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Research Article

Qualitative HPTLC Phytochemical Profiling of the Seeds of *Swietenia mahagoni* Jacq

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ABSTRACT

The science of medicine is developing, and attempts are being made across the board to replace rationalism with empiricism. Diabetic patients who are concerned about their health are increasingly looking for medicinal plants with anti-hyperglycemic properties. The chosen plant, *Swietenia mahagoni* Jacq, was the subject of the current study's phytochemical investigations. It has a variety of medicinal uses in ethno medicine. In Indonesia and India, the seeds and bark are used as traditional medicine to treat hypertension, diabetes, malaria, and epilepsy. Small pieces of *S. mahagoni* Jacq. Seeds were dried at room temperature in the shade. The seeds were reused into a fine, coarse form. The factory material was kept in a watertight vessel in a clean, dark position. Birth of factory material, phytoconstituent identification, and HPTLC may all be used in phytochemical analyses of a factory. The CAMAG Linomet 5 Automatic TLC sample applicator, CAMAG TLC SCANNER 3, and CAMAG REPROSTAR 3 scanner were used for HPTLC analysis. The chromatogram run was 9 cm long. The images were taken using a CAMAG REPROSTAR 3 scanner with Palm pussycat's software (interpretation 1.3.4), which was used for densitometry scanning in the reflectance absorbance mode at visible light, UV 254 nm, and UV 366 nm. Deuterium lights furnishing a nonstop UV diapason between 190 nm and 400 nm were used as the radiation source. By comparing the results to the standard oleanolic acid, the presence of oleanolic acid is demonstrated. Grounded on the findings of the current disquisition, for review.

Keywords: Antihyperglycemic; *S. mahagoni*; Phytoconstituents; Deuterium lights; Diabetics

INTRODUCTION

The Indian medical systems are regarded as a vast repository of knowledge from which many beneficial things can be learned. Native medications are quite significant from an economic and professional standpoint. Many of the drugs that are currently on the market have either been directly or indirectly produced from plants, which have historically been an excellent source of pharmaceuticals. Simple assertions do not satisfy the scientific mind unless they are supported by experimental data. A thorough research of indigenous pharmaceuticals would enable much more to be done to advance their cause and make them truly beneficial to the people of this nation [1].

Diabetes mellitus

Diabetes, frequently known as diabetes mellitus, is a set of metabolic ails characterized by persistently elevated blood sugar situations. Frequent urine, increased thirst, and increased hunger are signs of elevated blood sugar. Diabetes can lead to a wide range of consequences if ignored. Diabetic ketoacidosis and non-ketotic hyperosmolar coma are exemplifications of acute complications. Cardiovascular complaint, stroke, habitual order failure, bottom ulcers, and eye damage are serious long term consequences [2]. A high frequency of threat factors was set up among the diabetic subject's including pre-hypertension (37), hypertension (53.7), fat (14.8), rotundity (57.4), hypercholesterolemia (25.9) and hypertriglyceridemia (39.6).

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Numerous indigenous Indian medicinal shops have been set up to be useful to successfully manage diabetes. One of the great advantages of medicinal shops is that these are readily available and have veritably low side goods. India has about 45,000 factory species and numerous of them have medicinal parcels [3].

MATERIALS AND METHODS

Plant profile

Swietenia mahagoni Jacq. (Meliaceae) is a large, deciduous, and economically important timber tree native to the Central America and is commonly known as "Mahogany". Commonly it is called as Puerto Rico, Spanish, Cuban or Jamaica Mahagony tree [4]. It is an important plant that is connected to the African genus *Khaya* and the source of one of the continent's most well-known traditional remedies (Figure 1) [5].

Figure 1: Seed pods of *S. mahagoni* Jacq.

Preparation and extraction of plant material

Plant drying and size reduction: Small pieces of *S. mahagoni* Jacq. seeds were dried at room temperature in the shade. The seeds were reused into a fine, coarse form. The factory material was kept in a watertight vessel in a clean, dark position. Birth of factory material, identification of the phytoconstituents, quantitative computation of the total phenolic and flavonoid content, and HPTLC analysis are some of the possible way in phytochemical examinations of a factory (Figures 2-4).

