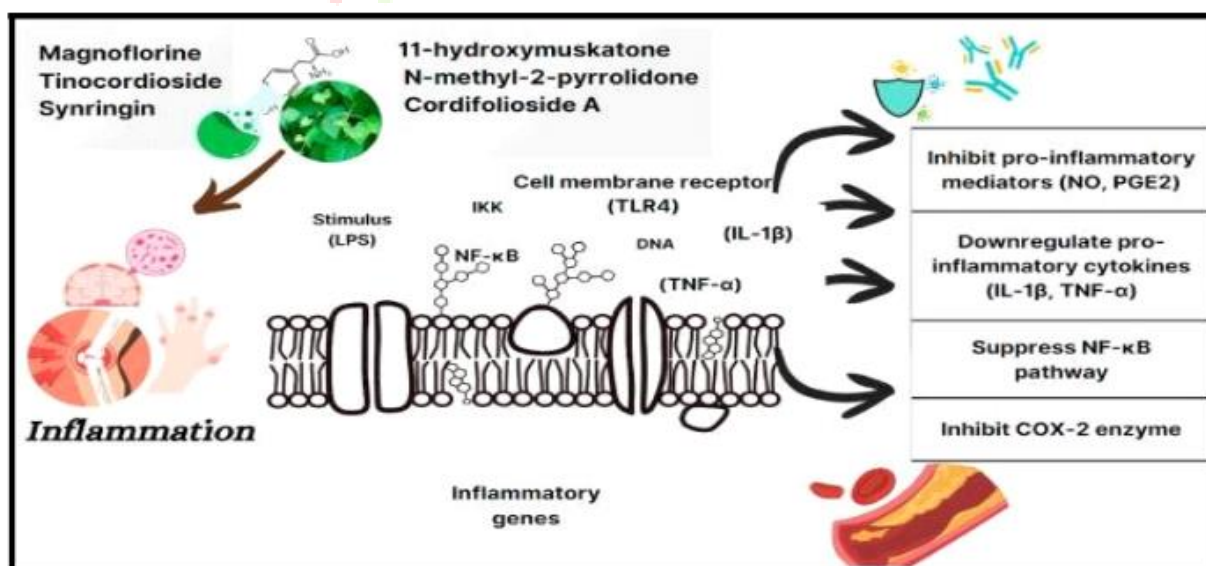


Fig.4.

Lipopolysaccharides - induces inflammatory & its attenuation by giloy leaves components through NF-κB pathway.

CONCLUSION: In above conclusion, we study the immune enhancement or supportive properties of guduchi leaves indicates these leaves offer a variety range of health care benefits. They help in boosting the immune system, regulating the process of apoptosis in an immunity cells, & act as antioxidants. The leaves contain active components such as alkaloidal, flavonoids, polysaccharide & terpenes they play a role in activating immunity cells. This activation helps in preventing cell damage and reduces inflammation.

Overall, the Guduchi leaves are considered a natural immuno enhancement agent, and they are believed to have additional properties like antioxidant, gastro hepatoprotective, and anti-inflammation effects.

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