

WOODY CLIMBING SHRUB – GYMNEMA SYLVESTRE: A REVIEW

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ABSTRACT

Gymnema sylvestre is a plant included in Apocynaceae family and is located in many regions of Asia, Africa and Australia. Widely used as a traditional medicine, gymnema sylvestre is also known to have antioxidant, antibiotic, anti-inflammatory, antiviral, gastro and hepatoprotective, anticancer and lipid-lowering activities. This review discusses in details on different pharmacological and Pharmacognostical Studies of Gymnema sylvestre and its chemical constituents associated with its therapeutic potentials.

KEYWORDS: Stigmasterol, Triterpenoid Saponin, Gymnemic Acid, Gymnema sylvestre,

INTRODUCTION

Gymnema sylvestre

Gymnema sylvestre is a medicinal Pant belonging to the family Apocynaceae. It is Mainly found in central and southern of India and tropical of Africa. It is slow-growing, medicinal woody climber. In Ayurveda it is called as ' Meshshringa'. And it has antidiabetic and anti-obesity activities. Various Parts of this plant also used in treatment of asthma, eye complaints, inflammation and snake bite, laxative, diuretic cough suppressant. Is also shows hepatoprotective, antimicrobial, antihypercholesterolemic and sweet suppressing activities.^[1] Leaves of This plant contain gymnemic acids: a mixture of at least 17 different saponins, acidic glycosides and anthraquinones.^[2]

The stems of this plant consists of new triterpenoid saponin along with six known constituents: conduritol A, Stigmasterol, lupeol, stigmasterol-3-O- β -D-glucoside, the sodium salt of 22 α -hydroxy-longispinogenin-3-O- β -D-glucopyranosyl-(1 \rightarrow 3)- β -D-glucuronopyranosyl-28-O- α -L-rhamnopyranoside, and oleanolic acid-3-O- β -D-glucopyranosyl-(1 \rightarrow 6)- β -Dglucopyranoside. Compounds 3 and 6 were obtained from the genus Gymnema and compound 5 was obtained as the sodium salt form for the first time. Inhibition activities of compounds 1, 5-7 on the non-enzymatic glycation of protein in vitro were evaluated.^[3]

Synonym: Sanskrit: Meshashringi, madhunashini, Hindi: Gur-mar, merasingi, Marathi: Kavali, kalikardori, vakundi, Gujrathi: Dhuleti, mardashingi, Telugu: Podapatri, Tamil: Adigam, cherukurinja, Kannada: Sannagerashambu.^[4]

Plant description: Taxonomy

Gymnema sylvestre (Retz.) R.Br. ex Sm. is a vulnerable and slow growing species. It appears as highly branched, woody and can climb up to the top of the tree that grows in the dry forests of central and southern India and in other regions of Asia.^[5,6] Pubescent Type of Shurb and younger stems and branches^[7] root system is tap root Type.^[8] Stems are cylindrical, branched, hard, twining, internodes terete, 0.7- 17.2 cm long and 2 -10 mm in diameter.^[8,9] Leaves are acute or shortly acuminate, have petioles of 1- to 2-cm long, are smooth above, with a rounded base, a densely velvety pubescent beneath, and ciliate along margins, especially on the nerves. Venation is of transverse and reticulate type with a marginal vein^[10,11] Seeds are 1.3 cm long, flat with a thin marginal wing and narrowly ovoid-oblong^[10,12] Flowers are small and yellow in color, in axillary and lateral umbel in cymes. Follicles are terete, lanceolate and of up to 3 inches in length^[7] Flowering of the plant occurs during August to March. Propagation through seed is difficult due to a low viability of seeds and, thus, plantation of root cuttings in June and July or plantation of terminal cuttings in February and March is done as an alternative approach.^[10]

Stem of gymnema sylvestre**1. Pharmacognostic study**

- **Macroscopy:** Stem is cylindrical, internodes terete, 0.7-17.2 cm long and 2 -10 mm in diameter, young stems and branches densely pubescent.^[13]
- **Microscopy:** In transverse section stem shows circular outline with entire or somewhat wavy margin. Epidermis forms the single outermost layer consisting of barrel to rectangular cells. A thick

cuticle covers the epidermis. Uniseriate multicellular hairs are present. Cortex consists of parenchymatous cells. A distinct endodermis is absent. Pericycle is represented by scattered groups of thick walled stone cells, forms a large and complete ring. The vascular tissues occur in the following sequence –

primary phloem, secondary phloem, cambium, secondary xylem, primary xylem, interaxylary phloem and pith. Different types of crystals of calcium oxalate and stone cells are present. Laticiferous tubes are also found in this region in all plants collected from different localities.^[13]