Figure 2: Opened fruits of *S. mahagoni* JACQ.

Figure 3: Seeds of *S. mahagoni* Jacq. (with cotyledons), collection location: South Canara, India.

Figure 4: Seeds of *S. mahagoni* Jacq. (without cotyledons), collection location: South Canara, India.

Extraction

Using specific solvents in a typical extraction method, extraction includes separating the bioactive portion of the plant seed from the inert components. These preparation types include the decoction, fluid extraction, tinctures, semisolid extract, and powder categories. To obtain the concentrated form of the active chemical, extraction is done for a variety of reasons.

Extraction method

Using a Soxhlet extractor, 500 g of the air dried powder from the seeds of *S. mahagoni* Jacq. were repeatedly extracted with solvents of increasing polarity.

Petroleum ether extract of seeds of *S. mahagoni* Jacq: Using the continuous hot percolation method and a Soxhlet apparatus, 2 litres of petroleum ether were used to extract the dried coarse powder of *S. mahagoni* Jacq. The extraction was finished after 72 hours, and after taking an extract of petroleum ether, the solvent was again distilled. A desiccator was used to retain the extracted material, which was brown in hue.

Benzene extract of seeds of *S. mahagoni* Jacq: The marc that remained after the petroleum ether extraction was dried and then extracted using the continuous hot percolation process with 2 liters of benzene. The extraction was finished after 72 hours. After filtering, distillation at low pressure was used to get rid of the solvent. The marc was dried for further extraction, and the light brown extract was kept in a desiccator.

Ethyl acetate extract of seeds of *S. mahagoni* Jacq: The marc that remained after the benzene extraction was dried and then extracted using the continuous hot percolation process using 2

liters of ethyl acetate. The extraction was finished after 72 hours. After filtering, distillation at low pressure was used to get rid of the solvent. The marc was dried for additional extraction before the dark brown extract was kept in a desiccator.

Ethanolic extract of seeds of *S. mahagoni* Jacq: After ethyl acetate extraction, the remaining marc was dried and then extracted with 2 liters of ethanol using the continuous hot percolation method. The extraction was finished after 72 hours. After filtering, distillation at low pressure was used to get rid of the solvent. The extract, which was semisolid in colour and yellowish brown, was kept in a desiccator. All of the aforementioned extracts were employed for pharmacological and biological screening, identification of plant ingredients, and phytochemical content analysis.

Phytochemical screening: To identify the plant's active ingredients, phytochemical experiments were performed on the various extracts of *S. mahagoni* Jacq. The outcomes were displayed in Table 2.

HPTLC analysis of ethanol extract *S. mahagoni* Jacq plant sample with oleanolic acid standard

Preparation of test solution: The provided plant sample of *S. mahagoni* Jacq's ethanolic seed extract was centrifuged at 3000 rpm for 5 minutes. For an HPTLC analysis, this solution served as a test solution.

Preparation of standard solution: For the analysis, 1 mg of the prescribed amount of oleanolic acid was combined with 1 ml of chloroform.

Mobile phase: Toluene-ethyl acetate (8:2)

Spray reagent: 10% H_2SO_4 in methanol

Sample application and spot development: The samples were spotted in bands of 5 mm using a Hamilton 100- l hype on an aluminum plate 60 GF_{254} that had been carpeted in silica gel (20 cm × 10 cm × 250 m; E. Merck). Prior to chromatography, the plates were actuated at 110°C for 5 twinkles after being prewashed with methanol. The distance between each band was kept at 6 mm. The CamagLinomet 5 automatic TLC sample applicator was used at a constant operation rate of 100 nl/s. The slit size was held to 5 mm × 0.45 mm, and the scanning speed used was 10 mm/s. Each track was tri-sectionally scrutinized, the monochromator band range was set to 20 nm, and birth correction was applied. Linear thrusting development was carried out in a 20 cm × 10 cm binary through glass chamber impregnated with the mobile phase. The optimized chamber achromatism time for mobile phase was 30 min at room temperature (25°C ± 2°C) at relative moisture of 60 ± 5. The length of chromatogram run was 9 cm. posterior to the development, HPTLC plates were dried in current of air with the help of air teetotaler in a rustic chamber with acceptable ventilation. On a CAMAG REPROSTAR 3 scanner running Palm pussycats software (winCATS1.3.4 interpretation), densitometry scanning was carried out in the reflectance absorbance mode at visible light, UV 254 nm, and UV 366 nm and the images were taken. Deuterium lights furnishing a nonstop UV diapason between 190 nm and 400 nm were used as the radiation source [6].

