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Phytochemical Screening and Pharmacognostic studies and Antidiabetic activity of Meshashringi (*Gymnema sylvestre* (Retz.) R.Br. ex. Sm.) Leaf and Stem Components

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ABSTRACT

BACKGROUND:*Over the past century, phytochemicals found in plants have played a crucial role in pharmaceutical development.Gymnema sylvestre, a renowned medicinal plant, is a member of the Apocynaceae family.*

METHODS:*This study aimed to analyze the potentially beneficial bioactive compounds present in the leaves and stem of Gymnema sylvestre. The yield of Chemical constituents from plant extracts was determined by using preparative chromatographic methods, including TLC, GC-MS, and HPLC analysis. Anti-diabetic activity was evaluated by using α-amylase inhibition and α-glucosidase inhibition assays.*

RESULTS: *TLC analysis using a dichloromethane: methanol: formic acid solvent system revealed three fractions with Rf values of 0.51, 0.79, and 0.90.GC-MS analysis produced a spectrum showing 11 major peaks. The quantities of gymnemic acid, gymnemagenin, and deacyl gymnemic acid were determined by using HPLC analysis. The starch-iodine method was utilized in two important enzymatic inhibition tests, α -amylase and α -glucosidase, to evaluate the sample's ability to lower glucose levels.*

CONCLUSION: *Gymnema sylvestre leaf and stem extracts were found to contain major bioactive constituents such as gymnemic acid, gymnemagenin, and deacyl gymnemic acid, as confirmed by TLC, GC-MS, and HPLC analyses. The extract exhibited significant inhibitory effects on α-amylase and α-glucosidase enzymes, surpassing the standard drug acarbose. These findings highlight the strong antidiabetic potential of G. sylvestre and its value as a promising source of plant-based therapeutic agents. The methanol extract of G.sylvestre possesses significant antidiabetic activity.*

Keywords: *Gymnema sylvestre, Pharmacognosy, Histochemistry, Phytochemical analysis,GC-MS,TLC, HPLC, Antidiabetic activity.*

Introduction

Phytochemicals are bioactive substances that are derived from plants.They are referred to as secondary metabolites.[1] Bioactive components are naturally produced by all plant parts, including the stem and leaves.[2] [3] *Gymnema sylvestre,* another names is Gurmar, it is a Hindu word that means 'sugar destroyer'.[4] Where the English term "Gymnema" is originates. *Gymnema sylvestre* have lot of medicinal value, which is decreases blood sugar, are becoming more and more in demand in thepharmaceutical industry.[5]Gurmar leaves are used to treat ailments due to their unique ability to block the sensation of sweet foods on the tongue and inhibit the absorption of glucose in the intestinal tract.[6] For this reason, it is known as the sugar destroyer.[7]GC-MS analysis has made significant breakthroughs in identifying chemical components and elucidating their structures due to its high sensitivity. Plant extracts contain numerous potential components, but only small amounts of active chemicals. Sensitive bioassays are necessary to detect these small quantities and the wide range of chemicals present. The introduction of TLC and chromatographic techniques such as GC-MS and HPLC has made analyzing these substances easier and more affordable.

Gymnema sylvestre leaves, a popular herb for treating diabetes, are increasingly sought after by the pharmaceutical industry.[8] The leaves contain gymnemic acid IV, deacyl gymnemic acid, and gymnemagenin the plant's main active ingredient commonly used to treat hypercholesterolemia, diabetes, and related conditions.[9] Additionally, the leaves possess stomachic, cough-suppressing, and diuretic properties.[10]Glucose levels in the blood are elevated by Diabetes Mellitus, which is a common disease nowadays.[11]Diabetes has a negative impact on various organ systems in the human body, including the heart and kidneys, and is especially damaging for those with chronic diabetes.[12] It is also utilized by pharmaceutical companies to produce herbal medications.[13]Study on phytochemical analysis and chemical constituents of *Gymnema sylvestre.*

Materials and Methods

Plant material collection

The plant material was collected from Hassan, Karnataka. The plant samplewas identified with the help of floras [14] [15] and received authentication from Herbarium of GKVK, UAS, Bangalore.

Microscopic Studies
The transverse sections of leaf and stem were stained with alcoholic safranin, and mounted in Canada balsam using the microtechnique method of Johanson.[16]

Histochemical Tests
The following reagents were used to confirm the alkaloids[17].

Wagner's Reagent
40 ml of dist. H_2O, 0.5 gm of Iodine and 1 gm of Potassium Iodide were dissolved. Formation of a reddish-brown color indicates the presence of alkaloids.

Mayer's Reagent
40 ml of dist. H_2O, 12.45 gm of Mercury Chloride and 40 gm of Potassium Iodide were dissolved. Formation of pale yellow or white color indicates the presence of alkaloids.

Plant Leaf Extract Preparation
The collected plant material was shade-dried, powdered, and stored in a closed container for further use. The dried powdered material was subjected to continuous hot extraction using a Soxhlet apparatus with 90% methanol as solvents.[10] This methanol extract was stored in the refrigerator for further use.[18]

Isolation of Gymnemic acid
1% aqueous KOH solution was mixed with a crude leaf and stem extract, and the mixture was continuously stirred using a magnetic stirrer for 40 to 60 mint. Filter the extract. Diluted HCl was then slowly added to the filter solution.After 50 mint, the gymnemic acids precipitated. The concentrated solution was filtered and then left to dry at room temperature. As a result, gymnemic acid was precipitated.

Various color tests to confirm the Gymnemic acid
Phenolic test
2ml of methanol, taken in a clean test tube, then a small quantity of gymnemic acid was diluted. Addition of few drops of $FeCl_3$, a dark blue color was appearing, its indicated the presence of Phenol.

