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Studies of Helicteres Isora's Antioxidant and Antidiabetic Activity Review

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ABSTRACT

Since ancient times, herbal medicine plants have been used to treat a variety of ailments. The helicteres isora, often known as the Indian screw tree, is a Southeast Asian medicinal plant. This study looked into the antioxidant and anti-diabetic effects of plant and animal extracts. Antioxidants are necessary to neutralise harmful free radicals in the body, especially when the body's natural defence mechanisms fail. The 1,1 diphenyl-2, picrylhydrazyl (DPPH) and nitric acid (NO) reducing tests were used to determine antioxidant activity. A glucose tolerance test was used to assess the anti-diabetic activity of various extracts of H. isora roots. Distilled water, ethanol, methanol, and acetone were used to make extracts of leaves, bark, roots, and fruits (both fresh and dry). Each extract was put to the test.

KEYWORDS: *Antioxidant activity, helictere isora, phytochemical analysis of H.isora, phenolic content, antidiabetic activity*

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Helicteres isora fruit

INTRODUCTION

The Indian screw tree is a medicinally valuable sub-deciduous shrub or small tree that grows in India [1].The various plant components are said to contain phytosterols, saponins, sugars, lignin, alkaloids, triterpenoids and their acetates, cucurbitacin B, isocucurbitacin B, flavonoids, neolignans, rosmarinic acid derivatives, betulic acid, daucosterol, tannnins, anthoquinones, sterols, lupeol [2] It has antispasmodic, antipyretic, and anti-diarreoheal properties. Diabetes mellitus is a chronic disease defined by high blood glucose levels caused by a lack of insulin, either completely or partially.[3] In modern medicine, there is still no satisfactory treatment for diabetes mellitus, despite the fact that insulin therapy, oral hypoglycemic medications, a limited diet, and workouts, either alone or in combination, make up the majority of the treatment options for diabetic patients today. Treatment using traditional medicine in the form of plant extracts has been reported to have astonishingly effective effects in a large number of cases. In a glucose tolerance test, we discovered that the butanolic extract of the roots

of H. isora has antihyperglycemic properties. [4]Antioxidants play a significant role in illness prevention in humans. Antioxidants found naturally in leafy vegetables and seeds, such as ascorbic acid, vitamin E, and phenolic compounds, have been shown to reduce oxidative damage linked to a variety of diseases, including cancer, cardiovascular disease, cataracts, atherosclerosis, diabetes, arthritis, immune deficiency diseases, and ageing. (5),(6),(7) For a long time, medicinal plants have been investigated for their bioactive components. (8, 9, 10) The current complete evaluation is mostly focused on Helicteres isora's plant profile, phytochemical analysis, and inquiry.

Description of plant

Helicteres isora L. is a small tree or large shrub in the Malvaceae family with the local name "Marorphali," sanskrit name "Avartani," and English name "Indian screw tree." The plant prefers deciduous trees and shrubs (11) The plant is mostly used in India to treat stomachaches, rickets, diarrhoea, discomfort, ulcers, and carbuncles. 12) The plant is a big shrub or small tree with a height of 5-8 metres. The leaves are obovate or suborbicular, with a cordate base, uneven margins, crenate or serrate apex, and crenate or serrate crenate or serrate apex. The leaf has 3-5 nerves at the base, is scabrous above, and is stellately tomentose at the bottom. The petioles of the leaves are 1.2 cm long. Young stellate-tomentose shoots protrude from the bark, which is pale grey and finely furrowed. Flowers are axillary, single, or in cymes, with bracts that are 2-3 mm long and linear, with two brown glands in the axil.With 5 uneven lobes, the flower calyx is somewhat golden, tubular, and persistent. The tube is 1.5-2 cm long, dense, stellate, and hairy, and it is dense, stellate, and hairy. Petals are 5 in number, uneven in length, clawed, obovate, and crimson to pale blue in colour. The staminal column is cylindrical and 3-3.5 cm long, with ten stamens and five staminodes. The ovaries are 2-2.5 mm long, pentalobed, and 5-celled, and are found at the tip of the gynophore. The ovules are numerous, with five styles and a subulate stigma. The follicles are spirally twisted, stellate-tomentose, and beaked, and are 4-6 cm long and 5 in number. The seeds are around 2-3 mm long, black, angular, and wrinkled.

