

**A MIRACULOUS ENDANGERED MEDICINAL PLANT
OF CHHATTISGARH – *GYMNEMA SYLVESTRE*****SANDIP KUMAR CHANDRAKER***

*Department of Biotechnology, Govt. Pt. J. L. N. Art And Science Post Graduate
College Bemetara, Chhattisgarh, India Pin No.- 491335*

ABSTRACT

Gymnema sylvestre (R.Br.), (Medhasirghi) family: Ascleiadaceae is deciduous seed plant. It is an important medicinal plant which grows wild in the tropical forests of central, western and southern India and in the tropical areas of Africa, Australia and China. It is popularly known as Gurmar. *Gymnema sylvestre* is a vine-like plant and is considered as herbal remedy for high blood sugar. The important active ingredient of *Gymnema sylvestre* is an organic acid called “Gymnemic acid”. The recent studies have shown that the extract of *Gymnema sylvestre* is useful in controlling blood sugar to treat type-II diabetes. Chewing the leaves destroys the ability to discriminate the “sweet” taste,. This plant is commonly known as gurmar, medhasirghi or “sugar destroyer.”. Floristic study of the erstwhile seven district of chhattisgarh was made by nation botanical research institute, lacknow and identified as *Gymnema sylvestre* is endangered plant in Chattisgarh.

KEY WORDS: *Gymnema sylvestre*, medicinal plant, diabetes, gurmar.

**SANDIP KUMAR CHANDRAKER**

Department of Biotechnology, Govt. Pt. J. L. N. Art and Science Post Graduate
College Bemetara, Chhattisgarh, India Pin No.- 491335

*Corresponding author

INTRODUCTION

India is a treasure house of biodiversity in its various ecological conditions, rich ethnic diversity and vast traditional knowledge. The 'World Health Organization' estimates in less developed countries that 75-80% of the people rely-on plant based medicines for primary health care. Diabetes is a silent killer. If uncontrolled, it can lead to deadly complications. The 'diabetes capital of the world' India has 40 million people currently suffering from the disease. In 2025, one in every five Indians will be a diabetic. Sushruta, the classic book on Ayurveda, describes *Gymnema sylvestre* R Br protolouged Roem & schult. A valuable medicinal plant belonging to the family Asclepiadaceae (APG: Apocynaceae) (Angiosperm Phylogeny

Group), as a destroyer of 'Madhumeha' (glycosuria) and other urinary disorders, it has also become popular in western medicine¹⁻³.

CONSTITUENTS

Chemical constituents: Triterpenoid saponins of gymnemic acid A, B, C and D with sugar residues such as glucuronic acid, galacturonic acid, ferulic and angelic acids attached as carboxylic acids. The leaves also contain betaine, choline, gymnamine alkaloids, inositol, d-quercitol. Hydrocarbons such as nonacosane, hentriacontane, tritriacontane, pentatriacontane, phytin, resin, tartaric acid, formic acid, butyric acid, amino acids such as leucine, isoleucine, valine, alanine, γ -butyric acid^{4,6}.



Figure 1
Mature part of Gymnema sylvestre R.Br.

SCIENTIFIC CLASSIFICATION⁵

Kingdom	:	Plantae – Plants
Subkingdom	:	Tracheobionta – Vascular plants
Super division	:	Spermatophyta – Seed plants
Division	:	Magnoliophyta – Flowering plants
Class	:	Magnoliopsida – Dicotyledons
Subclass	:	Asteridae
Order	:	Gentianales
Family	:	Asclepiadaceae – Milkweed family
Genus	:	<i>Gymnema</i> R. Br. – gymnema
Species	:	<i>Gymnema sylvestre</i> (Retz.) Schult. – miracle fruit

IT IS LOCALLY CALLED AS⁶

Synonyms : *Periploca sylvestris* Willd., *Gymnema melicida* Edgew.

English Names	:	Vine, Periploca of the the Woods
Chinese	:	Chi geng teng
Gujarati	:	Kaavalee, Medhasinge
Hindi	:	chamatkar beri, Gurhmar, Medhasingi, chhota-dudhilata, gudmar, gurmar, medhashingi,
Kannada	:	madhunasini, kadhasige, sannagera, sannagerasehambu
Malayalam	:	Shiru kuranja
Marathi	:	kavali, bedaki, bedakuli, kalikardori, kaoli
Oriya	:	meshasringi
Sanskrit	:	Meshashiringi, ajaghandini, karnika, kshinavartta, madhunasini
Tamil	:	Sirukurinchaan, Amudhapushpam, Chakkarakkolli.
Telugu	:	podapatri
Urdu	:	gurmar gurmar booti, gurmar patta

BOTANICAL DESCRIPTION

Gymnema is a woody climbing plant that grows in Malaysia, Srilanka, Australia, Indonesia, Japan, Vietnam, tropical forests of central and southern India and China up to 600m. In India, it is found in tropical forest of Andhra Pradesh, Bihar, Chhattisgarh, Tamilnadu, Uttar Pradesh and West Bengal. It is also found in Banda, Konkan, Western Ghats, and Deccan extending to the parts of western and northern India^{7, 8}

PHYTOCHEMISTRY

Table 1
A number of constituents have been reported from *Gymnema sylvestre* R.Br.

