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Research Article

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## Pharmacognostical, Micromeretic Parameters & Preliminary Phytochemical investigation studies on *Gymnema sylvestre* (Gurmar). Leaves

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### ABSTRACT

*Gymnema sylvestre* (Asclepiadaceae), known as “gurmar” for its distinct property as sugar destroyer, is a reputed herb in the Ayurvedic system of medicine. The phytoconstituents responsible for sweet suppression activity includes triterpene saponins known as gymnemic acids, gymnemasaponins, and a polypeptide, gurmarin. Leaves is green, 2 to 6 cm long, 1 to 4 cm in diameter, Odour is characteristic, taste slightly bitter. It has been used in various Asian traditional medicines for the treatment arthritis, diuretic, anemia, osteoporosis, hypercholesterolemia, cardiopathy, asthma, constipation, microbial infections, indigestion, and anti-inflammatory. *G. sylvestre* has good prospects in the treatment of diabetes as it shows positive effects on blood sugar homeostasis, controls sugar cravings, and promotes regeneration of pancreas. The aim of the study is to cover the pharmacognostical, preliminary phytochemical screening and Micromeretics properties *Gymnema sylvestre* Leaves. Preliminary phytochemical examination of extracts of *Gymnema sylvestre* Leaves shows the presence of Alkaloid, carbohydrates, Glycosides and Steroids and Triterpenoids. Physicochemical parameters of fruit of the plant are like foreign organic matter (2.1%), total ash (8.44% w/w), acid insoluble ash (3.78% w/w) water soluble ash (25.12% w/w) Moisture content (2.23%) and Swelling index (2.90%) were found. Alcohol soluble extractive (18.92%), aqueous extractive values (25.12%) and pet-ether extractive values (11.50%) were found respectively. Micromeretic parameters were also determined and angle of repose (29.97), Bulk density (0.32), Tapped density (0.48), Carr’s Index (30.30) and Hausner’s Ration (1.28) were found respectively. In these present investigations, various pharmacognostical standization parameters such as macroscopy, microscopy and preliminary phytochemical screening were carried out which could be helpful in authentication *Gymnema sylvestre* Leaves. The result of the present study will also serve as reference material in the preparation of herbal monograph.

**Keywords:** *Gymnema sylvestre*, Asclepiadaceae, osteoporosis, hypercholesterolemia, cardiopathy, asthma, constipation

### ARTICLE INFO

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## 1. Introduction

Medicinal plants are various plants used in herbalism and thought by some to have medicinal properties. Few plants or their phytochemical constituents have been proven to have medicinal effects by rigorous science or have been approved by regulatory agencies such as the United States Food and Drug Administration or European Food Safety Authority. India is a country known for ancient scripts, the number system, invention of zero and Vedas. Medicines in India are used by about 60 per cent of the world's population. These are not only used for primary health care not just in rural areas in developing countries, but also in developed countries as well where modern medicines are predominantly used. While the traditional medicines are derived from medicinal plants, minerals, and organic matter, the herbal drugs are prepared from medicinal plants only [1-5]. *Gymnema sylvestre* (Asclepiadaceae) known as

“gurmar” for its distinct property as sugar destroyer, is a reputed herb in the Ayurvedic system of medicine. The phytoconstituents responsible for sweet suppression activity includes triterpene saponins known as gymnemic acids, gymnemasaponins, and a polypeptide, gurmarin. Leaves is green, 2 to 6 cm long, 1 to 4 cm in diameter, Odour is characteristic, taste slightly bitter.

It has been used in various Asian traditional medicines for the treatment arthritis, diuretic, anemia, osteoporosis, hypercholesterolemia, cardiopathy, asthma, constipation, microbial infections, indigestion, and anti-inflammatory. *G. sylvestre* has good prospects in the treatment of diabetes as it shows positive effects on blood sugar homeostasis, controls sugar cravings, and promotes regeneration of pancreas [6,7,8].

