



Ethnobotanical Studies and Biological Screening of *Tinospora cordifolia*

Bindu Modi^{1*}, Hari Timilsina^{1*} Ram Chandra Basnyat^{1*}

Central Department of Chemistry, Kirtipur, Kathmandu

Email Address: bindu.ms13@gmail.com

seasonphoenix@gmail.com, basynyatram@gmail.com

Abstract

The aim of this study was to carry out the ethno-botanical survey to determine the importance of traditional medicinal *Tinospora cordifolia* plant and to evaluate phytochemical screening and anti-oxidant potential of plant extract of *Tinospora cordifolia*. Traditionally, it is used alone or with other medicinal plants to treat common disease such as fever, diabetics, urinary tract infection and piles problem. Phytochemical screening proved that plant extracts are the rich sources of secondary metabolites such as alkaloids, glycosides, flavonoids, terpenoids etc. Antioxidant activity of these plant extracts was studied by DPPH radical scavenging assay which proved the inhibitory concentration, IC₅₀ value of hexane and methanol extract of leaves of *Tinospora cordifolia* were 140 and 79.41 µg/ml and hexane and methanol extract of stem were found to be 126.52 and 76.26 µg/ml, Similarly IC₅₀ value of methanol extract of leaves and stem from percolation method were 94.83 and 91.88 µg/ml. The IC₅₀ value thus provided scientific information that *T. cordifolia* can be used as a potential candidate in different pharmaceutical purpose.

Keywords: Antioxidants, Hexane extract, Medicinal plants, Methanol extract, Phytochemical screening.

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Introduction

The term ethnobotany was coined by John W. Harsberger in 1896 (Davis, E. W., 1995). Ethnobotany, study of interaction between plant and people within a particular emphasis on traditional tribal cultures. According to WHO about 65 to 80% of the world's population in the developing countries depend essentially on the plant extracts as folk medicine for their primary health due to poverty and lack of access to modern medicine (Awoyemi O. K., et al., 2012).

Nature has been a source of medicinal agents for thousands of years and an impressive number of modern drugs have been isolated from natural sources, many of them based on their use in

traditional medicine (Ramamurthy, V., et al., 2013). People have been using plant and plant products for healing of various diseases as medicine without knowing their chemical constituents and biological activities since prehistoric time (Gewali, M. B., and Awale, S., 2008).

Tinospora cordifolia, a glabrous, climbing shrub belonging to the family Menispermaceae, is an important medicinal plant cultivated throughout the Indian subcontinent (Kapil, A., and Sharma, S., 1997). In Nepal, it is distributed throughout the tropical region of altitude from 300m to 1200m above sea level. There are 15

species of *Tinospora*. Out of which, only 4 species have been reported in India and two species have been reported in Nepal. (Chintalwar, G., *et al*, 1999). The family Menispermaceae consists of 75 genera, with 520 Species. The family Menispermaceae is highly specialized in its rich diversification of biologically active alkaloids. Because of this richness the plant family is used worldwide in traditional medicines to treat a wide variety of ailments (Martin, G. J., 2010).

The leaves are simple, 5-10 cm long, alternate, ex-stipulate, long petiolate (Sankhala, L. N., *et al.*, 2012). The matured stem has warts on the surface. The young stem is green soft wooded, dry, cylindrical and 5 mm to 25 mm in diameter (Singh, R. P., *et al.*, 2006)

Tinospora cordifolia is commonly known as Heartleaf moonseed. It is called Guduchi, Gurjo in Nepal, Amrita in sanskrit, Golancha in Bengali, Gulancha in Hindi, Gulvel in Guajrati, Tippateege in Telagu, Amrutaballi in Kannada, Gilo in Urdu, Amudam in Tamil and *Tinospora* in English (Mangal, M., *et al.*, 2012).

A large number of chemical compounds constituents were isolated from *Tinospora cordifolia* belonging to different classes such as alkaloids, diterpenoid lactones, glycosides, steroids, sesquiterpenoid, phenolics, aliphatic compounds and polysaccharides.. A number of different active principles, including alkaloids (berberine), bitter compounds (tinospurin, tinosporic acid and tinosporol), essential oil and a mixture of fatty acids, have been identified as contributing to the observed medicinal effects (Aranha, I., *et al.*, 2012).