Derivatization: The formed plate was sprayed with the appropriate spray reagent and baked in a hot air oven at 100°C for drying. The plate was photographed utilising the photo-documentation (CAMAG REPROSTAR 3) chamber in visible light mode.

Scanning: Derivatization was followed by fixing the plate to the scanner stage of the CAMAG TLC scanner 3 and performing 500 nm scanning. It was noticed the peak table, peak display, and peak densitogram. The sample loaded plate was held in the TLC twin trough development chamber with the appropriate mobile phase up to 90 mm (after being saturated with solvent vapour).

Photo-documentation: To remove solvents from the created plate, hot air was used to dry it. The plate was held in a photo-documentation chamber (CAMAG REPROSTAR 3) while images were taken at visible, UV 254 nm, and UV 366 nm wavelengths.

RESULTS AND DISCUSSION

Phytochemical investigations of *Swietenia mahagoni* Jacq

The extraction of plant material and subsequent identification of the phytoconstituents are steps in the phytochemical analysis of a plant. 500 gm of the air-dried powder from the seeds of *S. mahagoni* Jacq. Were extracted using a solvent extractor in steps with increasing polarity, and the extracts were evaporated using a rotor evaporator to obtain the concentrate of active ingredient. The following solvents produced the highest extract yields: Petroleum ether (1.45%), benzene (1.68%), ethyl acetate (10.24%), and ethanol (12.86). The ethanol extract of HN was determined to have the highest yield (12.86%). In the Table 1 below, the % yield of various S. mahagoni Jacq seed extracts is reported [7].

Table 1: Successive solvent extraction of *Swietenia mahagoni* Jacq.

S. no.	Extracts	Colour and consistency	Percentage yield of extracts of *Swietenia mahagoni* Jacq. %(w/w)
1	Petroleum ether	Brown colour	1.45
2	Benzene	Pale brown colour	1.68

3	Ethyl acetate	Dark brown colour	10.24
4	Ethanol	Yellowish brown colour semi solid	12.86

Phytochemical screening: Below are the findings of the preliminary phytochemical screening tests conducted on the various solvent extracts of *S. mahagoni* Jacq. seeds. Alkaloids, carbohydrates, flavonoids, phytosterols, saponins, phenolic compounds, tannins, lignins, proteins, free amino acids, gums, and mucilage were all present in the petroleum ether extract, but glycosides, fixed oils, and fats were not. Alkaloids, carbohydrates, flavonoids, phenolic compounds, tannins, lignins, proteins, free amino acids, gums, and mucilage were all present in the benzene extract, but glycosides, fixed oils and fats, phytosterols, and saponins were not. Alkaloids, carbohydrates, glycosides, flavonoids, phytosterols, saponins, phenolic compounds, tannins, lignins, proteins, free amino acids, gums, and mucilage were all present in the ethanol acetate extract, but fixed oils and fats were not present. Alkaloids, sugars, glycosides, flavonoids, phytosterols, fixed oils and fats, saponins, phenolic compounds and tannins, lignins, proteins and free amino acids, gums, and mucilage are all present in ethanol extract (Table 2) [8].

Table 2: Preliminary phytochemical screening of *Swietenia mahagoni* Jacq. seed extracts.