Glycoside test
In a test tube a pinch of gymemic acid was dissolved in a 2ml of methanol and 1ml of alpha napthol solution was added from the side of the test tube. At the junction of the two layers, a bluish red ring appeared, signifying the presence of glycoside.

Thin Layer Chromatography (TLC)
The number of chemical constituents present in the crude plant extract was determined using Thin Layer Chromatography (TLC). The analysis was carried out on pre-coated silica gel plates (grade F_{254}).[19] Thin layer chromatographic examination revealed the presence of several prominent bioactive compounds in the plant extract. Separation of the chemical components of *Gymnema sylvestre* leaf extract was achieved using a solvent system consisting of dichloromethane, methanol, and formic acid in the ratio of 75:25:10.[20]

GCMS Analysis
Various bioactive compounds present in the plant extract were identified using Gas Chromatography–Mass Spectrometry (GC–MS) analysis[21].
The analysis was performed using a PerkinElmer Clarus 600 GC–MS system equipped with TurboMass™ version 5.2 software. Separation was achieved using a non-polar standard capillary column operated with a split injection mode at a ratio of 25:1. Helium was used as the carrier gas, and 1 µl of the methanolic extract was injected at an injector temperature of 220°C.The oven temperature program was initiated with a 3-mint delay at an initial temperature of 180°C, followed by a gradual increase at a rate of 7°C per mint up to 300°C, and maintained at this temperature for 15 mint. The mass spectrometer was operated in electron ionization (EI) mode at an ionization energy of 70 eV, with a scan range of 50–600 Da. Identification of the compounds present in the test sample was carried out based on their retention time, molecular weight, and mass spectral data.[22]

HPLC Analysis of Leaf and stem Extract from *Gymnema sylvestre*
Quantitative Phytochemical analysis
The leaf extracts were filtered using a Sartorius RC membrane syringe filter, and an injection volume of 20 µl was used for analysis. High-performance liquid chromatography (HPLC) was performed using a Shimadzu HPLC system equipped with a Supelcosil LC-18 C18 column (250 × 4.6 mm). The mobile phase consisted of solvent A, comprising 1 mM KH_2PO_4 with 0.5 ml phosphoric acid in 1000 ml of distilled water, and solvent B, acetonitrile.The chromatographic system was operated at a back pressure of approximately 250 psi, with a flow rate of 1.0 ml/mint, and detection was carried out using a UV detector set at 210 nm. Although the total run time was 40 mint, a longer run time of 60 mintwould be preferable for improved separation of compounds.[23]

Anti-Diabetic activity of *Gymnema sylvestre* leaf and stem extracts
α-Amylase Inhibition Assay By Starch-Iodide Method
The chosen extracts and compounds were screened for α-amylase inhibition using a slightly modified version of the Ononamadu et al. (2020) approach.The following were added in triplicate to 250 µl of each extract (62.5, 125, 250, 500, and 1000 µg/ml) in a test tube: Phosphate buffered α-amylase (250 µl, 0.05 mg/ml), starch (250 µl, 1% w/v), and 250 µl of phosphate buffer (200 mM, pH 6.9 and containing 6 mM sodium chloride) were added to the reaction mixture, which was then incubated for 15 mint at 37°C.After stopping the enzymatic reaction with one molar HCl (20 µl), 100 µl of iodine reagent (5 mM I_2 and 5 mM KI) was added.At 625 nm, the absorbance was measured and the color shift was reported. There was no test extract or chemical in the control reaction, which represented 100% enzyme activity. Acarbose was used as the benchmark.[24]

α - Glucosidase inhibition assay
The method described by Shai et al. (2011) was slightly modified to evaluate the effect of the samples on α-glucosidase activity.Various concentrations of the sample were preincubated with 400 µl of α-glucosidase (0.067 U/ml) for 30 mint. The reaction was initiated by adding 200 µl of 3.0 mM p-nitrophenyl-α-D-glucopyranoside (pNPG) prepared in 0.1 M sodium phosphate buffer (pH 6.9).After incubation at 37°C for 30 mint, the reaction was terminated by adding 2 ml of 0.1 M Na_2CO_3.[25]

Results

Morphology of dried plant material:

The powdered leaf and stem material of *Gymnema sylvestre* was yellowish green in color. The powder characteristics are shown in figure 1. Powder microscopy of leaves and stem revealed the presence of vessels, different types of stone cells, Starch cells, parenchymatous cells, palisade and spongy parenchymatous cells, fibers multicellular, unicellular trichome with upper epidermal cells.[26]

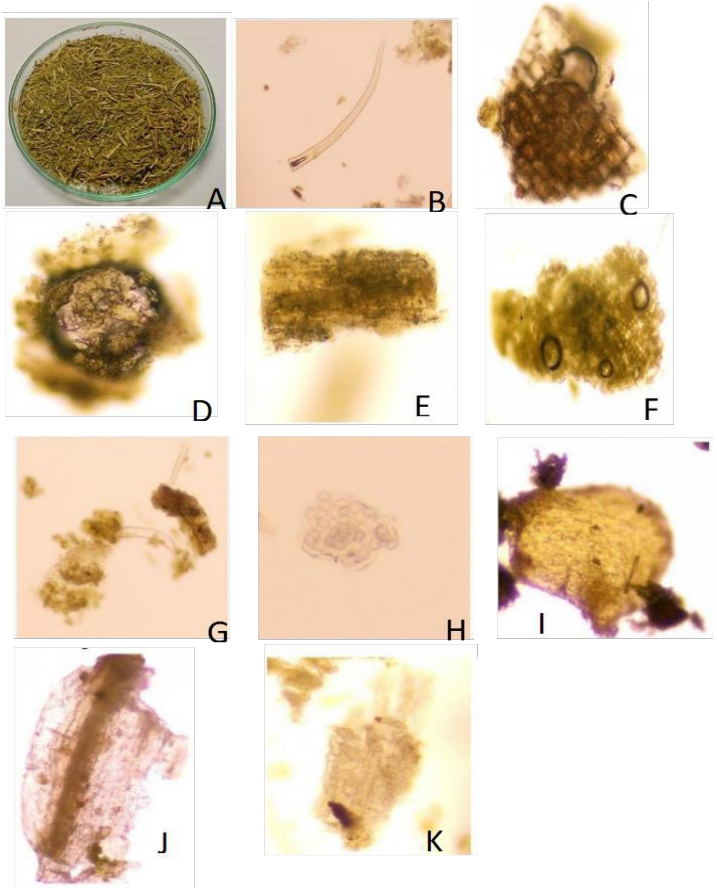

Figure1: MicromorphologyofG.sylvestreplantpowderimage (10X)