S. No.	Constituents	
1.	Triterpene saponins	Gymnemic acids-acylated (tigloyl, methylbutyryl) derivatives of deacylgymnemic acid (DAGA) which is a 3-O- β -glucuronide of gymnemagenin (3 β , 16 β , 21 β , 22 α , 23, 28-hexahydroxy-olean-12-ene). ⁹
2.	Oleanane saponins	Gymnemic acids and gymnemasaponins ¹⁰
3.	Dammarene saponins	Gymnemosides a, b, c, d, e, and f ¹⁰
4.	Gurmarin	A novel 35-amino-acid peptide with a 4209 molecular weight ¹¹
5.	Triterpenoid saponins	
	Gymnemasins A	3-O [β -D-glucopyranosyl (1-3)- β -D-glucopyranosyl]-22-O-tiglyol gymnemanol ¹²
	Gymnemasins B	3-O- β -D-glucopyranosyl-(1-3)- β -D-glucuronopyranosyl]- gymnemanol ¹²
	Gymnemasins C	3-O- β -D-glucuronopyranosyl-22-O-tigloylgymnemanol ¹²
	Gymnemasins D	3-O- β -D-glucopyranosyl-gymnemanol ¹²
6.	Gymnemanol (aglycone)	3, β -16, β -22, α -23-28-pentahydroxyolean-12-ene ¹²
7.	Gymnestrogenin	Pentahydroxytriterpene ¹⁰
8.	Flavonol glycoside	Kaempferol galactopyranoside ¹³ 3-O- β -D-glucopyranosyl-(1-4)- α -L-rhamnopyranosyl-(1-6)- β -D
9.	Sterols	Stigmasterol ¹⁴
10.	d-Quercitol	d-Quercitol ¹⁴
11.	Lupeol	Lupeol ¹⁵
12.	Parabin	Parabin ¹⁵ Conduritol A ¹⁶ Quercitol
13.	β -Amyrin related glycosides	β -Amyrin related glycosides ¹⁷
14.	Anthraquinones	Anthraquinones ¹⁷

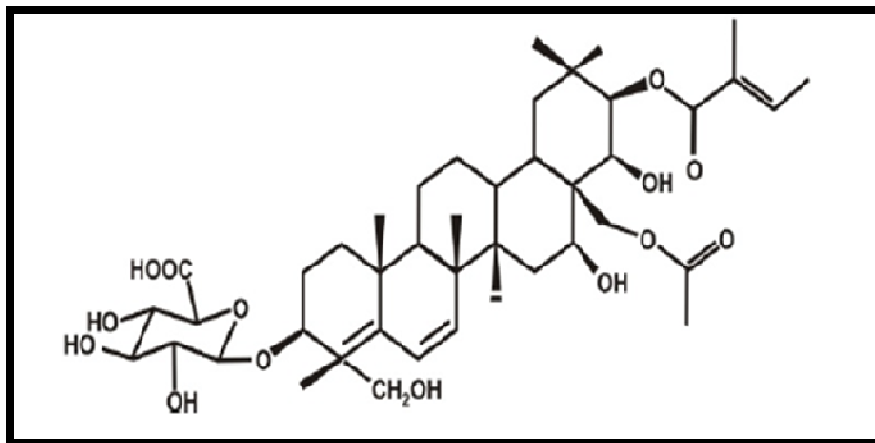


Figure. 1
Structure of gymnemic acid.

