

Pharmacognostic studies on *Gymnema sylvestre* (Retz.) Schult

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Abstract

Gymnema sylvestre is a plant that grows in the tropical forests of central and southern India and in parts of Africa. Herbalists in India have used the leaves of this long, slender plant as a treatment for diabetes for more than 2,000 years. According to Sushruta, *Gymnema* is used to treat Madhumeha ie glycosuria in Ayurveda. *Gymnema* is used in the treatment of diabetes mellitus and in food additives against obesity and caries. However, *Gymnema* has also been used as a remedy for allergies, urinary tract infections, anemia, hyperactivity, digestion, cholesterol, and weight control. *Gymnema* leaves have antibacterial compounds. *Gymnema* alters the taste of sugar when it is placed in the mouth, thus some use it to fight sugar cravings. Some postulate that the herb actually reduces cravings for sugar by blocking sugar receptors in the tongue; *Gymnema* is also reported to have anti-allergic, antiviral, lipid lowering, and other beneficial effects. *Gymnema* contains compounds known as gymnemic acids and triterpenoid saponins, gymnemasins A, B, C and D. However, extracts of this plant are widely used in Australian, Japanese, Vietnamese and Indian folk medicine. In the present study pharmacognostic studies are carried out on 'Gudmar' to authenticate and standardize this herb.

Keywords: *Gymnema sylvestre* TLC physicochemical anatomical microbial limits

Introduction

Gymnema is also known by the names *Gymnema Sylvestre*, Gurmar, Gurmabooti, Rams Horn, Periploca of the Woods, and Meshasringi. *Gymnema* is a climbing plant that grows in the tropical forests of central and southern India. The woody *Gymnema* plant also grows in parts of Africa. Leaves of this long, slender plant have been used for more than 2,000 years. The leaves, when chewed, interfere with the ability to taste sweetness, which explains the Hindu name "gurmar". In the past, powdered *Gymnema* root was used to treat snake bites, constipation, stomach complaints, water retention, and liver disease. However, the name Gurmar best describes the primary use of *Gymnema* - because "gurmar" means "sugar destroyer". This herb has been used in Ayurvedic medicine for thousands of years to treat adult-onset diabetes, a condition once described as "honey urine." The hypoglycemic (blood sugar lowering) action of *Gymnema* leaves was first documented in the late 1920s. *Gymnema*, is not only an effective anti-diabetic agent but they also have diverse biological activities [1].

Methanolic extract of *Gymnema* when assessed for anti-oxidant property by three different methods – DPPH free radical quenching activity, reducing power assay and hydroxyl free radical quenching activity emerged as strong anti-oxidant agent [2]. An attempt was made to study the anti-cancerous property of *Gymnema* by fabricating silver nanoparticle incorporating aqueous extract of *Gymnema* against human adenocarcinoma colon HT29 cells. This green synthesized silver nanoparticle was characterized further, was examined for presence of phytochemicals both quantitatively and qualitatively. *Gymnema* showed good anticancer activity

against cancer cells thus, may serve as a potential anticancer drug [3].

A randomized, double-blind, placebo-controlled clinical trial was performed in patients' diagnosed with metabolic syndrome. Two doses of *Gymnema* was given with 300mg/capsule for over 12 weeks. Patients were screened for body weight (BWt), body mass index (BMI), total cholesterol, low-density lipoprotein cholesterol, and very low-density lipoprotein (VLDL) before and after intervention, showed the *Gymnema* decreased BWt, BMI, and VLDL levels paving it way as a anti-obesity agent [4]. Aqueous extract of *Gymnema* leaves were subjected to broad spectrum microbial activity to check their inhibitory effect, showed its effect on 9 of 13 microbes, with *Pseudomonas aeruginosa* (23.3 mm) being most inhibited among gram negative followed by *Candida albicans* with inhibition zone of 22.6 mm and no effect of the leaves were seen on gram positive bacteria [5]. This was proven right again when green synthesis of aqueous extract of *Gymnema* with silver nitrate portrayed anti-Antibacterial activity against two different pathogens such as *Staphylococcus aureus* (Gram-positive), *Escherichia coli* (Gram-negative) in a agar well diffusion method showing good zone of inhibition [6].