A: Plant powder sample, B: Trichome, C: Epidermis with cortex, D: Stone cells,E: Pericycle,F:MassesofStarchgrain,G:Fibrous,H:Parenchymatous cells,I:Stone cells, J: Palisade and Spongy Parenchyma, K: Epidermis with cortex

Microscopic Studies

Transverse section of Stem: A circular outline is visible on the stem (Figure 2A), with a margin that is either entirely or partially wavy. Trichomes consist of groups of multicellular uniseriate cells. The outermost layer of the epidermis is composed of barrel-shaped or rectangular cells and is covered by a thick cuticle. The outermost portion of the cortex consists of 3–4 rows of polygonal or oval parenchymatous cells, with no distinct endodermis present. The pericycle is represented by scattered groups of stone cells with thick walls. Vascular tissues found in the stem anatomy include primary xylem, secondary xylem, interaxillary phloem, pith, cambium, and primary phloem.[27]

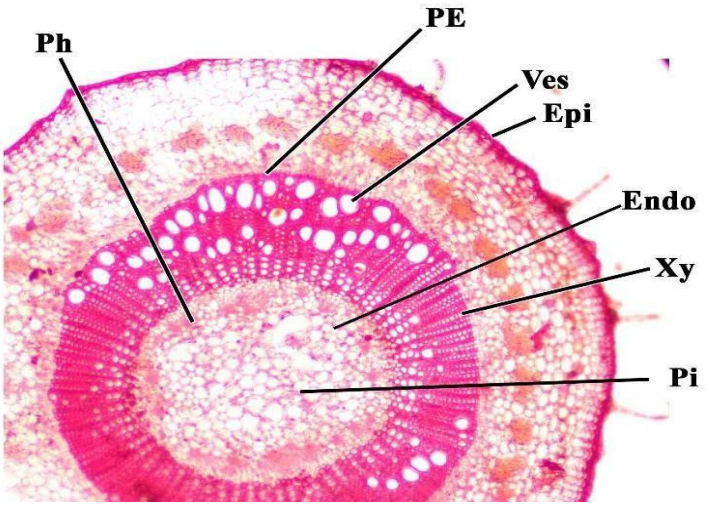

Figure 2: A - Transverse Section of Stem Note: Ves:Vessels; Xy: Xylem; Ph: Phloem; Epi: Epidermis; Ecto: Ectoderm; Endo:Endoderm and Pi: Pith

Transverse section of Midrib: The midrib (Figure 2B) is oval-shaped on the abaxial side and features a small protrusion on the adaxial side. Single rows of cells on both sides of the midrib form multicellular, unbranched trichomes. The ground tissue consists of compact parenchyma. On the abaxial side, discontinuous wide strands form the vascular strand of the midrib. Radial rows of xylem elements are accompanied by numerous phloem patches located on both the upper and lower sides of the xylem strands.[28]

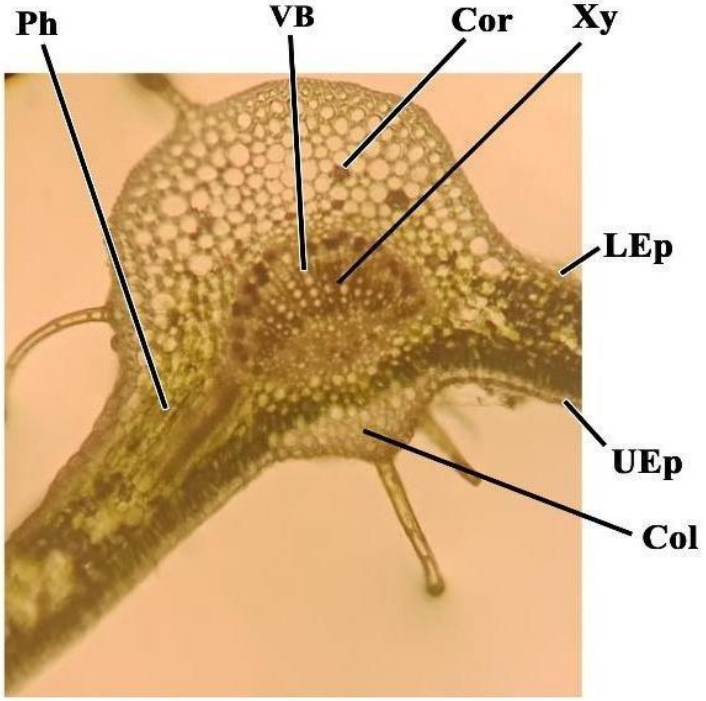

Figure: 2B- Transverse section of leaf midrib Note: Cor: Cortex; Col: Collenchyma;Xy: Xylem; Ph: Phloem; UEp: Upper epidermis;LEp: Lower epidermis and VB: Vascular bundle

Histochemical Tests

The present study only uses histochemical tests for alkaloids from different plant parts because *Gymnena sylvestre* is a rich source of alkaloids.Histochemistry analysis was carried out on the free-hand sections of *G. Sylvestre* leaf and stem using different reagents. Alkaloids were detected using a variety of reagents, includingwagner and mayer reagent. Alkaloids were recognized by using mayer reagent formation oflight yellow or cream in color. The presence of alkaloids was shown by the reddish-brownprecipitate produced by Wagner's reagent.[29]

Biochemical test

The outcomes of performing the phenolic test, which is the +ve test that indicates there is a -OH group in the molecule, resulted in the formation of a dark blue color. To confirm theglycosidic nature a blue-red ring was made.