Preparation of h isora extraction [13]

The powdered drug, 500 grammes, was transferred into a soxhlet apparatus and sucessive extractions were performed using petroleum ether, 60 to 80 degrees Celsius, chloroform, acetone, and ethanol. Each cycle for an individual solvent lasted 24 to 36 hours. Finally, the marc was macerated with hydroalcoholic (solvent (70 percent ethanol, 30 percent water vv) for 48 hours.

Examination of phytochemicals

Standard procedures were used to conduct qualitative phytochemical analysis on H. isora root extracts

Check for alkaloids [14]

With Hager's reagent, alkaloids (found in plant extract) produce a yellow precipitate (saturated solution of picric acid)

Check for protein [15]

The xanthoproteic reaction is a type of reaction that occurs when a substance is When protein is heated with strong nitric acid, it usually becomes yellow. When the solution is made alkaline, the hue changes to orange. The nitration of aromatic ring containing amino acids like phenylalanine and tyrosine causes the hue.

Check for carbohydrates [14]. [16]

Molisch's experiment: Adding a few drops of alcoholic alpha-naphthol solution to the test sample (2-3 ml), shaking well, and then adding a few drops of concentrated H2SO4 from the test tube's side indicates the presence of carbohydrates . The appearance of a purple to violet colour ring at the junction indicates the presence of carbohydrates.

Check for steroids [14]

Test by Salkowski :Plant extracts (sample) were treated with a few drops of strong sulfuric acid; the presence of steroids is shown by red colour at the lower layer, while the presence of triterpenoids is indicated by yellow colour at the lower layer

Examine for flavonoids. [14]

Shinoda examination: After a few minutes of adding a few magnesium turnings and dropwise concentrated hydrochloric acid to the solution, pink scarlet, crimson red, and occasionally green to blue hue develops

Tannin and phenol tests [14]

Test for ferrochloride When plant extract was treated with ferric chloride solution, it became blue if hydrolysable tannins were present and green if condensed tannins were present

Saponin glycosides are tested for. [14]

Test of froth formation :In a test tube, combine 2 mL plant extract with water, shake well, and a stable froth (foam) is created, indicating the presence of saponin glycosides in the plant sample.

Antioxidant activity of plant

The plant's anti-oxidant potential has been discovered by a number of researches. The plant is a powerful scavenger of radicals such as 1, 1-diphenyl-2-picrylhydrazyl (DPPH), hydroxyl (OH), and superoxide (SOR). (17, 18)The fruits include a compound known as 4, 4'-O-di—D-glucopyranosyl

rosmarinic acid, which has substantial scavenging ability against superoxide anion generated by xanthine and xanthine oxidase (XOD) (19)The fruit's phenolic extract has hydroxyl radical scavenging, DPPH radical scavenging, and peroxidation inhibitory action that is dosage dependant (20)The antioxidant DPPH radical-scavenging activity and Ferric reducing antioxidant power (FRAP) of the ethanolic fruit extract were found to be comparable to normal Trolox (21)The ethanolic leaf extracts have a high DPPH and nitric oxide (NO) radical scavenging activity, as well as a high reducing power (22)A substantial DPPH radical scavenging activity was also observed in a subcritical water extract of the plant prepared at 160°C, 10 bar pressure, 30 min time, with a 1: 30 sample-to-solvent ratio (23)The DPPH reagent absorbance was used as a control, and the radical scavenging activity of the samples was determined using the following formula:. (Absorbance of control − Absorbance of sample) X 100 = percent inhibition Control absorbance (24)