Guduchi can also lower the side effects of modern therapeutic drugs and increases their efficacy and safety (Chavan, S. P., *et al.*, 2016). Traditionally, the plant has been used as an anti-spasmodic, anti-inflammatory, jaundice, diabetes, seminal weakness, urinary tract infections, fever, general debility, skin diseases, and expectorant, carminative, digestive, anti-stress and aphrodisiac (Mishra, P., *et al.*, 2014).

The plant is also being reported to exhibits antioxidant activity to counter act the effect of

free radicals. Free radicals or reactive oxygen species are formed in our body as well as a result of biological oxidation. The over production of free radicals as hydroxyl radical, superoxide anion radical, hydrogen peroxide can cause damage to the body and contribute to oxidative stress (Preeti *et al.*, 2017).

Materials and Methods

Plant Material

The plant material were chosen based on the traditional uses by consulting with the local plant users, healers and old persons having indigenous knowledge who have been using these plants since many years for treatment of different from Ilam district.

Extract Preparation

Extract was prepared by both soxhlet extraction using successive solvents; hexane and methanol and by cold percolation using methanol. Then, the extract was filtered and were allowed to evaporate.

Phytochemical Analysis

Freshly prepared extracts were used for phytochemical assay to determine the presence of the following phytoconstituents, i.e., alkaloids, phenols, flavonoids, glycosides, tannins, saponins, steroids, terpenoids, sugar, and proteins (I. Ciulei, 2013).

Antioxidant Activity

Free radical scavenging activity was determined by using 1,1-diphenyl-2-picryl hydrazyl radical (DPPH), which is very stable free radical having purple color. (Jamuna, S., *et al.* 2012). Free radical scavengers are added, DPPH is reduced and its color is changed to yellow based on the efficacy of antioxidants. Scavenging of DPPH free radical determined the free radical scavenging capacity or antioxidants potential of the test sample which shows its effectiveness, prevention, interception and repair mechanism against injury in a biological system. The percentage of radical scavenging activity was calculated using the following formula:

$$\text{Radical SCV (\%)} = \frac{A_0 - A_1}{A_0} \times 100$$

Where, A₀ is the absorbance of the control and A₁ is the absorbance of the sample extracts.

Results and Discussion

Ethno-botanical Survey

Today's world is alarmed with various diseases and problems; some are life threatening. The world is facing a fierce health issues due to the rapid growth and spreading of numerous resistant and newly developing diseases. *Tinospora cordifolia*, a multipurpose valuable medicinal plant widely used for the treatment of various diseases.

The stem of *Tinospora cordifolia* is one of the constituents of several ayurvedic preparations used in general debility, dyspepsia, fever and urinary diseases. The stem is bitter, stomachic, diuretic, stimulates bile secretion, causes constipation, allays thirst, burning sensation, vomiting, enriches the blood and cures jaundice.

According to the data collected from our experimental survey, It is a climber commonly called "gurjo" found in the range of 500-1500m. It can be wild or cultivated and mostly use for medicinal purpose. The plant is found during summer. There are several variety of *Tinospora sp.* Yet, local people are unaware of it. Though the plant isn't easily available yet there is no report on any conservation efforts made by government or local residents. The plant has not been commercialized yet. People usually collect it's leaves and stem for treating different diseases. The plant is either used by direct inhale or with the combination of other plants. Traditionally, local communities worldwide have wide knowledge about local plant and other natural resources, on which they are so immediately and intimately dependent. Unfortunately, much of this knowledge is being lost as traditional cultures are being eroded.

Ethno-botanical survey can play very useful roles in rescuing disappearing knowledge and returning back to local communities. *Tinospora cordifolia* is used as a traditional medicinal plant with unique properties. Traditionally, it is used

alone or with other medicinal plants to treat common disease such as fever, diabetics, urinary tract infection. Piles problem can be controlled by eating this plant mixed with milk or water and thus, preventing the bleeding and constipation.

Tinospora cordifolia is a multidimensional plant with its various aspects beneficial to the mankind. It's a pity that the plant and its numerous advantages are unknown to many. If well documented, this plant can prove to be a boon for countries economy. So it's high time we spend our time, money and research on appropriate place and elevate the country's fortune by giving importance to many relatively unknown plants such as *Tinospora cordifolia* which are being overshadowed by expensive and dangerous synthetic drugs.