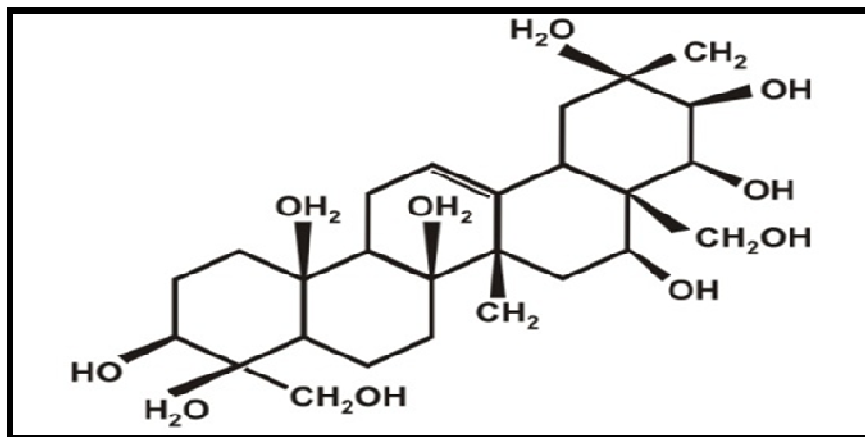


Figure. 2
Structure of Gymnemagenin

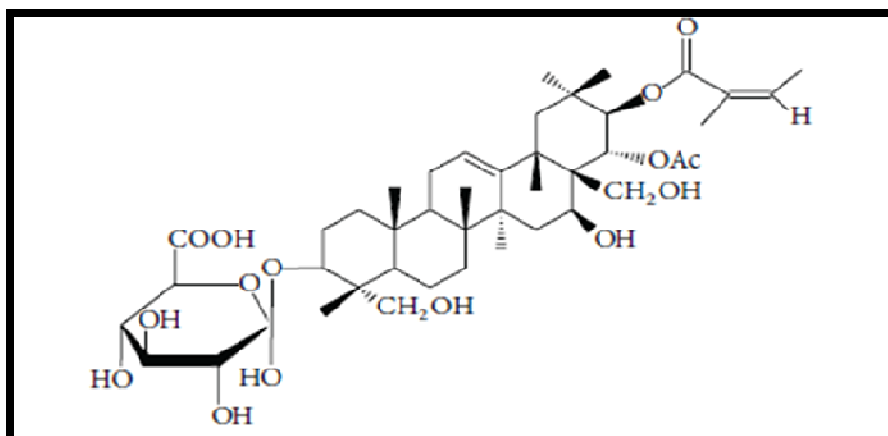


Figure. 3
Gymnemoside

PHARMACOLOGICAL ACTIVITIES**Antidiabetic Property.**

The herb accounts for its sweet inactivation property to the presence of triterpene saponins known as gymnemic acids, gymnema saponins, and gurmardin. Experimental trials confirmed the hypoglycemic effect of *Gymnema sylvestre* on beryllium nitrate and streptozotocin treated rats. There was a slight increase in body weight and protein and a significant decrease in fasting blood glucose in diabetic rats treated with *Gymnema Sylvestre*, *C. auriculata*, *E. jambolanum*, and *S. reticulata* and the effect were quite similar to insulin and glibenclamide treated mice. An investigation to determine the antioxidant activity of *Gymnema* leaf extract and the role of antioxidants in diabetic rats was performed by Kang et al.¹⁸ using ethanolic extracts. Several antioxidant assays, namely, thiobarbituric acid (TBA) assay with slight modifications, using egg yolk lecithin or 2-deoxyribose (associated with lipid peroxidation), superoxide dismutase- (SOD-) like activity assay, and 2,2-Azinobis (3 ethylbenzothiazoline-6-sulfonic acid) (ABTS) assay (involved in electron or radical scavenging), depicted significant antioxidant activity of the ethanolic extract. Further LC/MS analysis revealed the presence of antihyperglycemic compounds like gymnemagenin and gymnemic acids in *G. sylvestre* extract and the level of lipid peroxidation reduced by 31.7% in serum, 9.9% in the liver, and 9.1% in kidney in diabetic rats fed with the ethanolic extract. The activity of transaminases in gluconeogenesis and ketogenesis in diabetes like glutamate pyruvate transaminase (GPT) in serum and glutathione peroxidase in cytosolic liver returned to normal levels after the administration of ethanolic leaf extract in diabetic rats¹⁹. Antihyperglycemic effect of crude saponin fraction and five triterpene glycosides (gymnemic acids I-IV and gymnemasaponinV), isolated from the methanolic extract of the leaves, was reported²⁰. It was found that gymnemic acid IV (3.4/13.4mg/kg) decreased blood glucose levels by 14.0 –60.0% within 6 hours of administration as compared to glibenclamide. It has been reported that gymnemic acid IV

increased plasma insulin levels in STZ-diabetic mice at a concentration of 13.4mg/kg while it did not cause inhibitory effect on α -glucosidase activity in the brush border membrane vesicles of small intestine in normal rat.

Antiarthritic Activity.