Total Phenolic Content:

Phenolics, also known as polyphenols, are secondary plant metabolites that are found in abundance in plants and plant products. Due to their redox characteristics, phenolic chemicals primarily contribute to the antioxidant capacity of plants. The antioxidant activity of phenolic compounds is due to their ability to neutralise free radicals and prevent hydroperoxide breakdown into free radicals (25, 26)

Anti-diabetic activities:

Overall, research findings on H. isora root extract exhibited insulin-sensitizing, anti-hyperglycemic, and hypolipidemic activities, implying that the extract could be used to treat type-2 diabetes (27, 28, 29, 30, 31, 32) Kumar and Murugesan (2007) found that giving aqueous bark extract to diabetic rats resulted in a significant reduction in lipid peroxidation products and a normalization of endogenous antioxidant levels in the heart (28)In the brains of diabetic rats, Kumar et al. (2007) found a significant rise in the activities of plasma insulin and endogenous enzymes such as SOD, CAT, GPX, GST, and GSH after treatment with an aqueous extract from H. isora bark (33)These findings suggested that the aqueous extract from the bark of H. isora may have an antioxidative role, and thus may have a protective effect against lipid peroxidation–induced membrane damage in the brain. (33) Saponins from H. isora have been shown to have anti-diabetic effects by activating the PI3K/Akt pathway, which leads to the phosphorylation and inactivation of GSK-3/, which stimulates glycogen synthesis and increases Glut4-dependent glucose transport across the cell membrane (32)

Therapeutic Efficacy of Bioactive Compounds:

The therapeutic efficacy of medicinal plants/herbs is based on the bioactive substances they contain and the physiological action they have on the human body. In different parts of H. isora, preliminary qualitative studies on various extracts suggested the presence of phenolics, flavonoids, glycosides, tannins, carotenoids, ascorbic acid, and saponins (34, 35,36,37,38) Furthermore, earlier studies revealed that the herbal product Triphala has a significant polyphenolic proportion of gallic acid (50 percent) [39] Gallic acid was discovered to be one of the antioxidants present in H. isora during our recent research [results unpublished]. Furthermore, the chemical composition of various parts of H. isora meets the criteria for a good antioxidant reservoir in terms of major constituents (40)

Ethnobotanical claims and their likely scientific explanations* are listed in.TABLE 1: possible scientific basic of plants part of plant H.isora

Plant parts	Diseases	Ethno-medicinal use	Scientific foundation	Evidence from experiments (ref)
BARK	Diarrhea	Bark boiled with water taken orally thrice per day	Antimicrobial activity/ Antispasmodic action	41, 42, 43, 44
	Diabetes	1 fresh fruits each taken orally	Antioxidant activity/ Anti-hyperglycemic and hypolipidemic effects Decreased level of glucose, glycosylated hemoglobin and plasma glycoproteins; Increase in levels of plasma insulin, hemoglobin	45, 46, 47, 48
FRUITS	Gastrointestinal problems	5 g fruit powder with salt should be taken three	Antioxidant activity/ Antimicrobial effects	41, 42,43

		times a day with water.		
SEEDS	Dysentery	5 g seed powder, boiled twice a day	Antimicrobial activity for diarrhea and dysentery due to amoebiasis.	44, 41, 42,43
ROOT	Cut and wounds	Externally, fresh root paste with turmeric paste is administered.	Antioxidant activity/ Antimicrobial activity	45, 46, 47, 48
LEAVES	Skin infections	Three times a day, apply fresh leaf paste	Antioxidant activity/ Antimicrobial properties	41, 42, 43, 44

CONCLUSION:

