Original Article

Gymnema Sylvestre (Retz.) R.Br. Ex Sm.: A Botanical, Ethnopharmacological, Phytochemical, And Pharmacological Overview

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Abstract

Gymnema sylvestre (Retz.) R.Br. ex Sm. is a perennial climbing shrub found over the tops of woody trees in tropical forest of India. It is a miracle plant having great anti-diabetic potential. The phytoconstituents of Gymnema sylvestre were isolated and their chemistry and structures were studied and elucidated. An inspection of literature revealed some extraordinary pharmacological activities of this plant. The present review is an effort to emphasize the various traditional use as well as, phytochemistry, pharmacological uses therapeutic properties on G. sylvestre.

Keywords: Gymnema sylvestre; Gymnemic acid; Phytochemistry

INTRODUCTION

Plant-derived medicines are increasingly popular in modern society as natural alternatives to synthetic drugs (Balakumar et al., 2011a; Kiruba et al., 2011a; Premkumar et al., 2011; Domettila et al., 2013; Sathya et al., 2017; Mariyammal et al., 2023). There has also been an emerging interest in the study of medicinal plants and their traditional use by different ethnic communities of India in recent times (Balakumar et al., 2011b; Kiruba et al., 2011b; Mithraja et al., 2011; Prakash et al., 2011; Rajan et al., 2011; Sukumaran et al., 2011). That herbs are the primary source of medicine for these people has been due to the wealth of this life-form in their environs (Anitha et al., 2012; Jeeva and Marimuthu, 2012; Jeeva et al., 2012; Marimuthu et al., 2012; Mithraja et al., 2012a-c; Sukumaran et al., 2012) and a tribute to the wide range of bioactive ingredients present in them (Kiruba et al., 2012; Mary et al., 2012; Sheeja et al., 2012; Rajan et al., 2015; Princy et al., 2022a,b). Gymnema sylvestre belonging to the family Asclepiadaceace has been used by Indian Healers for nearly 2000 years as a part of Ayurvedic traditional system. It is known as Sirukurinja in Tamil, and is widely used in herbal medicine owing to its potent antidiabetic property (Thakur et al., 2012). The Plant is known to possess various pharmacological activities like antidiabetic (Gupta, 1963), hypolipidemic (Kanetkar et al., 2007) and anti-inflammatory (Malik et al., 2008). The plant is widely used in Traditional Indian system and studies on this plant were started as early as 1930. The Gymnema sylvestre was found to contain olenane type of glycosides known as Gymnemic acid (Maeda et al., 1989).

Health Organization (WHO) medicinal plants would be the best source to obtain a variety of drugs. About 80% of individuals from developed countries use traditional medicine, which has compounds derived from medicinal plants (Sukumaran et al., 2021). The use of photochemical for pharmaceutical purpose has gradually increased in many countries; these plants are still widely used in ethno- medicine around the world (Prakash et al., 2008; Jeeva et al., 2009; Kingston et al., 2009; Joselin et al., 2012; Jeeva and Femila, 2012; Rasingam et al., 2012; Sukumaran et al., 2014). Medicinal plants represent a rich source of antimicrobial agents and powerful

drugs (Florence et al., 2012; Jeeva et al., 2012; Joselin et al., 2013; Kiruba et al., 2013; Asha et al., 2014; Janakiraman et al., 2014; Joselin et al., 2014; Lincy et al., 2014a,b). The crude extracts of plant leaf and isolated active phytochemical gymnemic acid, of known antimicrobial properties, can be of great significance in the therapeutic treatments, which are due to the secondary metabolites synthesized by the plant. These products are known by their active substances like, alkaloids (saponins), phenolic compounds, as well as in tannin, which are used either directly as precursors in the pharmaceutical industry.

Distribution

Gymnema sylvestre is a perennial, woody climbing plant that grows in the tropical forests of central and southern India, in dry forests upto 600 m, common throughout the district from January to November. Distributed in Asia, Trophical Africa, Malaysia and Sri Lanka (Komalavalli and Rao, 2000).

Taxonomic position

Gymnema sylvestre R.Br.

Kingdom	: Plantae
Division	: Magnoliophyta
Class	: Magnoliopsida
Order	: Gentianales
Family	: Asclepiadaceae
Genus	: Gymnema
Species	: Sylvestre
Local name	: Sirukurinjan

Morphology

It is a potent antidiabetic plant and used in folk, ayurvedic and homeopathic systems of medicine. G. sylvestre is a large, more or less pubescent, woody climber. It is occasionally cultivated as medicinal plant. The Leaves are opposite, usually elliptic or ovate (1.25– 2.0 inch×0.5–1.25 inch).Flowers are small, yellow, in umbellate cymes. Follicles are terete, lanceolate, upto 3 inches in length.

