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Exploring the Ethnomedicinal Properties and HPTLC Fingerprinting of *Tinospora cordifolia* (Willd.) Miers. Leaf Juice Extract

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Tinospora cordifolia (Willd.) Miers. Leaves juice, ethnomedicinal, HPTLC.

Abstract
This study presents the High-Performance Thin Layer Chromatography (HP TLC) fingerprinting of leaf extract from Tinospora cordifolia (Willd.) Miers. a plant renowned for its medicinal properties. Using HP TLC, we aimed to identify and quantify the phytochemical constituents present in the extract. Eight distinct chromatographic profiles were observed, revealing a diverse array of compounds. The analysis highlighted significant secondary metabolites, including alkaloids, flavonoids, and terpenoids, which may contribute to the plant's therapeutic potential. This fingerprinting technique not only facilitates the standardization of Tinospora cordifolia (Willd.) Miers extracts but also serves as a reference for further pharmacological studies. Our findings underscore the importance of HP TLC in assessing the quality and efficacy of herbal medicines. Further research is recommended to explore the biological activities of the identified compounds.

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INTRODUCTION

Tinospora cordifolia (Willd.) Miers commonly known as Guduchi or Giloy, is highly regarded in traditional medicine systems, particularly in Ayurveda. Its ethnomedicinal properties are extensive and include: Immunomodulatory Effects Widely recognized for boosting the immune system, it helps in enhancing the body's resistance to infections and diseases 'The plant is used to alleviate inflammation, making it beneficial in conditions like arthritis and other inflammatory disorders. Traditionally, it is employed to reduce fever, especially in conditions like malaria and other infections. Digestive Health Guduchi is known to support digestion and is often used to treat gastrointestinal disorders such as dyspepsia and diarrhea.

The presence of various phytochemicals contributes to its ability to neutralize free radicals, thus protecting against oxidative stress. Liver Protection It is believed to support liver health and has been used in managing liver-related conditions. Stem of Tinospora *cordifolia*

(Willd.) Miers is used to cure Jaundice, diabetics (Sharma et.al 2015) skin disease and anemia. (Kirtikar et.al 1993) *Tinospora cordifolia* (Willd.) Miers leaves is used to treat respiratory issues like cough and asthma due to its expectorant properties and is sometimes used in herbal formulations aimed at reducing stress and anxiety, contributing to overall mental well-being. The plant is also recognized for its nutritional value, being rich in vitamins and minerals.

These ethnomedicinal properties illustrate the significance of *Tinospora cordifolia* (Willd.) Miers in traditional healing practices and highlight its potential for further scientific exploration and integration into modern medicine.This study presents a comprehensive analysis of leaf juice through HPTLC fingerprinting, highlighting its potential as a valuable crude drug in traditional medicine. The developed HPTLC profile serves as a reliable method for quality control, enabling the estimation of key marker compounds that are indicative of the plant's pharmacological properties.The identification of specific phytochemicals aligns with the traditional uses of *Tinospora cordifolia* (Willd.) Miers emphasizes its role in enhancing immunity, combating inflammation, and promoting overall health. This research underscores the importance of standardizing herbal extracts to ensure consistency and efficacy in therapeutic applications. Moreover, the findings contribute to the growing body of evidence supporting the nutritional and medicinal benefits of *Tinospora cordifolia* (Willd.) By establishing a robust fingerprinting method, this study lays the groundwork for further research into the plant's bioactive components, facilitating its integration into modern healthcare and nutritional practices.

World health organization emphasize proving scientific validity of plant drug based on application of scientific knowledge ensuring identity, purity, quality of drugs. (Brown et.al), (Tilburt 2008), (Tripathi 2020). Plants shows anti-inflammatory (Kapuret et.al (2009) and anti - alllergic (Nayampaalli et.al, 1982), antioxidant (Stanley et.al 2001) antineoplastic (Jagita Et.al1998) properties have been reported. In Ayurvedic of medicine Rasayanas for strengthening for immune system different countries is used inflammation, chronic fever anemia and hemorrhoids urinary disease viral hepatitis (Singh Et.al 2003), (Shivkumar Et.al 2011).

Stem of *Tinospora cordifolia* (Willd.) Miers.contain phenylpropanoids glycosides like cordifoliside A and B syringin with diterpenoids tinosporaside, tinosporin, tinosporidine, tinocordifoliside and alkaloids columbine, isocolumbin, berberinemangonoflorine (Dahanayakeetet.al.2020), During for covid pandemic some patients used juice of stem of *Tinospora cordifolia* (Willd.) Miers. for prevention (Choudhary P2020; Lital. et.al 2021). In conclusion, the HPTLC fingerprinting profile not only enhances the quality control measures for Tinospora cordifolia but also reaffirms its significance in traditional medicine, paving the way for future studies aimed at unlocking its full therapeutic potential.