Phytoconstituents	Petroleum ether extract	Benzene extract	Ethyl acetate extract	Ethanol extracts
Alkaloids	(+)	(+)	(+)	(+)
Carbohydrates	(+)	(+)	(+)	(+)
Glycosides	(-)	(-)	(+)	(+)
Flavonoids	(+)	(+)	(+)	(+)
Phytosterols	(+)	(-)	(+)	(+)
Fixed oils and fats	(-)	(-)	(-)	(+)
Saponins	(+)	(-)	(+)	(+)
Phenolic and tannins	(+)	(+)	(+)	(+)
Lignins	(+)	(+)	(+)	(+)
Proteins and free amino acids	(+)	(+)	(+)	(+)
Gums and mucilage	(+)	(+)	(+)	(+)

Note: (+)=indicates the presence; (-)=indicates the absence

HPTLC analysis of ESM-ethanol extracts of *S. Mahagoni* jacq. with oleanolic acid standard

For the HPTLC examination of *S. mahagoni* Jacq. samples and oleanolic acid with high resolution and repeatable results, mobile phases of various compositions were examined. Toluene: Ethylacetae (8:2) was used as the mobile phase to accomplish a satisfactory separation of the phyto constituents, which produced a peak for oleanolic acid at RF 0.34. Figure 3 shows the HPTLC plate of the ESM before derivatization, and Figure 3 shows the HPTLC plate of the ESM after derivatization. After derivatization (10% H_2SO_4 in ethanol was sprayed on plates, dried at room temperature, and plates were heated for 5 minutes in an oven at 105°C), it was possible to see that there was a pink coloured zone in the visible mode of the SEM track, which indicated the presence of oleanolic acid (Table 3 and Figures 5-11).

Table 3: HPTLC data of ethanolic seed extract of *S.mahagoni* Jacq (ESM).

Track	Peak	Rf	Height	Area	Assigned substance
Sample ESM	1	0.02	20.5	193.4	Unknown

Sample ESM	2	0.06	398.5	7463.4	Unknown
Sample ESM	3	0.09	116.7	1707.8	Fatty acid 1
Sample ESM	4	0.12	146.3	2498.5	Fatty acid 2
Sample ESM	5	0.14	135	2025.5	Fatty acid 3
Sample ESM	6	0.17	44.8	582.1	Fatty acid 4
Sample ESM	7	0.21	135.7	2135.4	Fatty acid 5
Sample ESM	8	0.25	201.2	4165	Fatty acid 6
Sample ESM	9	0.28	233.1	7305.3	Fatty acid 7
Sample ESM	10	0.34	157.4	4644.1	Oleanolic acid
Sample ESM	11	0.44	20.2	171.6	Fatty acid 1
Sample ESM	12	0.97	142.5	1309.2	Unknown
SO	1	0.34	53.2	497.8	Oleanolic standard

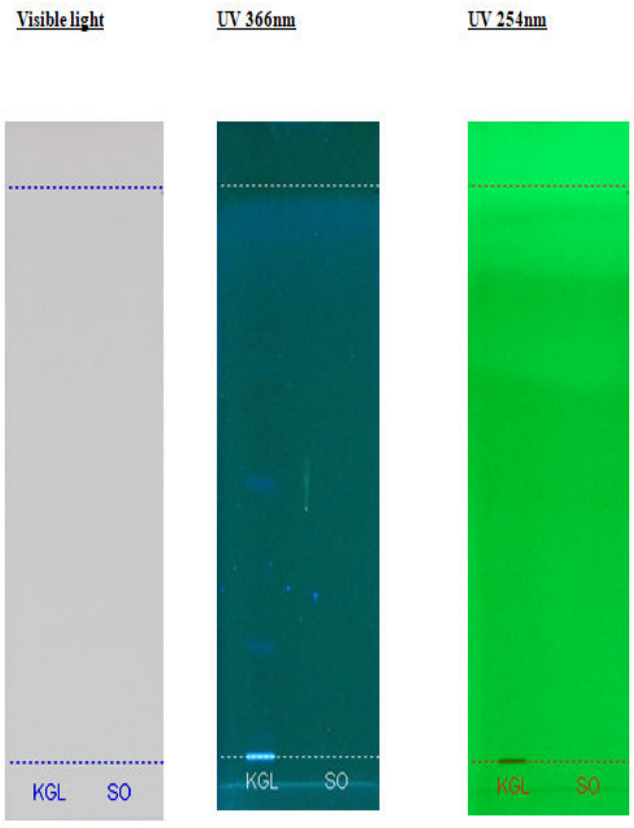

Figure 5: HPTLC plate of ESM before derivatization.