Thin Layer Chromatography

Thin layer Chromatographic analysis demonstrated that the plant extract included a variety of strong biomolecules. The methanolic extract showed several spots of Deacyl Gymnemic acid, Gymnemagenin, and Gymnemic acid IV with Rf values of 0.51, 0.9, and 0.79 shown in Figure 3A. In a less polar system, the polarity of compounds with a high Rf value is low, and vice versa, according to TLC analysis, which gives an indication of the polarity of different chemical ingredients.[30] Using a Dichloromethane: Methanol: Formic acid ratio of 75:25:10, An Rf value of 0.79 was discovered by Balamurali Krishna et al. (2012) in their TLC analysis of gymnemic acid from *Gymnema sylvestre*.[31] The chromatogram was visualized under UV light (Normal light,366 nm, 254 nm, whight light) Figure 3B.

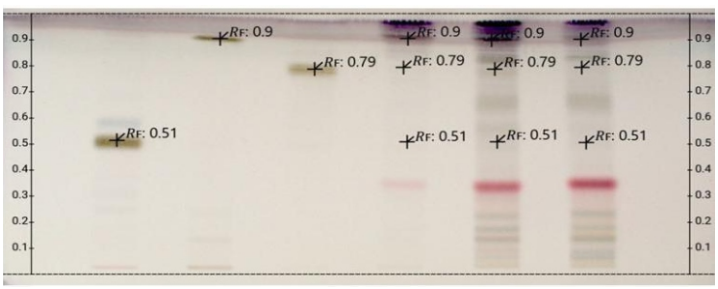

Figure 3A: Chemical constituents develop by using at different wavelength of light

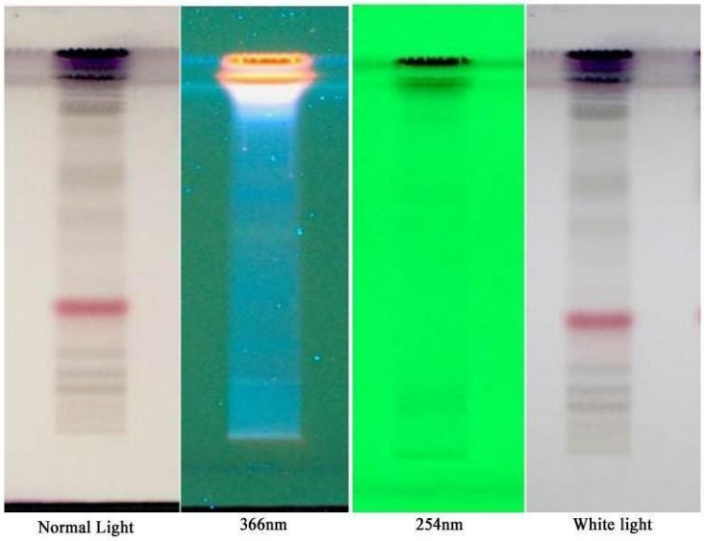

Figure 3B: Chemical Constituents develop by using at different wavelength of light GC-MS Study

The methanolic extracts of *Gymnema sylvestre* obtained from both leaf and stem explants were analyzed for the presence of bioactive compounds using Gas Chromatography–Mass Spectrometry (GC–MS) in Figure 4. The identified active principles, along with their retention time (RT), molecular weight (MW), molecular structure, and percentage peak area, are presented in Table 1.GC–MS analysis revealed that the methanolic extract of *G. sylvestre* contained a total of eleven distinct compounds, predominantly belonging to the classes of terpenes and both saturated and unsaturated fatty acids. Among the identified compounds, 9-octadecenoic acid (Z)- and its methyl ester were detected as major constituents, consistent with the findings reported by Parimala Devi.[32]

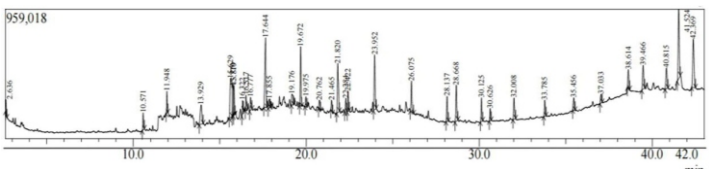

Figure 4: GCMS Chromatogram Of Gymnema sylvestre stem and leaf extracts

Table 1: List of chemicals found in the methanolic extract of Gymnema sylvestre leaf and stem extract at different retention times by GCMS analysis

Sl.No	Retention Time	Compound	Molecular weight(g/mol)	Structure	Area%
1.	2.636	Propanoic acid, ethyl ester	102.13	$C_5H_{10}O_2$	0.88
2.	10.571	4-(1-Aminoethyl)phenol	137.17	$C_8H_{11}NO$	1.44
3.	11.948	2-Methoxy-4-vinylphenol	150.17	$C_9H_{10}O_2$	1.52
4.	13.929	Tuckolide	216.2	$C_{10}H_{16}O_5$	3.40
5.	15.630	Cyclooctasiloxane, hexadecamethyl-	593.23	$C_{16}H_{48}O_8Si_8$	7.67
6.	16.320	Heneicosane	296.57	$C_{21}H_{44}$	0.95
7.	16.515	2(3H)-Benzothiazolone	134.13	C_7H_5NOS	1.42
8.	17.645	Cyclononasiloxane,octadecamethyl-	414.90 g/mol	$C_{18}H_{54}O_9Si_9$	8.56
9.	19.175	1-Heptyloxymethyl-4,5-dimethoxy-2-nitrobenzene	206.324	$C_{16}H_{25}NO_5$	1.51
10.	19.670	Cyclodecasiloxane, eicosamethyl-	741.54	$C_{20}H_{60}O_{10}Si_{10}$	4.85
11.	19.975	Benzothiazole, 2-(2-hydroxyethylthio)	211.3	$C_9H_9NOS_2$	0.92

