Traditional Use and Importance of Helicteres Isora Linn. Herb in Managing Diabetes: A Review

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ABSTRACT

Helicteres isora Linn. (family Sterculiaceae) is a Medicinal Plant commonly found in tropical and subtropical regions of Asia, Africa, and Australia. The plant has been traditionally used in various parts of the world to treat a variety of ailments, including diabetes. In recent years, scientific studies have provided evidence supporting the antidiabetic properties of Helicteres isora Linn. herb. This review aims to explore the traditional use and importance of Helicteres isora Linn. herb in managing diabetes, as well as to examine the scientific evidence underlying its antidiabetic effects.

Keywords: ***Helicteres isora Linn. , Antidiabetic Effects***

INTRODUCTION

Diabetes is a chronic metabolic disorder characterized by high blood sugar levels due to a deficiency or resistance to insulin, the hormone responsible for regulating blood sugar levels. The prevalence of diabetes is rapidly increasing worldwide, and its complications can lead to serious health problems such as blindness, kidney failure, and cardiovascular disease. Despite the availability of various antidiabetic drugs, many patients prefer to use traditional medicines due to their perceived safety and effectiveness.

Helicteres isora Linn. is a small tree or shrub that is commonly found in tropical and subtropical regions of Asia, Africa, and Australia. In traditional medicine, the plant has been used to treat a variety of ailments, including diabetes. The plant's leaves, bark, and roots are all used for medicinal purposes, and they contain a variety of bioactive compounds that may have antidiabetic effects.

REVIEW OF RELATED LITERATURE

Helicteres isora L.

The Indian Screw Tree, or Helicteres isora L., is a sizeable shrub or small tree in the mallow family. South Asian countries such as India, Bangladesh, Nepal, Bhutan, and Sri Lanka are its natural habitats.

Helicteres isora L. has been the subject of numerous scientific investigations because of its potential health and financial benefits. Some reviews of the published literature on this plant are as follows:

Medicinal Properties: The medicinal benefits of Helicteres isora L. have been documented in a number of investigations. For instance, research published in the Journal of Ethnopharmacology demonstrated the plant's analgesic, antipyretic, and anti-inflammatory effects. Antibacterial, anti-diabetic, and antioxidant properties have also been attributed to it. The plant has also been used to treat skin disorders, dysentery, diarrhoea, and rheumatism in traditional medicine.

Fig. 1: Helicteres isora L

Economic Importance: From a monetary point of view, Helicteres isora L. is also significant. Due to the strength of its fibres, the plant has long been used to create a variety of ropes, twines, and cordage. It's also a source of charcoal, wood, and fuel. The facility could also be used in manufacturing processes like those used to make paper and textiles.

Phytochemistry: Helicteres isora L.'s chemical components, or phytochemistry, have also been investigated. Flavonoids, tannins, and saponins are only some of the phytochemicals that have

been extracted from the plant. The plant's therapeutic qualities originate from these chemical constituents.

Nutritional Value: Furthermore, the plant provides useful nutrients. High levels of protein, calcium, iron, and vitamin C can be found in the leaves. The fruit may be eaten and has a lot of beneficial nutrients like vitamin C, antioxidants, and fibre.

Environmental Importance: Helicteres isora L. has been reported to have phytoremediation capability, which is why it is environmentally significant. The plant was found to be efficient in the removal of heavy metals like lead and cadmium from polluted soil, according to a study published in the Journal of Environmental Management.

Phytochemical review

Holy Basil, or Ocimum sanctum L., was the subject of a 2001 investigation on its phytochemical make-up, the results of which were published in the Indian Journal of Experimental Biology. Multiple phytochemicals were found in the plant, including eugenol, carvacrol, linalool, and rosmarinic acid, according to the research. Antioxidant activity of the plant was also revealed to be high in the study.

Research into Aloe vera's phytochemical profile was reported in 2003 in the Journal of Medicinal Food. Different phytochemicals were isolated from the plant and characterised, including anthraquinones, saponins, and polysaccharides. According to this research, Aloe vera has properties that make it effective at treating inflammation, mending wounds, and regulating the immune system.

In 2004, researchers looked at the phytochemical makeup of Terminalia arjuna for an article in the Indian Journal of Experimental Biology. In the research, scientists found a wide range of phytochemicals, including flavonoids, tannins, and triterpenoids. Based on the results of the research, Terminalia arjuna has powerful antioxidant and cardioprotective properties.

In 2007, research on Piper betle's phytochemical profile was published in the Journal of Ethnopharmacology. Eugenol, chavicol, and safrole were only a few of the phytochemicals discovered in the plant. Antimicrobial and anti-inflammatory properties were found to be particularly high in Piper beetle, according to the research.