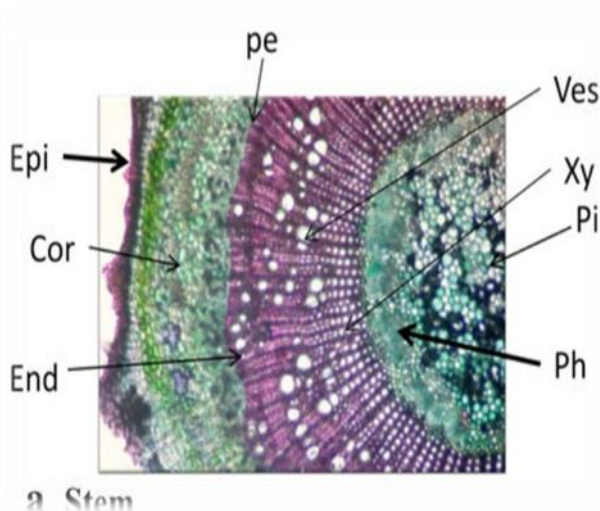


Fig. no. 1: TS of stem of gymnema sylvestre.^[13]

2. Preliminary qualitative phytochemical screening of stem of gymnema sylvestre

The preliminary phytochemical study of the methanol extracts of stem of *Gymnema sylvestre* revealed the

presence of alkaloids, anthraquinones, catechin, coumarin, flavonoids, phenols, steroids, tannins, terpenoids and xanthoprotein. (Table 1).^[14]

Table no. 1 + Presence – Absence.

Presence/ absence of bioactive components	Petroleum ether extract	Chloroform Extract	Acetone Extract	Methanolic Extract	Aqueous Extract
Alkaloids	-	-	-	+	-
Anthraquinones	-	-	+	+	-
Catechin	-	-	-	+	-
Coumarin	-	+	+	+	-
Flavonoids	-	-	-	+	-
Phenols	-	+	+	+	-
Quinones	-	-	-	-	-
Saponins	+	-	-	-	-
Steroids	+	+	-	+	-
Tannins	+	+	+	+	-
Terpenoids	-	-	-	+	-
Xanthoprotein	+	+	+	+	-
Sugar	-	+	+	-	-

3. Quantitative phytochemical screening of stem of gymnema sylvestre

Total terpenoid and 2.5092% of Gymnemic acid content (Table 2). So, Gs variant contains higher content of total terpenoid than total alkaloid. Sangeetha 2012 reported Gymnemic acid content in hairy variant was 3.75%2. In

this work, we found decreased content of Gymnemic acid (2.5%). This variation is due to the change in the time and season of collection. Collection time and season influence the bioactive compounds in both qualitatively and quantitatively.^[15]

Table no. 2

Compound	Colour and Nature	Value %
Total Alkaloid	Brown and oily in nature	0.0046

Total Terpenoid	Dark green and oily in nature	12.1947
Gymnemic acid	-	2.5092

4. Chemicals compound present in different extracts of gymnema sylvestre^[17]

Table no. 3

Extract	Compounds
Aqueous	Alkaloids, saponins, proteins, phenols, glycosides, resins, tannins, Alkaloids, phenols, tannins, flavonoids, saponin Sterols, triterpenoid, tannins Alkaloids, phytosterols, tannins, phenols, Terpenoids, flavonoids, tannins, Saponins, Alkaloids, phenols, tannins, saponin, Terpenoids, alkaloids, flavonoids, saponins, tannins, quinone, Anthraquinones, tannins, saponins
Ethanol	Alkaloids, proteins, phenols, glycosides, resins, tannins, Alkaloids, saponins, glycosides, tannins, flavonoids, Alkaloids, phenols, tannins, flavonoids, saponin, Sterols, triterpenoid, tannins, Alkaloids, phytosterols, tannins, phenols 48 Alkaloids, phenols, tannins, saponin, Alkaloids, tannins, quinone, Flavonoids, alkaloids, glycosides
Methanol	Alkaloids, phenols, tannins, flavonoids, saponin, Flavonoids, phenols, saponins, tannins, triterpenes, Terpenoids, tannins Anthraquinones, alkaloids, flavonoids, phenols, steroids, tannins, terpenoids Terpenoids, alkaloids, saponins, quinone
Chloroform	Alkaloids, phenols, tannins, flavonoids, saponin ,Flavonoids, phenols, triterpenes, Steroids, terpenoids , Tannins, Phenols, steroids, tannins
Petroleum ether	Flavonoids, phenols, triterpenes, Terpenoids, saponins, Saponins, tannins and steroids

5. Phytochemistry of stem of gymnema sylvestre

Stems of *Gymnema sylvestre* were investigated using chromatographic techniques and were found to have several therapeutically important chemical compounds such as stigmasterol and triterpenoid saponin. Stigmasterol compounds have multiple therapeutic potentials including antidiabetic, hypoglycemic, antioxidant, anticancer activities. Triterpenoid saponins also exhibited anti-tumor, anti-fungal, hepatoprotective and antidiabetic potential in several studies.^[18-21]