## 2. Materials and Methods

### Selection, Collection and authentication of plant/plant material:

The fresh leaves of *Gymnema sylvestre*, were collected in the months Jan 2014 to March 2014 from the in and around local areas of Bhopal District of M.P. and identified & authenticated by Dr Zia Ul Hasan, Professor, Head Dept. of Botany, Safia college of science Bhopal, M.P., and were deposited in Laboratory, Voucher specimen No. 470/Bot/Safia/2014 for leaves of *Gymnema sylvestre*. After authentication the plant parts were washed, shade dried and crushed to obtain coarse powder.

### Pharmacognostic examination:

#### (I) Macroscopic examination:

The macroscopy/morphology of the selected plant such as color, odor, size, shape, taste, and surface characters were carried out. [9] (Table: 1)

#### (II) Microscopic examination:

##### Leaves of *Gymnema sylvestre* :

The epidermal cells of lamina are square shaped with outer convex wall and thin cuticle. When viewed transversally, epidermal cell surface are interrupted with trichomes, which are uniseriate, multicellular with 2 to 5 celled, present in abundance on both the surfaces. Single layered closely arranged palisade cells are present just below the adaxial epidermis. Vascular bundles are amphicribal and the mesophyll is 3-5 celled thick. (Figure 1)

##### Micromeretic parameters: [9]

#### (i) Angle of repose:

The angle of repose of *Gymnema sylvestre* powder was determined using a glass funnel clamped on a retort stand 10 cm away from the flat surface of the bench. 50 g of the powder sample was placed into the funnel and allowed to flow freely to form a conical heap. The angle of repose was calculated from the heap using the equation as follows.(Table:2)

$$\tan \theta = h/r$$

$$\theta = \tan^{-1} h/r$$

Where, h = height of pile,  $\theta$  = angle of repose, r = radius of the base of the pile

#### (ii) Bulk Density and Tapped Density:

In the present study, we had taken the weighed quantity (50 gm) of shade-dried and presieved (#40/120) drugs powders and carefully added them to a cylinder with the aid of a funnel without any losses. The initial volume was noted and the sample was then tapped until no further reduction in volume was noted. The initial volume gave the bulk density value and after tapping the volume reduced, giving the value of tapped density [9].

(Table:2)

**(iii) Carr's index:** Carr's index has been used as an indirect method of quantifying powder flow ability from bulk density; Carr's index was calculated using results obtained from bulk and tapped densities above using the relation Carr' index (%) = Tapped density - Bulk density  $\times$  100 /Tapped density

**Hausner's ratio:** Hausner's ratio was determined using the results obtained from both bulk and tapped density. It was calculated using the formula as follows;

Hausner's ratio = Tapped density/ Bulk density

### Physical Evaluation:

#### Evaluation Parameters:

##### 1. Physical evaluation:

The dried part were subjected to standard procedure for the determination of various physicochemical parameters [10-14].

##### 2. Determination of foreign organic matter (FOM)

Accurately weighed 100 g of the drug sample and spread it out in a thin layer. The foreign matter should be detected by inspection with the unaided eye or by the use of a lens (6X). Separate and weigh it and the percentage present was

calculate. (Table-3)

### 3. Determination of moisture content (LOD):

Place about 10 g of drug (without preliminary drying) after accurately weighing in a tared evaporating dish and kept in oven at 1050 C for 5 hours and weigh. The percentage loss on drying with reference to the air dried drug was calculated. (Table-3)

### 4. Determination of swelling index

Swelling index is determined for the presence of mucilage in the leaves. Accurately weigh 1 g of the leaves and placed in 150 ml measuring cylinder, add 50 ml of distilled water and kept aside for 24 hours with occasional shaking. The volume occupied by the leaves after 24 hours of wetting was measured. (Table-3)

### 5. Determination of ash value

The determination of ash values is meant for detecting low-grade products, exhausted drugs and sandy or earthy matter. It can also be utilized as a mean of detecting the chemical constituents by making use of water-soluble ash and acid insoluble ash.