Phytochemical Analysis

The analysis of the presence of main groups of natural constituents present in the different plant extracts was done by the color reaction using different specific reagents. This result shows the presence of most of the phytochemicals in the polar extracts in both samples.

Table 1: Phytochemical screening of *Tinospora cordifolia*

Phytochemicals	M (S)	M (L)
Polyphenols	+	+
Alkaloids	+	+
Reducing Sugar	+	+
Terpenoids	+	+
Coumarins	-	-
Saponins	+	+
Glycosides	+	-
Flavonoids	+	+

(+) indicates present and (-) indicates absent

Where,

M (S) = Methanol extract of stem of *Tinospora cordifolia*

M (L) = Methanol extract of leaves of *Tinospora cordifolia*

Antioxidant activity

IC₅₀ values of each extracts and ascorbic acid were calculated. Absorbance was measured at 517 nm. % radical scavenging activity of

different extracts of *Tinospora cordifolia* stem and leaves ascorbic acid at different concentrations are tabulated.

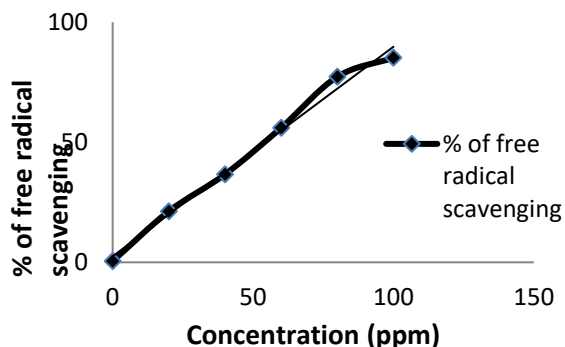
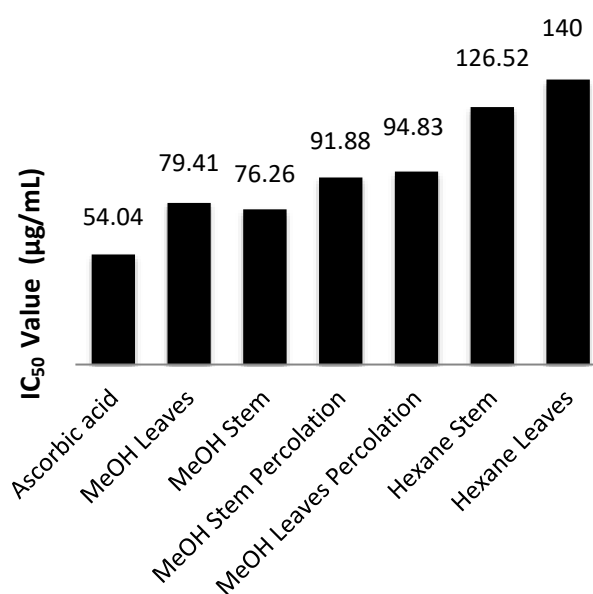


Figure1 : Antioxidant activity of standard ascorbic acid

Calibration curve was constructed by measuring the absorbance of ascorbic acid in order to calculate the IC₅₀ value, which was found to be 54.04µg/mL.

Comparatively, the IC₅₀ values of the methanol extract of leaves and stem are lower than their corresponding hexane extracts and are near to the IC₅₀ value of the ascorbic acid (standard, 54.04µg/mL), evidencing the remarkable antioxidant activity these parts of the plant showed. Thus, they can act as potential natural antioxidants. Among all other extracts, methanol extract of stem was found to be 76.26 µg/mL, slightly greater than that of standard ascorbic acid (54.04µg/mL) making it the most potent or effective antioxidants.



Conclusions

Tinospora cordifolia is a multidimensional plant with its various aspects beneficial to the mankind. Traditionally, it is used alone or with other medicinal plants to treat common disease such as fever, diabetics, urinary tract infection, Piles problem.

Phytochemical screening of methanol extracts of stem of *T. cordifolia* showed the presence of alkaloids, polyphenols, terpenoids, glycosides, quinones, reducing sugars and saponins and that of leaves showed the presence of flavonoids, terpenoids, quinines, reducing sugars, polyphenols and saponins.