- **Study of stem of gymnema sylvestre from different localities:** In addition, quantitative estimations of gymnemic acid in stem of *Gymnema sylvestre* is found out and their corresponding values are as follows - Amboli (0.56%), Dapoli (0.68%), botanical garden (0.91%), Khambataki Ghat (0.75%) and Mulshi (1.74%). Value of gymnemic acid is present less stem while more in leaves of all the plant collected from different localities. It is also indicated that it is more in quantity in Mulshi followed by botanical garden, Khambataki Ghat, Dapoli and at last Amboli.^[13]

1. Estimation of gymnemic acids in gymnema sylvestre collected from different localities^[13]

Table no. 4

Plant part used	
Name of the locality	Stem %/gm /Dry weight
Amboli	0.74%
Dapoli	0.93%
Khambataki Ghat	0.84%
Mulshi	1.12%

2. Estimation of alkaloids in gymnema sylvestre collected from different localities^[13]

Table no. 5

Name of the locality	Plant Part Used (Stem)%/gm/dry weight
Amboli	0.74
Dapoli	0.93

Khambataki Ghat	0.84
Mulshi	1.12

3. Estimation of protein in *Gymnema sylvestre* collected from different localities^[13]

Table no. 6

Name of the locality	Plant Part Used (stem) %/gm/dry weight
Amboli	2.01
Dapoli	1.55
Khambataki Ghat	1.02
Mulshi	2.33

- To study the chemical constituents of stems of *Gymnema sylvestre* (Retz.) Schult.

METHOD

Chromatographic techniques using silica gel, C18 reversed phase silica gel, and prep-HPLC were used. The structures were elucidated on the basis of MS and spectroscopic analysis (1D and 2D NMR), as well as chemical methods.

RESULTS

Seven compounds were isolated and their structures were elucidated as conduritol A (1), stigmasterol (2), lupeol (3), stigmasterol-3-O- β -D-glucoside (4), the sodium salt of 22 α -hydroxy-longispinogenin-3-O- β -D-

glucopyranosyl-(1 \rightarrow 3)- β -D-glucurono-pyranosyl-28-O- α -L-rhamnopyranoside (5), oleanolic acid-3-O- β -D-glucopyranosyl-(1 \rightarrow 6)- β -D-glucopyranoside (6), and the sodium salt of 22 α -hydroxy-longispinogenin 3-O- β -D-glucuronopyranosyl-28-O- α -L-rhamnopyranoside (7). The inhibition activities of compounds 1, 5–7 on non-enzymatic glycation of protein in vitro were evaluated.

CONCLUSION

Compound 7 is a new triterpenoid saponin. It was shown that compounds 1, 5–7 have weak inhibition activities for non-enzymatic glycation of protein in vitro.^[23]

6. Pharmacological activities

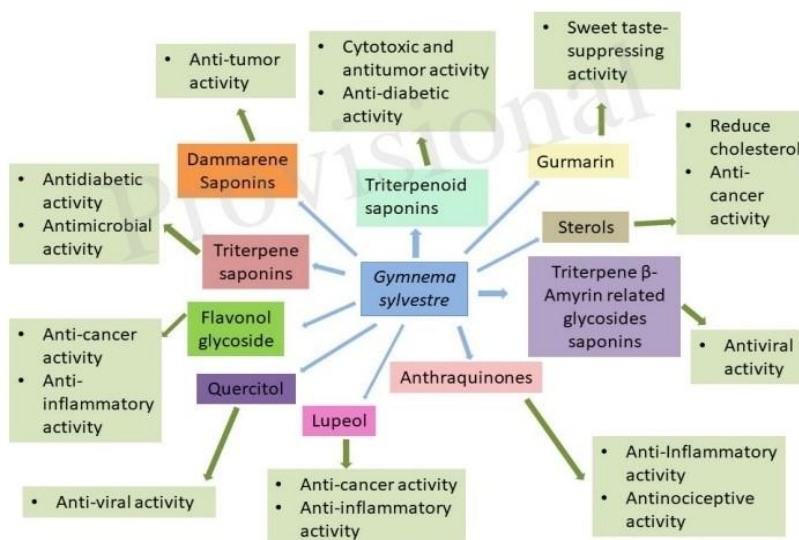


Fig. no: 2: Pharmacological activities of constituents of *Gymnema sylvestre*.^[22]

CONCLUSION

Every part of *Gymnema Sylvestre* Plant Possess various Pharmacological activities, Depending upon Their Chemical constituents. Various Research has been made on the leaves of *Gymnema sylvestre* but In the stem Of *Gymnema* There are various phytoconstituents present which shows various pharmacological properties as that of the leaves. Phytoconstituents like Stigmasterol, Triterpenoid Saponin, Lupeol, Gymnemic acid are present in the stem of *Gymnema sylvestre* which might shows antiulcer, Antitussive, emetic., antidiabetic Activities respectively. Our Purpose of this article is to

provide scientific base for the Research of Phytoconstituents of *Gymnema sylvestre* stem.

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