Seeing the therapeutic importance of *Gymnema*, pharmacognostic characters of *Gymnema* have been study and document in this paper.

Materials and Methods

Voucher specimen: The plant materials were collected and Identity was confirmed with the voucher specimen using [7].

Physico-chemical values such as the percentage of total ash,

acid-insoluble ash, and water and alcohol-soluble extractives were calculated as per the Ayurvedic Pharmacopeia of India, [8]. TLC fingerprinting profile carried as per [9]. For the Anatomical studies, transverse sections (TS) and powder microscopy studies were prepared and stained [10, 11]. A standard guideline for total microbial Limit count was provided by WHO [12].

Results and Discussions

Table 1: Pharmacognosy features

Physicochemical Constants			Organoleptic Characters	
Parametrs	Values	Limit	Parametrs	Values
TA	6.8%	NMT 11%	Taste	Slightly bitter
AIA	2.8%	NMT 1%	Color	Greenish brown
ASE	9.85%	NLT 25%	Odour	None
WSE	14.65%	NLT 15%	Texture	Coarse

TA - Total Ash; AIA - Acid Insoluble Ash; ASE - Alcohol Soluble Extractive; WSE - Water Soluble Extractive; NMT- Not More Than, NLT- Not Less Than Limit as prescribed by Ayurvedic Pharmacopeia of India

The physiochemical parameters did not abide by the recommend value by Ayurvedic Pharmacopeia of India. This could be due to the presence of adulterants such as salts, silica or improper handling of raw materials. The above-mentioned Organoleptic properties are unique for the particular plant (table 1)

Table 2: TLC Profile

TLC Finger Printing Profile								
Under Visible Light								
Rf Values	0.11	0.15	0.66	0.81	-	-	-	-
Sprayed with 10% H ₂ SO ₄								
Rf Values	0.06	0.09	0.33	0.43	0.6	0.93	0.98	-
Sprayed with Anisaldehyde								
Rf Values	0.06	0.09	0.31	0.56	0.88	0.94	-	-
Under Short UV (254 nm)								
Rf Values	-	-	-	-	-	-	-	-
Under Long UV (366 nm)								
Rf Values	0.03	0.18	0.65	0.78	-	-	-	-

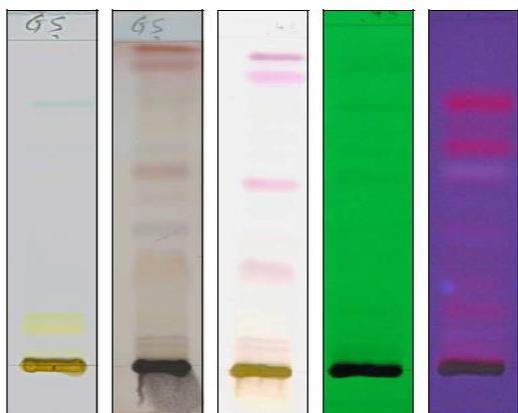


Fig 1: TLC Chromatograms

Gymnema sylvestre showed 4 bands under visible light, 7 bands when sprayed with 10% H₂SO₄ and 6 bands when

sprayed with Anisaldehyde. Further, 0 and 4 bands under short and long UV light respectively were observed. The results are qualitative TLC finger print profile of plant under study (table 2, fig 1)

Anatomical Characters

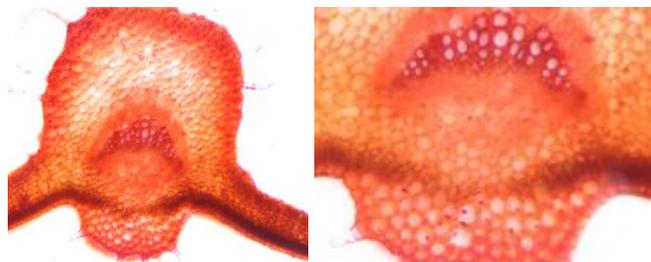


Fig 2: Anatomical Characters of *Gymnema sylvestre*

The mid rib region of the leaf section shows a single layer of epidermis giving rise a number of trichomes, epidermis; 3 to 4 layers of collenchymatous cells are seen followed by layers of parenchymatous cells. The xylem cells are present just below the layer of palisade cells. The larger xylem cells are present in the cesurrounded by th nter e phloem cells (fig 2).