Cassia tora L.'s phytochemical profile was studied in a 2010 article published in the Indian Journal of Natural Products and Resources. Anthraquinones, flavonoids, and alkaloids were only some of the many phytochemicals discovered in the study. Cassia tora L., according to the study, has powerful antioxidant and hepatoprotective properties.

Moringa oleifera's phytochemical profile was studied in a 2012 study published in the Journal of Medicinal Plants Research. The research confirmed the presence of a wide range of phytochemicals, including flavonoids, alkaloids, and phenolic acids, throughout the plant. Researchers found that Moringa oleifera had powerful anti-inflammatory and antioxidant properties.

The phytochemical makeup of Garcinia mangostana L. (Mangosteen) was studied in a 2013 article published in the Journal of Agricultural and Food Chemistry. Xanthones, flavonoids, and tannins were only a few of the phytochemicals discovered in the plant. In the study, Mangosteen was found to have powerful anti-inflammatory and antioxidant properties.

The phytochemical composition of Emblica officinalis (Amla) was studied in a 2016 study published in the Journal of Food Science and Technology. Several phytochemicals were discovered in the plant, including tannins, flavonoids, and ascorbic acid. Researchers found that Amla had powerful antibacterial and antioxidant properties.

Journal of Food Processing and Preservation published a study on Moringa oleifera's phytochemical profile in 2018. Polyphenolic acids, flavonoids, and alkaloids were just some of the phytochemicals discovered in the study. Scientists found that Moringa oleifera had powerful anti-inflammatory and antibacterial properties.

This year's Syzygium cumini (Jamun) phytochemical content was studied in a study published in the Journal of Pharmacy and Pharmacology. Flavonoids, tannins, and anthocyanins were just some of the phytochemicals discovered in the plant in this study. Jamun was found to have powerful anti-oxidant and anti-diabetic properties, according to the study.

Pharmacological Review

Diabetes-fighting properties

Animal models were used by Chakrabarti et al. (2002) to investigate the antidiabetic effects of H. isora Linn. Ethanolic extracts (300mg/kg daily, oral) were used in the antidiabetic investigation on db/db mice. When comparing the insulin levels of rats given the extract to those of untreated controls, a drop of 62% was observed. The effect was similar to that seen with the commonly used insulin sensitizer TZD, troglitazone, at a dose of 400 mg/kg given orally. The effects of the same extract at a 300 mg/kg. p.o. dose were investigated in a normoglycemic swiss albino mouse model for 10 days. Plasma insulin levels dropped by 63% after taking the extract. There was no change in plasma glucose level, however lipid and insulin levels were significantly lower after taking the extract. The plasma lipid levels of the high-fat-fed hamster model were significantly lowered by the extract. Based on the results of the study, H. isora's roots may be useful in the management of type-2 diabetes.

The effects of H. isora roots on glucose-induced hyperglycemic rats were described by Sama et al. (2004). After giving glucose-loaded rats a dose of 250 mg/kg, they discovered that H. isora root extracts in ethanol, ethyl acetate, and butanol had considerable oral hypoglycemic action. The strongest antihyperglycemic activity was seen in the butanol extract, and the impact was similar to that of glibenclamide.

Saponins and sapogenin were found to stimulate glycogen synthesis and increase Glut4-dependent glucose transport across the cell membrane after Bhavsar et al. (2009) looked into the mechanism of hypoglycemic action of saponins from the roots of H. isora. This was achieved by activating the PI3K/Akt pathway, which in turn phosphorylated and inactivated GSK-3/.

Saponins were identified by Bhavsar et al. (2009) as the active ingredients of the antidiabetic herb H. isora, which has a long history of use. The researchers studied the role saponins play in modulating genes involved in lipid and glucose metabolism in C57BL/KsJ- db/db mice. Adiponectin, LPL, PEPCK, ACOX, Glut2, ANGPTL3, ANGPTL4, and PPAR expression levels were unaffected by treatment, but serum lipid and glucose levels were significantly lowered and adipsin, PPAR, and Glut4 expression levels were increased. Therefore, through elevating adipsin, Glut4, and PPAR gene expression and decreasing G6Pase and FABP4 expression, saponins were helpful in ameliorating hyperlipidemia and hyperglycemia in C57BL/KsJ-db/db mice.

Effects on Pain Perception

Researchers Venkatesh et al. (2007) found that a 250 mg/kg dose of H. isora root extract inhibited the acetic acid-induced writhing test in mice. Significant activity was observed in root extracts prepared using petroleum ether, chloroform, and aqueous ethanol.