HPLC Study:

The active principles extracted from the dried leaves were subjected to HPLC analysis and separated into three distinct fractions based on their retention times, in comparison with standard compounds, as described by Shimizu et al. (1997). Methanol was used as the extraction solvent for isolating the chemical constituents from *Gymnema sylvestre*.The results presented in Table 2 and Figure 5 illustrate the percentage composition of deacyl gymnemic acid, gymnemagenin, and gymnemic acid IV identified in the methanolic leaf extract.[33]

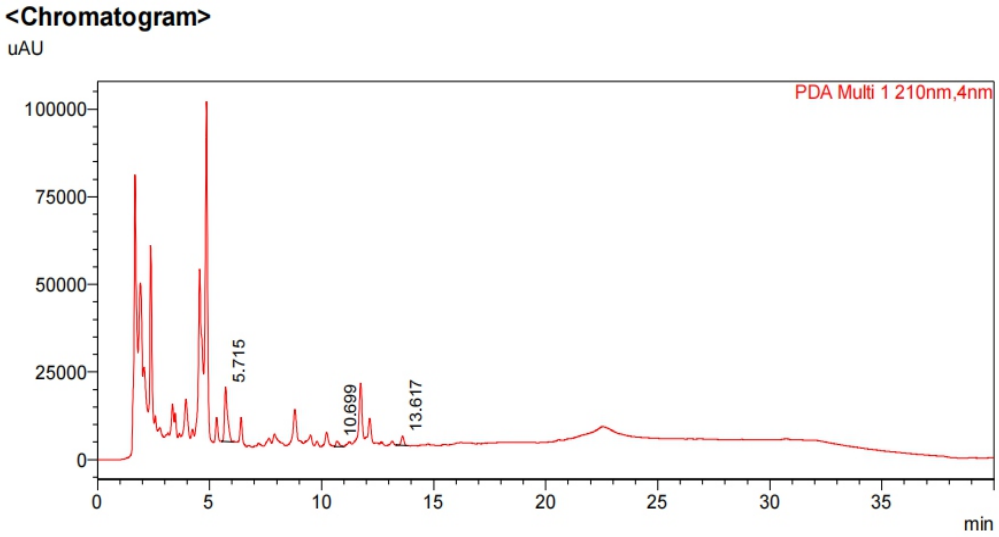

Figure 5: HPLC Chromatogram of Gymnema sylvestre stem and leaf extracts

Table 2: % of Chemical components from Gymnema sylvestre Methanolic stem and leaf Extracts

SL.NO.	The ecotype name	Location of the collection	% of Deacyl Gymnemic acid(w/w)	% of Gymnemagenin (w/w)	% of Gymnemic acid IV(w/w)
1.	Koratikere	Hassan	4.45	0.32	0.17

Anti-Diabetic activity *Gymnema sylvestre* leaf and stem extract

α-Amylase Inhibition Assay By Starch-Iodide Method

The anti-diabetic activity of the standard drug acarbose and the test sample was evaluated using the starch–iodide method, and the results are presented in Table 3 and Figure 6. Acarbose exhibited a concentration-dependent increase in inhibitory activity, with percentage inhibition rising from 21.92 ± 0.0882% at 62.5 µg/ml to 80.36 ± 0.0493% at 1000 µg/ml. Correspondingly, the optical density values decreased with increasing concentration, indicating effective inhibition of enzymatic activity.Similarly, the test sample demonstrated significant anti-diabetic activity in a dose-dependent manner. The percentage inhibition increased from 42.35 ± 0.0467% at 62.5 µg/ml to 77.94 ± 0.0874% at 1000 µg/ml, with a concomitant reduction in optical density values. Notably, the sample showed higher inhibitory activity than acarbose at lower concentrations (62.5–250 µg/ml). However, at higher concentrations (500 and 1000 µg/ml), acarbose exhibited slightly greater inhibition compared to the sample.[34]

Table 3: α-Amylase Inhibition Assay

Anti-diabetic activity of Standard -Acarbose			
Sl no.	Concentration	OD	%inhibition
S1	62.5	1.475±0.032	21.92±0.0882
S2	125	1.250±0.012	33.83±0.0882
S3	250	0.979±0.016	48.17±0.085
S4	500	0.616±0.009	67.39±0.0698
S5	1000	0.371±0.008	80.36±0.0493
Anti-diabetic activity of Sample by Starch-iodide method			
T1	62.5	0.162±0.0058	42.35±0.04672
T2	125	0.125±0.017	55.52±0.0754
T3	250	0.094±0.014	66.55±0.049
T4	500	0.082±0.010	70.82±0.0731
T5	1000	0.062±0.009	77.94±0.08736