The leaf extract of *Gymnema sylvestre* was examined for antiarthritic activity on albino rats. The water soluble and petroleum ether (40–60°C) extract was found to be significantly effective in controlling arthritis. It was also assumed that the most potent antiarthritic activity of the leaves may be due to the nature of triterpenoids, steroids, and saponin glycosides²¹. Different extracts were suspended with 1% Tween 80, and the drug Diclofenac sodium was administered once daily through oral route and the effect was monitored for²¹ days. It was observed that the rats developed swelling in multiple joints on induction with an adjuvant and exhibited inflammation in cells, bone destruction, and reshaping. The petroleum ether extract treated group showed significant reduction in paw swelling possibly due to inhibiting the response of inflammatory cells or blocking the release of mediators like cytokines (IL-1b and TNF-a), GM-CSF, interferons, and PGDF which are responsible for pain and disabilities arising due to destruction of bone and cartilage²². The other possible mechanism of action suggested protection of the release of joint cartilage and bone destruction in chronic arthritic model²¹. The multiple studies employing use of polar solvents in extract preparations by investigators demonstrated the antiarthritic potential of the leaf extract.

Antibiotic and Antimicrobial Activity.

The antibiotic and antimicrobial activity of different extracts of *Gymnema sylvestre* was determined²³ against a number of pathogens, namely, *S. aureus*, *E. coli*, and *B. subtilis* while no activity was observed against gram-negative bacteria. *Gymnema sylvestre* leaf extracts showed good prospects as an antibiotic herbal remedy was effective as herbal formulation for the treatment of microbe's related infections²³. The antibacterial activity of *Gymnema Sylvestre*

and gymnemic acid was also studied against *E. coli* and *B. cereus* and the antimicrobial effect was significant against the microbes²⁴. Bhuvaneshwari et al.²⁵ demonstrated that the methanolic extracts of *Gymnema sylvestre* were assessed for antimicrobial activity of aerial and root parts separately. The result exhibited that the methanol extracts in acidic range have good activity towards all the pathogens showing its broad spectrum nature. In a similar study, the antimicrobial effect of ethanolic extract of *Gymnema sylvestre* against *Bacillus pumilus*, *B. subtilis*, *P. aeruginosa*, and *S. aureus* showed promising antimicrobial effect²⁶. It can be inferred from the studies that the methanolic and ethanolic leaf extract of *Gymnema sylvestre* possesses considerable antibiotic and antimicrobial activity.

Anti-Inflammatory Activity.

In the Ayurvedic system of medicine, the leaf of *G. Gymnema sylvestre* has been widely used and is considered as bitter, acrid, thermogenic, digestive, liver tonic, anodyne, and anti-inflammatory²⁷. The bioactive constituents in *G. sylvestre* known as tannins and saponins are responsible for the anti-inflammatory activity of the plant²⁸. In the study, carrageenin induced paw oedema and cotton pellet induced granuloma rats were taken, and the aqueous extract of *G. sylvestre* leaf was investigated for its anti-inflammatory activity at the doses of 200, 300, and 500mg/kg with drug, phenylbutazone as standard. It was found that the gymnema aqueous extract at a concentration of 300mg/kg significantly decreased the paw oedema volume by 48.5% within 4 hours of administration while the drug phenylbutazone decreased the paw oedema volume by 57.6%. Also, the aqueous extract at a concentration of 200 and 300mg/kg exhibited reduction in granuloma when compared with the control group²⁹.

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Immunostimulatory Activity.

Immunomodulation is referred to as the regulation or control of the immunity which involves the enhancement or reduction in the immune responses. The body response to a particular condition might be regulated by agent that enhances or suppresses its action³⁰. *Gymnema Sylvestre* is reported to be an immune stimulatory plant and the leaves possess immune stimulatory effect³¹. The aqueous leaf extract was tested for immune stimulatory activities by detecting the movement of neutrophils, chemotaxis tests, phagocytosis of killed *C. albicans*, and nitroblue tetrazolium assays. Aqueous leaf extract of *Gymnema Sylvestre* showed remarkable immune stimulatory activity at 10, 25, 50, 100, and 1000 µg/mL on human neutrophils under *in vitro* conditions³².

DOSAGE AND TOXICITY

The typical therapeutic dose of an extract, standardized to contain 24-percent gymnemic acids, is 400-600 mg daily. It is not clear from examining the studies whether divided doses are ideal but, because it is being used to

regulate blood sugar, three divided doses with meals would seem ideal. No significant adverse effects have been reported, aside from the expected hypoglycemia.³³ Safety in pregnancy has not been established.

CONCLUSION

Natural products are having a great importance in ancient traditional medicine systems. The use of medicinal plants in the management of various illnesses is due to their phytochemical constituents and dates back antiquity³⁴. Herbs are the natural drugs

used to regain the alterations made in normal physiological system by foreign organisms or by any malfunctioning of the body. From different literature and review it has been seen that plant *Gymnema Sylvestre* is a resuscitative plant due to its important medicinal properties and having medicinally important chemicals. The present review suggests that *Gymnema sylevestre* important medicinal plant, widely used in traditional system to treat diabetes, obesity and other major diseases. More studies are required on chemical and molecular characterization of various accessions of *Gymnema*.

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