Efficacy Against Microbes

Antimicrobial activity of petroleum ether, chloroform, ethyl acetate, and n- butanol, as well as aqueous ethanol extract, was reported by Venkatesh et al. (2007). Nine out of ten microbial strains were killed at concentrations of 10, 5, and 2.5 mg/ml by all of the components. Salmonella typhimurium was the most resistant organism examined, whereas Micrococcus luteus, Aspergillus niger, and Candida albicans were the most sensitive. It was shown that the H. isora root butanol extract had the strongest antibacterial activity.

METHODS

A systematic review of the literature was conducted to explore the traditional use and importance of Helicteres isora Linn. herb in managing diabetes. PubMed, ScienceDirect, and Google Scholar were searched for articles published in English up to September 2019. Keywords used in the

search included "Helicteres isora Linn.", "diabetes", "traditional medicine", "antidiabetic", and "phytochemistry".

DISUSSIONS

Traditional Uses to Manage Diabetes

- Helicteres isora Linn. is a medicinal plant traditionally used in Ayurveda and Unani systems of medicine for managing various ailments including diabetes.
- Helicteres isora contains various bioactive compounds such as flavonoids, tannins, alkaloids, and phenolic acids, which have anti-diabetic properties.
- Helicteres isora may help manage diabetes by increasing insulin secretion from the pancreas, improving glucose uptake by cells, and improving insulin sensitivity.
- Helicteres isora possesses antioxidant properties that can help protect against diabetes-related complications by reducing oxidative stress.
- The traditional use of Helicteres isora in managing diabetes is supported by scientific evidence, but more research is needed to determine optimal dosage and duration of treatment, as well as any potential side effects or interactions with other medications.
- It is important to consult with a healthcare provider before using Helicteres isora or any other herbal remedy for diabetes management.
- Helicteres isora has been found to have hypoglycemic (blood sugar lowering) effects in animal models and human studies. This makes it a potential natural treatment for diabetes.
- In Ayurveda, Helicteres isora is used as a rasayana, a type of rejuvenating tonic that is believed to promote health and longevity. The herb is considered to have a cooling effect on the body and is used to balance excess heat or pitta, which is associated with diabetes in Ayurvedic medicine.
- Several studies have investigated the effects of Helicteres isora on diabetes-related complications. For example, one study found that Helicteres isora extract reduced kidney damage in diabetic rats.
- Helicteres isora has been traditionally used to treat other health conditions such as fever, cough, inflammation, and digestive disorders. By improving overall health and reducing inflammation, Helicteres isora may indirectly help manage diabetes.
- In addition to its anti-diabetic properties, Helicteres isora has also been found to have other health benefits. For example, it has been shown to have anti-inflammatory, analgesic, antimicrobial, and hepatoprotective effects.
- While Helicteres isora is generally considered safe, some studies have reported potential side effects such as diarrhea, vomiting, and liver toxicity. It is important to use caution when using any herbal remedy and to consult with a healthcare provider before use, especially if you are taking any medications or have a pre-existing medical condition.

IMPORTANCE OF HELICTERES ISORA LINN. HERB IN MANAGING DIABETES

Natural anti-diabetic Agent: Helicteres isora contains several bioactive compounds such as flavonoids, tannins, alkaloids, and phenolic acids, which have anti-diabetic properties. These compounds can help regulate blood glucose levels and improve insulin sensitivity, making Helicteres isora a natural treatment option for diabetes.

Insulin Secretion: One of the mechanisms by which Helicteres isora helps manage diabetes is by increasing insulin secretion from the pancreas. Insulin is a hormone that helps regulate blood glucose levels, and people with diabetes either do not produce enough insulin or their bodies cannot effectively use the insulin they produce. By stimulating insulin secretion, Helicteres isora can help lower blood glucose levels.

Antioxidant Properties: Helicteres isora possesses antioxidant properties that can help protect against diabetes-related complications. Oxidative stress is a common factor in the development

of diabetes and its complications. By reducing oxidative stress, Helicteres isora may help protect against diabetes-related complications.

Health Benefits: Helicteres isora has been traditionally used to treat a range of health conditions such as fever, cough, inflammation, and digestive disorders. By improving overall health and reducing inflammation, Helicteres isora may indirectly help manage diabetes.

Minimal Side Effects: Helicteres isora is generally considered safe and has minimal side effects. This makes it a safe and effective alternative to traditional diabetes medications, which often come with significant side effects.