Morphology of plant:

Tinospora cordifolia (Willd.) Miers belongs to Menispermaceae. Dioecious, climbing, woody shrub, stem succulent, bark papery, corky, when mature. Leaves deeply cordate,5-7 nerved, entire, acuminate with glandular-papillose patches on lower surface in basal nerve axils. Flower unisexual, yellow, in racemes, or panicles, axillary, terminal or on old stems. Sepals 6 (3+3). Petals 6, Stamens 6. staminodes 6, carpels 3 stigma forked. Drupe, round-, essile, red when ripe.

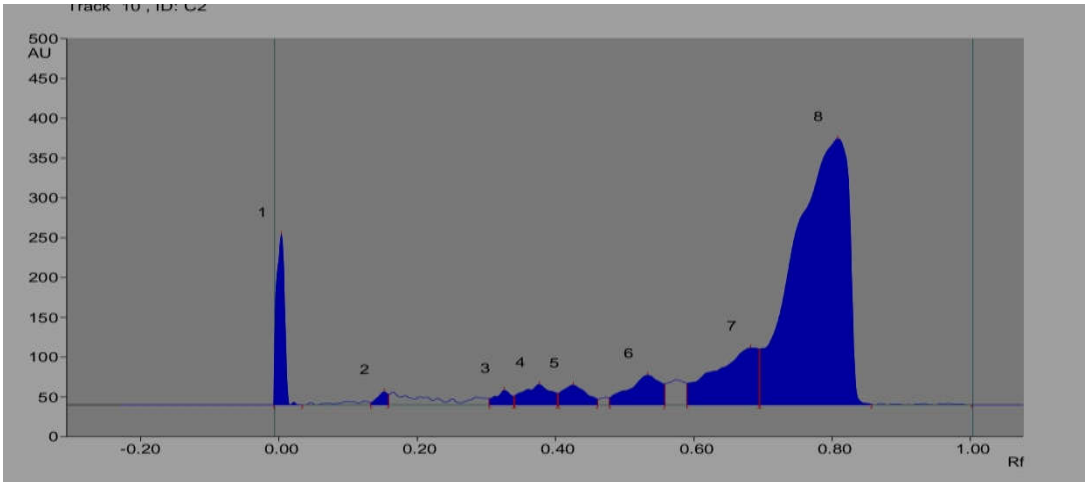

Figure 1: Spectra of HPTLC Chromatogram: HPTLC of methanolic extract of *Tinospora cordifolia* (Willd.) Miers **(Resolution at 220 nm; vol-20µl, mobile phase- Mobile phase methanol. -nhexane-ethyl acetate (7:3)**

MATERIAL AND METHODS

HPTLC is the best technique for better resolution and estimation of constituents with reasonable accuracy within a short period (Wagner et. al, 1998), Objective behind the present study was to carry out phytochemical analysis of leaf extract of *Tinospora cordifolia* (Willd.) Miers. Fresh leaves of *Tinospora cordifolia* (Willd.) Miers were collected from Poladpur Dist Raigad and brought to laboratory and was identified with the help of Flora of Kolhapur District in the Botany department of Sundarrao More Arts Commerce Science College Poladpur Dist Raigad.for further analysis and washed gently with running tap water to remove surface dust and pollutants. The leaves were dried under the shade. The dried plant material was made of powder using a mixture grinder.

HPTLC Analysis: -HPTLC fingerprinting of extracts were carried out as per the method described by Mona et al (2012). Two microliters of the ethanolic extract was applied (band length –8.0 mm) on a precoated TLC aluminum sheets of silica gel G60 F254 of 200 µm thickness plate-05 x10cm (Merck, Mumbai) using LINOMAT V TLC applicator (CAMAG, Muttenz, Switzerland) equipped with a 100-µL syringe. Prior application, the plate was pre-washed with ethanol AR and dried at 60°C. TLC plates were developed using the mobile phase Toluene: ethyl acetate: formic acid (5:4:0.3) in a CAMAG HPTLC twin-trough chamber (10 x10cm). The chamber was saturated with filter paper for 15 minutes and plate equilibrium was carried out for 10 minutes. Plate was developed up to 85.0 mm and dried under a stream of air. Separated bands were quantified by HPTLC densitometric scanning using CAMAG TLC Scanner 4 in the absorption mode (multi wavelength Scanning) operated by WinCATS software (version 1.4.8). After scanning the spectra and tables thus obtained were analyzed to interpret the results.

The Rf value of maximum position in pic for high concentration to low concentration of Phytoconstituents where observed in Table no 1 is 0.81, 0.0,0.68,0.53,0.38,0.43,0.33,0.15, int erm of area for the pick number 8(19382.3),1(1801.6),7(34404.6),6 (1297.9),4(755.2),5 (651.8), 3(301.4) first two covers 73.90% of total which constituents of phytochemicals, peak number 1 and 8.The RF value of high maximum intensity to low maximum intensity is observed as 0.81,0.00,0.68,0.53,0.43,0.38,0.33,0.15.