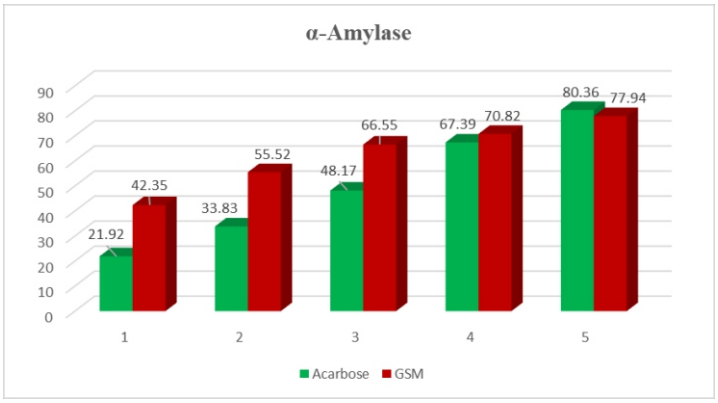

Figure 6: Combined graph of anti-diabetic Activity of Acarbose and Test sample by starch Iodide method (α- Amylase)

α - Glucosidase inhibition assay

The α-glucosidase inhibitory activity of the standard drug acarbose and the test sample was evaluated, and the results are presented in Table 4 and Figure 7. Acarbose exhibited a strongconcentration-dependent inhibitory effect, with percentage inhibition increasing from 20.39 ± 0.07% at 62.5 µg/ml to 96.69 ± 0.073% at 1000 µg/ml. This increase in inhibition was accompanied by a corresponding decrease in optical density values, indicating effective suppression of α-glucosidase activity.The test sample also demonstrated significant α-glucosidase inhibition in a dose-dependent manner. The percentage inhibition increased from 58.68 ± 0.0665% at 62.5 µg/ml to 95.59 ± 0.056% at 1000 µg/ml, with a marked reduction in optical density values as the concentration increased. Notably, the sample showed substantially higher inhibitory activity than acarbose at lower concentrations (62.5 and 125 µg/ml). At higher concentrations (500 and 1000 µg/ml), the inhibitory activity of the sample was comparable to that of the standard drug.[35]

Table 4: α-glucosidase Inhibition Assay

Anti-diabetic activity of Standard -Acarbose			
Sl No.	Concentration	OD	%inhibition
S1	62.5	0.578±0.0188	20.39±0.07
S2	125	0.422±0.010	41.87±0.09
S3	250	0.278±0.09	61.71±0.056
S4	500	0.098±0.012	86.50±0.067
S5	1000	0.024±0.010	96.69±0.073
Anti-diabetic activity of Sample by Starch-iodide method			
T1	62.5	0.300±0.009	58.68±0.0665
T2	125	0.154±0.008	78.79±0.0529
T3	250	0.143±0.012	80.30±0.0650
T4	500	0.066±0.008	90.91±0.0469
T5	1000	0.032±0.007	95.59±0.056

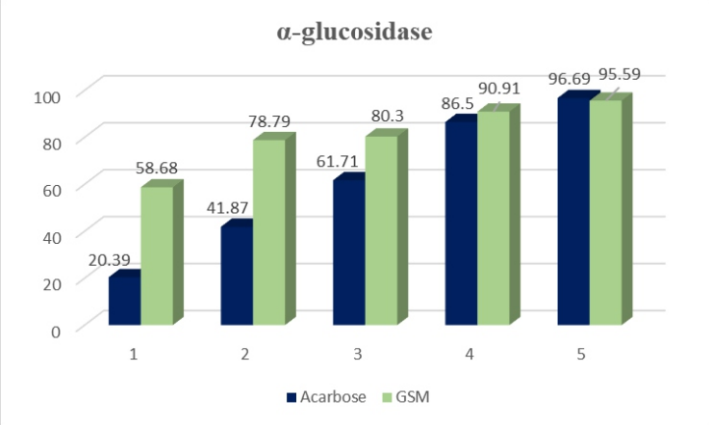

Figure 7: Combined Graph of anti-diabetic activity of Acarbose and α-glucosidase by Starch-iodide Method (α-glucosidase)

Discussion

The present study histochemical tests are restricted to only histochemistry of alkaloids in different plant parts. *Gymnema sylvestre* leaf and stem free-hand sections were subjected to various reagent treatments in order to perform histochemical analysis. Several reagents were used to detect alkaloids, including Mayer's, which produced a cream or pale yellow color indicating the presence of alkaloids, and Wagner's, which produced reddish-brown precipitate indicating the presence of alkaloids. The outcomes of the phenolic test, which showed that the molecule had an OH group. At the intersection of the two layers, a bluish red ring formed, signifying the presence of glycoside.Powder anatomy of *Gymnema sylvestre* revealed epidermal fragments with multicellular hairs. A few mesophyll and palisade parenchyma cells were observed, with the hairs being uniseriate and smooth. Glandular hairs were also present within the epidermal cells. The powder anatomy showed abundant starch grains, simple to compound round-shaped stone cells, non-lignified fibers, and vessels with cortical walls.Examine the TLC plate under UV light at 254 nm and 366 nm. Then, observe the plate under white light after dipping it in vanillin–H_2SO_4 reagent and heating it at 105°C ± 5°C for approximately 10 mint. The methanolic extract exhibited several spots corresponding to Deacyl Gymnemic acid, Gymnemagenin, and Gymnemic acid IV, with Rf values of 0.51, 0.90, and 0.79, respectively.A total of 11 compounds had beenidentified from the methanolic extract of *G.sylvestre*through GC-MS analysis. *G. sylvestre* methanolic extract included different compounds, the main constituents of *Gymnema sylvestre* are Propanoic acid,4-(1-Aminoethyl) phenol,2-Methoxy-4-vinylphenol.Among these, deacyl gymnemic acid was found to be the predominant compound, accounting for 4.45% (w/w) of the extract. The gymnemagenin content was comparatively lower at 0.32% (w/w). gymnemagenin, an aglycone moiety of gymnemic acids IV, plays a crucial role in the biological activity of these compounds, particularly in modulating glucose uptake and inhibiting intestinal glucose absorption. The Gymnemic acid IV content was found to be the lowest among the three quantified compounds, at 0.17% (w/w). Alpha-amylase and alpha-glucosidase these enzymes are capable of breaking down carbohydrate into glucose, which can then be further absorbed by the body. This suggests that the bioactive constituents in the sample effectively inhibit α-amylase, there by potentially reducing the breakdown of starch into glucose.[32]In the α-glucosidase inhibition assay, a similar concentration-dependent trend was observed, with significantly higher inhibition values. The greater inhibition observed in this assay compared to α-amylase suggests that the sample is more effective against α-glucosidase, which plays a key role in the final step of carbohydrate digestion.