The IC₅₀ values of different plant extracts exhibited that the methanol extract of TC stem was the most potent natural antioxidant among all extracts which was confirmed by comparing its IC₅₀ value to the standard. Methanol extract of TC leaves also showed considerable antioxidant property. Methanolic percolation extract of the plant showed stem has the better anti-oxidant property than leaves. However, hexane extract of TC leaves and stem because of very high IC₅₀ values are termed as poor antioxidant.

Recommendations

The results obtained from this research are quite revealing and worthy enough on the study factor, its great potential is far from achieved. Since phytochemicals are known to show wide range of biological and pharmacological activities, it is desired to prepare the plant extracts in other major solvents apart from discussed here so that wide varieties of phytochemicals in higher amount can be extracted. Moreover, the plant extract can be subjected to other medicinal activity parameters such as anti-diabetic test, anticancer test, antiseptic, anti-inflammatory test etc.

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References

- Aranha, I., Fatima C., & Yeldur P. V. 2012. Immunostimulatory properties of the major protein from the stem of the Ayurvedic medicinal herb, guduchi (*Tinospora cordifolia*)." *Journal of ethnopharmacology*, **139(2)**: 366-372.
- Awoyemi., O. K., E.E. Ewa, I. A. Abdul Karim and A. R. Aduloju 2012. Ethnobotanical Assessment of Herbal Plants in Southwestern Nigeria, *Academic Research International*, **5**: 50-57.
- Chavan, S. P., Kadlaskar, B. B., Sawant, P., Rathod, R., Gholap, A. H., & Modi, H. K. 2016. A crucial role of guduchi (*Tinospora cordifolia*) in nephrotic syndrome. *World J Pharm Pharm Sci*, **5 (10)**: 1400-6.
- Chintalwar, G., Jain, A., Sipahimalani, A., Banerji, A., Sumariwalla, P., Ramakrishnan, R., & Sainis, K. 1999. An immunologically active arabinogalactan from *Tinospora cordifolia*. *Phytochemistry*, **52 (6)**: 1089-1093.
- Ciulei I., *Phytochem.*, 2003. **63(1)**: 97-104.
- Davis, E. W. 1995. Ethnobotany: an old practice, a new discipline (Vol. 40). Dioscorides Press, Portland, OR. (GT)
- Gewali, M. B., & Awale, S. 2008. Aspects of traditional medicine in Nepal. *Japan: Institute of Natural Medicine. University of Toyama*.
- Jamuna S., Paulsamy S. and Karthika K., 2012. *Journal of Applied Pharmaceutical Science*, **2(7)**: 149-154.
- Kapil, A., & Sharma, S. 1997. Immunopotentiating compounds from *Tinospora cordifolia*. *Journal of ethnopharmacology*, **58(2)**: 89-95.
- Mangal, M., Sheoryan, A., Mangal, A. K., Kajla, S., Choudhury, A., & Dhawan, A. 2012. Biotechnological Advances in *Tinospora cordifolia* (Willd.) Miers Ex Hook. F. & Thoms: Overview of Present Status And Future Prospects.
- Martin, G. J. 2010. *Ethnobotany: a methods manual*. Routledge.
- Mishra, P., Jamdar, P., Desai, S., Patel, D., & Meshram, D. 2014. Phytochemical analysis and assessment of in vitro antibacterial activity of *Tinospora cordifolia*. *International Journal of Current Microbiology and Applied Sciences*, **3(3)**.
- Priti, Rani, S. 2017. Phytochemical screening, antibacterial and antioxidant activity of leaves extract of *Tinospora cordifolia*, *Journal of Pharmacy Research*, **11**: 991-995.
- Ramamurthy, V., Rajeswari, D. M., Gowri, R., Vadivazhagi, M. K., Jayanthi, G., & Raveendran, S., 2013. Study of the phytochemical analysis and antimicrobial activity of *Dodonaea viscosa*. *Journal of Pure and Applied Zoology*, **1(2)**: 178-184
- Sankhala, L. N., Saini, R. K., & Saini, B. S. 2012. A review on chemical and biological properties of *Tinospora cordifolia*. *International Journal of Medicinal and Aromatic Plants*, **2(2)**: 340-344.
- Singh, R. P., Banerjee, S., Kumar, P. V. S., Raveesha, K. A., & Rao, A. R. 2006. *Tinospora cordifolia* induces enzymes of carcinogen/drug metabolism and antioxidant system, and inhibits lipid peroxidation in mice. *Phytomedicine*, **13(1-2)**: 74-84.