It was discovered in this study that the phytochemical constituents of different plant parts of Helicteres isora L. differed. The extracts' high phenolic content was favourably linked with their free radical scavenging efficacy.Quantitative assays and phenolic profiling of extracts employing RP-HPLC backed up these findings. The current paper provides a brief overview of Helicteres isora's various therapeutic applications (L.). Both laboratory and epidemiologic studies have found substantial evidence that every part of the H. isora plant has medicinal properties. According to studies, bioactives in alcoholic and acetone extracts of fruits exhibit strong antioxidant and free radical scavenging properties.compounds.Anti-inflammatory and anti-cancer properties have yet to be evaluated in animal models or in a clinical setting. To do so, extensive study is required.find anti-cancer, anti-inflammatory, anti-diabetic, and hepatoprotective targets in cells We believe that further extensive cohort studies, both in the lab and in the clinic, are required for the creation of herbal formulations including H.isora alone or in combination with other herbals to combat a variety of disorders, including cancer.

Reference

[1] Shriram V, Jahagirdar S, Latha C, Kumar V, Dhakephalkar P, Rojatkare S and Shitole MG: Antibacterial & antiplasmid activities of Helicteres isora L. Indian J Med Res 2010; 132: 94-99.

[2] Loganayaki N, Siddhuraju P and Manian S: Antioxidant activity and free radical scavenging capacity of phenolic extracts from Helicteres isora L. And Ceiba pentandra L. J Food Sci Technol 2013; DOI. 10. 1007/S 1397-011-0389-x.

[3] Cheng J. Herbs used to treat Diabetes mellitus in Chinese Traditional Medicine. In: GovilJN, Singh VK, Majumdar VK, editors. Recent Progress in Medicinal Plants; 1st edition. 2003; 8: 175-184

[4] Venkatesh S, Reddy GD, Reddy BM. Antihyperglycemic activity of Helicteres isora roots in alloxan induced diabetic rats. Pharm Biol. 2003; 41: 347-350

[5] Pietta P, Simonetti P and Mauri P, Antioxidant activity of selected medicinal plants, J Agric Food Chem, 1998, 46, 4487-4490.

[6] Lee KG, Mitchell AE and Shibamoto T, Determination of antioxidant properties ofaroma extracts from various beans, J Agric Food Chem, 2000, 48, 4817-4820.

[7] Middleton E, Kandaswamy C and Theoharides TC, The effects of plant flavonoids on mammalian cells: implications for inflammation, heart disease and cancer, Pharmacol Rev, 2000, 52, 673-751

[8] Pandey S, Shukla A, Pandey S, Pandey A. An overview of resurrecting herb 'Sanjeevani' (Selaginella bryopteris) and its pharmacological and ethnomedicinal uses, The Pharma innovations, 2017: 6(2): 11-14.

[9] Pandey S, Shukla A, Pandey S, Pandey A. Morphology, chemical composition and therapeutic potential of Somlata (Sarcostemma acidum Wight. & Arn.), Pharma Science Monitor, 2017: 8(4): 54-60.

[10] Pandey S. Morphology, chemical composition and therapeutic potential of Stevia rebaudiana, Indo American Journal of Pharmaceutical Sciences, 2018: 05(04): 2260-2266.

[11] Reddy C S, Reddy K N, Murthy E N, Raju V S. Tree wealth of Eastern Ghats of Andhra Pradesh, India: an updated checklist. Check List, [S. l.], 2009: 5(2): 173-194,

[12] https://www.gbif.org

[13] GOpALASATHEESKUMAR K. Significant role of soxhlet extraction process in phytochemical research mintage journal of

pharmaceutical and medical science, 2018, 7 (suppl1): 43- 47

[14] Kokate CK, Purohit AP, Gokhale SB. Pharmacology: Pathway to screen phytochemical nature of natural drugs. Pune, India: Nirali Prakashan; 2008. p. A. 1-A. 6.

[15] Siddiqui AA, Ali M. Practical Pharmaceutical Chemistry: Identification Test of Organic Drugs. New Delhi: CBS Publishers and Distributers; 2008. p. 126-32.

[16] Khandelwal KR. Practical Pharmacology Techniques and Experiments. Pune, India: Nirali Parkashan; 2006. p. 15-163.