Conclusion

According to the current study, using 90% methanol in a continuous hot extraction process with a Soxhlet apparatus yielded significant results, produced the maximum yield of extraction. The identification and quantification of phytoconstituents present in plant materials require analysis of Thin-Layer Chromatography (TLC).The resulting plant extract can be subjected to comprehensive analysis using gas chromatography-mass spectrometry (GC-MS) and high-performance liquid chromatography (HPLC) to accurately identify, quantify, and characterize the diverse chemical constituents present. The identification of these 11 compounds through GC-MS with significant components. Chemical constituents can be analyzed by using HPLC techniques since they are proven to be accurate, exact, and time-efficient. The starch-iodide method confirmed that the test sample effectively inhibits both α-amylase and α-glucosidase activities in a concentration-dependent manner. The findings support the use of this sample as a natural therapeutic agent for diabetes management, especially in controlling postprandial blood glucose levels.

Limitation of study

The study has been carried out in the species of *Gymnema sylvestre* derived from the habitat of Karnataka, India.

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Nil

Conflicts of interest

There are no conflicts of interest.

References

1. Zhen, H. S., Zhu, X. Y., Lu, R. M., Liang, J., Qiu, Q., & Meng, Q. M. (2008). Research on chemical constituents from stem of Gymnema sylvestre. Journal of Chinese Medicinal Materials, 31(8), 1154-6.