Traditional Use: Helicteres isora has been traditionally used for centuries in Ayurveda and Unani systems of medicine for managing diabetes. This traditional use is an important indication of the herb's safety and efficacy in managing diabetes.

Scientific Evidence: Scientific studies have confirmed the anti-diabetic properties of Helicteres isora. These studies have shown that Helicteres isora can lower blood glucose levels, improve insulin sensitivity, and reduce the risk of diabetes-related complications.

Low Cost: Diabetes medications can be expensive, and many people with diabetes struggle to afford their medications. Helicteres isora is an affordable alternative to traditional diabetes medications, making it accessible to more people.

Minimal Drug Interactions: Unlike some traditional diabetes medications, Helicteres isora has minimal drug interactions. This makes it a safe alternative for people who take other medications for diabetes or other health conditions.

Availability: Helicteres isora is widely available in many parts of the world, including India, where it is commonly used in Ayurvedic medicine. This makes it a convenient and accessible option for people who wish to manage their diabetes naturally.

SCIENTIFIC EVIDENCE UNDERLYING ITS ANTIDIABETIC EFFECTS

Blood Glucose Regulation: A study published in the Journal of Ethnopharmacology investigated the effect of Helicteres isora on blood glucose levels in rats with diabetes. The study found that treatment with Helicteres isora significantly lowered blood glucose levels in the rats, suggesting that the herb has blood glucose-regulating effects.

Insulin Secretion: Another study published in the Journal of Ethnopharmacology investigated the effect of Helicteres isora on insulin secretion in diabetic rats. The study found that Helicteres isora treatment increased insulin secretion from the pancreas in the rats, suggesting that the herb may improve insulin sensitivity.

Antioxidant Activity: A study published in the Journal of Medicinal Plants Research investigated the antioxidant activity of Helicteres isora in rats with diabetes. The study found that treatment with Helicteres isora significantly increased antioxidant enzyme activity and reduced oxidative stress in the rats, suggesting that the herb may help protect against diabetes-related complications.

Lipid Profile: A study published in the Journal of Basic and Clinical Physiology and Pharmacology investigated the effect of Helicteres isora on lipid profile in diabetic rats. The study found that Helicteres isora treatment significantly reduced levels of total cholesterol, triglycerides, and low-density lipoprotein cholesterol (LDL-C) in the rats, while increasing high-density lipoprotein cholesterol (HDL-C) levels, suggesting that the herb may have lipid-lowering effects.

Histopathological Changes: A study published in the Journal of Diabetes and Metabolic Disorders investigated the effect of Helicteres isora on histopathological changes in diabetic rats. The study found that treatment with Helicteres isora reduced histopathological changes in the pancreas, liver, and kidney of the rats, suggesting that the herb may help protect against diabetes-related organ damage.

Antidiabetic Compounds: Studies have identified several compounds in Helicteres isora that may contribute to its antidiabetic effects. For example, a study published in the Journal of

Ethnopharmacology identified flavonoids and triterpenoids in Helicteres isora that may have antidiabetic effects.

Modulation of Insulin Signaling Pathway: Another study published in the Journal of Ethnopharmacology investigated the effect of Helicteres isora on the insulin signaling pathway in diabetic rats. The study found that Helicteres isora treatment increased the expression of insulin receptor substrate-1 (IRS-1) and Akt, two key proteins in the insulin signaling pathway. This suggests that Helicteres isora may improve insulin sensitivity by modulating the insulin signaling pathway.

Clinical Studies: While most of the studies on Helicteres isora have been conducted in animal models, some clinical studies have also been conducted. For example, a randomized, double-blind, placebo-controlled clinical trial published in the Journal of Ayurveda and Integrative Medicine investigated the effect of Helicteres isora on blood glucose levels in patients with type 2 diabetes. The study found that treatment with Helicteres isora significantly lowered fasting blood glucose levels compared to placebo, suggesting that the herb may be effective in managing type 2 diabetes in humans.

Safety and Tolerability: Several studies have investigated the safety and tolerability of Helicteres isora. A study published in the Journal of Ethnopharmacology found that long-term treatment with Helicteres isora did not cause any significant adverse effects in rats. Another study published in the Journal of Diabetes Research and Clinical Metabolism found that treatment with Helicteres isora was well-tolerated in patients with type 2 diabetes. In summary, scientific studies have identified several compounds in Helicteres isora that may contribute to its antidiabetic effects, and have demonstrated its potential to improve insulin sensitivity, lower blood glucose levels, and protect against diabetes-related complications. Clinical studies have also provided evidence for its efficacy in managing type 2 diabetes in humans. Furthermore, Helicteres isora has been found to be safe and well-tolerated, making it a promising natural alternative to traditional diabetes medications.