### 6. Total ash:

Accurately about 3 gms of air dried powder was weighed in a tared silica crucible and incinerated at a temperature not exceeding 450<sup>0</sup>C until free from carbon, cooled and weighed and then the percentage of total ash with reference to the air dried powdered drug was calculated. The percentage of total ash with reference to the air-dried drug was calculated. (Table-4)

### 7. Acid insoluble ash

The ash obtained in the above method was boiled for 5 minutes with 25ml of dilute HCl. The residue was collected on ash less filter paper and washed with hot water, ignited and weighed. The percentage of acid insoluble ash was calculated with reference to the air dried drug. (Table-4)

### 8. Water soluble ash:

The ash obtained in total ash was boiled for 5 minutes with 25 ml of water. The insoluble matter was collected on an ash less filter paper, washed with hot water and ignited to constant weight at a low temperature. The weight of insoluble matter was subtracted from the weight of the ash. The difference in weights represents the water soluble ash. The percentage of water soluble ash with reference to the air dried drug was calculated. (Table-4)

### 9. Determination of extractive value

Place about 4.0g of coarsely powdered air-dried material, accurately weighed, in a glass-stoppered conical flask. Macerate with 100ml of the solvent specified for the plant material concerned for 6 hours, shaking frequently, then allow to stand for 18 hours. Filter rapidly taking care not to lose any solvent, transfer 25 ml of the filtrate to a tared flat-bottomed dish and evaporate to dryness on a water bath. Dry at 105°C for 6 hours, cool in a desiccator for 30 minutes and weigh without delay. Calculate the content of extractable matter in mg per g of air dried material. For ethanol-soluble extractable matter, use the concentration of solvent specified in the test procedure for the plant material concerned; for water-soluble extractable matter, use water as the solvent. (Table-5)(Graph-1)

### Extraction:

Sample were shattered and screened with 40 mesh. The shade dried coarsely powdered (250gms) were loaded in Soxhlet apparatus and was extracted with ethanol until the extraction was completed. After completion of extraction, the solvent was removed by distillation. The extracts were dried using rotator evaporator. The residue was then stored in dessicator for further used for chemical evaluation.

### Phytochemical Screening: [10-15]

Preliminary phyto chemical screening was carried out by using standard procedure. The phyto chemical screening showed the presence of alkaloids, glycoside, carbohydrates, saponins, fats and oils, flavonoids, tannins and resins in the respective drugs. (Table: 6).

**Table 1:** Morphological Parameter

S. No	Name of the drug	Part of the plant	Size	Shape	Color	Odour	Taste
1.	<i>Gymnema sylvestre</i>	Leaves	2-6 cm length 1-4 cm width	Simple, Petiolate, rounded to cordate base	Green	Characteristics	Slightly Bitter and Astringent

**Table 2:** Micromeretic Parameters

S. No	Drug	Angle of repose	Bulk density	Tap density	Carr's index	Hauser Ratio
1.	<i>Gymnema sylvestre</i>	29.97	0.32	0.48	30.30	1.28

**Table 3:** Physico-chemical Characteristics

S. No	Name of The Drug	Foreign Organic Matter (FOM) (% w/w)	Swelling index (SI) (% w/w)	Moisture content (MC) (% w/w)
1.	<i>Gymnema sylvestre</i>	2.1	2.90	2.23

**Table 4:** Percentage Ash Values

S. No	Name of The Drug	Total Ash Value(TA) (% w/w)	Acid Insoluble Ash Value(AIA) (% w/w)	Water Soluble Ash Value(WSA) (% w/w)
1.	<i>Gymnema sylvestre</i>	8.44	3.78	25.12

**Table 5:** Solvent Extractive Values

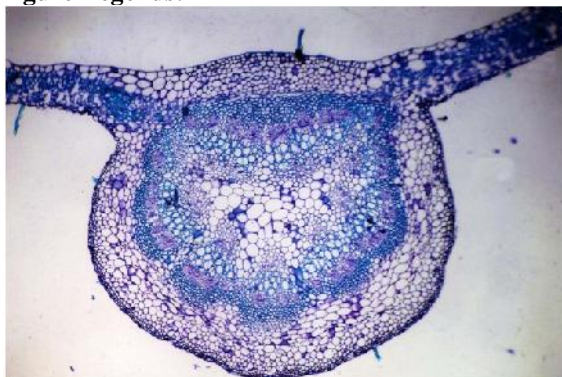
S. No	Name of the drug	Water soluble Extractive value (%w/w)	Alcohol soluble Extractive value (%w/w)	Pet. ether soluble extractive value (%w/w)
1.	<i>Gymnema sylvestre</i>	25.12	18.92	11.50