Part used: Leaves, Stem, Root, Fruit (Rupanar et al., 2016; Pingale et al., 2018)

Medicinal uses

Gymnema has a long history of use in India's Ayurvedic medicine. Indian first used Gymnemato treat diabetes almost 2,000 years ago. Today Gymnemais used for diabetes (Joseph and Ellen Flannery, 2005) metabolic syndrome, weight loss and cough it is also used for malaria and as a snake bite, antidote ,digestive stimulant, laxative ,appetite, Suppressant and diuretic. The primary application was for adult -on set diabetes a condition once described as " honey urine " and is continued to be recommended today in India. In the 1920, preliminary scientific studies found some evidence that Gymnema leaves can reduce blood sugar leaves, but nothing much came of this observation for decades (American botanical council P.O box 201660). Today Gymnema has become increasingly popular in the United states as a supportive treatment of diabetes (Bone Kerry, 2002).

Traditional Medicine

G. Sylvestre is used in folk, Ayurvedic system to treat type 1 and 2 diabetes. It is also used in the treatment of urinary complaints, stomach problems, piles, chronic cough, breathing troubles, asthma, eye complaints,

cardiopathy, constipation, jaundice, and bronchitis (Nadkarni,1993; Vaidyaratnam,1995; Chopra et al.,1992). It is also used by trials to treat to neutralize the toxin of snake bite (Selvanayagam et al.,1995) .

Herbal medicine

Phyto-medicine or Botanical medicine is popularly called as "Herbal Medicine" because various plant parts like seeds, berries, roots, leaves, bark or flowers, etc. are used for medicine preparation. Use of herbal medicine is becoming popularized as up-to-date analysis and experi-mentation show their importance in the treatment and prevention of diseases due to their natural origin and less side effects. Before herbal medicine preparation or formulation, herbalists must have necessary information about its cultivation, collections, processing, diagnosis, extraction of active phytochemicals, etc.

Phytochemistry

Gymnema leaves contains gymnemic acid as an effective substance (Mitul Shah, 2010).The Primary chemical constituents of Gymnema include gymnemic acid, tartricacid, Gurmarine, calcium oxalate, glucose stigma stirol, betain and cholin. Few new triterpenoid, saponins, Gymnenmasins A,B,C and D were also isolated from the leaves of Gymnema sylvestre (Suttisri et al., 1995; Sahu et al., 1996) three new oleanane type triterpene glycosides were isolated from the leaves of plants .six oleanane types saponins isolated from the leaves (Ye et al., 2000; 2001).

Gymnemic acid the active compound of this plant widely used as antidiabetic (Shanmugasundaram et al., 1983; Mitul shah, 2010), anti sweetener (Kurihara, 1992), anti inflammatory activities (Mitul Shah, 2010), antihypercholesterolemic (Bishayee and Chatterjee, 1994), antimicrobial (Sative et al., 2003) and ethno-veterinary medicinal properties (Kalidas et al., 2009). The anti diabetic array of molecule has been identified as a group of closely related Gymnemic acids (Liu et al., 1992; Sinsheimer and Manni, 1965), after it was successfully isolated and purified from the leaves of Gymnema sylvestre. Later the phytoconstituents of Gymnema sylvestre were isolated and their chemistry and structure were studied and elucidated.

Pharmacological uses

The G. sylvestre has the insulin stimulation activity and hence probably it is useful in controlling diabetes mellitus. Oral administration of the G. sylvestre corrected the hypoglycemia in moderately diabetic rats and result continued for more than two months after discontinuing G. sylvestre (Shanmugasundaram et al., 1981). In another study with diabetic rabbits as compared to untreated diabetic animal, G. sylvestre produced not only blood glucose homeostasis but also increased the activities of the enzymes involved in the utilization of glucose by insulin dependent pathways: it controlled phosphorylase levels, gluconeogenic enzymes and sorbitol dehydrogenase. The uptake and incorporation of (Suzuki et al., 1993) glucose into the glycogen and proteins were increased in the liver, kidney and muscle. The pathological changes in the liver also reversed (Shanmugasundaramet al.,1983). G. sylvestre showed that it doubles the islet number and beta cell number and glucose homeostasis instreptozotocin treated rats (Shanmugasundaram et al., 1990). The antidiabetic effect of G. Sylvestre powder in the stomach of rates (Mary Sujin et al., 2008).

Therapeutic properties

Plants used as a complementary or alternative treatment have been and continue to be the subject of studies for the detection of single molecules or phytocomplexes with therapeutic activities. In fact, while their traditional uses are valid, the knowledge of these plants is not sufficient for them to be used safely in modern medicine.

Therapeutic products on the market today are often the result of a compromise between tradition and market demand (Zarrelli et al., 2011). A natural source can possess a variety of therapeutic properties, which must be supported by clinical findings. Each source typically undergoes transformations that reflect the specific ways that the source will be clinically applied in the culture in which it will be marketed.

CONCLUSION

In present years, traditional as well as pharmacological uses of herbal products received much attention because it is believed that they are safe for human use. This review will serve to extend and advance the current knowledge of the medicinal plant, G. sylvestre. This medicinal plant contains biologically active phytoconstituents.

Gymnema sylvestre, has an important place among such anti diabetic medicinal plants because of its good scientific evidences that it actually work in diabetes so that its other therapeutic uses can be widely explored. And further studies also required for the development of its in-vitro micro propagation for the conservation of this plant because of overuse they have reached to endangered level.

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