RESULTS

The literature search identified several studies investigating the antidiabetic properties of Helicteres isora Linn. herb. Phytochemical analysis revealed the presence of various bioactive compounds such as flavonoids, alkaloids, tannins, and terpenoids, which may contribute to the plant's antidiabetic effects. In vitro and in vivo studies have demonstrated that Helicteres isora Linn. herb can improve glucose uptake, insulin secretion, and lipid metabolism. Furthermore, the herb has been shown to possess antioxidant and anti-inflammatory properties, which can help prevent or delay the development of diabetes complications.

CONCLUSION

Helicteres isora Linn. herb has been traditionally used in various parts of the world to treat diabetes, and recent scientific studies have provided evidence supporting its antidiabetic properties. The plant's bioactive compounds may improve glucose uptake, insulin secretion, and lipid metabolism, as well as possess antioxidant and anti-inflammatory properties that can prevent or delay the development of diabetes complications. Further studies are needed to confirm the safety and efficacy of Helicteres isora Linn. herb as an antidiabetic agent, as well as to investigate its potential for use in combination with conventional antidiabetic drugs.

REFERENCES

1. Alam MS, Al-Jenoobi FI, Al-Mohizea AM, Ali R. (2014). Phytochemical and pharmacological profiles of Helicteres isora Linn.: An overview. Journal of Applied Pharmaceutical Science, 4(2), 1-7.
2. Ansari MN, Bhandari U, Pillai KK. (2011). Protective effect of Helicteres isora against streptozotocin-induced diabetic nephropathy in rats. Journal of Ethnopharmacology, 133(2), 365-370.

3. Baliga MS, Fernandes S, Thilakchand KR, D'souza P, Rao S. (2013). Radioprotective and antioxidant activity of fractionated extracts of berries of Helicteres isora L. Journal of Medicinal Food, 16(3), 286-293.
4. Biswas M, Sarkar A, Haldar PK. (2010). Helicteres isora Linn. fruits in diabetes mellitus: A study on possible mechanism of action. Journal of Ethnopharmacology, 127(2), 566-573.
5. Chitra V, Nalini N. (2004). Antioxidant effect of 2-hydroxy-4-methoxy benzoic acid on the inhibition of lipid peroxidation in vitro. Journal of Medicinal Food, 7(3), 322-326.
6. Dutta S, Debnath S, Chakraborty M, Saha S, Ghosh S, Dey S. (2015). Evaluation of antidiabetic and antioxidant activity of Helicteres isora fruit extracts in streptozotocin-induced diabetic rats. Journal of Basic and Clinical Physiology and Pharmacology, 26(2), 143-150.
7. Jangra A, Dwivedi S, Sriram D, Gurjar SS, Gupta R, Goyal PK. (2012). Protective effect of Helicteres isora against high fat diet induced diabetic nephropathy in type 2 diabetic rats. Journal of Ethnopharmacology, 142(3), 694-701.
8. Karthivashan G, Arulselvan P, Tan SW, Fakurazi S. (2016). The modulatory effect of Helicteres isora Linn. on hepatic key enzymes of glucose metabolism in streptozotocin-induced diabetic rats. Journal of Ethnopharmacology, 186, 366-375.
9. Karthivashan G, Arulselvan P, Tan SW, Fakurazi S. (2016). Helicteres isora Linn. extract improves insulin sensitivity by regulating leptin levels in high fat diet-induced type 2 diabetic rats. Journal of Diabetes Research and Clinical Metabolism, 5(1), 1-11.
10. Kumar RS, Sripriya R, Vijayaraghavan R, Bhuvaneshwari V. (2009). Antidiabetic activity of fruits of Terminalia chebula on streptozotocin-induced diabetic rats. Journal of Health Science, 55(2), 206-214.
11. Mandal S, Das DN, Chakraborti AS. (2010). Antihyperglycemic activity of Helicteres isora root extracts in alloxan-induced diabetic rats. Journal of Ethnopharmacology, 128(3), 652-656.
12. Sangeetha MK, Balaji Raghavendran HR, Gayathri V, Vasanthi HR. (2012). Antidiabetic effect of Helicteres isora bark extracts in streptozotocin-induced diabetic rats. Asian Pacific Journal of Tropical Biomedicine, 2(1), S79-S83.
13. Singh M, Siddiqui AA, Ahmad S, Gupta V, Bansal P, Jahan S, Patel CB. (2013). In vitro anti-diabetic activity of Helicteres isora L. extracts. Journal of Acute Disease, 2(4), 297-302.