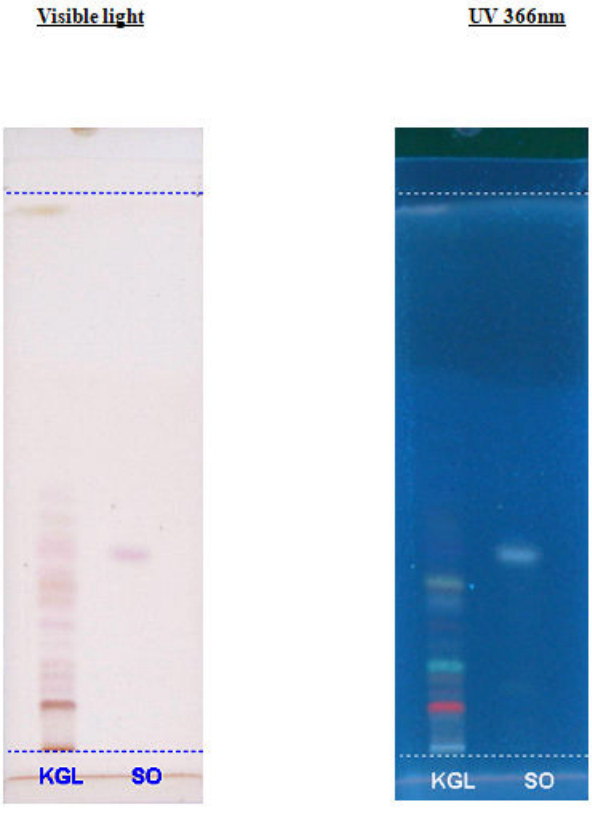

Figure 6: HPTLC plate of ESM after derivatization.

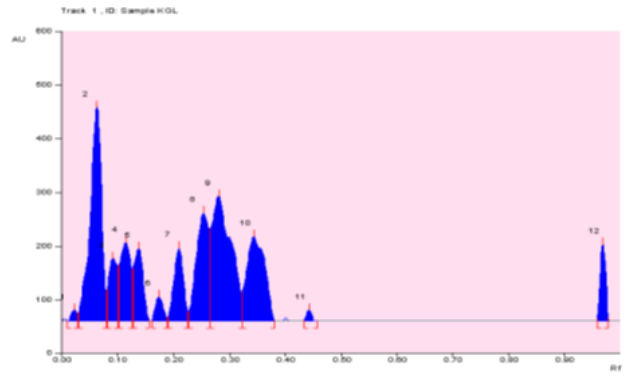

Figure 7: Sample KGL plant extracts sample-Baseline display (Scanned at 500 nm).

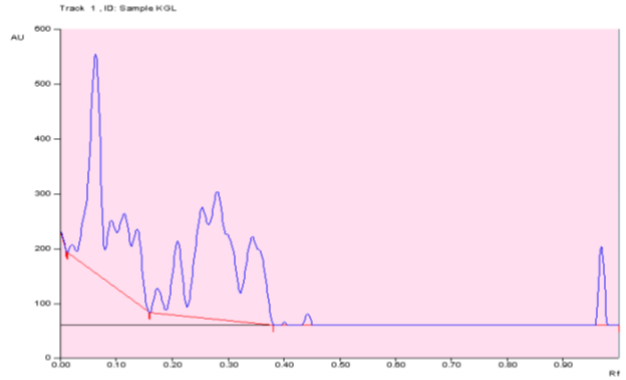

Figure 8: Sample KGL plant extracts sample peak densitogram display (scanned at 500 nm).

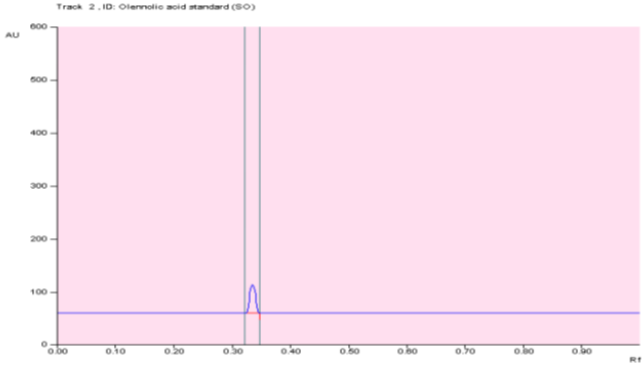

Figure 9: Track STD-Oleanolic acid standard baseline display (scanned at 500 nm).