Powder Characters: Powder Color: Light green:

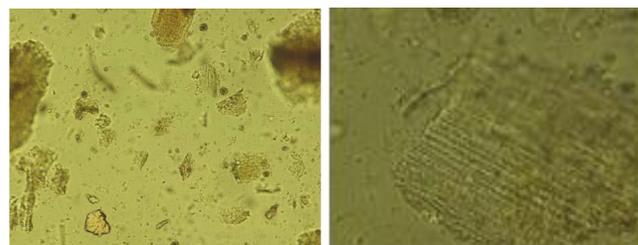


Fig 3: Powder characteristics of *Gymnema sylvestre*

1. Dumble shaped epidermal cells,
2. Stone cells are present, and palisade parenchyma cells are present,
3. Phloem fiber and calcium oxalate crystals are present.

Powder microscopy helps to distinguish the different broken sections of the sample that are unique and play a major role in the authentication of the raw sample (fig 3).

Microbial Limit Test

Total Aerobic Bacterial Count (TABC): 2.6×10^3
Total Yeast and Mould Count (TYMC): 1.6×10^3
 (Microbial contamination limit for raw herbs - TABC: $<10^7$, TYMC: $<10^5$)

All criteria were within the limits specified by the WHO Guidelines and Indian Herbal Pharmacopeia.

Conclusion

In the present study, pharmacognostic parameters of *Gymnema*, a therapeutically important plant has been studied to standardize and authenticate the plant material.

Physicochemical values did not obey with the limits as prescribed by Ayurvedic pharmacopeia of India which could suggest improper handling of plants. TLC profile can act as fingerprint profile of the plant. Organoleptic, anatomical and powder microscopic studies are unique to the given plant. Microbial limit of the raw herb was well with the limit recommend.

References

1. Saneja A, Sharma C, Aneja KR, Pahwa R. *Gymnema sylvestre* (Gurmar): A review. *Der Pharmacia Lettre*. 2010; 2(1):275-284.
2. Gunase karan V, Srinivasan S, Rani SS. Potential antioxidant and antimicrobial activity of *Gymnema sylvestre* related to diabetes. *Journal of Medicinal Plants*. 2019; 7(2):05-11.
3. Arunachalam KD, Arun LB, Annamalai SK, Arunachalam AM. Potential anticancer properties of bioactive compounds of *Gymnema sylvestre* and its bio functionalized silver nanoparticles. *International Journal of Nanomedicine*. 2015; 10:31.
4. Zuniga LY, González-Ortiz M, Martínez-Abundis E. Effect of *Gymnema sylvestre* administration on metabolic syndrome, insulin sensitivity, and insulin secretion. *Journal of medicinal food*. 2017; 20(8):750-754.
5. Arora DS, Sood H. *In vitro* antimicrobial potential of extracts and phytoconstituents from *Gymnema sylvestre* R. Br. Leaves and their biosafety evaluation. *AMB Express*. 2017; 7(1):115.
6. Gomathi M, Prakasam A, Raj kumar PV, Rajesh kumar S, Chandrase karan R, Anbarasan PM, *et al*. Green synthesis of silver nanoparticles using *Gymnema sylvestre* leaf extract and evaluation of its antibacterial activity. *South African Journal of Chemical Engineering*. 2020; 32:1-4.
7. Gamble JS. *Flora of the Presidency of Madras*. Newmann and Adlard London West, 1935, Vol 1-3.
8. *The Ayurvedic Pharmacopoeia of India*, Ministry of Health and Family welfare, Govt. of India, 2001, Vol 1-4.
9. Stahl E. *Thin layer chromatography*, Springer International Student Edition New York, 1965.
10. Wallis TE. *Text Book of Pharmacognosy*, Fifth Edition, CBS Publication and Distributors, 1957, 389-396.
11. Johansen D. A. *Plant Micro technique*. McGraw-Hill, New York, 1940-523.
12. WHO. *Quality Control methods for Medicinal Plant materials*, WHO, Geneva, 1998, 22.