[17] Khandelwal KR. Practical Pharmacology Techniques and Experiments. Pune, India: Nirali Parkashan; 2006. p. 15-163. -699.

[18] Shaikh R, Pund M, Dawane A, Iliyas S. Evaluation of Anticancer, Antioxidant, and Possible Anti- inflammatory Properties of Selected Medicinal Plants Used in Indian Traditional Medication, J Tradit Complement Med, 2014: 4(4): 253-257.

[19] Satake T, Kamiya K, Saiki Y, Hama T, Fujimoto Y, Kitanaka S et al. Studies on the Constituents of Fruits of Helicteres isora L, Chem Pharma Bull, 1999: 47(10): 1444-1447.

[20] Loganayaki N, Siddhuraju P, Manian S. Antioxidant activity and free radical scavenging capacity of phenolic extracts from Helicteres isora L. and Ceiba pentandra L, J Food Sci Technol, 2013: 50(4): 687-695.

[21] Rattanamaneerusmee A, Thirapanmethee K, Nakamura Y, Bongcheewin B, Chomnawang M T. Chemopreventive and biological activities of Helicteres isora L. fruit extracts, Res Pharm Sci, 2018: 13(6): 484-492.

[22] Mahajan R, IMahajan R, Itankar P. Antioxidant, Antimicrobial and Wound Healing Potential of Helicteres isora Linn. Leaf Extracts, Digital Chinese Medicine, 2020: 3(3): 188-198

[23] Didar Z. Comparative in vitro Study of the biological activity and chemical composition extractsof Helicteres isora L. obtained by water and subcritical water extraction, Food Quality Safety, 2020: 4(2): 101-106

[24] Pai VT, Sawant SY, Ghatak AA, Chaturvedi PA, Gupte AM and Desai NS J Food Sci. Technol. 2013; DOI. 10. 1007/S 13197-013-1152-2.

[25] Javanmardi JC, Stushnoff EL, Vivanco JM (2003) Antioxidant and phenolic content of Iranian ocimu accessions. Food Chem 83: 547-550.

[26] Li H., Hao, Z., Wang, X., Huang, L. and Li, J: Antioxidant activities of extracts and fractions from Lysimachia foenum-graecum Hance. Bioresource Technology, 2009; 100: 970– 974.

[27] Chakrabarti R, Vikramadithyan RK, Mullangi R, Sharma hypolipidemic activity of Helicteres isora in animal models. J Ethnopharmacol 2002; 81(3): 343-9.

[28] Kumar G, Murugesan AG. Influence of Helicteres isora bark extracts on plasma and tissue glycoprotein components in streptozotocin diabetic rats. Journal of Clinical and Diagnostic Research 2007; 4: 330-8.

[29] Bhoopati RA, Elanchezhiyan C, Sethupathy S. Antihyperlipidemic activity of Helicteres isora fruitextract on streptozotocin induced diabetic male Wistar rats. Eur Rev Med Pharmacol Sci 2010; 14: 191-6.

[30] Venkatesh S, Reddy BM, Reddy GD, Mullangi R, Lakshman M. Antihyperglycemic and hypolipidemic effects of Helicteres isora roots inalloxan-induced diabetic rats: a possible mechanism of action. J Nat Med 2010; 64(3): 295-304.

[31] Kumar V, Sharma M, Lemos M, Shriram V. Efficacy of Helicteres isora L. against free radicals, lipid peroxidation, protein oxidation and DNA damage. Journal of Pharmacy Research 2013; 6(6): 620-5.

[32] Bhavsar SK, Föller M, Gu S, Vir S, Shah MB, Bhutani KK et al. Involvement of the PI3K/AKT pathway in the hypoglycemic effects of saponins from Helicteres isora. J Ethnopharmacol 2009; 126(3): 386-396.

[33] Kumar G, Sharmila BG, Murugesan AG, Rajasekara PM. Effect of Helicteres isora bark extracts on brain antioxidant status and lipid peroxidation in streptozotocin diabetic rats. Pharmaceutical Biology 2007; 45(10): 753-9.