The result from HPTLC fingerprint scanned at wavelength 254 nm for *Tinospora cordifolia* (Willd.) Miers Pierre shows polyvalent phytoconstituents and corresponding ascending order of Rf value is from 0.01 to 0.70 in which highest concentration of the phytoconstituents

was found to be 45.07% and its corresponding RF value was found to be 0.01 respectively.

Table 1: RF Value of leaf extract of *Tinospora cordifolia* (Willd.) Miers. Leaf at UV254nm

Peak	Start position	Start height	Max position	Max height	Max%	End position	End Height	Area	Area %
1	-0.01Rf	0.0A U	0.00 RF	213.9AU	28.83%	0.03RF	0.0 AU	1801.6 AU	6.48%
2	0.13Rf	2.9AU	0.15 RF	16.5 AU	2.22%	0.16 RF	3.3 AU	188.3 AU	0.68%
3	0.30 Rf	7.8AU	0.33 RF	18.3 AU	2.46%	0.34 RF	0.9 AU	301.4 AU	1.08%
4	0.34 Rf	11.4AU	0.38 RF	25.6 AU	3.45%	0.40 RF	4.6 AU	755.2 AU	2.72%
5	0.40 Rf	14.6AU	0.43 RF	24.7 AU	3.33%	0.46 RF	7.1 AU	651.8 AU	2.35%
6	0.48 Rf	8.8AU	0.53 RF	37.0 AU	4.99%	0.56 RF	26.3 AU	1297.9 AU	4.67%
7	0.59 Rf	27.2AU	0.68 RF	71.5 AU	9.64%	0.70 RF	70.3 AU	3404.6 AU	12.25%
8	0.70 Rf	70.3AU	0.81 RF	334.4 AU	45.07%	0.86 RF	0.8 AU	19382.3AU	69.76%

RESULT AND DISCUSSION

This study presents a comprehensive analysis of *Tinospora cordifolia* (Willd.) Miers leaf juice through HPTLC fingerprinting, highlighting its potential as a valuable crude drug in traditional medicine. The developed HPTLC profile serves as a reliable method for quality control, enabling the estimation of key marker compounds that are indicative of the plant's pharmacological properties. The identification of specific phytochemicals aligns with the traditional uses of *Tinospora cordifolia* (Willd.) Miers emphasizes its role in enhancing immunity, combating inflammation, and promoting overall health. This research underscores the importance of standardizing herbal extracts to ensure consistency and efficacy in therapeutic applications.

Moreover, the findings contribute to the growing body of evidence supporting the nutritional and medicinal benefits of *Tinospora cordifolia* (Willd.) Miers By establishing a robust fingerprinting method, this study lays the groundwork for further research into the plant's bioactive components, facilitating its integration into modern healthcare and nutritional practices.

In this study, HPTLC fingerprinting was employed to analyze the phytochemical constituents of *Tinospora cordifolia* (Willd.) Miers leaf extracts. The results revealed distinct bands corresponding to various bioactive compounds, with retention factor (Rf) values providing key insights into their identity.

The Rf values obtained in this analysis allow for the comparison with standard compounds, facilitating the identification of specific constituents known for their medicinal properties. For instance, compounds such as alkaloids, glycosides, and flavonoids were noted, which align with traditional uses of *Tinospora cordifolia* (Willd.) Miers in herbal medicine. The presence of these phytochemicals supports the ethnomedical claims regarding the plant's efficacy in treating various ailments, including immune system enhancement and anti-inflammatory activities. The identified compounds can be linked to pharmacological effects, corroborating the historical usage of *Tinospora cordifolia* (Willd.) Miers in traditional medicine systems.

Furthermore, the variation in intensity and number of bands may indicate the plant's adaptability and potential for varying phytochemical profiles depending on factors such as geographical location and environmental conditions. This emphasizes the need for further research to explore these variations and their implications for therapeutic applications.

HP TLC analysis shoes different pics of leafy extract it was run along with the standard and received to validate the presence of phytochemical compounds from the chromatogram after their derivative the results from HP TLC fingerprints of different wavelength 366 and 254 NM shows the presence of phytoconstituents and the RF value from ascending order 0.00 to .86. The highest constituent 0.86 this was soon in its different pics of phytoconstituents. The HPTLC method is simple, rapid, accurate, reproducible, selective and economical for quality and quantitative determination of plant material (Harborne et, al., 1988).

CONCLUSION

In conclusion, the HPTLC fingerprinting profile not only enhances the quality control measures for *Tinospora cordifolia* (Willd.) Miers but also reaffirms its significance in traditional medicine, paving the way for future studies aimed at unlocking its full therapeutic potential.

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