**Table 6:** Qualitative Phytochemical Tests

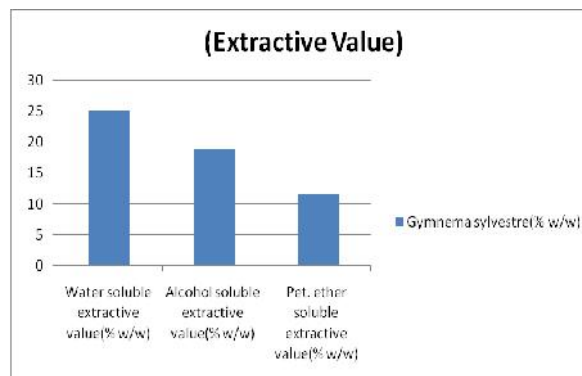
S. No	Compound	Ehtanolic extract of <i>Gymnema sylvestre</i>
1.	Carbohydrates	+
2.	Glycosides	+
3.	Alkaloids	+
4.	Protein & Amino acid	-
5.	Tannins & Phenolic compounds	-
6.	Flavonoids	-
7.	Fixed oil and Fats	-
8.	Steriods & Triterpenoids	+
9.	Waxes	-
10	Mucilage & Gums	+

Where, + = Present, - = Absent

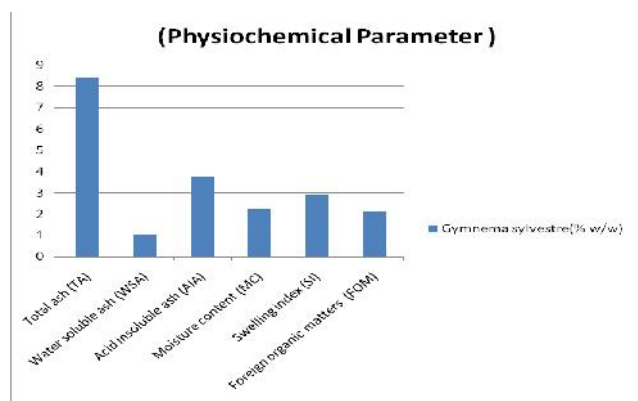
**Figure Legends:**



**Figure 1:** T.S. of Leaves of *Gymnema sylvestre*



**Graph 1:** Solvent extraction values of *Gymnema sylvestre*



**Graph 2:** Physiochemical Properties of *Gymnema sylvestre*  
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### 3. Results and Discussion

*Gymnema sylvestre* Leaves have provided many remedies for various diseases from ancient days to now a day. . The present study is associated to pharmacognostical, physical constants and preliminary phytochemical screening of *Gymnema sylvestre* Leaves. Leaves is green, 2 to 6 cm long, 1 to 4 cm in diameter, Odour is characteristic, taste slightly bitter. Preliminary phytochemical examination of extract of *Gymnema sylvestre* Leaves shows the presence of Alkaloid, carbohydrates, Glycosides, Steriods & Triterpenoids.

Physicochemical parameters of Leaves of the plant are foreign organic matter (2.1%), total ash (8.44% w/w), acid

insoluble ash (3.78% w/w) water soluble ash (25.12% w/w) Moisture content (2.23%) and Swelling index (2.90%) were found. Alcohol soluble extractive (18.92%), aqueous extractive values (25.12%) and pet-ether extractive values (11.50%) were found respectively. Micromeretic parameters were also determined and angle of repose (29.97), Bulk density (0.32), Tapped density (0.48), Carr's Index (30.30) and Hausner's Ration (1.28) were found respectively.

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#### Discussion:

For the proper identification of plant, physicochemical parameters provide useful information. From the continuing studies it can be accomplished that the above pharmacognostical characteristics, phytochemical parameters, Micromeretic parameters, together may be utilized for the future studies on *Gymnema sylvestre* Leaves This makes the plant beneficial for the future pharmacological activities.