[34] Gayathri P, Gayathri Devi S, Srinivasan SSS. Screening and Quantitation of Phytochemicals and Nutritional Components of the Fruit and Bark of Helicteres isora. Hygeia J. D. Med 2010; 2(1): 57-62.

[35] Tambekar DH, Khante BS, Panzade BK, Dahikar SB, Banginwar YS. Evaluation of phytochemical and antibacterial potential of

Helicteres isora L. fruits against enteric bacterial pathogens. Afr J Tradit Complement Altern Med 2008; 5(3): 290-3.

[36] Basniwal PK, Suthar M, Rathore GS, Gupta R, Kumar V, Pareek A, et al. In vitro antioxidant activity of hot aqueous extract of Helicteres isora Linn. Fruits. Natural Product Radiance 2009; 8(5): 483-7.

[37] Loganayaki N, Siddhuraju P, Manian S. Antioxidant activity and free radical scavenging capacity of phenolic extracts from Helicteres isora L. and Ceiba pentandra L. J Food Sci Technol 2013; 50(4): 687-95.

[38] Jain A, Sinha P, Desai NS. Estimation of flavonoid, phenol content and antioxidant potential of Indian screw tree (Helicteres isora L.). International Journal of Pharmaceutical Sciences and Research 2014; 5(4): 1320- 33. 30

[39] Sandhya T, Mishra KP. Cytotoxic response of breast cancer cell lines, MCF 7 and T 47 D to triphala and its modification by antioxidants. Cancer Lett 2006; 238(2): 304-13.

[40] Jain A, Sinha P, Desai NS. Estimation of flavonoid, phenol content and antioxidant potential of Indian screw tree (Helicteres isora L.). International Journal of Pharmaceutical Sciences and Research 2014; 5(4): 1320-30.

[41] Tambekar DH, Khante BS, Panzade BK, Dahikar SB, Banginwar YS. Evaluation of phytochemical and antibacterial potential of Helicteres isora L. fruits against enteric bacterial pathogens. Afr J Tradit Complement Altern Med 2008; 5(3): 290-3.

[42] Venkatesh S, Sailaxmi K, Reddy BM, Ramesh M. Antimicrobial activity of Helicteres isora root. Indian Journal of Pharmaceutical Sciences 2007; 69: 687-9.

[43] Shriram V, Jahagirdar S, Latha C, Kumar V, Dhakephalkar P, Rojatkar S, et al. Antibacterial & antiplasmid activities of Helicteres isora L. Indian J Med Res 2010; 132: 94-9.

[44] Raaman N, Balasubramanian K, et al. Antioxidant and anticancer activity of Helicteres isora dried fruit solvent extracts. J Acad Indus Res 2012; 1(3): 148-52.

[45] Basniwal PK, Suthar M, Rathore GS, Gupta R, Kumar V, Pareek A, et al. In vitro antioxidant activity of hot aqueous extract of Helicteres isora Linn. Fruits. Natural Product Radiance 2009; 8(5): 483-7.

[46] Loganayaki N, Siddhuraju P, Manian S. Antioxidant activity and free radical scavenging capacity of phenolic extracts from Helicteres isora L. and Ceiba pentandra L. J Food Sci Technol 2013; 50(4): 687-95.

[47] Chitra MS, Prema S. Hepatoprotective activity of Helicteres isora Linn. Against CCl4 induced hepatic damage in rats. Hamdard Medicus 2009; 52(1): 112-5.

[48] Pradhan M, Sribhuwaneswari S, Karthikeyan D, Minz S, Sure P, Chandu AN et al. In vitro cytoprotection activityof Foeniculum vulgare and Helicteres isora in cultured human blood lymphocytes and antitumour activity against B16F10 melanoma cell line. Research Journal of Pharmacy and Technology 2008; 1(4): 450-2.