2. Yoshikawa, M., Murakami, T., & Kadoya, M. (1997). Medicinal foodstuffs. IX. The inhibitors of glucose absorption from the leaves of Gymnema sylvestre R.Br. (Asclepiadaceae): structures of gymnemosides A and B. Chemical and Pharmaceutical Bulletin, 45(10), 1671-6.
3. Manohar, S. H., Naik, P. M., Praveen, N., & Murthy, H. N. (2009). Distribution of gymnemic acid in various organs of Gymnema sylvestre, Journal of Forestry Research, 20, 3, 268–270, 2-s2.0-70350061324, https://doi.org/10.1007/s11676-009-0046-7.
4. Singh, V. K., Umar, S., Ansari, S. A., & Iqbal, M. (2008). Gymnema sylvestre for diabetics, Journal of Herbs, Spices and Medicinal Plants, 14, no. 1-2, 88–106, 2-s2.0-67749137215, https://doi.org/10.1080/10496470802341508.
5. Shimizu, K., Ozeki, M., Iino, A., Nakajyo, S., Urakawa, N., & Atsuchi, M. (2001). Structure-activity relationships of triterpenoid derivatives extracted from Gymnema inodorum leaves on glucose absorption, Japanese Journal of Pharmacology, 86(2), 223–229, 2-s2.0-0034939108, https://doi.org/10.1254/jjp.86.223.
6. Xie, J. T., Wang, A., Mehendale, S., Wu, J., Aung, H. H., Dey, L., Qiu, S., & Yuan, C. S. (2003). Anti-diabetic effects of Gymnema yunnanense extract, Pharmacological Research, 47, no. 4, 323–329, 2-s2.0-0037375912, https://doi.org/10.1016/S1043-6618(02)00322-5.
7. Reddy, P. S., Gopal G. R., & Sita, G. L. (2004). In vitro multiplication of Gymnema sylvestre R.Br., an important medicinal plant, Current Science, 10, no. 1–4, 2-s2.0-0001550522.
8. Gurav, S., Gulkari, V., Duragkar, N., & Patil, A. A. (2007). Systemic review: pharmacognosy, phytochemistry, pharmacology and clinical applications of Gymnema sylvestre R Br., Pharmacognosy Reviews, 1, 338–343.
9. Babu, P. A., Suneetha, G., & Boddepalli, R. (2006). A database of 389 medicinal plants for diabetes, Bioinformation 2006; 1, no. 4, 130-131, https://doi.org/10.6026/97320630001130.
10. Shane-McWhorter L. (2009). Dietary supplements for diabetes: an evaluation of commonly used products, Diabetes Spectrum, 22, no. 4, 206–213, 2-s2.0-73849103197, https://doi.org/10.2337/diaspect.22.4.206.
11. Singh, V. K., Umar, S., Ansari, S. A., & Iqbal, M. (2008). Gymnema sylvestre for diabetics, Journal of Herbs, Spices and Medicinal Plants, 14, no. 1-2, 88–106, 2-s2.0-67749137215, https://doi.org/10.1080/10496470802341508.
12. Yoshikawa, K., Amimoto, K., Arihara, S., & Matsuura, K. (1989). Structure studies of new antisweet constituents from Gymnema sylvestre, Tetrahedron Letters, 30, no. 9, 1103–1106, 2-s2.0-0024557250, https://doi.org/10.1016/ S0040-4039(01)80371-3.
13. Yoshikawa, M., Murakami, T., Kadoya, M., Li, Y., Murakami, N., Yamahara, J., & Matsuda, H. (1997). Medicinal foodstuffs. IX. The inhibitors of glucose absorption from the leaves of Gymnema sylvestre R.Br. (Asclepiadaceae): structures of gymnemosides A and B, Chemical and Pharmaceutical Bulletin, 45, no. 10, 1671–1676, 2-s2.0-0030718477, https://doi.org/10.1248/cpb.45.1671.
14. Gamble, J. S., Bishen, S., & Mahendra P. S. (1991). Flora of the presidency of Madras. Vol I-III, Dehra Dun.
15. Matthew, K. M. An excursion flora of central Tamil Nadu, India. Oxford and IBH publishing co., New Delhi.
16. Johanson, D. A. (1940) plant microtechnique. McGraw-Hill Book co. Inc., New York.
17. Khanna, V. G, & Kannabiran, K. (2008). Antimicrobial activity of saponin fractions of the leaves of Gymnema sylvestre and Eclipta prostrate. World J Microbiol Biotechnol, 24, 2737-2740.
18. Liu, H. M., Kiuchi, F., & Tsuda, Y. (1992). Isolation and structure elucidation of gymnemic acids, antisweet principles of Gymnema sylvestre R.Br., Chemical and Pharmaceutical Bulletin, 40, no. 6, 1366–1375, 2-s2.0-0026693047, https://doi.org/10.1248/cpb.40.1366.
19. Fried, B., & Sherma, J. (1994). Thin Layer Chromatography: techniques and applications. Third edition, revised and expanded. Chromatographic science series 66. Marcel Dekker, Inc. New York, USA. 451.
20. Sangeetha, S., Archit, R., & Sathiavelu, A. (2014). Phytochemical testing, Antioxidant activity, HPTLC and FTIR analysis of antidiabetic plants Nigella sativa, Eugenia jambolana, Andrographis paniculata and G.sylvestre. Res J.Biotech., 9(9), 66-72.
21. Liebler, D. C., Burr, J. A., Philips, L., & Ham, A. J. L. (1996). Gas chromatography - mass spectrometry analysis of vitamin E and its oxidation products. Anal. Biochem, 236, 27-34.
22. Sahaya-Sathish, S., Janakiraman, N., & Johnson, M. (2012). Phytochemical analysis of Vitex altissima L. using UV-Vis, FTIR and GC-MS. Int. J. Pharm Sci & Drug Res 4(1), 56-62.
23. Kusum-devi, Nimisha Jain, A validated HPLC method for the estimation of gymnemic acid as deacyl gymnemic acid in various extracts and formulations of Gymnema sylvestre. International journal of phytomedicine, 6 (2), 165-169.
24. Laha, S., & Paul, S. (2019). Gymnema sylvestre: A potent Herb with Anti-diabetic and Antioxidant potential. Pharmacogn J, 11(2), 201-206.
25. Baskaran, K., Ahamath, B. K., Shanmugasundaram, K. R., & Shanmugasundaram, E. R. B. (1990). Antidiabetic effect of a leaf extract from Gymnema sylvestre in non-insulin-dependent diabetes mellitus patients, Journal of Ethnopharmacology, 30, no. 3, 295–305, 2-s2.0-0025087317, https://doi.org/10.1016/0378-8741(90) 90108-6.
26. Anjum, T., Tamchos, S., Dahiya, J., Sharma, G., & Shiddamallayya, N. (2025) Pharmacognostic evaluation and TLC/HPTLC analysis of Nimba flowers (Azadirachta indica A. Juss) used in ayurveda. J Drug Res Ayurvedic Sci, 10, 164-76.
27. Mownika, S., Ramya, E. K., & Sharmila, S. (2020). Anatomical and histochemical characteristics of Morinda citrifolia L. (Rubiaceae). Int J Pharm Sci & Res, 11(2), 669-77. doi: 10.13040/IJPSR.0975-8232.11(2).669-77.
28. Leena, K., Darshana, P., & Avinash, P. (2020). Pharmacognostic standardisation and high performance thin layer chromatography fingerprint profile of Gymnema sylvestre R. Br. Leaves. International Journal of Botany Studies, 5(2), 96-103.
29. Kharate, M. S., Algunde, S. M., Gaikwad, R. S., & Kute, A. M. (2024). The Taxonomic Aspects, Anatomy and Histochemical Analysis of Morinda Citrifolia L. of Family Rubiaceae. International Journal of Scientific Research in Science and Technology, 11(12), 124-131.
30. Fried, B., & Sherma, J. (1994). Thin layer chromatography: techniques and applications. Third edition, revised and expanded. Chromatographic science series 66. Marcel Dekker, Inc. New York, USA, 451P.
31. Jain, A., Parashar, A. K., Nema, R. K., & Narsinghani, T. (2014). High performance thin layer chromatography (HPTLC): A modern analytical tool for chemical analysis. Curr Res Pharm Sci., 04, 8-14.
32. Ramachandran, A., Muthukrishnan, S., & Maheshwaran, V. (2025). Phytochemical analysis of Caesalpinia bonduc (L.) Roxb. Seeds and commercially available seed powder by FTIR and GC-MS techniques. J Drug Res Ayurvedic Sci., 10, 137-47.
33. Wang, D., Fengyuan, H., Zhenjiang, L., Li, D. (2014). Phytochemical composition, antioxidant activity and HPLC fingerprinting profiles of three pyrola species from different regions. Plos one, 9, e963299.
34. Baskaran, K., Ahamath, B. K., Shanmugasundaram, K. R., & Shanmugasundaram, E. R. B. (1990). Antidiabetic effect of a leaf extract from Gymnema sylvestre in non-insulin-dependent diabetes mellitus patients, Journal of Ethnopharmacology, 30, no. 3, 295–305, 2-s2.0-0025087317, https://doi.org/10.1016/0378-8741(90)90108-6.
35. Anturlikar, S. D., Gopumadhavan, S., Chauhan, B. L., & Mitra, S. K. (1995). Effect of D-400, a herbal formulation, on blood sugar of normal and alloxan-induced diabetic rats, Indian Journal of Physiology and Pharmacology, 39, no. 2, 95–100, 2-s2.0-0028931620.