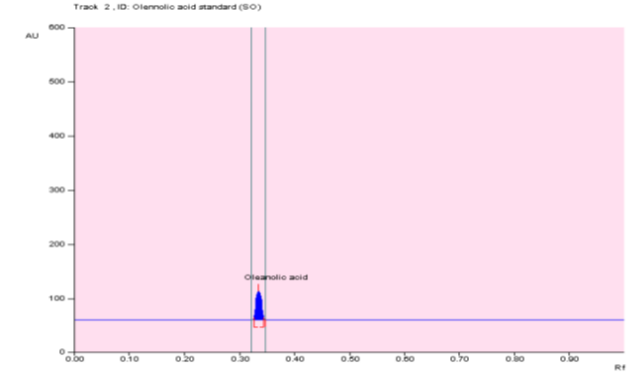

Figure 10: Track STD-Oleanolic acid standard peak densitogram display (scanned at 500 nm).

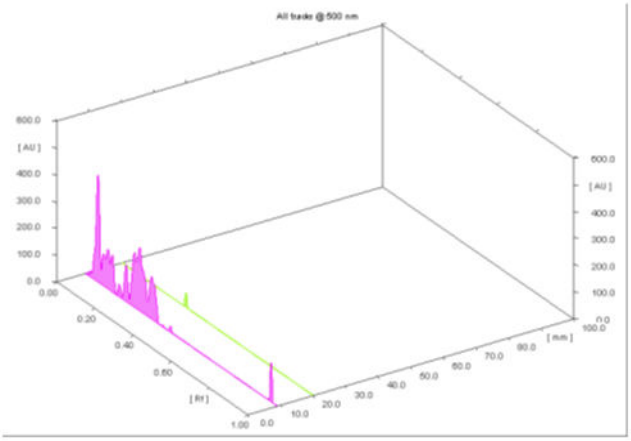

Figure 11: 3D display of all tracks.

Figures 10 and 11, respectively, depict the densitometric peak of the ethanolic seed extract of *S. mahagoni* Jacq (ESM) and oleanolic acid. Figure 5 displays the ESM and oleanolic acid 3D chromatogram peaks. Using toluene-ethylacetate (8:2), an ethanolic extract of *Swietenia mahagoni* Jacq. seeds was created. The HPTLC chromatogram displayed a total of 12 peaks with various Rf values and peakareas @500 nm. Both the standard Oleonolic acid and the ESM had the same Rf value (0.34) in the chromatogram. This verifies that *S. mahagoni* Jacq's (ESM) ethanolic seed extract contains oleonolic acid.

CONCLUSION

The current study focuses on evaluating the qualitative phytochemical potential and HPTLC analysis of *S. mahagoni* Jacq. (Meliaceae), a plant used in traditional Chinese medicine to treat diabetic mellitus. Using a Soxhlet apparatus and the continuous hot percolation process, the plant components were shade dried, shrunk in size, and simultaneously extracted with a variety of solvents, including petroleum ether, benzene, ethylacetate, and ethanol. The following solvents likely contributed to the percentage yields of the extracts: petroleum ether: 1.45%; benzene: 1.68%; ethyl acetate: 10.24%; and ethanol: 12.86. The ethanol extract of ESM (12.86%) had the highest percentage yield. For this research study, the ethanolic

extract was preferred because it produced a high yield. It was determined whether there were any flavonoids, amino acids, tannins, steroids, glycosides, or reducing sugars in the ethanolic extract of *S. mahagoni* Jacq seeds. Alkaloids, flavonoids, fixed oils, and lipids have all been detected in the ethanolic extract from this plant. When compared to the standard oleanolic acid, HPTLC analysis of the seeds of *S. mahagoni* Jacq reveals the presence of oleanolic acid. We need additional analysis in wet lab investigations based on the findings from the current study to evaluate and identify new medication candidates. Therefore, we can anticipate that using the seeds' extract of *S. mahagoni* Jacq could offer a natural diabetes treatment that avoids the drawbacks of synthetic drugs.

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